GRIGORE T. POPA UNIVERSITY OF
MEDICINE AND PHARMACY IASI

HABILITATION THESIS

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PUBLIC HEALTH AND MANAGEMENT

Interferences and Perspectives of Research in Public Health & Management

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ABSTRACT OF THE HABILITATION THESIS

The present Habilitation Thesis titled „Interferences and Perspectives of Research in Public Health and Management" is a synopsis of my professional, scientific and academic achievements, during 1997 to 2018, and at the same time, underlines the development of my career.

The thesis was elaborated in accordance with: (1) the Order 6129/2016 of the Romanian Ministry of Education and Research, on obtaining the Habilitation Certificate, (2) the recommendations of the National Council for Attestation of Titles, Diplomas and Certificates (CNATDCU) and (3) the own Methodology of the Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania.

This Habilitation Thesis was structured in three sections referring to: the results of the personal scientific research of the post-doctoral period and their dissemination (Section A), the prospects for further development of the career (Section B) and the references, as proof of insertion in the national and international context of knowledge on the domain (Section C).

On this main sections, I added a synthesis of my entire career, which brings in attention the whole path, from the moment of finishing the university studies (1989) to the present status, presenting: (1) the personal evolution (until the acquisition of the professional degree of primary doctor in two related specialties, also found in the university curriculum: Food Hygiene and Nutrition; Public Health and Management), (2) and academic path (from admission into the university environment as instructor through competition, to associate profesor).

My doctoral research was completed in 1997, with the title of Doctor of Medical Sciences, following the public support of my PhD thesis. In the PhD thesis titled "Comparative study of the effectiveness of some methods of prevention of dental decay in the infantile population", I made a synthesis of the main scientific information in the field, bringing a series of personal contributions regarding the risk factors study, highlighting the direct correlation between the consumption of sugar/inhabitant and the carious morbidity level. Through a modern approach to prophylaxis of carious disease at the population level, I have achieved: (1) the preventive strategies presentation, with their advantages and disadvantages, (2) the presentation of cariopreventing policies and programs. In the experimental-applicative domain: (3) I evaluated the effectiveness of three programs for the prevention of carious disease in children, applied in children's homes and schools in Iasi County, (4) knowledge of the spread of fluoride in the drinking water sources, both on the territory of Moldova and Iaşi County, (5) highlighting the inverse correlation between the fluorine level in the water and the carious morbidity level, (6) I designed and realized a relational database for the dynamic evaluation of the oro-dental health of children, which enabled the computer-assisted statistical processing the data and the calculation of the efficiency indicators of the implemented cariopreventive programs. So, is the first study to track and quantify the effectiveness of combining two or more methods in prevention.

Although my postdoctoral period (from 1997 to 2018), can be characterized by the involvement in a wide range of research topics; the key initiatives in scientific research can be grouped in two main directions that underpin the thesis structure.

Consecutively,

-In Capther I, "SCIENTIFIC CONTRIBUTIONS IN MANAGEMENT AND PUBLIC HEALTH", I approached the main *issues of public health* (such cancer, nutrition, diabetes, the medical-social problem of the elderly, the problem of disadvantaged population groups), and *health management issues* (as quality management of health services, human resources

management in the health sector, management of negotiation in Dental Medicine), and

-In Capther II „SCIENTIFIC CONTRIBUTIONS IN PUBLIC HEALTH DENTISTRY AND MEDICAL-DENTAL MANAGEMENT", I approached the main *issues of public health dentistry* (the interface between general and oral diseases, caries disease, oral cancer) and the issues related to *management and marketing of oral-dental health services* (management & marketing of dental office).

The habilitation thesis includes two other distinct chapters also:

-Chapter III, reviews the professional evolution (from the young doctor, to the the acquisition of the professional degree of primary physician in two related disciplines: Hygiene of Nutrition and Nutrition, Public Health and Management) and academic course (from admission in the university environment as a presenter through competition to university lecturer), and

-Chapter IV is dedicated to the presentation of my plans for the next years.

The synthesis of postdoctoral research activity reveals my active involvement in: European/ international projects and 128 *in extenso* publications (of which 19 in ISI Thompson rated journals, 29 in journals or in international databases).

Moreover, the national and international visibility of research activity is demonstrated by a Hirsch index = 9 in the Thomson ISI Web of Science Core Collection (93 citations) and a Hirsch index = 6 in Scopus (77 citations). Also, I received 2 awards for research works: (1) Bronze medal at EUROINVENT 2018- European Exhibition of Creativity and Innovation, Iași, Romania, 2018 and (2) The Swiss Society of Periodontology Award at EUROPERIO 3, Geneva, 2000.

In *conclusion*, in the habilitation thesis, I tried to synthesize the main achievements and perspectives of research activities in the vast and dynamic Public Health and Management domain.

REZUMATUL TEZEI DE ABILITARE

Prezenta teză de abilitare intitulată „Interferențe și Perspective ale Cercetării în Sănătate Publică și Management" este o prezentare sintetică a realizărilor științifice, academice și profesionale din perioada 1997-2018, care, subliniază în același timp, și planurile de viitor și direcțiile de dezvoltare a carierei.

Respectând (1) Ordinul 3121/27.01.2015 a Ministerului Educației și Cercetării din Romania privind organizarea procesului de obținere a certificatului de abilitare, (2) recomandările Consiliul Naţional de Atestare a Titlurilor, Diplomelor şi Certificatelor Universitare (CNATDCU), (3) și metodologia proprie a Universității de Medicină și Farmacie Grigore T. Popa, prezenta teză de abilitare a fost structurată în trei secțiuni. Acestea fac referire la: cercetarea științifică proprie din perioada postdoctorală și diseminarea rezultatelor acesteia (Secțiunea A), perspectivele de dezvoltare a carierei (Secțiunea B) şi referințele bibliografice (Secțiunea C), ca dovadă a inserției în contextul național şi internațional al cunoaşterii pe domeniul abordat.

Cercetarea mea doctorală, coordonată de Acad. dr. Gh. Zamfir, a fost finalizată în 1997. În teza de doctorat intitulată "Studiu comparativ al eficacității unor metode de prevenire a cariei dentare în populația infantilă" am făcut o sinteză a principalelor informații științifice în domeniu, aducând o serie de contribuții personale privind studiul factorilor de risc, evidențiind corelația directă dintre consumul de zahăr/locuitor și nivelul morbidității carioase. Prin abordarea modernă a profilaxiei bolii carioase la nivelul populației am realizat: (1) prezentarea strategiilor preventive, cu avantajele și dezavantajele acestora, (2) prezentarea politicilor și programelor de cărioprevenție. În plan experimental-aplicativ: (3) am urmărit performanța și am evaluat periodic eficacitatea a trei programe de prevenire a bolii carioase, programe aplicate în casele de copii, școli și respectiv licee din județul Iași, (4) cunoașterea răspândirii fluorului în sursele de apă potabilă, atât în județul Iași cât și de pe teritoriul Moldovei (5), evidențiind relația inversă dintre nivelul de fluor din apă și morbiditatea carioasă, (6) am proiectat și am realizat o bază de date relațională pentru evaluarea dinamică a sănătății oro-dentare a copiilor, care a permis prelucrarea statistică a datelor și calcularea indicatorilor de eficiență ai programelor cario-preventive implementate. Mai mult, a fost primul studiu care a urmărit și cuantificat eficiența combinării a două sau mai multe metode de prevenire a cariei dentare la copii.

Perioada postdoctorală (1997 - 2018) este caracterizată prin implicarea într-o gamă largă de subiecte, individualizându-se două direcții principale de cercetare care fundamentează structura tezei.

Consecutiv,

-în Capitolul I, intitulat "CONTRIBUȚII ȘTIINȚIFICE ÎN MANAGEMENT ȘI SĂNĂTATE PUBLICĂ", am relevat contribuția personală în studiul principalelor probleme de sănătate publică (ex. cancer, diabet, violență, problematica medico-socială a persoanelor vârstnice) și probleme de management al sănătății;

-în Capitolul II, "CONTRIBUȚII ȘTIINȚIFICE ÎN SĂNĂTATEA PUBLICĂ ÎN MEDICINA DENTARĂ ȘI MANAGEMENTUL MEDICO-DENTAR", am abordat principale problemele ale sănătății publice în medicina dentară (interfața dintre bolile generale și cele oro-dentare, boala carioasă, cancerul oral) și aspecte legate de managementul și marketingul serviciilor de sănătate oro-dentară (managementul și marketingul cabinetului de medicină dentară).

Teza de abilitare include, de asemenea, alte două capitole distincte:

-Capitolul III trece în revistă evoluția pe plan profesional (de la tânăr medic până la dobândirea gradului profesional de medic primar în două specialități conexe: Igiena alimentației și nutriție; Sănătate publică și management), și didactic (parcursul academic, de

la accederea în mediul universitar ca preparator titular prin concurs, până la conferențiar universitar);

-Capitolul IV este dedicat prezentării planurilor de viitor.

Sinteza activității de cercetare din perioada postdoctorală evidențiază: implicarea în 3 proiecte europene/internaționale, publicarea *în extenso* a 128 de articole (dintre care 19 în reviste cotate ISI Thompson, 29 în reviste de specialitate sau în baze de date internaționale).

Vizibilitatea națională și internațională a activității de cercetare este demonstrată de un Hirsch-index = 9 în Thomson ISI Web of Science Core Collection (93 citări) și Hirsch-index = 6 in Scopus (77 citări). De asemenea, am primit 2 premii pentru cercetare științifică: (1) Medalia de bronz la EUROINVENT 2018- Expoziția Europeană de Creativitate și Inovare, Iași, România, 2018 și (2) Premiul Societății Elvetiene de Parodontologie, la EUROPERIO 3 (Al Treilea Congres European de Parodontologie), Geneva 2000.

În *concluzie,* în prezenta teză de abilitare am încercat să sintetizez principalele realizări științifice proprii și perspectivele activității de cercetare într-un domeniu vast și dinamic, cel al *Sănătății Publice și Managementului*.

CONTENTS:

SECTION A.

SCIENTIFIC, ACADEMIC AND PROFESSIONAL ACHIEVEMENTS ON INTERDISCIPLINARY THEMATIC DIRECTIONS AND SPECIALIZED ONES

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SECTION A.

SCIENTIFIC, ACADEMIC AND PROFESSIONAL ACHIEVEMENTS ON INTERDISCIPLINARY THEMATIC DIRECTIONS AND SPECIALIZED ONES

My research activity has been focused, primarily, on the following two directions:
-on MANAGEMENT AND PUBLIC HEALTH,
-and PUBLIC HEALTH DENTISTRYAND MEDICAL-DENTAL MANAGEMENT.

Chapter I.
SCIENTIFIC CONTRIBUTIONS IN MANAGEMENT AND PUBLIC HEALTH

I.1 INTRODUCTION

The Order of the Ministry of Health of Romania, 398/28.04.1992 renamed the Social Medicine specialty according to the Anglo-Saxon International Nomenclature, now the new name of the specialty is Public Health and Management [1]. As a result, graduate doctors from the Faculty of Medicine are admitted to postgraduate studies of long-term specialization in Public Health and Management, the duration of training in the specialty being 4 years. At the end of the training period, as a result of passing the examination of specialist physician, a diploma certifying their specialization in public health and management is given to them.

A **definition of public health** was originally put forward by Winslow in 1920 as:
"The science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in personal hygiene, the organization of medical and nursing services for early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for maintenance of health, organizing these benefits in such a fashion as to enable every citizen to realizes his birthright of health and longevity" [2].

Marks L, Hunter JD, Alderslade R, summarized the main definitions of public health [3] from a selection of key institutions, both internal to World Health Organization (WHO) and external ones (Table 1).

Table 1.
DEFINITIONS OF PUBLIC HEALTH USED BY MAJOR STAKEHOLDERS

Organization	Public Health Concept	Source	Comments
Internal			
WHO HQ	"Public health refers to all organized measures (whether public or private) to prevent disease, promote health, and prolong life among the population as a whole. Its activities aim to provide conditions in which people can be healthy and focus on entire populations, not on individual patients or diseases. Thus, public health is concerned with the total system and not only the eradication of a particular disease."	Glossary of globalization, trade and health terms. Geneva, WHO, 2011 (accessed at: http://www.who.int/trade/glossary/en/) [4]	- Art and science - Organized efforts of the society +Among the population as a whole
WHO HQ	"The art of applying science in the context of politics so as to reduce inequalities in health while ensuring the best health for the greatest number."	The World Health Report 1998; Life in the 21st century: A vision for all. Geneva, WHO, 1998 [5]	- Art and science + Best health + Politics + Inequalities
WHO HQ	"Public health is the science and art of promoting health, preventing disease, and prolonging life through the organized efforts of society."	Nutbeam D. Health promotion glossary. Geneva, World Health Organization, 1998 [6]	Acheson definition
WHO Europe	"The science and art of preventing disease, prolonging life and promoting mental and physical health and efficiency through organized community efforts. Public health may be considered as the structures and processes by which the health of populations is understood, safeguarded and promoted through the organized efforts of society."	Health 21: the health for all policy framework for the WHO European Region; Health for All Series no 6, WHO Europe, Copenhagen, 1999 [7]	+Mental and physical health +Efficiency -Organized efforts of society +Organized community efforts

European Observatory on Health Systems and Policies	"Public health is the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals."	European Observatory on Health Systems and Policies Glossary (accessed at:http:// www.euro.who.int/ observatory/ glossary/topp age) [8]	Wanless, definition +Art and science +Organized efforts +Individual choices
External			
European Commission	Public health is the science and art of preventing disease, prolonging life and promoting mental and physical health and efficiency through organized community effort. Public health may be considered as structures and processes by which the health of the population is understood, safeguarded and promoted through the organized efforts of society (adapted from Nutbeam [6]).	DG SANCO. Health Inequalities Glossary, 2007(accessed at: http://ec.europa.eu/health/ ph_determinants/socio_ec onomics/documents/ev_0 60302_co03a_en.pdf) [9]	Based on Acheson definition and Nutbeam definition
European Public Health Association, (EUPHA) and the Association of Schools of Public Health in the European Region	"Public health is the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals."	Programme of the 3rd European Public Health Conference, Integrated Public Health, Amsterdam, The Netherlands, 2010. (accessed at: www.aspher.org/pliki/pdf /amsterdam2.pdf) [10]	
The American Public Health Association (APHA)	The American Public Health Association synthesized the many definitions and perspectives on public health and identified six basic principles of contemporary public health theory and practice: a) emphasis on collective responsibility for health and the prime role of the state in protecting and promoting the public's health; b) focus on whole populations; c) emphasis on prevention, especially the population strategy for primary prevention; d) concern for the underlying socioeconomic determinants of health and disease, as well as the more proximal risk factors; e) multi-disciplinary basis which incorporates quantitative and qualitative methods as appropriate; and f) partnership with the populations served.	American Public Health Association (accessed at: www.apha.org) [11]	-Art and science +Social determinants

(Aspects which are emphasized or omitted are indicated in the comments column).

Public Health might be misunderstood because this medical science and practice is difficult to define. At one level, public health involves medical care provided within a community and outside a hospital setting. In a different context, public health can have global repercussions and refer to efforts to prevent epidemics and improve the health of entire population.

The Centers for Disease Control and Prevention (CDC, Atlanta, USA) says:…"*Public Health are complex and required the coordination of multiple organizations*". Together, these systems should strive to provide the following essential services (fig. 1) outlined by the CDC:

1.Monitor health status to identify and solve community health problems.

2.Diagnose and investigate health problems and health hazards in the community.

3.Inform, educate and empower people about health issues.

4.Mobilize community partnerships and action to identify and solve health problems.

5.Develop policies and plans that support individual and community health efforts.

6.Enforce laws and regulations that protect health and ensure safety.

7.Link people to needed personal health services and assure the provision of health care when otherwise unavailable.

8.Assure competent public and personal health care workforce.

9.Evaluate effectiveness, accessibility, and quality of personal and population-based health services.

10. Research for new insights and innovative solutions to health problems [12].

According to the WHO, Public Health is interdisciplinary.

For example, epidemiology, biostatistics and health services management are all relevant.

Environmental health, community health, behavioral health, health economics, health management, public policy, mental health and occupational safety are other important subdomains.

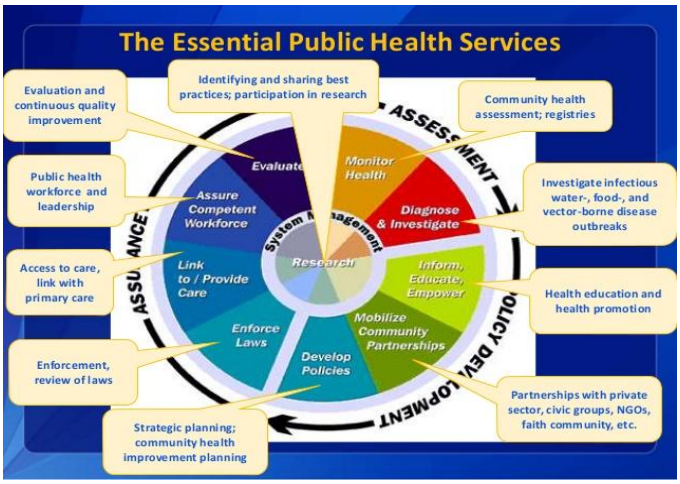


Figure1. **Public Health essential services**- outlined by Centers for Disease Control and Prevention (CDC, Atlanta, USA) [12].

An Evolving Approach to Public Health

Public health has been evolving over time. From the late 19th century through much of the 20th century, an era we call Public Health 1.0, public health practice was modernized through the advances in epidemiology, vaccines, antibiotics and lab sciences, as well as a system of sanitation and standards in food and water safety.

The era of Public Health 2.0 was marked by the 1988 publication of "*The Future of Public Health"*, an Institute of Medicine report which found that public health authorities were so overwhelmed by the demands of providing safety-net clinical care that they struggled to address the rising burden of chronic disease. Since its call to action nearly three decades ago, governmental public health agencies have become more professionalized and standardized. The core tenets of Public Health 1.0 and 2.0 remain essential by today [13].

Public Health Research can contribute to knowledge and in other instances it involves ongoing systematic data collection activities and dissemination of data to those who need to know in the prevention and control of the public's health (See fig. 2 with just some examples of public health research under the core functions of public health and its essential services).

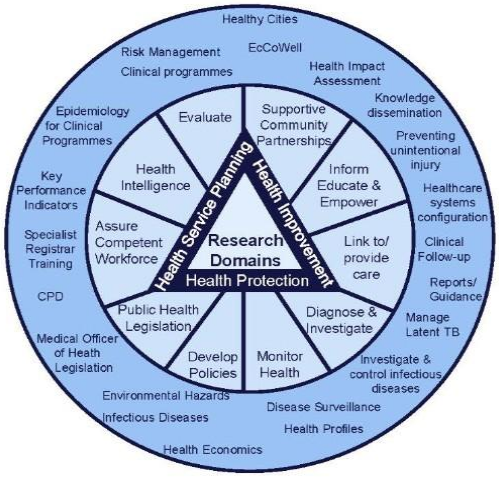


Figure 2. **Public Health Research domains** [13]

In public health, relevant, high quality research is essential for: health assessment, health policy development and providing of the health services. Such research provides new perspectives and creative solutions to major public health issues and provides the necessary data for both health programs activities and for development of health policy.

So, public health practice is based on:

-science, both classical and natural medical sciences (biology, physical risks) and increasingly, social and behavioral sciences (sociology and psychology);

-"*our understanding of human culture and behaviors that influence health and disease*" [13].

Prioritization of public health issues: *the criteria*

Addressing all the unmet needs and access issues identified in the needs assessment is rarely feasible. Therefore, it necessary to identify the needs that has of highest priority for the community. Determining health priorities helps direct resources to the programs that matter most to communities. Additionally, legitimate documented needs, including those that cannot be immediately addressed, can be useful for responding quickly to funding opportunities that may become available in the future.

Several priorities may be identified, some to be addressed immediately and others to be dealt with later. It is important to reach consensus on oral health priorities and to then create realistic objectives to address these priorities.

The following criteria [13] may be helpful in making decisions about priorities:

-*Scale of the Problem.*

-*Impact of Addressing the Problem*. Assess the feasibility and impact of addressing the problem, and correlate the two.

-*The Size or Extent of the Problem.* Assess and compare the perceived size or extent of the problem (how many individuals are affected), the seriousness of the problem, and the feasibility of implementing evidenced-based interventions that will result in improved outcomes.

-*Indicators*

Compare local health indicators to national health indicators. Use a ranking system (e.g., 1–5) to identify indicators as "better than," "same as," or "worse than," and then arrive at a consensus about where the community should focus its efforts.

-*Availability of Acceptable Interventions*

Assess the availability of interventions, the feasibility of implementing such interventions, and their acceptability for addressing a public health issue using the Priority Rating System for Public Health Programs (PEARL) Framework, a tool for assessing the socioeconomic, legal, and political viability of various interventions.

The framework looks at the following:

P =	Propriety; is an intervention suitable?
E =	Economics; does it make economic sense to address this problem?
A =	Acceptability; will the community agency accept an emphasis on this problem, and will they accept the proposed intervention?
R =	Resources; are funding and other resources available or potentially available?
L =	Legality; do the current laws allow the intervention to be implemented, and if not, is it worthwhile to expend time, energy, and resources working for legislative and regulatory change?

I.2 RESEARCH ON THE IMPORTANT PUBLIC HEALTH ISSUES

The new EU framework programme for research and innovation during the period of 2014-2020 will provide financing opportunities to approach the social challenges in the areas of health, demographic changes and wellbeing.

The habilitation thesis is consistent with the "2014-2020 National Health Strategy" and the "Plan of Actions for 2014-2020 to implement the National Strategy", adopted in Romania in 2014 November [14].

I.2.1 Chronic Non-communicable Diseases as Public Health Issues

Non-communicable chronic diseases (NCDs) [15], such as cardiovascular disease, cancer, diabetes, have long been the leading cause of death (fig. 3) and disability. Globally, more than 70% of deaths are due to NCDs.

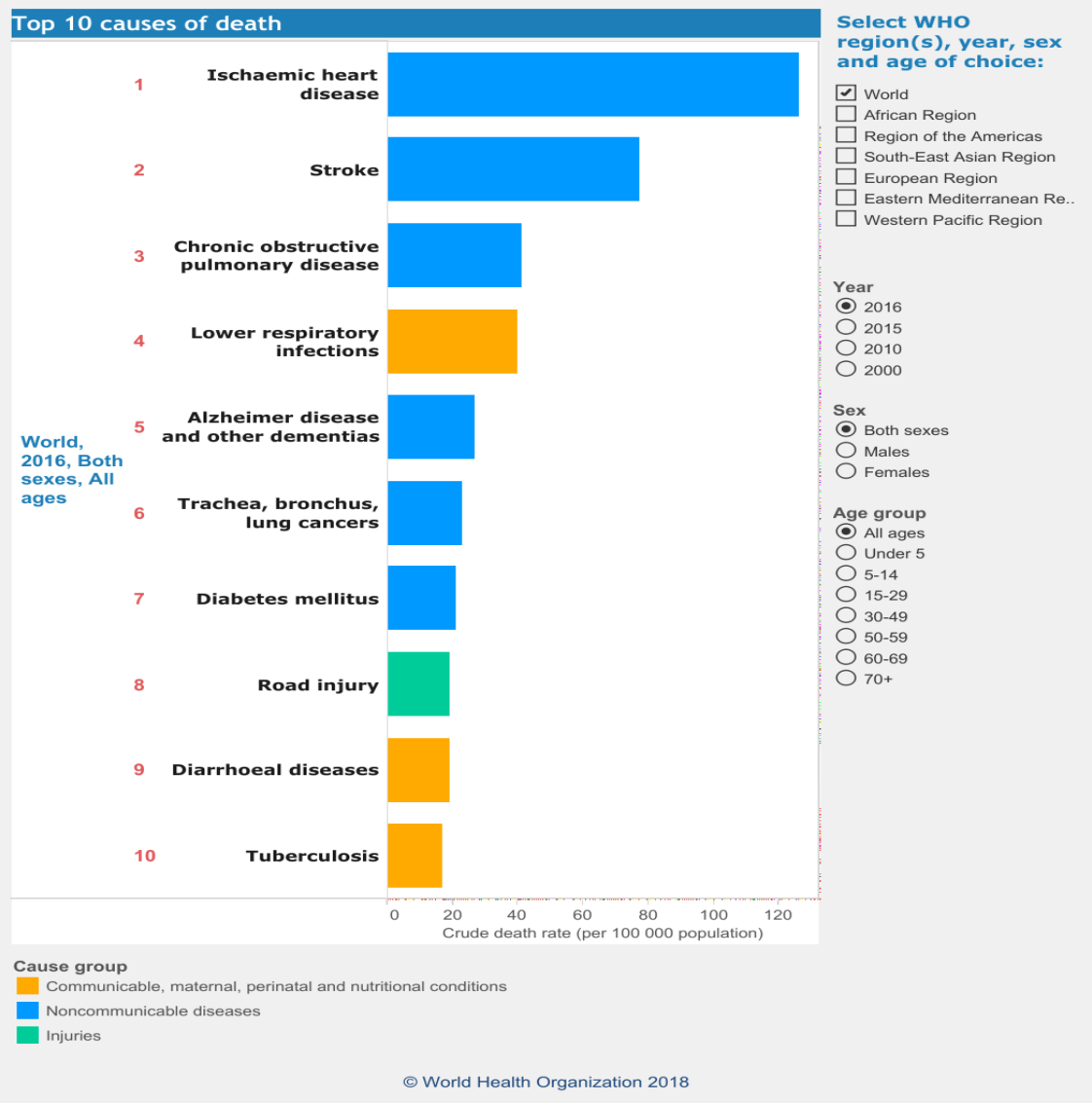


Figure 3. **Non-communicable chronic diseases in the Top 10 causes of death worldwide (**in 2016).

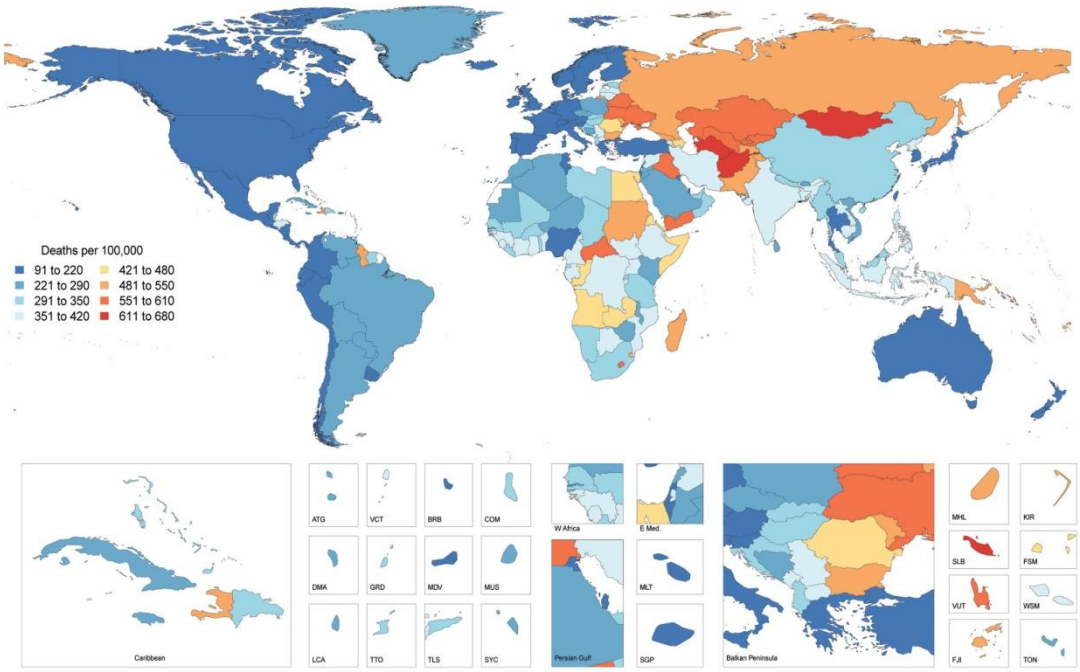
Non-communicable chronic diseases represent a global public health issue [16] as major contributors to the burden of diseases worldwide; NCDs represent two-thirds of the total burden of disease in middle-income countries and are expected to grow to three quarters by

2030, usually alongside their economic development. In United States (USA), a developed country of the world, more than 87% of Americans have at least one chronic condition [17].

Non-communicable chronic diseases directly affect the general health budget, employee productivity and the economies of the world. Treatment of NCDs accounted for about 75% of USA healthcare spending [18].

Four modifiable risk factors are the main factors that cause NCDs, associated disability and premature death: lack of physical activity, inappropriate nutrition, tobacco use and excessive alcohol consumption. In principle, if a risk factor can be modified, then morbidity (disease and sufferingat the population level) and avoidable mortality (early death) can be avoided or prevented. Therefore, preventive strategies and health promotion policies seek for ways to reduce the impact of modifiable risk factors at the population level [18].

Cardiovascular disease (CVDs) is a major public health issue globally. Throughout the world, it is the major public health issue that is dominated by death statistics in last decades and accounts for nearly half of NCDs. Cardiovascular diseases [19] take the lives of 17.7 million people every year, 31% of all global deaths (fig. 4).



Roth, G.A. et al. J Am Coll Cardiol. 2017;70(1):1-25.

Figure 4. Global **Cardiovascular Diseases Age-standardized Mortality Rates- 2015** [19]

Cardiovascular diseases, heart and blood vessels diseases are the main causes of morbidity and mortality worldwide. Cardiovascular disease is also a major cause of disability and declining quality of life [20].

In Europe, cardiovascular disease is the number one cause of mortality both in women and men; it is responsible for about ½ of the total deaths with more than 1.9 million deaths each year in the European Union [21]. Within this group of patients, the acute myocardial infarction (AMI) is responsible for ¾ of heart diseases mortality (fig. 5) [22, 23].

The European Council recognized the need for the surveillance of cardiovascular diseases within the general framework of health monitoring.

Figure 5. **Cardiovascular diseases as main cause of premature death in Europe** [22] www.escardio.org/atlas

These are an epidemic that spreads also *in developing countries* because communities and individuals adopt a more prosperous and less healthy lifestyle. In developed countries, cardiovascular diseases represent the first cause of mortality, a major cause of disability and premature death.

The main cardiovascular diseases are stroke, hypertension, coronary artery disease, heart failure. They are frequently intertwined with atherosclerosis as the underlying pathology.There are also other important diseases that, although they have a lower prevalence, have a high burden on health. I refer to congenital heart diseases, rheumatic heart disease, peripheral arterial diseases and cardiomyopathy.

In Romania, most deaths in are due to either cardiovascular diseases.The standardised death rate for AMI was the highest in the EU in 2014, much higher than the EU average, and the cerebrovascular diseases (second highest in the EU) contribute significantly to mortality also. Taken together, these diseases of the circulatory system claimed the most fatalities in Romania, with a standardised rate of 951.3 deaths per 100 000 inhabitants in 2014, being two and a half times higher than the EU average (373.6) and the second highest in the EU after Bulgaria [20, 24, 25].

The burden of cardiovascular diseases are also economic. Cardiovascular disease has been estimated to cause a loss in the European Union's economy of about € 169 billion per year, this represents a total annual cost per capita of € 372. Costs vary between Member States from less than 50 €/capita in Malta to over 600 €/capita in Germany and the UK. Moreover, countries with poor economic development have a higher morbidity of cardiovascular diseases [26]. Economic losses due to cardiovascular disease mortality and morbidity amount to over € 35 billion in the EU, accounting for 21% of the total cost of these diseases- about two-thirds of these costs are due to premature deaths (€24.4 billion) and 1/3 is due to sickness disability (€10.8 billion) among middle-aged people.

Unlike many other lifestyle-related diseases, the causes/risk factors for cardiovascular disease are relatively well known. These are: the inappropriate diet, that results in diabetes mellitus, hyperlipidemia, physical inactivity, smoking and the increase of blood pressure that leads to hypertension. There are other identified causes, but this is the group of risk factors underlying the epidemic. In well-studied cardiovascular diseases, relatively much is known about the pathophysiology of risk factors. In addition, knowledge from clinical trials dictates primary and secondary prevention and risk management [27].

Cardiovascular disease can be prevented. Few chronic diseases have had such a widespread

scientific basis for prevention and treatment as cardiovascular disease. Their prevention begins at community level, where we can intervene to reduce the prevalence of smoking, unhealthy nutrition and physical inactivity. Thus, the implementation of preventive strategies and health programs results in changes in the overall population and in the reduction of cardiovascular morbidity and mortality [28].

Cancer is a generic term for a large group of different diseases that can affect any part of the body with complex distributions in human populations and with various aetiological factors. Other terms used are malignant tumors or neoplasms. A defining feature of cancer is the rapid production of abnormal cells beyond their usual limits, which can then invade different parts of the body and spread to other organs, the latter process is referred to as metastasizing. Metastasis is a major cause of death in cancer.

The global cancer burden is estimated to have risen from 15.2 (fig. 6) to 18.1 million new cases and cancer is in the leading causes of death worldwide because of an estimated rise from 8.8 to 9.6 million deaths, between 2015 and 2018 [29, 30].

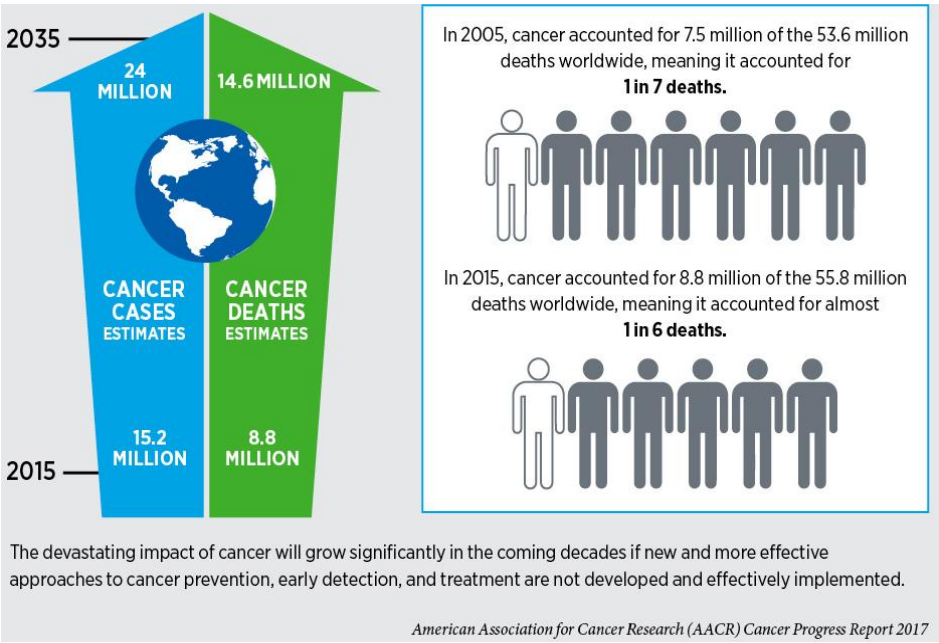


Figure 6. **The global cancer burden** [30]

Europe accounts for 23.4% of the global cancer cases and 20.3% of the cancer deaths, although it has only 9.0% of the global population [31].

Approximately one third of cancer deaths are due to the main five risk factors: high bodymass index, low fruit and vegetable consumption, lack of physical activity, tobacco use and alcohol consumption.Tobacco use is an important risk factor for cancer and is responsible for about 22% of cancer deaths [32, 33]. Also, presenting to a late-stage at physician, the inaccessible diagnosis services and lack of modern treatment are common in these countries.

In 2017, only 26% of the world's developing countries reported that they have oncology specialists and services available in the public health sector. The situation is quite different in developed countries of the world, more than 90% of them reporting good insurance with specialists, oncology services and modern treatment options in the public health sector.

The economic impact of cancer is significant and increases. The total annual cost of cancer in 2010 was estimated at about US $ 1.16 trillion [34].

Only one in five developing countries reported data needed to establish cancer policy.

The most common cancers are: Lung (2.09 million cases); Breast (2.09 million cases); Colorectal (1.80 million cases); Prostate (1.28 million cases); Skin cancer (non-melanoma) (1.04 million cases). The most common causes of death are cancers of: Lung (1.76 million deaths); Colorectal (862 000 deaths); Liver (782 000 deaths); Breast (627 000 deaths) [35].

Considerable efforts are made to develop effective therapeutic approaches. Even if major discoveries in the clinical management of cancer patients will be accomplished in the near future, the changes will mainly affect the affluent part of the world population.

In 2017, the World Health Assembly passed the resolution *Cancer Prevention and Control through an Integrated Approach* (WHA70.12) urges governments and WHO to accelerate action to achieve the targets specified in the *Global Action Plan* and *2030 UN Agenda for Sustainable Development* to reduce premature mortality determined from cancer [36, 37].

In Romania, approximately one in five adults reported smoking on a daily basis in 2014. This is almost equal to the EU average. Gender disparities are pronounced, with four times as many men (32.2%) smoking as women (8.3%). Worryingly, smoking rates appear to be rising among young girls: 17% of 15-year-old girls said they smoked regularly in 2013–14, up from 12% in 2005 [38]. A number of measures have been implemented to reduce the prevalence of smoking in the population, including laws restricting the consumption of tobacco (since 2002) and banning smoking in all indoor public spaces,in health and education facilities (since 2016). Also, most deaths are due to cancer [39, 40]. Lung cancer remains the most common cause of cancer mortality, with the standardized rate rising (table 2). Mortality from colorectal cancer has also increased sharply, by more than 30%, despite efforts to strengthen the national cancer plan and the implementation of population-based screening programs for breast, cervical and colorectal cancer [41, 42, 43]. Romania has always had among the highest levels of cervical cancer mortality across the EU.

Table 2.
CANCER MORBIDITY and MORTALITY in ROMANIA- 2018

Indicators	Males	Females	Total
Population	9 485 608	10 095 020	19 580 628
Number of new cancer cases	45 022	38 439	83 461
Age-standardized incidence rate (World)	264.7	192.3	222.4
Risk of developing cancer before the age of 75 years (%)	45.6	31.2	37.3
Number of cancer deaths	29 929	20 973	50 902
Age-standardized mortality rate (World)	167.6	88.9	123.3
Risk of dying from cancer before the age of 75 years (%)	35.9	20.4	27.0
5-year prevalent cases	97 511	104 719	202 230

Source: [44].

The implementation at national level of the European Network of Cancer Registries project was established with support from the European Commission in collaboration with the International Agency for Research on Cancer (IARC/WHO). It aimed to improve quality, comparability and availability of cancer data and in promoting the use of cancer registries in cancer control, health care planning and research. It assisted cancer registries in Europe and facilitated collaboration, developed guidelines and standards for data collection [35].

The European Directive 95/46/EC that provides the basis for national legislation on the protection of individuals with regard to the processing data is applicable to the gathering, storage, transmission and analysis within medical data. It is adopted in Romania also.

The methodology for cancer registration was reviewed in 2003 in order to improve the implementation of registration within institutional, districts and national level.

General Directorate for Medical Assistance/Ministry of Health, the Oncology Institutes in Bucharest and Cluj-Napoca, Institutes of Public Health in Iasi and Cluj-Napoca, Health District Authorities, District oncology clinics/ambulatories, Center of Health Statistics were involved in the implementation of National Cancer Registry.

According to WHO recommendations, two basic approaches are proposed to reducing the burden of cancer: early detection and training for health workers to rapidly refer for diagnosis and treatment, screening interventions in asymptomatic population only for cervix and breast cancers. Further revisions of Ministry of Public Health within functioning mechanisms and methodology aspects, defined roles and responsibilities are needed.

In Romania, the screening programs for cancer have been declining in recent years, particularly among people under 65. This has been attributed to a lack of systematic screening and poor coverage [36].

Considering the importance of Cancer as a Public Health Issue, I participated as public health expert, on behaf of Romanian College of Physicians (as team member), in the European project "**Instruire şi prevenţie pentru o viaţă sănătoasă**", Project ID: POSDRU/63/3.2/S/ 20596.

Cărăuşu Elena Mihaela– public health expert (partner 3- team member);
Partnership Agreement Registration No.: SRF, 68632/19.12.2008.
Link: http://www.ms.ro/?pag=164&id=8133
Personal contribution to the project:

- Active participation in organizing the "**Instruire şi prevenţie pentru o viaţă sănătoasă**", the 2012 Regional Conference in Iasi.
- Graduation of the Training session in the field of cancer screening programs, Certificate MS-B series, no. 2797/ February 22, 2013.

Publication on this topic:

- Volovăţ SR, Apostol R, Volovăţ C, **Cărăuşu Elena Mihaela** (2011). Quality of Life of women with breast cancer treated in adjuvant setting with Tamoxifen or aromatase inhibitors. European Jurnal of Cancer, volume 47 (Suppl 1): S379/P 5163, IF=5.394, ISSN: 0959-8049. IDS Number: 831TA, Accession Number WOS: 000295752801331 Doi:10.1016/S0959-6049(11)71605-7.

I.2.1.1 Quality of Life of women with breast cancer treated in adjuvant setting with Tamoxifen or aromatase inhibitors

∗Introduction

Breast cancers represent a heterogeneous group of diseases that differentiate from the point of view of treatment and prognosis by immunohistochemical elements such as expression of estrogen/progesterone receptors or HER2 gene mutations.

Hormonal receptor expression occurs in over 50% of breast cancers, representing the motivation of applying hormonal treatments at various stages of the disease [40].

Adjuvant hormonal treatment is Tamoxifen associated/or not with suppression of ovarian function.

Hormone adjuvant treatment reduces the risk of relapse of the disease and death by breast cancer. At the same time another important concern is the quality of the patient's life. In this regard, the side effects of Tamoxifen (TMX) and aromatase inhibitors (AINs) are considered. The introduction of an aromatase inhibitor in adjuvant hormonal treatment has the advantage of increasing the free range of the disease, reduces the risk of local or remote recurrence and reduces the risk of breast cancer.

∗Methodology

The *aim* of our study is the assessment and comparison of the quality of life in women with early stages breast cancer receiving Tamoxifen *versus* aromatase inhibitors (AINs).

Over a period of 10 years, 2001-2009, from a total of 2998 cancer patients diagnosed in the Iaşi Center of Medical Oncology Iasi, 629 female patients were with breast cancer. Of the total breast cancer female patients, 441 of them followed hormonal treatments, predominantly in stages II-III of the disease. There were selected 223 patients with early stages of breast cancer.

Given the attempt to evaluate the quality of life of patients receiving adjuvant hormonal therapy, of the 441 female patients, 177 (95 premenopausal and 82 postmenopausal patients) received Tamoxifen adjuvant therapy and/or aromatase inhibitors. The female patients were divided in two groups: 115 receiving Tamoxifen and 107 receiving aromatase inhibitors. From the female patients receiving AINs, 33 of patients have received Exemestane, 60 Letrozole and 14 Anastrazole.

The patients have completed an EORTC C30 and EORTC BR23 questionnaire at the beginning of the treatment (after one month) and after 2 years of treatment.

Statistical data processing was done using the SPSS vs. 16.0.

On the basis of the questionnaires, according to the recommendations in the user manual, some raw scores and linearized scores were created, studying their behavior.

There was calculated the difference related with global status, functional scales, emotional scales, cognitive scales and symptoms scales.

In the statistical processing of data obtained through life quality questionnaires, the Wilcoxon test was used to reveal statistically significant differences between one-month and 2-year results for female patients treated with AIDs.

The Kruskal-Wallis test (1 month versus 2 years of treatment) was used to compare the quality of life in the group of Tamoxifen-treated female patients and the AIDs treated group.

∗Results

In the case of anastrazole treatment, there are statistically significant differences in all standardized scores of the questionnaires indicating a slight decrease in the quality of life after 2 years of treatment compared to the first month of treatment in terms of overall health status, categories that represent physical status (symptoms such as dizziness, dyspnea, loss of appetite, pain) and the social condition of the patients.

Our results show a better quality of life for Anastrazole *vs.* Letrozole and for AINs *vs.* Tamoxifen group, mainly on physical scales both after 2 months and after 2 years of treatment.

In the same time, the physical scales were with better results after 1 month of treatment *versus* 2 years of treatment.

∗Discussions

Endocrine treatment in breast cancer is generally a well-tolerated treatment, with moderate side effects that are tolerated by most patients. However, in some patients these side effects are of increased intensity, causing a deterioration in the quality of life and, consequently, manifestations of non-compliance [42].

Measurement of quality of life is increasingly being incorporated into randomized trials evaluating breast cancer treatments. Thus, the quality of life assessment becomes more and more a final goal of current studies, along with "global survival", "free disease interval"or "toxicity assessment" [44]. So, the comparison of hormonal treatments in terms of quality of life is thus as important as other survival indicators.

Our current study revealed, by comparing the results for the groups receiving aromatase inhibitors, a decrease in the quality of life in all three groups after 2 years of treatment compared with the 1 month follow-up, also revealed by other studies. This decline in quality of life is seen in terms of overall health status as well as physical functions. A particular feature of physical functions is pain, which in the case of aromatase inhibitors is mainly represented by arthralgia.

∗Conclusions

Following the hormonal treatment period, there is a mild worsening of quality of life for Tamoxifen and AINs too. In the same time, the quality of life is better in the group with AINs treatment comparative with the Tamoxifen treatment.

The impact of cancer diseases is on the rise. So, urgent action are needed, mainlly in developing countries to increase interest to develop preventive strategies of cancer diseases, because these countries are experiencing an epidemic of cancer and inequalities between people on access to specialized health care, prevention, treatment and care palliative worsens.

Current knowledge of the causes of human neoplasms have led to the development of strategies for their prevention and control of cancer diseases. Prevention of the known causes of cancer remains the most promising approach in reducing the consequences of cancer, in particular in countries with limited resources.

Reduce overweight and obesity, increased physical activity, moderation in alcohol intake, control tobacco smoking and of occupational carcinogens known are the main approaches we have to reduce the burden of neoplasms.

Diabetes mellitus is one of the main public health issue, as recognized by a United Nations Resolution (since 2006). Diabetes mellitus is a heterogeneous disease characterized by increased blood sugar. Diabetes mellitus is a major source of spending in healthcare systems around the world and also has an impact on economic productivity [45].

The current classification recognizes two main types of diabetes mellitus: type 1, due to the destruction of cells producing insulin of the pancreas and which usually require exogenous insulin for survival; and type 2, accounting for 85-95% of all cases of diabetes due to a combination in increase of insulin resistance and decrease of insulin production [45].

In 2017 (fig. 7), approximately 425 million adults (20-79 years) worldwide were living with diabetes mellitus and this figure is expected to increase considerably by 2045 to 629 million as populations age and become more sedentary and overweight (the main risk factors for type 2 diabetes mellitus).

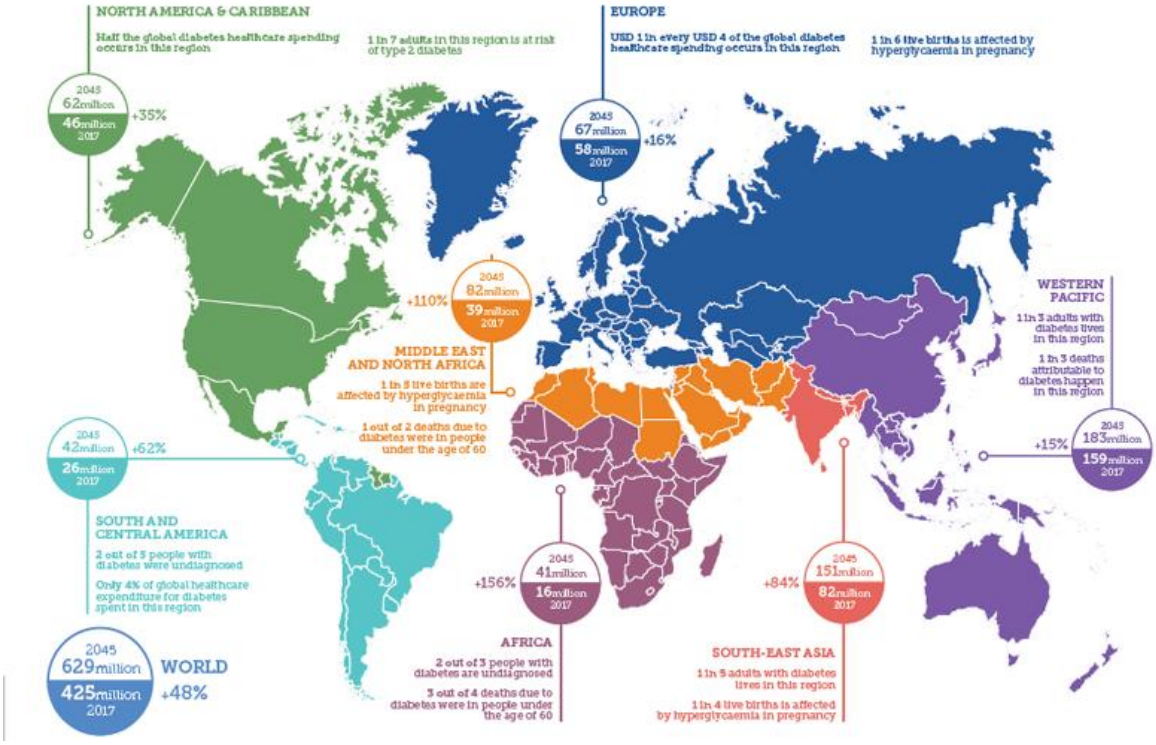


Figure 7. **Diabetes mellitus**- Global fact sheet 2017 [45]

Contrary to general perception, over 79% of people with diabetes live in low or middle income countries and most new cases of diabetes in the coming decades will be in these countries.

Diabetes reduces the life expectancy by about 15 years in type 1 and 10 years in type 2, and in many populations is the main cause of visual loss, kidney failure and lower limb amputation.

The costs of diabetes include both direct costs from medical care as well as indirect costs incurred through loss of productivity or earnings, both of which are important contributors to the global economic burden.

Prevention or at least delaying the onset of type 2 diabetes by behavioral or pharmacological measures has been convincingly demonstrated in several studies. At best, these studies could achieve a reduction of 60%.

Prevention of type 1 diabetes remains the subject of research.

A significant reduction in the incidence of complications in people with diabetes mellitus is possible. However, achieving these reductions requires well-organized medical care and resources, as well as good education and support for people with diabetes mellitus in managing their condition.

In Romania, in 2015, diabetes mellitus prevalence was 11% (in the population aged between 20 to 79). In the records of Health Ministry, the number of people with diabetes was 999 192 (+8.73%) and the number of new cases diagnosed was 73 740 (mean value~202 new cases/per day). In the last 10 years the number of people for whom diabetes treatments have been reimbursed has doubled and costs increased 6 times [46].

The National Diabetes Program aims to improve health, increase the life expectancy of diabetics and ensure access to the specialized health services of the patients included in the program [47].

Considering diabetes mellitus as a public health issue, 1 scientific paper are presented at international level on COST Action 16112, Congress "Natural Products and the Hallmarks of Chronic Diseases", 25–27 March 2019, Luxembourg.

Publication on this topic that support the personal contribution on the project:

- Pantea Stoian A, Mitrofan G, Colceag F, Serafinceanu C, Eftimie Totu E, Mocanu V, Mănuc D, **Cărăuşu Elena Mihaela** (2019). Oxidative Stress Applied in Diabetes Mellitus- A New Paradigm. Proceedings, 2019; 11, 7. doi:10.3390/proceedings2019011007.

I.2.1.2 Oxidative Stress Applied in Diabetes Mellitus- A New Paradigm

During last decade, many research groups proved that the oxygen species generate adverse effects due to the imbalance between the production of ROS (reactive oxygen species) and the body's biological capacity to neutralize them (i.e., enzymes). In the meantime, the evolution of some significant diabetes complications, such as cardiovascular or renal disease, is related to the oxygen species as the primary pathogenic mechanism. Although obesity and a sedentary lifestyle are well-known risk factors for type 2 diabetes [45], at molecular level the oxidative stress is regarded as the primary contributor to the pathogenic process.

Almost all of the chronic diseases have been associated with a high quantity of free radicals, or modified signal transductions.

In dedicated medical research, two approaches could apply from point of view of nutritional interventions: (1) the situation when it is used to prevent a particular disease or, (2) when it is able to alleviate progression, symptoms or complications of the disease.

In addition, the considered specific diseases are divided as follows: (1) the group that involves the so-called mitochondrial oxidative stress conditions (cancer and diabetes) and (2) the group that involves the inflammatory or oxidative conditions (atherosclerosis, chronic inflammation, ischemia and reperfusion injury).

In diabetes mellitus, hyperglycemia is one of the main factors leading to specific structural changes, as protein and lipid oxidation, which are the most common (fig. 8).

For instance, the free radicals induce damage to sulfhydryl groups. As consequence, the proteins are not recognized anymore, resulting in cross-reactions and finally triggering the autoimmune disorders. In the meantime, abnormal LDL produced by the peroxidation of plasmatic lipids is not identified by liver's LDL receptors and subsequently, macrophage scavenger receptors take modified LDLs, forming engorged lipid macrophages (LEM) and infiltrate under blood vessel endothelium. It should be also considered that the lipid peroxidation mechanism is governed by the loss of membrane functionality and integrity. The membrane lipids are influenced by the chain reaction between polyunsaturated fatty acids and ROS.

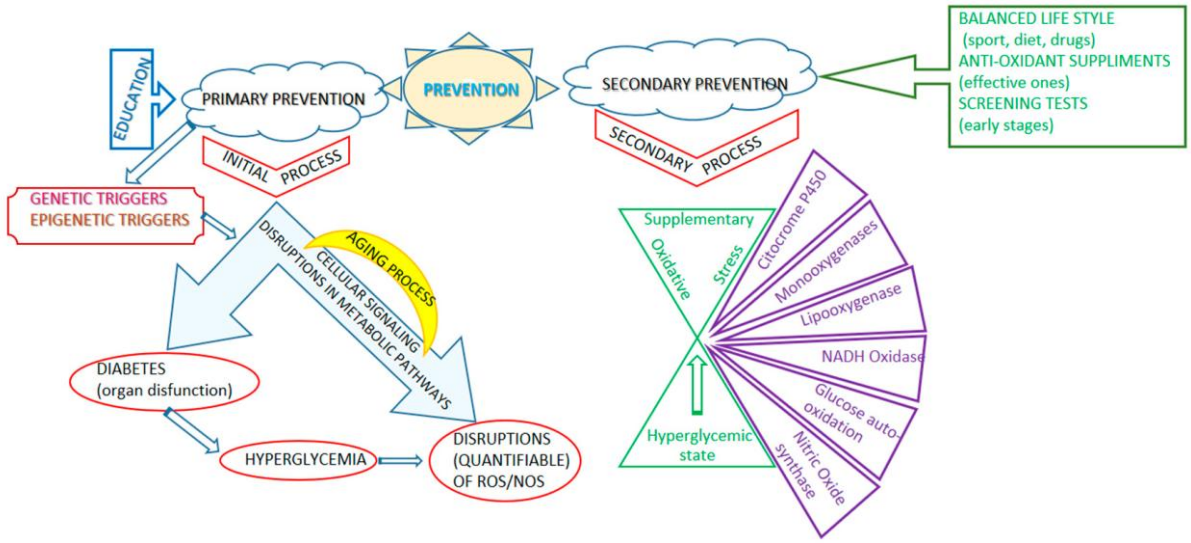


Figure 8. Presentation of main primary and secondary prevention approaches in diabetes

Such chemical processes have as consequence increased cellular membrane permeability as well as an increased calcium influx.

The subsequent effect of all these chemical transformations at the membrane level leads to mitochondrial damage. Another aspect to be considered is related to the effects of certain antioxidants whose molecules might change their first functionality *in vivo*.

As mentioned above, there are many strategies by which the body tries to cope with an increased flow of free radicals; some of them are short or medium term reactions, while others can be considered as long-term defence mechanisms.

In the physiopathology of type 2 diabetes, insulin resistance (IR) is seen as the primary factor involved in hyperglycemic state, and the central dogma considers IR a high risk to the body and should be counteracted at any cost, but recently insulin resistance is seen as a physiological defence against metabolic stress [48].

In *conclusion*, the research made in the field of oxidative stress will have a meaningful impact in understanding the signalling pathways that generate chronic diseases (i.e. diabetes) and could bring a significant difference on approaching the primary and secondary prevention on other chronic NCDs as well.

I.2.2 Overweight and Obesity as a Public Health Issues

Worldwide, obesity has a particular importance for public health. The life expectancy in developed countries of the world may be threatened by the rapid increase in the morbidity of obesity and its associated health problems.

In many developing countries also, obesity has begun to be seen as an important public health issue [48]. More than half of overweight people are in middle or low income countries. Approximately 10% of boys and 9% of girls aged 5-17 are overweight, based on recently developed international standards. Obesity is associated with a wide range of co-morbidities,

including well-known diabetes and coronary heart disease, adverse effects on respiratory function and sleep, back and joint pain which determines a reduction in physical activity. Obesity is estimated to be one of the three risk factors that contribute most to the global burden of disability-adjusted life years lost (DALYs).

Preventive interventions should target both adults and children, because in adulthood there are the greatest increases in obesity and its complications.

Overweight and obesity are the result of small errors in the energy balance, leading to weight gains and persistence of weight gain.

In high-income countries, physical activity and energy expenditure have fallen due to diminished physical activity in the work and domestic environment, while physical activities during leisure have remained stable. Thus, overall energy consumption has been declining.

Health promotion strategies and health programs to reduce overweight and obesity are complex. Interventions should be done at individual, community and social levels. These may include changes in the physical environment that promote safe physical activity; economic measures that use incentives to promote change; political interventions to encourage it and socio-cultural interventions.

The association of anthropometric indices with ethnic origins is discussed and the rationale for population-specific criteria for abdominal obesity is outlined. Application of these criteria in population surveys from 191 countries, around the year 2000, suggest that there were about 1.1 billion overweight and obese adults in the world of whom 320 million were obese with BMI of 30 kg/m^2 or more. More than half of overweight people are in middle- or low-income countries. About 10% of boys and 9% of girls aged 5–17 years are overweight, based on recently developed international standard criteria. Worldwide obesity has doubled since 1980 and kills 2.8 million adults each year [48]. United States has the highest prevalence of obesity among OECD (Organization for Economic Cooperation and Development) countries [49].

Childhood obesity also has increased at alarming rates with some 42 million children estimated to be overweight [50]. More than 35% of adults and almost 17% of children are obese, with especially high rates among poor and minority children [51, 52].

Childhood obesity has serious short- and long-term health consequences. Obese children are more likely to have risk factors for cardiovascular disease, including high cholesterol and blood pressure, type 2 diabetes (children now account for half of all new cases of diabetes type 2), skeletal problems, sleep apnea, mental health issues, such as low self-esteem and depression [54]. Obese children are also subjectsof discrimination [55]. More than 50% of overweight children become obese adults who experience elevated health risks for heart disease, stroke, diabetes, osteoporosis, lower-body disability, some types of cancer, and premature mortality [56].

The burdens of obesity are also economic. Rising health care costs are mostly driven by obesity-related costs. Estimates indicate that in 2008 some 10% of medical spending in the USwas related to obesity, amounting to as much as $147 billion [56]. Obesity-related costs will account for 21% of medical spending in 2018 if obesity prevalence continued to rise.

As the human and financial costs of obesity have become better recognized, government officials and public health leaders increasingly have called for strong action. Comprehensive approaches that act on environmental and social determinants of food choice and activity level are recommended [57]. The complexity of such an approach is reflected in the following recommended policies and strategies: taxing unhealthy foods and beverages, such as soda and snack food, to make them cost prohibitive; providing agricultural subsidies to lower the cost of healthy foods, such as fresh produce and whole grains; setting standards to lower sodium levels and prohibit the use of trans-fatty acids in food products; banning unhealthy foods from public schools and child care facilities; restricting or banning the advertising of unhealthy foods to children; posting calorie counts on restaurant and take-out menus; using “counter-

advertising" to show the harmful effects of unhealthy foods; redesigningcommunities and streets to incorporate parks, sidewalks, and bike paths; and reducing sedentary behavior by limiting time viewing television and playing computer games [57].

Children's status as developing agents further complicates childhood obesity prevention. Parents have responsibility for rearing children and considerable discretion over cultural and lifestyle matters, including many daily decisions that directly affect a child's food and activity-related environments and behaviors. Some measures would likely confer benefit regardless of parental behavior (e.g., banning food advertising to children or removing trans-fats from packaged foods). But, others will have their intended effect only if parents make certain choices, some of which will require that they change their health-related habits.

In Romania, the Ministry of Health organizes and finances national health programs, some aimed at preventing and combating obesity in children and adult population [58]. Despite recent efforts aimed at modifying diet through healthy eating campaigns, the average diet in Romania is considered to be relatively unhealthy [59]. It is characterized by high consumption of animal fats and high-caloric food with high sugar and salt content. So, the school and the family have to collaborate in order to solve the childhood obesity problem [60] in our country.

Speaking about the preventing and combating of childhood obesity we find small progress of the **nutrition education** in the schools of our country [60].

The implementation of nutritional education programs in the Romanian public schools system could be a major factor in preventing childhood obesity, which is a problem affecting more than one of three children in Romania.

Starting with the idea that improving the lifestyle of children is based on action taken in schools, the World Health Organization (WHO, 2005) has developed a tool for implementing nutrition education programs in Europe: a document named „*Nutrition Policy in Schools*"[61]. Starting with 2006, there is a network that aims to integrate health policies within schools, called: "*The European Network of Health Promoting Schools*" (ENHPS).

By introducing nutritional education into the Romanian pre-university education system (a complex of means, methods and educational programs) it is intended to involve the school in the difficult approach of preventing childhood obesity and its complications and in maintain the individual and community health. Also, the education for nutrition involves appropriate health policies and activities at the individual and community level [62].

Nutrition education can have a positive influence upon the way the children see the food choices and eating habits. It can inspire them to consume fruit, legumes and unprocessed foods and it can even cause the change of their health outlook for the rest of their lives [63]. Information on food, nutrition and health is essential for children right from their early years. So, nutrition education can help the school children to combat a constant range of aggressive marketing techniques that are used by food manufacturers (the sugar/salt addition to different processed foods) by learning about the correlation between healthy eating and health [64].

Even if a child does not experience obesity and/or malnutrition, he can still benefit from nutritional education, because the focus is on health rather than just on overweight [65]. This can help the children to make healthy choices for good reasons and not because they are worried about their body shape being as they see in the media (on television, in magazines, or online) [66].

The nutrition education in school [67] gives children the necessary information and the skills in order to develop healthy eating behaviour and to select a healthy food [68]. In the greatest part of the educational interventions that were conducted, the learning strategies applied determined positive and durable changes in the eating behaviour of school children [69]. Thus, the nutrition education in school plays an important role in the prevention of childhood obesity by promoting a healthy nutrition [70].

I.2.3 Violence as a Public Health Issue

Violence has probably always been part of the human experience. Its impact can be seen, in various forms, in all of the world.

Each year, more than a million people lose their lives, and many more suffer non-fatal injuries, as a result of self-inflicted, interpersonal or collective violence [71]. Overall, violence is among the leading causes of death worldwide for people aged 15 to 44 years [72]. Although precise estimates are difficult to obtain, the cost of violence translates into billions of US dollars (fig. 5) in annual health care expenditures worldwide, and billions more for national economies in terms of days lost from work and lost investment.

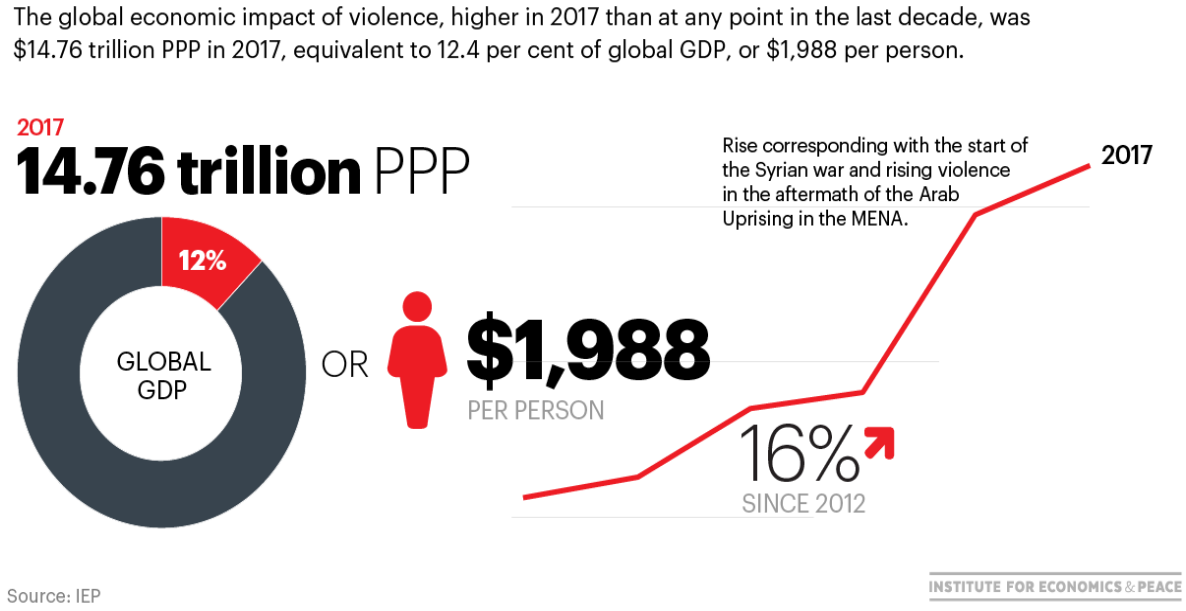


Figure 5. The Global **Economic Impact of Violence** [73]

Violence is now clearly recognized as a main public health issue worldwide [74].

The public health approach to violence is inter-disciplinary and science-based [75]. It draws upon knowledge from others medicine disciplines, like epidemiology, including also, psychology, criminology, sociology, education and economics [76]. This has allowed the practice of public health related to violence [77] to be innovative and responsive to a wide range of violence related diseases, illnesses and injuries around the world.

The public health approach emphasizes collective action also [78]. It has proved time and again that cooperative efforts from such diverse sectors as health, education, social services, justice and policy are necessary to solve what are usually assumed to be purely "medical'' problems [79, 80]. Each sector has an important role to play in addressing the problem of violence and, collectively, the approaches taken by each have the potential to produce important reductions in violence.

There are other reasons why violence became a greater focus for public health. *For example*, in the United States, homicide and suicide have consistently been among the top 15 leading causes of death [81]. Suicide rates among adolescents and young adults 15-24 years of age almost tripled between 1950 and 1990 [82]. Similarly, from 1985 to 1991 homicide rates among 15-19 years old males increased 154%, from rates of the previous 20 years for this age group. These trends raised concerns and provoked calls for new solutions.

So, WHO launched "The World Report on violence", in order to make the Violence and Health whole world conscious of the effects of violence and to underline the importance of health medical care in preventing and fighting against it [71]. The WHO did the same thing in Romania (2006-2007), by launching an analysis of the violence phenomenon at national level.

Currently is great concern about the way in which gender-based violence affects women from an early age.The spread of gender-based violence is increasing, representing one of the most urgent social problems of the contemporary world. An EU report (2012) based on face-to-face interviews with 42,000 women from all EU states shows the following:

-the percentage of women who have been affected by physical violence by their partner since the age of 15 is 20% for the EU average and 23% in Romania;

-the percentage of women who have been affected by sexual violence by their partner since the age of 15 is 7% according to the EU average and 2% in Romania;

-the percentage of women victims of psychological violence by their partner since the age of 15 is 43% for the EU average and 39% in Romania [83].

Despite their young age, physical and sexual violence among young people (18-24 years) is similar to that in the general population (20% compared to 22%). However, psychological violence is alarming: 50% of young women were psychologically assaulted by their partner.

The impact of gender-based violence does not only affect victims, through physical and psychological consequences, but can also have social and economic consequences for the medical system, public health, public and economic policies and normative system [84].

Considering the importance of violence prevention, I participated (2017-2019) in the DAPHNE 2017 **European Project: „Light4violence"**, as *team member* and *public health expert*.

European Project „Lights, camera and action Against Dating Violence (Lights4Violence)", (Adeverința 24137/16. 12. 2018).
Personal contribution:
- Participation on Project Meeting at Health Institute „Carlos III", Madrid, Spain, 25-26 Jan 2018. (Dispoziția 164/20.12.2017).

Link: http://www.lights4violence.eu/content/prevention-dating-violence-among-adolescents-and-health-consequences
http://www.lights4violence.eu/partners

The DAPHNE 2017 ***European project "Lights4Violence"*** is coordinated by Medical Sciences Faculty, University of Alicante, Spain, in collaboration with universities and institutions from Portugal, Romania, Poland, Italy and United Kingdom. Our project has received funding from the European Comission Directorate- General Justice and Consumers Rights, Equality an Citizen Violence Against Women Programme 2016, under Grant Agreement No. 776905 [85]. "Grigore T. Popa" University of Medicine and Pharmacy of Iasi, Romania, is project partner and the team is composed by: Mocanu Veronica (Pathophysiology Discipline, Faculty of Medicine), Ioan Beatrice Gabriela (Legal Medicine Discipline, Faculty of Medicine), Antohe Ileana (Nursing Discipline, Faculty of Medicine), **Cărăuşu Elena Mihaela** (Public Health and Management Discipline, Faculty of Dental Medicine), Anton-Păduraru Dana (Paediatric Discipline 2, Faculty of Medicine), Dascălu Cristina Gena (Discipline of Information and Medical Biostatistics, Faculty of Dental Medicine).

The ***aim*** of the **"Lights4Violence"** ***pilot study*** is to highlighted that the students had the psycho-educational training to understand and complete such an assessment of psychological profile and attitude related to violence without any risk [85].

The team from "Grigore T. Popa" University of Medicine and Pharmacy Iasi contributed to the first phase of the project through the pilot study.

Publication on this topic that support the personal contribution in the project:

- Vives-Cases C, Davo-Blanes MC, Ferrer-Cascales R, Sanz-Barbero B, Albaladejo-Blázquez N, Sánchez-San Segundo M, Lillo-Crespo M, Bowes N, Neves S, Mocanu V, **Carausu EM**, Pyżalski J, Forjaz MJ, Chmura-Rutkowska I, Vieira CP, Corradi C (2019). Lights4Violence: a quasi-experimental educational intervention in six European countries to promote positive relationships among adolescents. BMC Public Health; 19:389, IF (2018)=**2.567**.
  Accession Number WOS: 000464143400001, PubMed ID: 30961558, IDS Number: HS8UA.
  https://doi.org/10.1186/s12889-019-6726-0

I.2.3.1 Lights4Violence: A Quasi-experimental Educational Intervention in Six European Countries to Promote Positive Relationships among Adolescents

∗Introduction

There is a growing concern about how intimate partner violence (IPV) is increasingly appearing at earlier ages. In 9 of the 14 areas included in the WHO Multi-Country Study on Women's Health and Domestic Violence against Women, current physical and/or sexual IPV in the last 12 months among 15 to 24 year-old ever-partnered women was over 30% in most of the studied countries [86]. According to European Union Agency for Fundamental Rights (FRA), out of all women in an intimate partner relationship, 22% have experienced physical and/or sexual violence since the age of 15 [87].

Studies conducted in the United States, where the majority of the studies on this form of gender-based violence are carried out, showed that 20.9% of students had experienced some form of physical and/or sexual dating violence (DV), which is defined as the perpetration of violence by at least one member of an unmarried couple on the other member within the context of dating or courtship [88]. If studies included psychological violence, the prevalence of this type of gender-based violence increased to 65% [89, 90]. Violence can also take forms of cyber-violence conducted by computer mediated communication tools. It has been estimated that 17% of the cyberbullying perpetrators targeted a former boyfriend/girlfriend [91]. In addition, it has been associated with an increase in other violence-related behaviors, including substance use, depression, suicidal behavior, poorer educational outcomes, post-traumatic stress, unhealthy weight control and risky sexual behavior [92, 93]. Recent studies suggests that teenagers' silence over the problems of gender-based violence is the answer to attitudes presented by adults and the cultural climate surrounding gender identity, gender roles and sexuality [94]. Many of parents are often unaware of the problem and they hardly ever discuss it with their children. This is a combination of factors that caused this public health issue: adults turning gender and sexuality issues in teenage relations into taboo subjects, the lack of training and support for professionals in the schooling systems to competently address these issues, absence of sexual education, highly internalized gender stereotypes and prejudice. Thus, teenagers rarely share their problems with adults or seek help [95].

Considering the complexity of gender violence, since the 1990's, actions have been taken at a European level to eliminate any form of violence against women. The European Parliament, the European Council and the European Commission have adopted resolutions, conclusions and strategies about violence against women in general (as a violation of human rights) [96]. The Council of Europe Convention on Preventing and Combating Violence against Women and Domestic Violence is one of the more recent and significant treaty aiming to create a legal framework at pan-European level to protect women against all forms of violence, and prevent, prosecute and eliminate violence against women and domestic violence [97].

Tackling dating violence and promoting positive relationships

Public health research and interventions have begun to focus on positive health, in which actions in health look to so called "health assets" or what individuals, families and communities can do to increase their level of control over and improvement of their health [98]. This model of positive health emphasizes the origins of good health and has become a point of departure for the development of health promotion interventions [99]. This programs have been carried out in both the educational and social contexts that focus both on primary prevention (directed at the whole population) and secondary prevention (directed at youth at high risk) focused on gender violence in young people and adolescents [100, 101].

In our project, the intervention proposed shares some of the above-mentioned elements, but its objectives relate to the promotion of protective factors (or assets) to prevent gender violence. These assets are related to the capacity for communication, empathy, pro-social

abilities, anger management, perspective taking and non-violent conflict resolution [102]. In this sense, it uses a model for positive youth development, centered on individual, family and community efforts to improve and gain control over health [103]. The model emphasizes youth strengths, stressing the development of capacities (personal, moral, cognitive, conceptual and social) that support young people in resisting risk factors, and reducing or confronting behavior problems such as drug use, risky sexual relationships, antisocial behaviors and depression problems [104]. These capacities are related to resources and assets that provide the necessary support and experiences to avoid and deal with risky situations, or to reduce their severity or consequences when they take place [105].

To our knowledge, there are no studies that evaluate dating violence prevention programs aimed at promoting protective assets in young people with the focus on positive youth development [106]. Active participation and the use of tools, such as video and short films, are also characteristics that help address health assets, given their role in motivating young people to adopt a more active role in carrying out the program activities [107].

This paper describes the study protocol that our team use in the *Lights4Violence* project [108], a public health research funded by the European Commission Directorate-General for Justice and Consumers Rights, Equality and Citizen Violence against Women Program 2016, under the Grant Agreement number 776905, for the period 2017–2019.

∗Methodology

The overall goal of our study is to contribute to evidence-based strategies to prevent dating violence focused on adolescents' strengths and capabilities to develop positive relationships with their peers rather than gender violence risk factors.

Our main objective is to implement and evaluate the effectiveness of an educational intervention, titled "Filming Together to See Ourselves in a New Present", to promote dating violence protective assets among secondary school students from different European cities (Alicante, Rome, Iasi, Matosinhos, Poznan and Cardiff).

The study is a longitudinal quasi-experimental educational intervention with a quantitative evaluation. The evaluation will be carried out using an on-line questionnaire distributed to the intervention and the control groups at three time periods: before starting the program (baseline), after finishing the study -including the dissemination phase- (time 1 or T1) and six months after implementation (time 2 or T2).

A statistical analysis was performed for sample size estimation, based on data from a previous published random-effects meta-analysis of 23 studies about school-based interventions aimed to prevent violence and negative attitudes in teen dating relationships [109]. The effect sizes (ES) in this meta-analysis was $g = 0.14$, 95% CI (0.10, 0.19), indicating a significant ES estimation according to Cohen criteria [110]. With an alpha = 0.05 and power = 0.90, the sample size needed for this effect was $N = 430$ to detect statistical differences between intervention and control groups in our study.

Participants' recruitment

Two groups of students are assigned either an intervention or control condition, respectively. The intervention group is composed of 100–120 students aged between 13 to 16–17 years, studying in secondary schools in each targeted city. The control group is composed of 120–150 students by city from other schools with similar socio-economic characteristics (relating to social characteristics and school location). The students from the control and the intervention groups will have the same composition in terms of age, gender and academic course. Control and intervention groups will belong to different educational centers in order to avoid contamination.

Lights4Violence Core intervention through "cinema voice"

The core intervention is developed in five modules, mainly addressed to students except for the two firsts, which will also include secondary school teachers. These five modules comprise between 15 and 17 sessions of approximately 50 min are distributed in ordinary class schedules, involving the teaching staff. In addition, are planned two types of dissemination activities. Firstly, a short film exhibition with the support of the city hall and other public institutions. The objective is to provide a space where participants can voluntary present their video capsules and briefly explain the production process. After the students' brief presentations, the short films will be shown. Secondly, the development of teaching guides for the use in other professors' classrooms. This second activity is designed to facilitate the use of the learning material by secondary professors that want to address related topics in their classes.

Our study is planned to last 24 months (from December 2017 to December 2019). Its implementation integrates three parts with activities related to the core intervention of the project, evaluation and communication and dissemination.

Three types of *evaluation* are: formative, results and process evaluation.

Formative Evaluation: prior to the implementation of the program in the whole sample, an *evaluation pilot study* will be carried out with a minimum of 20-30 students/country who are finishing the same grade as those who will receive the intervention.

Results Evaluation: a results evaluation will be applied to students, both in the intervention and control groups at the same time.

In order to evaluate the program results we use an on-line questionnaire.

For the evaluation purposes, the *dependent variables* are collected from the following:

-Student Social Support Scale- Assesses the student's perceived emotional, appraisal, informational, and instrumental social support received from teachers, parents, close friends, and peers [110].

-Questionnaire for Evaluating School Social Climate, Factor 1- this is a questionnaire that assesses school social climate. It displays a stable factorial structure in two social climate factors: (1) relative to the school and (2) relative to the teaching staff. In our project we will use factor 1 only [111].

-Maudsley Violence Questionnaire- measures a range of cognition relating to violent behavior drawn from clinical and theoretical perspectives. This measure integrates justification of violence in response to threatened self-esteem and the legitimization of violence as central elements [112].

-The Ambivalent Sexism Inventory- it is composed of two sub-scales whose items may be independently added for sub-scale scores or may be averaged for an overall composite sexism score. The first sub-scale is the hostile sexism scale and the second is the benevolent sexism scale [113].

-Social Problem-Solving Inventory-Revised Scale- a brief scale that measures young people's ability to resolve their social problems. Items are distributed in five sub-scales that evaluate functional and dysfunctional aspects of the ability to problem solve. The functional dimension is evaluated through two sub-scales: Positive Problem Orientation and Rational Problem Resolution; while the dysfunctional dimension is evaluated through the sub-scales Negative Problem Orientation, Avoidance Style and Impulsivity/Carelessness Style. These five dimensions allow obtaining a total score that corresponds to a general estimation of the ability to solve problems, in addition to the average scores in each dimension.

-A brief version of Aggression Questionnaire-Refined- measures main aspects of aggression: Physical Aggression and Verbal Aggression, which involve hurting or harming others and represent the instrumental or motor component of behavior; Hostility, which consists of feelings of ill-will and injustice and represents the cognitive component of behavior; and Anger, which involves physiological arousal and preparation for aggression and represents

the emotional or affective component of behavior.

-Rosenberg Self-Esteem Scale isa scale- measure global self-worth by assessing both positive and negative feelings about the self.

-Assertive Interpersonal Schema Questionnaire- this assertive behavior questionnaire, assesses four dimensions that refer to external emotional support, practical personal ability, interpersonal management and affective personal ability. Scores on the questionnaire higher than the average in each of the dimensions indicate good personal adjustment and adequate capacity for assertiveness [114].

-Subjective Happiness Scale- is a global measure of subjective happiness that evaluates wellbeing as a global psychological phenomenon, considering the definition of happiness from the perspective of the respondent.

-Bullying and cyberbullying scales- adapted from Lodz Electronic Aggression Questionnaire (LEAQ), measure the bullying and cyberbullying understood as a serious peer violence that is regular, intentional and involves imbalance of power and includes involvement as a perpetrator and a victim also in the context of involving actual or former romantic partners [115].

In addition, the following *co-variables* are included:

- Demographic variables- Questionnaire T0: age, gender, birthplace, parents' birthplace, nuclear family.
- Socioeconomic variables- Questionnaire T0: parents' employment and education.
- Violence exposure questions [116].

For the Process Evaluation are used the following indicators:

- Percentage of participation in each session- this indicator evaluate the program coverage.
- Percentage of hours dedicated to each of the initially foreseen sessions- to evaluate program completion based on whether the program has been implemented within the time provided or whether more time was needed.
- Evaluation of the participants' satisfaction with the program- questionnaire directed to students during the T1 period (at the end of the program).

SPSS software program is used for *data analysis.*

To evaluate the effects of the intervention in terms of the attitudes and behaviors, the change in the response variables are examined between time 0 (T0) and time 1 (T1), and between T1 and time 2 (T2). In order to quantify the association of the intervention with the change in variables we constructed linear regression models for both periods. Also, a multi-level linear regression models are constructed; level 1 will correspond to the time period (T0, T1 and T2) and level 2 with the group (intervention/ control). Using these models, we analyze the individual change in the response variables of each individual over time (eq. 1) as well as the average trajectory of the group, the variation of the individual trajectories and the magnitude of the change attributable to the intervention, controlling for the co-variables – age, gender, place of origin, socioeconomic level – that could explain the difference between individuals (eq. 2). A significant interaction between the intervention variable (intervention/ control) and the time period (T0, T1 and T2) indicate that the resulting variable is associated differently with the time period in both groups (intervention/control).

For the process evaluation, the success rate of the program is analyzed, stratified by gender, using the proportion of participants that initiate and finish the program in the three time periods. Finishing the program successfully is defined as participants having attended at least 80% of training sessions and participated in the assigned program activities.

Ethical considerations

Our study aims to meet the principles of the Convention on the Rights of the Child (art. 19); Helsinki Declaration (AMM, 2013); Convention No. 108 of the Council of Europe of January 28, 1981 for the protection of individuals with regard to the automatic processing of personal data; Directive 95/46 / EC of the European Parliament and of the Council, October

24th Regulation (EU) No 1381/2013 of the European Parliament and of the Council of December 17, 2013 that describes rules for the protection of the rights of persons with disabilities, and Equality and Citizenship for the period 2014 to 2020. In addition, the Coordinator Institution (University of Alicante, Spain) and all partners will ensure that all individuals working in the project in contact with children will have no prior convictions and sanctions and will ensure that everyone adopt the codes of good conduct and good praxis.

∗Discussions

The challenge of our study is related to promoting participation of all target groups, both those who will receive the intervention and evaluation and those who will receive only the evaluation, at least at first. In the case of the intervention groups, we consider that the participation of teachers is one of the main drivers of the proposed interventions with children. In the case of the control groups, we will offer the teachers our support and access to all training materials developed during the project so they can implement the workshop with students after the third 6-follow-up evaluation [117].

As in all longitudinal studies, we may lose cases during the intervention, mainly because the students may move. We estimate that these losses will affect our sample size very little.

It is possible that some scales show us that the students have very high capacities. In these cases, it may be difficult to identify changes due to a ceiling effect. Furthermore, ES in health education interventions are usually small to moderate, and statistical differences may not be significant at a country-level due to lack or statistical power.

In relation to the strengths of our study, the interventions proposed in *Lights4 Violence* go beyond the transmission of information centered on concepts and actions such as empowerment, in order to endow young people with motivation and learning related to healthy lifestyle habits [118]. They are designed to develop a process of participatory teaching/ learning in order to acquire competencies "to know", "to want" and "to do" in order to achieve a gradual process of empowerment [119]. The use of participatory techniques and learning resources that we use are especially important to promote adolescents' involvement in activities and programs.

Young people prefer and become more implicated in active projects that include activities such as theatre performances or community activities where they can have "a voice" in reflecting their opinions and ideas.

The production of the proposed short films- as a way or reinforcing the previous training in the core concepts and values of *Lights4Violence*- have been recognized as useful tool for learning and for work on health issues with young people and adolescents.

Also, the group learning develops- above all- abilities for social interaction, respect and support that are interrelated with learned knowledge and attitudes. It permits integrating the student's own experiences with the enrichment of the experiences of others, favors dialogue, the active and critical participation related to the topic at hand, and it develops the ability for conflict resolution and working as a group.

∗Conclusions

However, is a lack of comparative cross-national studies that assess strategies and interventions related to this public health issue in different European Member States and that evaluate their relative effectiveness in preventing violence among vulnerable populations such as adolescents.

*The originality of the project

To our knowledge, *Lights4Violence* is the first cross-national intervention study to promote healthy and positive relationships among adolescents. It is, in fact, the first attempt in our countries in preventing DV with the added value of promoting protective factors against gender violence related to communication skills, empathy, prosocial affective competencies, anger management and conflict management without violence.

I.2.4 Medical-social Problems of the Geriatric Population and of Disability as Public Health Issues

People worldwide are living longer. Today, for the first time in history, most people can expect to live into their sixties and beyond. Today, 125 million people are aged 80 years or older. By 2050, the world's population aged 60 years and older is expected to total 2 billion, up from 900 million [120].

A longer life brings with it opportunities, not only for older people and their families, but also for societies as a whole. Older people also contribute in many ways to their families and communities. Yet the extent of these opportunities and contributions depends heavily on one factor: health. If people can experience these years of life in good health and if they live in a supportive environment, their ability to do the things they value will be little different from that of a young person. If these added years are dominated by declines in physical and mental capacity, the implications for older people and for society are negative [120].

Considering the importance of this topic, in the last two years (2017-2019), I participated in the European collaborative project „COST Action CA16112- **Personalized Nutrition in aging society: Redox control of major age-related diseases** (NutRedOx)"as national coordinator for Romania, member of Management Committee (MC) at European level, and public health expert.

The ***aim*** of this collaborative project is the gathering of experts from across Europe, and from different disciplines that are involved on the research of biological redox active food components, and are relevant to the ageing of human organism, its health, function and vulnerability to disease [121].

The CA16112 "NutRedOx" network is focus on the impact of redox active compounds in food on healthy ageing, chemoprevention and redox control in the context of major age-related diseases.

Personal contribution in CA16112 "NutRedOx**"** European collaborative project:
-At National level- National project director in international consortium;
-At International level- Member of the International Management Committee (MC), representing Romania.
Adeverinta 24137/16. 12. 2018
Link:http://www.cost.eu/COST_Actions/ca/CA16112?management
https://www.cost.eu/actions/CA16112/#tabs|Name:management-committee
Project Duration: 29.03.2017 – 28.03.2021.
http://www.cost.eu/extension/pdfExport/pdfexport.php?%5b58199%5d/%5b/COST_Actions/ca/CA16112%5d/%5bCA16112%5d/%5b%5d
Type of European Project: COST Grant System, EU Programme Horizon 2020, 2016 COST Competition.
http://w3.cost.eu/fileadmin/domain_files/CA/Action_CA16112/mou/CA16112-e.pdf
28 participating countries (e.g., Austria, Cyprus, Czech Republic, France, Macedonia, Germany, Greece, Ireland, Lithuania, Poland, Romania, Serbia, Slovenia, Switzerland, Great Britain, etc.).
Link:http://www.cost.eu/COST_Actions/ca/CA16112?parties

Disability as a Public Health Issue

People with disabilities comprise approximately 15% of the world's population. These are people with impairments (such as visual impairment) and health conditions such as multiple sclerosis, spinal cord injury, depression. The prevalence is expected to increase, in part because of the world-wide ageing population and the steady increase in prevalence of chronic diseases.

More significantly, as expressed in both the World Health Organization's International Classification of Functioning, Disability and Health, and in the United Nations' Convention on the Rights of Persons with Disabilities, disability is the outcome of interaction between a person's intrinsic health state and their physical and social environment [123].

I.3 RESEARCH CONTRIBUTIONS ON HEALTH SCIENCES MANAGEMENT

I.3.1 The Crisis Impact on the Health System and on Population Health

The financial crisis began in USA in the autumn of 2008 and rapidly degenerated by contagion everywhere, becoming a global economic crisis in 2009.

The economic downturn has affected much of Europe severely. In 2009 real gross domestic product (GDP) growth rate fell in European Union Member States with a mean decrease of 4.3%. Also, the unemployment increased considerably from 7.2% in 2007 to 11% in 2013 although unemployment rates have varied widely from lows of 4.8% and 5.3% in Austria and Germany, to 26.3% and 27.6% in Spain and Greece respectively [124].

Because of the European sovereign-debt crisis, many European states have adopted harsh austerity policies and have substantially cutdown in public expenditure. Growth in health spending per capita fell in real terms in 2010 in almost all European countries, reversing a trend of steady increases. Namely, from an annual average growth rate of 4.6% per year, between 2000 and 2009, towards a fall in health spending per capita of 0.6% in 2010 [125].

As a result of the downturn in health spending in 2010, the percentage of GDP devoted to health stabilized o rdeclined slightly in many EU Member States. Nonetheless in 2010, European Union Member States devoted on average 9.0% of their GDP to health spending, up significantly from 7.3% in 2000, but down slightly from the peak of 9.2% in 2009 [126]. The consequences of the economic crisis on health have not been overlooked within various non-governmental institutions and by many policy makers through out the world.

For example, WHO identified the importance of awareness of the risks for health and health systems, but also the opportunities for action that the crisis entails by introducing a resolution in 2009 which invites EU Member States to ensure that their health systems continue to demonstrate effectiveness, and to act as wise economic actors in terms of investment, expenditure and employment [127]. Also, the Commission on Social Determinants of Health of the WHO has examined the global conditions of the economic crisis and elaborated a Report on the Crisis Impact upon Vulnerable Groups, addressed to the governments [128].

The economic downturn receives a lot of attention within the European Institutions. The European Parliament has appointed a new specific committee (CRIS Committee) in order to analyse the causes and consequences of the current crisis, the costs of inaction, and possible ways to overcome the crisis and to prevent any repeat [129].

The causes generating the crisis were not corrected, despite all declared efforts [130]. In addition, the Council of the European Union invited Member States and the European Commission to reflect on effective ways to invest in health [131].

The economic crisis in Romania had an important negative impact because the health system had already a lower than needed resources level [132, 133].

Publication on this topic:

- **Cărăuşu Elena Mihaela**, Paris S, Burlea LS, Tucmeanu AI, Antohe I (2017). The Crisis Impact on the Romanian Health System and Population Health. Revista de Cercetare și Intervenție Socială/ RCIS, vol. 57, p. 120-37, IF (2017)=**0,838**. ISSN: 1583-3410 (print), ISSN: 1584-5397 (electronic). Accession Number WOS:000404424800009, IDS Number: EZ0VR.

I.3.1.1 The Crisis Impact on the Romanian Health System and Population Health

∗ Introduction

The global crisis has affected Romania during 2008-2014 being a key factor with a significant negative impact on the health system and on population health [134].

∗Methodology

The aim of our study is to assess the impact of the crisis upon the Romanian health

system as the main socio-economic determinant of population health and to explore the results of the austerity policies meant to control the negative consequences of the crisis.

In the present retrospective study, the vulnerable indicators of the crisis were selected and classified in two categories: (1) indicators evaluating the crisis impact on the health system and (2) indicators evaluating the impact of the anti-crisis measures and austerity policies. So, we have investigated the crisis impact on socioeconomic determinants of health taking into account the main macro-economic indicators registered during crisis period of time.

In our analysis we used the population health indicators as health system outcomes.

The economic-financial impact of the crisis was studied using comparative analysis of the health services financing, the health programs financing and the consumption of compensated medicines from the National Health Insurance Fund (NHIF).

The political impact was evaluated by the analysis of the efficacy and consequences of the austerity policies targeted at lowering the global crisis effects.

The study was limited to the available European and national data sources.

∗Results

The determinants of health are classified into four groups: factors concerning human biology; environmental; macro-economic and socio-economic, cultural, educational; health system factors.

Each group includes direct and indirect health determinants.

The main direct determinants refer to human biology, life style (smoking, diet, alcohol drinking, drugs intake), physical and social environmental conditions (housing, the access to potable water and the hygienic conditions) and social group behavior (violence).

Social determinants of health are those social conditions (and their distribution in population) which influence individual and group differences in health status. The main social determinants of health are: unemployment, low social status, poverty/social exclusion, Gross Domestic Product (GDP), the socio-demographic alterations in the population structure, crisis situations etc.

The crisis impact on the main socio-economic determinants of health

Starting with 2008, on the international market there were signals announcing that "the economyis facing a new economic-financial crisis". These signals came from the evolution of developed countries (US, Great Britain, Spain etc.) economy, but Romania did not understand these signals.

Romania faced a significant economic decline during the global crisis. The recession began in the third trimester of 2008, and continued in 2009 and 2010.

Romanian economy gave signs of stabilization in 2011 (due to high agricultural production), but after the 2011 end there were registered two consecutive trimesters of economic regress, meaning recession. Also, the economic situation was characterized by micro-economic unbalance for the real economy and also by a precarious macro-economic balance, after the impact of the fiscal consolidation policies implemented to attenuate the crisis effects.

The crisis impact upon the work force

The global crisis had an important negative impact on the structure of the work force, bringing about the rise of unemployment alongside with the reduction of the occupied population.Romania registered the lowest level of the work force occupation in the EU-27 during the analyzed period of time. After the economic rise, registered during 2005-2008, starting with 2009 the occupied population began to fall reaching in 2011 the lowest ever registered value (9,138,000 persons).

In 2012, the occupied population was 9,263,000 persons; 55.3% were male, 54.8% were from urban areas. The number of employees decreased dramatically during 2008-2011 period,

the most significant drop in number of employees in EU-27.The decrease was the result of many causes, as following: economic crisis that led to bankruptcy of many companies; the movement of certain companies with foreign capital in other areas with lower level of the taxes etc. About half a million work places (in industry and constructions) disappeared. The number of employees from the public sector registered a decrease starting with February 2009. The private sector represents the engine of Romanian economy. It absorbs most of the work force. The private sector accounted for 66.2% of the employees in 2011.

For the next period a slow increase of the number of employees is expected, due to the hope on the Romanian economy revival.

All aspects related to the work force have an important influence on the population health. Unemployment is associated with increased poverty risk/social exclusion, poor mental health and suicide. There is a circular relation between employment and health. "*A poor health status has an impact upon the work possibilities; at the same time, unemployment contributes to poor health through more circuits: social, emotional, behavioral, material*". The lack of revenue has the strongest effect. The number of unemployed people was 709,383 in Romania, in December 2009. There was a decrease of the unemployed to 493,775 persons until December 2012.

The crisis impact on poverty risk

The main causes with a negative impact on poverty are the high level of unemployment and the lower level of the income.

Romania had the highest rate of poverty risk of the working persons from Europe (17%) in 2008, before the crisis debut. The situation was more difficult in 2012, when the poverty rate of the working persons was double compared with the EU27 average. Romania continues to be the bottom of the table of minimum wages in Europe.

Poverty has an important territorial dimension in Romania, affecting especially the population from the N-E, S-E and S-W regions.

Besides maintaining a low level of income among members of a community, poverty includes limiting access to services such as education, health, decision-making and lack of communal facilities like water, sanitation, roads, transport and communication. In 2010 Romania ranked fifth in the EU in regard to income inequality.

The crisis impact on the real revenue

Romania was the country with the greatest salary decrease from UE. The decrease of the real incomes had a negative economic impact, because the population consumption was 60% from GDP.

The crisis impact on the Romanian Health System

The Romanian health system was sustainable despite a long period of transition. A continuous decrease of the number of contributors to health revenue occurred after 2008. This was registered because of changes in the economy structure caused by the economic crisis. The number of the employees progressively decreased from about 9,000,000 in 2000, to 5,040,000 in 2008 and respectively 4,370,000 in 2010. The sub-financing of the health system is an old issue.

Romania occupied the last place in the EU as regards the health spending share from the Gross Domestic Product, with 5.68% in 2009, while the EU health spending grew up to 8.9%.

The relevant indicator of the financing of the health system is the *health spending per capita* (per inhabitant). The total spending for health per capita was 400.8 $USA in 2008, placing Romania on one of the last places in EU.

The financing of the health sector in Romania is mostly provided by the public sector (82% in 2008, 79% in 2009 and 78.1% in 2010).

The participation of the private sector in the health financing in Europe (EU27) is 27%.

In Romania, the participation of the private sector was lower (18% in 2008 and 21% in 2009), representing 1% from GDP. The biggest part of the revenue came from direct payments. Three quarters of the public financing of the Romanian health system comes from the National Health Insurance Fund (NHIF)- table 3.

Table 3.
THE REVENUE OF THE NATIONAL HEALTH INSURANCE FUND

Indicators (billions RON)	2008	2009	2010	2011	2012	2013 Jan- Sep
Contributions from engagers	7.02	6.52	6.83	6.64	7.25	5.70
Contribution from insured persons	6.84	6.34	5.97	6.62	6.62	5.56
Contribution from pensioners	0.20	0.24	0.28	2.03	1.22	0.64
State budget	0.20	0.24	3.49	2.03	1.39	3.46
Total revenue	15.78	14.62	17.26	17.82	19.45	16.08

Source: http://www.cnas.ro/

The National Health Insurance Fund was difficult to manage during the analyzed period, because of the decrease of the revenue (caused by the lowering of the contribution level and the impact of the crisis), and the increase in spending (due to the problems with the compensated medicines). Alongside with NHIF, the Romanian public health system has also used its own revenue from the Ministry of Health (HM). These came from taxes on alcoholic beverages and smoking products ("the vice tax") and from "the claw-back tax". In 2011, the vice tax generated revenue of 1.2 billions RON for the HM budget, and the claw back tax brought 240 million RON.

The financing of the primary health services

The primary health services are provided in Romania by the individual family health offices. Social Health Insurances settled contracts with 11,388 family doctors (GPs) in 2009. Over 94% of the total population was registered to GPs. The primary health assistance received limited revenue during the crisis period: in 2008 the primary health services received 1.13 billions RON (10.28% from NHIF); in 2009, 1.1 billions RON and 1.19 billions RON (12.4% from NHIF), in 2012. All these values were under EU27 average value of 25%. Family medicine received in 2009 a budget with 24% lower.

The financing of the secondary medical assistance

The secondary health assistance is formed of specialty and laboratory medical services offered in outpatient settings, in consulting rooms, ambulatory sanitary units, medical laboratories, diagnostic and treatment centers and multifunctional medical centers. All these sectors settled contracts for the delivery of medical services with the social health insurances.The revenue used by NHIF in 2009 for secondary health services was 2.15% (320,000 000 RON) and 2.15% (380,000 000 RON) in 2012.

The financing of the dental medicine services

The public providers of dental medicine services activate together with the private providers in Romania. The outpatient dental services are delivered by 14,529 dental offices, 90% with private practice. The public expenses for oral health during 2009 were of 97,516 000 RON (0.44% from NHIF), representing 4.54 RON per capita, meaning 20 times lower than in the majority of the EU countries. In 2012, the value of the dental medicine ambulatory services was 57,879 thousand RON (0.32% from NHIF). Romania is the only EU country where children do not receive free or partly compensated oral healthcare, including prevention.

The financing of hospital services

The third level of medical assistance is delivered in sanitary units with beds (hospitals), under the form of continuous assistance or day care. This is the domain with the greatest

population addressability, and the most expensive sector of the Romanian health system.

There were 503 hospitals, 430 of which being public hospitals (370 subordinated to the County Council and Mayor's Office) in 2010, in Romania. The hospitals sector spent the most part of the NHIF budget (44.8% in 2008 and 47.7% in 2009), augmented by HM funds for infrastructure interventions, medical equipment supply, together with the local public authorities given funds. The spending was 7.58 billions RON (41.9% from NHIF), from which 7.49 billions RON (41.63%) for general hospitals, but half of this spending was allocated to the 67 emergency hospitals in 2012.

In Romania there existed 12 private hospitals in 2006, but in 2012 their number increased to 86. Forty private hospitals were in contractual relationship with NHIF in 2009, but in 2010 there were 52. The private hospitals received from NHIF 150,703,000 RON in 2011, increasing with 40% the next year, in 2012 getting to 213,500,000 RON. The movement of funds from the public sector towards the private one determined the reduction of the NHIF spending for public hospitals with 10% in 2012.

Spending on medicines

The allocated fund for medicines in 2009 was of 2.18 billions RON (29.5% less than in 2008). The elimination of the limits for the compensated medicines in 2008 generated an increase of the consumption. Together with the reduction of the total revenue, this generated great debts in 2009 and 2010. In order to pay these debts, the NHIF was subsidized from the state budget with over 4.0 billions RON, used to pay the medication consumption of the previous year (in 2010 for 2009, in 2011 for 2010). The payments for 2011 (6.0 billions RON) were bigger than the yearly medication consumption, because the debts from 2010 were paid out. The spending on compensated medicines represented 18.5% (3.09 billions RON), in 2008, 14.5% (2.18 billions RON), in 2009 and 22.2% (3.9 billions RON, in 2010. In Romania the spending with medicines, as percentage from the total health allocated budget, are bigger than EU27 average. Considering the medicines spending per capita (in €), and taking into account the population purchasing power, Romania has the lowest EU value (€156).

The financing of the national health programs

The national programs have the legal aim to prevent and treat some illnesses with major impact on the population health and in some cases (AIDS, tuberculosis) with high epidemiological risk. These programs are financed from the State Budget and NHIF after the Budget Law is adopted every year. The spending on the health programs was 10.8% in 2008, 14.1% in 2009 and 12.8% in 2010 from the total NHIF.

The greatest number of beneficiaries from the health national programs in 2009 was enrolled in the Diabetes Program (565,000 patients), followed by the Oncology Program (97,000 beneficiaries).

The crisis impact on the long term sustainability of the social health insurances

The Romanian population uses more medical services than the social insurances availability allows. The NHIF, the main financing source of the Romanian health system, proved not to be financially sufficient. A deficit of 1,900,000 million RON it was registered in 2008, 2,150,000 million RON in 2009 and 4,290,000 million RON in 2010 (0.7% from GDP). These sums were covered by transfers from the State Budget.

The crisis impact on the human resources from the health domain

People are the only strategic resource of the Romanian health system and in spite of this there are no coherent policies for human resources. This lowers the motivation and the stability of the medical staff and determines serious imbalance. The values of the indicators related to providing the population with specialized human resources shows inequalities

between urban and rural areas: 63% of family physicians, 87.5% of the dentists, and 84.8% of the pharmacists are working in urban areas.

The crisis impact on the health of the population

Romania suffered great economic, political and social imbalance during the crisis, with significant impact on the population health.

The degradation of the health of the population was due to the economy fall, determined by the crisis itself and its consequences (the increase of the unemployment, the worsening of the life level, the sub-financing of the health system, and the impairment of the quality of the health services). The performance of the Romanian health system is one of the lowest in the EU, especially regarding the main European Core Health Indicators (ECHI) as health system outcomes.The consequences are evident at the general population level. The crude birth rate had a decreasing tendency during the analyzed period. The new socio-economic reality generated the decrease of the crude birth rate and maintained it at low values. The EU27 average value of this indicator was 10.7 ‰ (in 2009); while in Romania the value was under the average European level (10.4‰ in 2009 and 9.2‰ in 2011).

Romania is among the countries with *high mortality level*, even if during 2009–2012 the crude mortality rate was stabilized around the value of 12‰.

Infant mortality is an important demographic phenomenon and also a significant indicator of the socio-economic development. Romania had one of the highest infant mortality rates in Europe (9.4‰ in 2011). This indicator had great regional disparities; the N-E region registered the greatest value of this indicator (14.2‰). The values for rural area are greater (11.8‰) than those of urban area (7.5‰) for this indicator.

The age-adjusted mortality rate through all causes (954.4/100000 inhabitants in 2009, respectively 1198.8 in 2012) was greater than the EU27 average (601.2/100000 in 2009).

The cause-specific mortality rates by cardiovascular diseases, cancers and digestive diseases were high starting with 2009. The cardiovascular diseases represented the first mortality cause (548.4 per 100000 inhabitants in Romania towards the EU27 average of 216.8 per 100000 inhabitants).

Although in EU the cancer mortality trend decreased, in Romania the standardized mortality rate value for cancer significantly increased from 181.3 per 100000 inhabitants in 2009 to 230.2 per 100000 inhabitants in 2012.

A high level of the avoidable deceases was also registered. Alcohol abuse generates cardiovascular diseases, hepatic cirrhosis, homicides (2.2 per 100000 inhabitants in 2009, compared with the average EU27 of 0.9 per 100000 inhabitants) and traffic accidents.

Romania registered a high morbidity rate as a direct consequence of poverty, low educational and living standards.

Infectious diseases, such as hepatitis type A (17.35 new cases per 100000 inhabitants, compared with EU27 average of 3.47, in 2009), tuberculosis (108.2 new cases per 100000 inhabitants compared with the EU27 average of 15.9 in 2009) and sexually transmitted diseases, especially syphilis (18.7 new cases per 100000 inhabitants, compared with EU27 average of 3.7 new cases per 100000 inhabitants) were high as before crisis.

Life expectancy at birth is one of the key indicators which measure the health and the state development. In Romania, life expectancy at birth for female gender was 77.4 years and for male 69.8 years (in the EU, in 2009, life expectancy at birth was 76.4 ys. for male and 82.4 for female gender).

The austerity and anti-crisis measures

The Government introduced some budgetary and structural reforms, trying to lower the crisis effects during 2009 and 2010, but these were not enough to resist against the global pressures.

The governmental measures taken in Romania in order to lower the crisis effects and to stimulate the economy were: the allocation of 6.3% from GDP for investments in 2009 and 6.4% in 2010, the state warranties (2,600 000 million RON in 2010) for the co-financing of the European projects. Social policies were implemented to reduce unemployment and to sustain the business environment, like reducing the social contributions of the firms engaging unemployed people.

∗Discussions

Economic crisis may negatively impact on population health primarily through its potentially harmful impact on the social determinants of health [128]. Those who support the view by Stuckler and Basu [127], regarding the negative impact of austerity, emphasize risk factors such as unemployment, reduced income, perceived financial hardship, less healthy lifestyles, weakening of social security and employment protection, and stress related to hopelessness, anxiety and general insecurity]. Stuckler et al. [125] demonstrate that the negative impact of unemployment was modified by active labour market policies in 26 European countries.

Other researchers within the social determinants of health perspective emphasize higher mortality during economic upturns because individuals adopt less healthy or riskier lifestyles; for instance: extending working hours, decreasing leisure time, reducing sleep and thus raising stress and work injuries [130].

The crisis dimensions are often measured by changes in gross domestic product (GDP) and changes in unemployment rate while the austerity dimension is measured by changes in, as well as levels of, social expenditures [131]. However, to our knowledge, no study of the *current* crisis in European countries has assessed the interplay between the crisis and policy response taken by European governments, and its association with changes in population health. At five years into the greatest recession since the Great Depression, we can theoretically expect that severe and persistent economic crisis and austerity may have affected the social determinants of health, and thereby influenced even more NCDs. We may expect existing illness to become more limiting when the economic conditions turn worse and social expenditures are reduced, for instance when ill people face unmet needs for medical attention or when the psychological stress associated with difficult economic conditions increases. Cuts in health services, and more people being unable to meet increasing health costs, may also result, even in the short run, in more people with limiting long-standing illness.

Based on the background situation of Eurozone periphery countries one would expect, in line with Stuckler and Basu [127], to see a negative impact on population health. These countries that were most affected by the Great Recession had to use austerity measures, resulting in pay and benefits cuts, high unemployment, temporary work, housing evictions, financial hardship and lower levels of living.

Deteriorated subjective health may be experienced more strongly when a crisis has lasted longer: all the Eurozone periphery countries that were most severely stricken by the recession have suffered losses to wellbeing because of the crisis, especially Greece, Italy, Spain, Cyprus and Romania [129], which may at a later stage impact negatively on health.

The global crisis has affected Romania during 2008-2014 being a key factor with a significant negative impact [134] on the health system and on population health, but the population's perception was that these were fragmentary, implemented without much analysis and relatively ineffective [135]. The efforts of the government to reduce the impact of the crisis make people less healthy, causing high morbidity and mortality rates, because the Romanian people search medical support in advanced stage of their diseases (when it is too late, or too costly). Health is the key factor for the economic and social well-being [136]. The

health state of the general population and of the work force is essential for a competitive country [137]. A good health state determines the increase of the productivity, and this is the engine of the long term economic increase. Employees with precarious health cannot work with their whole potential. This generates negative outcomes in the economic activity, and supplementary costs for social budgets.

∗Conclusions:

(1) The oscillating evolution of the GDP during 2009–2012, the inflation rate, the unemployment, the external debt (of over €98,000 million), the deficit collection of the revenue for the budget, the significant decrease of the salary per hour, the rise of the poverty risk are some of the crisis consequences which determined the decrease in the health of the general population, the fall of the living level and of the quality of life.
(2) The NHIF, the main financial source for the public health system in Romania, has been proved financially inefficient. It registered a deficit of 1,900 000 million RON in 2008, and 2,150 000 million RON in 2009, and 4,200 000 million RON in 2010 (0.7% from GDP). Social Health Insurances received transfers from the state budget to cover the financial deficit, starting with the end of the year 2008. The crisis had negative impact on the human resources from the public health system: 25% decrease of the personal salaries, and high increase of emigration of the physicians and nurses.
(3) Romania suffered great economic, political and social imbalance during the crisis, with significant impact on the population health.The degradation of the health of the population was due to theeconomy fall, determined by the crisis itself and its consequences (the increase of the unemployment, the lowlife level, the sub-financing of the health system, and the impairment of the quality of health services).
(4) Austerity policies were implemented in Romania to reduce the effects ofthe crisis, but the population's perception was there were fragmentary and relatively inefficient.

I.3.2 Health Management

Management for health means all planning, organizing, human resource management, coordination, control and evaluation activities in order to design and acquire optimal decisions regarding health services [138].

Quality Management of Health Services

High-quality of health services involve the right care, at the right time, responding to the service users' needs and preferences, while minimizing harm and resource waste.

The *quality of care definition* (WHO) is "the extent to which health care services provided to individuals and patient populations improve desired health outcomes. In order to achieve this, health care must be safe, effective, timely, efficient, equitable and people-centred."The quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge. WHO definition implies that quality of care can be measured, is ultimately aimed at health improvements rather than simply increasing service inputs or refining system processes, and should reflect the desires of key stakeholders, including health services users and communities.

By including health services, the definition of quality of care spans both curative and preventive care, and facility and community-based care for individuals and populations [139].

Quality of health care increases the likelihood of desired health outcomes and is consistent with the folowing measurable characteristics: safety, effectiveness, timeliness, efficiency, equity, people centredness and integration of health care.

Information Technology and Management of Health Services

Health information technology is the application of information processing involving

both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making.

A *hospital information system* (HIS), known as *hospital management software* (HMS), is an element of health technology that focuses mainly on the administrational needsofhospitals.

A HIS is a comprehensive, integrated information system designed to manage all the aspects of a hospital's activity, such as medical, administrative, financial, legal issues and the corresponding processing of services.

Hospital information systems provide a common source of information about a patient's health history. Patient's laboratory tests informations, also includes visual results such X-ray, which may be reachable by health professionals. Hospital information systems provide internal and external communication among healthcare providers [140].

I.4 SCIENTIFIC CONTRIBUTIONS IN HEALTH EDUCATION AND HEALTH PROMOTION

I.4.1 Health Education and Health Promotion in Schools

Health Promotion in a school (HPS) setting could be defined as any activity undertaken that aims to improve and protect the health of everyone in the school community [141]. The HPS strives to make school a positive experience for students and staff by paying special attention to all aspects of health in every area of the school [142]. The whole school community takes action and places priority on creating an environment that will have the best possible impact on the health and learning of pupils, staff and parents [143].

Health education builds students' knowledge, skills, and positive attitudes about health. Health education teaches about physical, mental, emotional and social health [144]. It motivates students to improve and maintain their health, prevent disease, and reduce risky behaviors.

Onthis topic, I published 1 article *in extenso.*

- **Cărăușu Elena Mihaela**, Burlea LS, Lupu IC, Antohe I (2016). A *Study on the Cognitive Level of Health Education for Secondary School Students from the Rural Environment*; Revista de Cercetare și Intervenție Socială (RCIS), vol. 55, p. 19-30, IF (2016) = **0.838**; ISSN: 1583-3410 (print); ISSN: 1584-5397 (electronic). Accession Number WOS:000390636900002

I.4.1.1 A Study on the Cognitive Level of Health Education for Secondary School Students from the Rural Environment

∗ Introduction

On an international level, adolescents' health is recognized as a fundamental component of human development and welfare, on which depends the population's health, as well as the prosperity and development of all countries. In this respect, the EU Health Strategy „*Health is the greatest wealth*", 2008-2013, emphasizes the fact that „a good health state, from prenatal period, to adolescence constitutes in fact an important social and economic resource".

The WHO triggers in its report over „*The Health Behaviour of School-aged Children* (HBSC)" that in central and East-European countries, among which Romania is mentioned also, „adolescents' health is neglected by the authorities, therefore they are vulnerable and they have limited access to health services".

On national level, two strategic documents identify the main directions and major interventions in children and young people's health: „*National Health Strategy 2014-2020*" and „*National Strategy for protection and promoting children rights for the period of 2014-2020*".

In Romania, the primary health services are being provided by general practitioners who offers preventive and curative medical services for all children, regardless of the medical insurance that the parents/legal guardians have or do not have.

The main problems that can be found when it comes to primary health care are a limited capacity of actively identifying health risks among children in rural communities, but also the limited offer of preventive medical services in the main health package.

Social and economic factors are affecting health; therefore, inequalities at this level are reflected in the general and oro-dental health of adolescents from the rural environment.

Poverty has a negative impact over adolescents in the rural environment, 40% of them living in poor conditions or even at the limit of subsistence. Poverty affects adolescents' health and development by limiting access to health services, to a correct and balanced nutrition and to education opportunities on the one hand, and on the other hand, poorness influences the teenager's family, determining the parents to leave the country in order to look for a job.

∗ Methodology

Our research respected the methodology of the prevalence studies.

The investigation file used for collecting data comprised the following sections: general, social and economic factors; adresability to health services; general and orodental morbidity; attitude towards the general and oro-dental health condition; oro-dental health, pathology and hygiene.

The study was developed following on two research directions: (1) forwarding an elaborated questionnaire in this sense (the research method being social and medical enquiry), the quality of the answers being evaluated on a Likert scale; the obtained data was statistically processed using the following indicators: frequency, structure (the percent of the present/ absent answers), central tendency for quantitative characteristics (medium value) and for testing statistical significance of differences; (2) clinical examination of adolescents and introducing data regarding general and oro-dental health in the database.

The data provided by the questionnaire was corroborated with the results of the clinical examination.The demographic, social and economic factors, considered *independent variables*, were: age (already turned), gender (male/female), parent's education and type of family. For the family income level, the following categories were established: poorness, reduced and medium.

In our study, the prevalence of the general morbidity, the indicators of oro-dental morbidity, the addressability of the adolescents from the rural environment to the general practitioner, and to the dental medicine services in the last 2 years, oral hygiene, the degree of education for health, autoperception of oro-dental health (SOH) and autoperception of the general health, were considered *dependent variables*.

For the study of general morbidity for the adolescents from the rural environment are used the International Classification of Diseases and Health Problems, Revised Version 10 (ICD10-2013).

For the study of oro-dental morbidity there were followed the indicators recommended at European level which were correlated to the prevalence of general diseases indicators.

The present study was realized with the *aim* of knowing the level of health education level of adolescents in the rural environment, correlated with their health condition (general and oro-dental). In order to reach this aim, the research set the main *specific objectives*: (1) evaluating the cognitive level of health education regarding general and oro-dental health condition; (2) evaluating general morbidity and oro-dental morbidity in the studied group.

The results of the study are useful for consolidating a health promotion program, integrated at a community level, the program having been created for the main health problems raised into question by secondary scool students from the rural environment.

The group of subjects considered for this study comes from a rural community of Iasi county, located in the North-Eastern region of Romania, having 4975 inhabitants, 341 (6.85%) out of which being adolescents.

∗ Results

Initially there were 168 adolescents included in the study. Due to the fact that the global participation rate to our study was 95.24%, in the final group remained only 160 subjects, with ages between 13 and 15. The medium age for the total studied group was 13.92 years, 13.85 years for females and 13.98 years for males.

The studied group is representative for adolescents from the rural area within Iasi County, the maximum error being ± 2.68%.

Gender distribution of children in the studied group evidenced the prevalence of the male gender subjects (88 persons, respectively 55.0%) and of the female (72 persons, respectively 45.0%).

The general characteristics of the studied group are synthetically presented in table 4.

Table 4.
DEMOGRAPHIC AND SOCIAL CHARACTERISTICS OF THE STUDIED GROUP

Age / ***Gender*** / **General factors:**	**13-15 years**		
	Male n_1 (%)	**Female** n_2 (%)	**Total** N (%)
	88(55.0%)	72(45.0%)	160(100.0%)
Age (already turned):			
-13 years [1];	21(23.84)	25(34.72)	46(28.95)
-14 years [2];	48(54.56)	33(45.83)	81(50.63)
-15 years [3];	19(21.60)	14(19.44)	33(20.62)
Medium age (years)	13.98	13.85	13.92
Mother's education:			
-without education [1];	4(4.55)	7(9.72)	11(6.87)
-elementary school (ISCED 1) [2];	11(12.50)	16(22.22)	27(16.88)
-secondary school (ISCED 2) [3];	14(15.91)	12(16.67)	26(16.25)
-upper secondary education (ISCED 3) [4];	19(21.59)	13(18.06)	32(20.00)
-post secondary education (ISCED 4)[5];	20(22.73)	15(20.83)	35(21.86)
-master(tertiary education) (ISCED 7) [6];	9(10.23)	8(11.11)	17(10.63)
-non-answer[9].	11(12.50)	1(1.39)	12(7.50)
Family income on a monthly basis:			
-without any income [1];	7(7.95)	5(6.94)	12(7.50)
-poomess(sub 400 Lei/month)[2];	16(18.18)	11(15.27)	27(16.87)
-reduced (401-880 Lei/month)[3];	29(32.95)	25(34.72)	54(33.75)
-medium (881-1050 Lei/month)[4];	28(31.82)	21(29.17)	49(30.63)
-non-answer [9].	8(9.09)	10(13.89)	18(11.25)
Living conditions:			
-unsatisfactory [1];	20(22.73)	11(15.28)	31(19.36)
-satisfactory [2];	27(30.61)	29(40.28)	58(36.25)
-good [3];	23(26.14)	22(30.56)	45(28.13)
-unknown [9].	18(20.45)	10(13.89)	28(17.50)
Odds Ratio (OR); *CI 95%*- Confidence Interval95% for OR.			

Following a social and economic aspect, the studied lot includes adolescents from the rural environment whose parents either work abroad, or in their own homes doing subsistence agriculture and animal husbandry, or which beneficiate from minors' allowances.

Most of the adolescents from the studied group were from families with reduced monthly incomes, who have confronted with significant financial difficulties in the past few years.

Adolescents from the studied group filled in a health education questionnaire, which gathered questions related to health, disease prevention, personal and orodental hygiene.

The calculated mean value for all the answers offered by the adolescents from the studied lot to the health questionnaire is 1.86 for the total lot (the scale used for evaluating the answers was Likert 0-4), 1.8 for male gender and 1.9 for female gender.

Table 5 shows a synthesis of answers to the most important questionnaire items.

Table 5.
SYNTHESIS OF ANSWERS TO THE HEALTH EDUCATION QUESTIONNAIRE

Age / Gender / Item:	13-15 years		
	Male n_1 (%)	**Female** n_2 (%)	**Total** N (%)
	88(55.0%)	72(45.0%)	160(100.0%)
When is it mandatory for hands to be washed:			
-unsatisfactory/ incomplete answer [1];	27(30.68)	17(23.61)	44(27.50)
-satisfactory answer [2];	21(23.86)	19(26.39)	40(25.00)
-good answer [3];	19(21.59)	23(31.94)	42(26.25)
-very good answer [4];	16(18.18)	12(16.67)	28(17.50)
-non-answer [9].	5(5.68)	1(1.39)	6(3.75)
Mean value	2.0	2.1	2.07
How are „contageous" diseases transmitted?			
-unsatisfactory/ incomplete answer [1];	22(25.00)	16(22.22)	38(23.75)
-satisfactory answer [2];	31(35.23)	27(37.50)	58(36.25)
-good answer [3];	17(19.32)	14(19.44)	31(19.37)
-very good answer [4];	13(14.77)	9(12.50)	22(13.75)
-non-answer [9].	5(5.68)	6(8.33)	11(6.87)
Mean value	1.7	1.8	1.73
How can one prevent dental caries?			
-unsatisfactory/ incomplete answer [1];	19(21.59)	13(18.06)	32(20.00)
-satisfactory answer [2];	30(34.09)	26(36.11)	56(35.00)
-good answer [3];	23(26.14)	22(30.56)	45(28.13)
-very good answer [4];	12(13.64)	8(11.11)	20(12.50)
-non-answer [9].	4(4.55)	3(4.17)	7(4.37)
Mean value	2.3	2.4	2.37
When was the last time you changed our tooth brush?			
-I don't have one/I don't change the tooth brush [1];	20(22.73)	15(20.83)	35(21.88)
-last year [2];	26(29.55)	17(23.61)	43(26.86)
-6 months ago [3];	24(27.27)	22(30.56)	46(28.85)
-3 months ago [4];	13(14.77)	16(22.22)	29(18.13)
-non-answer [9].	5(5.68)	2(2.78)	7(4.37)
Mean value	1.8	2.1	1.98
How often do you brush your teeth?			
-twice a day [1];	13(14.77)	16(22.22)	29(18.13)
-daily[2];	20(22.73)	22(30.56)	42(26.25)
-sometimes [3];	26(29.55)	17(23.61)	43(26.86)
-never [4];	25(28.41)	14(19.44)	39(24.37)
-non-answer [9].	4(4.55)	3(4.17)	7(4.37)
Mean value	1.8	2.1	1.97
Odds Ratio (OR); *CI 95%*- Confidence Interval 95% for OR.			

The unsatisfactory general level of the answers received for the questions can be explained by the lack of interest for health education as what the adolescents and their parents are concerned, as well as the teachers.

The data presented in table 6 shows the results concerning the addressability of the adol from the rural environment to the dentist.

The addressability, calculated for the total group, was 60.62% (97 subjects), respectively 59.09% (52 persons) for male gender and 62.50% (45 persons) for female gender subjects.

The accessibility of adolescents from the rural environment to health services is influenced by factors related to organizing and functioning of health system, parents' education, but also by the family income.

The data presented in table 6 and table 7 brings forth the oro-dental morbidity in the case of secondary school students from the rural environment, which is relatively different for the two genders.

Table 6.
ADDRESSABILITY OF THE ADOLESCENTS FROM THE RURAL AREA
TO THE ORO-DENTAL HEALTH SERVICES

Age / **Gender** / **Factors:**	**13-15 years**			**Odds Ratio** (CI 95%)	***p* value**
	Male n_1 (%)	**Female** n_2 (%)	**Total** N (%)		
	52	45	97		
Addressability to dental office:					
-not scheduled [1];	2(3.85)	3(6.67)	5(5,15)	OR=0.74	
-emergency [2];	23(44.23)	22(48.89)	45(46,39)	(0.33-1.65)	p<0.05
-scheduled [3].	27(51.92)	20(44.44)	47(48,45)		
Most recent visit to the dental practitioner:					
-non-answer [9];	6(11.54)	2(4.45)	8(8.25)	OR=0.61	
-last year [1];	12(23.07)	16(35.55)	29(29.90)	(0.27-1.37)	p<0.05
-2 years ago [2];	15(28.85)	12(26.67)	27(27.84)		
-never [3].	19(36.54)	15(33.33)	34(35.05)		
Auto-perception of oral health (SOH):					
-non-answer [9];	1(1.92)	2(4.44)	3(3.09)	OR=0.41	p<0.05
-bad [1];	11(21.15)	17(37.78)	28(28.87)	(0.17-0.99)	
-medium [2];	19(36.54)	18(40.00)	37(38.14)		
-good [3].	21(40.38)	8(17.78)	29(29.90)		
Odds Ratio (OR); *CI 95%*- Confidence Interval95% for OR; RA- Attributable Risk.					

Table 7.
ORO-DENTAL MORBIDITY FOR ADOLESCENTS IN THE RURAL ENVIRONMENT

Age / ***Gender*** / **Factors:**	**13-15 years**			**Odds Ratio** (*CI 95%)*	***p* value**
	Male n_1 (%)	**Female** n_2 (%)	**Total** N (%)		
	52	45	97		
Oro-dental morbidity (prevalence)					
Dental caries [K02.1, K02.2, K02.3, K02.5, K02.8]	27(51.92)	24(53.33)	51(52.58)	OR=0.88 (0.39-1.95)	p<0.05
Radicular remainings [K08.3]	7(13.46)	11(24.44)	18(18.56)	OR=0.48 (0.17-1.37)	p<0.05
Subgingival and overgingival tartar [K03.5]	11(21.15)	8(17.78)	19(19.59)	**OR=1.24** (0.45-3.42) RA=19.35%	p<0.05
Affecting pulp and periapical tissue [K04.0 K04.1, K04.2]	5(9.62)	8(17.78)	13(13.40)	OR=0.49 (0.15-1.63)	p<0.05
Parodontal disease [K05.3, K05.4, K05.5, K05.6]	9(17.31)	13(28.89)	22(22.68)	OR=0.60 (0.25-1.45)	p<0.05
Dental abcess K04.6, K04.7, K04.8]	10(19.23)	7(15.56)	17(17.53)	**OR=1.29** (0.45-3.73) RA=22.43%	p<0.05
Dental and under-jaw anomalies	3(5.76)	5(11.11)	8(8.24)	OR=0.49 (0.11-2.18)	p<0.05
Dental trauma	5(9.62)	2(4.44)	7(7.22)	**OR=2.29** (0.42-12.41)	p<0.05
Oral hygiene:					
-unsatisfactory [1];	12(23.08)	15(33.33)	27(27.84)	OR=0.59	p<0.05
-medium [2];	22(42.31)	19(42.22)	41(42.27)	(0.24-1.43)	
-good [3].	19(36.54)	11(24.44)	30(30.93)		
Odds Ratio (OR); *CI 95%*- Confidence Interval95% for OR; RA- Attributable Risk.					

Table 8 presents the evaluation results of the addressability of adolescents from the rural area to the general practitioner or pediatrician.

The calculated addressability for the entire lot was 66.87% (107 subjects), respectively 63.64% (56 persons) for males and 70.83% (51 persons) for female gender subjects.

The reduced addressability to physician is a significant risk factor to the overall health of adolescents in rural areas. We noticed a significant association between parents' low education level (ISCED 1) and the reduce addressability to the family physician/pediatrician of the middle school students in rural areas (OR = 1.14).

Table 8.
ADDRESSABILITY OF ADOLESCENTS FROM THE RURAL AREA TO THE BASIC HEALTH SERVICES

Age / **Gender** / **Factors:**	**12-15 years**			**Odds Ratio** (CI 95%)	***p*** **value**
	Male n_1 (%)	**Female** n_2 (%)	**Total** N (%)		
	56	51	107		
Access to general practitioner or pediatrician (2015):					
-yes [1];	18 (32.14)	21(41.18)	39(36.45)	**OR=1.48**	
-no [2];	31(55.36)	26(50.98)	57(53.27)	(0.67-3.26)	p<0.05
-non-answer[9].	7(12.50)	4(7.84)	11(10.28)	RA=32.43%	
Self perception of health (SPH):					
-ill [1];	4(7.14)	7(13.73)	11(10.28)	OR=0.55	p<0.05
-healthy [2];	49(87.50)	42(82.35)	91(85.05)	(0.19-1.53)	
-non-answer [9].	3(5.36)	2(3.92)	5(4.67)		
Odds Ratio (OR); *CI 95%- Confidence Interval* 95% for OR; RA- Attributable Risk					

General morbidity (table 9) of secondary school students from the rural environment taken for study, dominated by untreated diseases (19.63%) and recently diagnosed (13.08%), with only 18.69% of the cases correctly diagnosed and treated determines social and health problems that are difficult to handle, on a medium term or long term.

In our study, the prevalence of smoking has low value (6.54%) as compared to the average of urban area at national level (14.2%).

Table 9.
PREVALENCE OF GENERAL MORBIDITY, SMOKING AND ALCOHOL CONSUMPTION

Age / ***Gender*** / **Factors:**	**13-15 years**		
	Male n_1 (%)	**Female** n_2 (%)	**Total** N (%)
	56	51	107
General prevalence	29(51.79)	26(50.98)	55(51.40)
Smoking	5(8.93)	3(5.88)	7(6.54)
Alcohol consumption	3(5.36)	1(1.96)	4(3.74)

A relatively healthy lifestyle was registered for 20.32% of the subjects, being insignificant higher in the case of males than in the case of female gender subjects 23.82% *vs.* 17.59%.

The highest number of subjects with a healthy lifestyle was registered at subjects with the age of 15 (17 persons– 10.62%).

∗ Discussions

In Romania, the population from certain rural regions of EU confronts with difficulties related to accessibility to basic health services. Numerous research sustain that in the families where parents have a low financial status and a low educational level, children adopt an unhealthy life style [143].

Emphasis is made on a coherent health politics, based on health education and health promotion [144], which should include: (1) an efficient control of risk factors for health and mentioning the ones that are common also for general diseases, as well as for oral health, in order to simultaneously prevent general diseases, as well as oro-dental ones; (2) implementing health programs designed for preadolescents and adolescencents from the rural environment, coming from poor families [145]; (3) the technical and legislative suport necessary for configuring an efficient health system, that integrates oral health in general health.

∗ Conclusions

The analysis of the results of our study show the following conclusions:

(1) Adolescents coming from the rural area have a precarious general and oro-dental health condition;
(2) The unsatisfactory general level of answers to the questionnaire can be explained by a low interest regarding health education on behalf of the adolescents, as well as their parents and teachers;
(3) Accessibility to health services that adolescents from the rural area have is influenced by factors related to organizing and functioning of health system, but also to the family income level and parents' education level.

The studies presented in the first chapter of this Habilitation Thesis are consistent with the "National Health Strategy":

-GO 3. Decreasing the growth rate of morbidity and mortality of non-communicable diseases and reduce their burden in the population through preventive national, regional and local health programs.

SO 3.1 Increasing the role and effectiveness of health promotion in reducing the burden of disease in the population in priority areas.

SO 3.2 Reducing the burden of cancer in the population by detecting early disease and reducing medium-term specific mortality.

The National Health Strategy is the commitment evidence of the Romanian Government and health sector decision-makers to *ensure and promote health* as a key determinant of a sustainable development of the Romanian society, including socially and economically, as a driver of progress and prosperity. Also, this official document is intended „to provide a general framework for the elimination of identified weaknesses in the health sector by: reducing important health inequalities, optimizing the use of resources in health services under increased cost-effectiveness with evidence-based medicine, and not in last but not least, to improve the administrative capacity and the quality of management at all levels" [14].

Chapter II.
SCIENTIFIC CONTRIBUTIONS ON PUBLIC HEALTH DENTISTRY AND MEDICAL-DENTAL MANAGEMENT

II.1 INTRODUCTION

Over the last 20 years, *dental public health* has expanded significantly, increased its complexity and applicability, with particular emphasis on the delivery system for oro-dental health care and on the impact of the population oral health status [150].

Nowadays, oral health is recognized as equally important in relation to general health.

A broadly accepted definition for *Public Health Dentistry* (PHD) has been given as "the science and art concerned with preventing oral disease, promoting oral health and improving the quality of life through the organized efforts of society" [150].

Public Health Dentistry is that subspeciality of Public Health providing leadership and expertise in policy development, oral health surveillance, population-based interventions or community-based disease prevention and health promotion, and the safety of the oral-dental services.

Public Health Dentistry and the private practice model of care delivery together bear the responsibility of assuring optimal oral health for individuals and populations [151].

Oral health is an important public health problem as dental diseases including dental caries, periodontal disease, oral neoplasms and dento-facial trauma are common, have significant impact on individuals and wider society, and are largely preventable [152].

Oral health was defined by WHO as "a state of being free from chronic mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing" [153].

Oral health promotion involves a common risk factor approach which may be based on the principles of the Ottawa Charter.

At the global level, WHO technical and policy support is needed to enable countries to integrate oral health promotion with general health promotion.

Expertise of WHO Collaborating Centres on Oral Health (like Iasi, Romania) is valuable in this process.

Examples include reducing the consumption of sugars through regulation of advertising and labeling of foods, training dental care professionals to give alcohol and tobacco advice, preventing accidents damaging the mouth through promotion of impact-absorbing surfaces for play areas, and for use mouthguards during contact sports.

Good oral hygiene and optimal exposure to fluoride is promoted through provision of low cost fluoride toothpastes and other sources of fluoride including community fluoridation schemes of salt, water, and milk.

Dental services are involved in the prevention and treatment of dental disease with the additional aim of improving the quality of life of affected individuals.

Dental health-specialized personnel can be trained also to provide atraumatic restorative techniques, a method of restoring decayed teeth.

To ensure their efficiency, dental services should provide high-quality, evidence-based patient management.

II.2 RESEARCH CONTRIBUTIONS ON THE PUBLIC HEALTH DENTISTRY

II.2.1 Oral Health of the Population

Oral health is a key component of overall health, wellbeing and quality of life. Although, oral health is recognized as an integral component of the right to health, it is less important/or absent from EU intergovernmental health agendas and national one.

The major challenges for oral health in the near future will be to turn knowledge and experience of disease prevention into action.

Publication on this topic:

- **Cărăuşu Elena Mihaela**, Dascălu CG, Zegan G, et al (2017). The General and Oral Health Status in Older Adults from Rural Environment of Iasi County, Romania. Revista de Cercetare şi Intervenţie Socială/RCIS; 59: 187-208. ISSN:1583-3410; eISSN:1584-5397. Accession Number WOS:000417645600013

II.2.1.1 The General and Oral Health Status in Older Adults from Rural Environment of Iasi County, Romania

∗Introduction

In Romania, the North-Eastern region is the area having the highest number of inhabitants with a mean population density of 100.2 inhabitants/km^2, which exceeds the mean value, 89.5 inhabitants/km^2, corresponding to the entire country. From North-Eastern region, Iasi is the county having the highest population density: 149.9 inhabitants/km^2.

The changes in population dynamics are expected to have a major impact on the general health apart from the concerns on oral health. Also, the demographic and socioeconomic factors affect health; therefore, the inequalities at rural environment are reflected in the geriatric population's general and oral health. Moreover, general health and oral health are interlinked because oral diseases and other noncommunicable diseases (NCDs) share "common risk factors".

The achieving of this study was *motivated* by the lack of recent data about health status (general and oral) in rural elderly. Also, such type of study provides valuable information that are necessary for the decision-makers (at national and local level) in order to assess the opportunity of health programs integrated at community level designed to solve the main health problems emphasized in geriatric population from the rural environment and to estimate the resources required for their implementation.

The *aim* of our study was to assess the health status in older adults, aged 65-74 years, from a rural community of Iasi County, in North Eastern region of Romania, in order to identify the main general and oral health issues.

The main *objectives* of our study were: (1) to evaluate the oral morbidity, the oral health related behaviors and the attitudes towards oral health; (2) to evaluate the general morbidity; (3) to study the addressability to health services; and (4) to evaluate the supplying medicines for the rural areas.

∗Methodology

The studied group was selected from a rural community having 4975 inhabitants, 1712 (35.51%) out of them being 65 to 74 years old. Initially, our study involved 208 individuals, during January to December 2016. The global response rate was 94.23% (5 persons left the study because they changed their residence and 3 deceased during the 2016). Finally, the studied group included 196 persons and it was statistically representative (accepted maximum error was ±2.58%) for the geriatric population from rural environment of Iasi County.

The data collection was carried out following the main directions: (1) a clinical examination (oral and general)- subjects were examined by a physician and information on their general and oral health status were recorded; (2) a questionnaire with 21 items that targeted: the self-perceived overall health, the self-related oral health; the addressability to oral health services.

The value of Cronbach alpha coefficient for the questionnaire was 0.724.

The *study protocol* was built according to the methodology of prevalence studies.

The following demographic and socio-economic factors were considered as *independent variables*: age, gender (masculine/feminine), marital status, living arrangements (refer to the place in which the old persons stay, the type of family in which they live and the people they stay with) educational level and personal monthly income.

In our study, the general morbidity indicators, the oral morbidity indicators, the addressability to health services, the supplying medicines, the self-perceived overall health, the self-related oral health (SOH) and the use of dental prosthesis have been taken as *dependent variables.*

The oral health related behaviors (the using of dental services during the past 2 years, smoking and alcohol use) and the oral health attitudes were also assessed.

The *descriptive analysis* was used to assess the general morbidity and oral morbidity indicators. To evaluate the gender differences in the prevalence of oral diseases and general health outcomes we used *analytic statistic methods*. Odd Ratio (OR) and Attributable Risk (AR, or risk difference) with 95% Confidence Intervals (CI 95%) were used as measures of association between demographic and socio-economic factors considered as independent variables and health indicators as dependent variables. To assess the significance of the identified differences we performed the Chi-squared test (Pearson χ^2); p value < 0.05 were considered to be statistically significant.

∗Results

The morbidity of older adults (table 10) from the rural environment, dominated by the NCDs, determines health (general and oral) and social problems that are difficult to manage. Analyzing the age structure of the studied group, one can notice that most of the subjects (68.88%) were part of the aged group 65 to 69 years.

Table 10.
GENERAL CHARACTERISTICS IN OLDER ADULTS FROM RURAL ENVIRONMENT

Age group: / ***Gender:***	**65-74 years**						Odds Ratio (*CI 95%)*
	Male		**Female**		**Total**		
	n_1	(%)	n_2	(%)	N	(%)	
	89	45.41	107	54.59	196	100.00	
General characteristics[code of Item in the data base]							
Education:							
-no formal schooling [1];	4	4.49	7	6.54	11	5.61	$OR_{[1+2+3]}$=0.7455
-primary school (ISCED1) [2];	11	12.36	16	14.93	27	13.76	(0.3074-0.9878)
-secondary school (ISCED2) [3];	14	15.73	27	25.23	41	20.92	
-post-secondary, non-tertiary education (ISCED3)[4];	39	43.82	33	30.84	72	36.73	
-vocational education (ISCED4) [5];	11	12.36	15	14.09	26	13.27	
-academic education (ISCED7) [6];	9	10.11	8	7.48	17	8.67	
-no answer [9].	1	1.12	1	0.93	2	1.02	
Personal monthly income:							
-no income [1];	7	7.86	5	4.67	12	6.12	$OR_{[1+2]}$=0.9052
-poor (less than 100 €/ month) [2];	17	19.10	26	24.30	43	21.94	(0.4834-1.6952)
-low income (101-200€/month)[3];	29	32.58	35	32.71	64	32.65	
-lower middle income (201-325€/ month) [4];	28	31.46	31	28.97	59	30.10	
-middle income (326 €/month- medium sallary) [5].	8	8.98	10	9.35	18	9.18	
Marital status:							
-unknown [9];	1	1.12	2	1.87	3	1.53	
-not married [1];	2	2.25	3	2.80	5	2.55	
-widower [2];	33	37.07	36	33.64	69	35.20	
-divoced [3];	4	4.49	6	5.61	10	5.10	**$OR_{[4+5]}$=1.14**
-curently married [4];	43	48.31	52	48.59	95	48.47	(0.65-2.01)
-consensual union [5].	6	6.74	8	7.48	14	7.14	p<0.05
Living arrangements:							
-unknown [9];	0	0.00	1	0.93	1	0.51	$OR_{[1]}$=0.6975
-not satisfying [1];	33	37.08	49	45.79	82	41.84	(0.3928-1.2385)
-satisfying [2];	26	29.21	23	21.49	49	25.00	
-good [3].	30	33.71	34	31.76	64	32.65	

Odds Ratio (OR); *CI 95%*- *C*onfidence *I*nterval 95% for OR; Bold values are Statistically Significant at p<0.05.

The main results on the *oral morbidity in older adults from rural environment* are shown in table 11.

Table 11.
ORAL MORBIDITY IN OLDER ADULTS FROM RURAL ENVIRONMENT

Age group: / ***Gender:*** / **Oral morbidity**	**65-74 years**						Odds Ratio (*CI 95%*)	Attributable Risk (AR)
	Male		**Female**		**Total**			
	n_1	(%)	n_2	(%)	N	(%)		
	89	45.41	107	54.59	196	100.00		
Prevalence indicators [code in data base]:								
Dental caries experience [K02.1, K02.2, K02.3, K02.5, K02.8]	51	57.30	64	59.81	115	58.67	OR=0.86 (0.49-1.52)	
Dental root residues [K08.3]	n_1=66 16	24.24	n_2=75 11	14.67	N=141 27	100.00 19.15	**OR=1.86** (0.79-4.37)	AR=0.4624
Prevalence of other diseases of hard tissues of teeth[K03]:	21	31.82	32	42.67	53	37.59	$OR_{[K03]}$=0.63 (0.31-1.25)	
-dental erosion [K03.2];	7	10.61	16	21.33	23	16.31		
-dental abrasion [K03.1];	6	9.09	13	17.33	19	13.48		
-other.	6	9.09	5	6.67	11	7.80		
Prevalence of dental calculus [K03.5, subgingival and supragingival calculus]	31	46.97	28	37.33	59	41.84	**OR=1.49** (0.76-2.91)	AR=0.3289
Prevalence of diseases of pulpar andperiapical tissues [K04.0 K04.1, K04.2]	8	12.12	5	6.67	13	9.22	**OR=1.93** (0.6-6.22)	AR=0.4817
Prevalence of periodontal diseases [K05.3, K05.4, K05.5, K05.6]	26	39.40	31	41.33	57	40.43	**OR=1.48** (0.75-2.91)	AR=0.3243
Periodontal status- CP index(more than 20 teeth/ subject):	n_1=32		n_2=27		N=59	100.00		
-bleeding [1];	2	6.25	1	3.70	3	5.08	**$OR_{[1]}$=1.7333** (0.1485-20.2332)	$AR_{[1]}$=0.4219
-calculus [2];	13	40.63	15	55.56	28	47.48		
-pockets 3.5-5 mm [3];	6	18.75	4	14.81	10	16.95		
-pockets 6 mm [4];	4	12.50	3	11.11	7	11.86		
-healthy [5];	2	6.25	0	0.00	2	3.39		
-excluded [6].	5	15.63	4	14.81	9	15.25		
Prevalence of disorders of gingiva [K06]:	n_1=89 22	24.72	n_2=107 29	27.10	N=196 51	100.00 26.02	$OR_{[K06]}$=0.88 (0.46-1.68)	
-gingival recession [K06.0];	11	12.36	17	15.89	28	14.29		
-gingival enlargement [K06.1];	5	5.62	8	7.48	13	6.63		
-alveolar pyorrhoea.	6	6.74	4	3.74	10	5.10		
Prevalence of gum diseases and edentulous alveolar ridge[K06.8, K06.9, K08.2]	n_1=38 **7**	18.42	n_2=55 12	21.82	N=93 19	100.00 20.43	OR=0.81 (0.29-2.29)	
Abscess [K04.6, K04.7, K04.8]	n_1=66 11	16.67	n_2=75 8	10.67	N=141 19	100.00 13.48	**OR=1.68** (0.63-4.45)	AR=0.4048
Prevalence of salivary glands diseases [K11]	n_1=89 4	4.49	n_2=107 3	2.80	N=196 7	100.00 3.57	**OR=1.63** (0.36-7.49)	AR=0.3865
Prevalence of lip and oral mucosal diseases [K13]	25	28.09	22	20.56	47	23.98	**OR=1.51** (0.78-2.92)	AR=0.3377
Prevalence of stomatitis and related lesions [K12]	8	8.99	5	4.67	13	6.63	**OR=2.01** (0.63-6.39)	AR=0.5025
Prevalence of lip and oral potentially malignant diseases [K13]	9	10.11	3	2.80	12	6.12	**OR=3.9** (1.02-14.88)	AR=0.7436
Pearson $\chi^2_{calculated\ value}$ and *p* value:	χ^2=4.515		df=1		*p*=0.0335			
Prevalence of temporo-mandibular joint diseases [K07.6]	11	12.36	15	14.02	26	13.27	OR=0.86 (0.38-1.99)	
Prevalence of dental trauma [1]:	n_1=66 16	24.24	n_2=75 8	10.67	N=141 24	100.00 17.02	**$OR_{[1]}$=2.68** (1.06-6.75)	$AR_{[1]}$=0.6269
-missing tooth [5];	14	21.21	7	9.33	21	14.89		
-excluded tooth [6].	2	3.03	1	1.33	3	2.13		
Pearson $\chi^2_{calculated\ value}$ and *p* value:	χ^2=4.580		df=1		*p*=0.0323			
Prevalence of edentulism:	n_1=89		n_2=107		N=196	100.00		
-total edentulism TE [2];	23	25.84	32	29.91	55	20.06	$OR_{[1]}$=0.82 (0.44-1.53)	
-partial edentulism PE [3];	15	16.85	23	21.50	38	19.39		
-TE+PE [1].	38	33.71	55	51.40	93	47.45		
Total / Partial edentulism ratio		1.53		1.39		1.48		
Use of dental prosthesis:								
-yes [1];	22	24.72	31	28.97	53	27.04	$OR_{[1]}$=0.805 (0.42-1.52)	
-not using the dentures [2].	1	1.12	1	0.93	2	1.02		
Prevalence of denture stomatitis [K12.1]	n_1=22 4	18.18	n_2=31 3	9.68	N=53 7	100.00 13.21	**OR=2.07** (0.41-10.37)	AR=0.5169
No of natural teeth:								
-20 teeth or more [1];	32	35.96	27	25.23	59	30.10	**$OR_{[1]}$=1.66** (0.89-3.07)	$AR_{[1]}$=0.3975
-10-19 teeth [2];	19	21.35	25	23.36	44	22.45		
-1-9 teeth [3].	15	16.85	23	21.50	38	19.39		

Pearson $\chi^2_{calculated\ value}$;df = number of liberty degrees; Odds Ratio (OR); *CI 95%- C*onfidence *I*nterval 95% for OR; Bold values are Stastically Significant at $p<0.05$; AR- Attributable Risk (risk difference).

Based on our data, was outlined the *oral morbidity model* of the older adults from the rural environment, which is relatively different for the two genders.

In male gender, the oral morbidity model is dominated by the dental caries disease, lip and mucosal diseases, dental trauma and edentulism. The main risc factors for oral health are: dental calculus, radicular residues, poor oral hygiene and no tooth brushing.

A relatively different oro-dental morbidity model is being emphasized in female gender, which is dominated by the dental caries disease, non-carious dental disorders, periodontal diseases and edentulism. The main risk factors are: dental calculus, poor oral hygiene and no tooth brushing.

Adresabillity to dental medicine services

The main results of the adresabillity to dental medicine services and self-perceived oral health in studied group are shown in table 12.

Table 12.
SELF-PERCIEVED ORAL HEALTH AND ADRESSABILLITY TO DENTAL MEDICINE SERVICES- in elderly from rural environment

Age group: / ***Gender:***	**65-74 years**						Odds Ratio (*CI 95%)*	Attributable Risk (AR)
	Male		**Female**		**Total**			
	n_1	(%)	n_2	(%)	N	(%)		
	89	45.41	107	54.59	196	100.00		
Items of questionnaire [code of Item in data base]:								
Adressabillity to dental services:								
-not programmed [1];	4	4.49	6	5.61	10	5.10		
-emergency [2];	32	35.96	45	42.06	77	44.39	$OR_{[2]}$=0.7735	
-programmed [3].	53	59.55	56	52.34	109	50.51	(0.4337-1.3795)	
Your latest visit to the dentist:								
-I don't remember [9];	17	19.10	12	11.21	29	14.80	$OR_{[1+2]}$=0.3707	
-last year [1];	35	39.33	51	47.66	86	48.98	(0.1999-0.6876)	
-2 years ago [2];	15	16.85	32	29.91	47	23.98	**$OR_{[3]}$=1.6648**	$AR_{[3]}$=0.3993
-more than 3 years ago [3].	19	21.35	15	14.02	34	17.35	(0.7904-3.5065)	
Self-percevied oral health (SOH):								
-unknown [9];	1	1.12	2	1.87	3	1.53	$OR_{[1+2]}$=0.6823	
-very poor [1];	11	12.36	17	15.89	28	14.29	(0.38-1.26)	
-poor [2];	19	21.35	28	26.17	47	23.98		
-average [3];	49	55.06	44	41.12	93	47.45		
-good [4];	7	7.87	11	10.28	18	9.18		
-very good [5].	2	2.25	5	4.67	7	3.51		
Motif of no presentation to the dentist in the last year:								
-unknown [9];	1	1.12	2	1.87	3	1.53	$OR_{[1]}$=0.8556	
-lack of money [1];	48	53.93	64	59.81	112	57.14	(0.48-1.51)	
-difficulties in walking [2];	18	20.22	23	21.50	41	20.92		
-fear [3];	7	7.87	12	11.21	19	9.69		
-neglect [4].	15	16.85	6	5.61	21	10.71		
Motif of actual presentation to the dentist:								
-pain [1];	32	35.96	27	25.23	59	30.10	**$OR_{[1]}$=1.6634**	$AR_{[1]}$=0.3888
-denture replacement [2];	4	4.49	8	7.48	12	6.12	(0.90-3.08)	
-repair/adjustment denture [3];	12	21.35	19	17.78	31	15.82		
-trauma [4];	5	5.62	2	1.87	7	3.57		
-difficult mastication [5];	15	16.86	21	19.63	36	18.37		
-oro-dental infection [6];	7	7.87	4	3.74	11	5.61		
-complex oral rehabillitation [7];	5	5.62	8	7.48	13	6.63		
-dental extraction [8].	16	17.98	11	10.28	27	13.78		

Odds Ratio (OR); *CI 95%- C*onfidence *I*nterval 95% for OR; Bold values are Statistically Significant at p<0.05; AR- Attributable Risk (risk difference).

∗Discussions

In the studied group the female subjects were predominant, compared to males.

From a *socio-economic perspective*, the studied group included older adults who work in their own establishments doing subsistence agriculture and animal husbandry, pensioners in agriculture and persons who benefit from support allowances.

For the most persons in the studied group, the personal monthly income is quite low, therefore in the recent years they are confronting with a lot of significant financial difficulties. It is noticed that for most of the older adults from rural environment, the main income came from the pension, which is not sufficient, especially for agriculture pensioners.

Oral morbidity in elderly from rural environment

Oral diseases are usually progressive and cumulative. The aging process may directly or indirectly increase the risk of oral disease, characterized by poor general health, illnesses or chronic diseases. By analyzing the morbidity caused by oral diseases, it was found that the dental caries, the total edentulism, the periodontal diseases and the oral potentially malignant disorders [153] were the most frequent oral health problems in rural geriatric population.

Also, the *precarious oral hygiene* and the lack of hygiene in prostheses determine an excessive germ colonization that has negative consequences over the oral health status of the older adults in rural environment.

The *dental caries* are the most common cause of tooth loss. A low socioeconomic and health literacy status is associated with a high prevalence of dental caries [154]. After 65 years old, the prevalence of root caries is higher.

Also, the gingival recession and the abrasion defects at the neck of the tooth increase the amount of root caries.

The non-caries odontal pathology is rather diversified, with a relatively high prevalence in rural geriatric population. The dental erosion is the progressive, irreversible loss of dental hard tissue which is chemically etched away from the tooth surface by extrinsic and/or intrinsic acids. The specific non-caries lesions, with cervical or occlusal location, are determined by multiple factors, also registering a close correlation between dental abrazion and aging [155]. These have a relatively high prevalence in rural geriatric population, but most of the times they remain untreated.

The periodontal diseases are one of the major causes of tooth loss. These include pathological conditions of the supporting structures of the teeth, gingiva, alveolar bone, periodontal ligament and cementum. The periodontal diseases share many common risk factors with other chronic diseases such as diabetes and cardiovascular diseases. The periodontal pathology found in elderly can be caused by poor oral hygiene, deficiencies existent in the sanogenous behavior and chronic diseases [156].

The disorders of the temporomandibular joint (TMJ) and the associated anatomical structures are important problems that often prove refractory to treatment and can be the cause of a significant increase of oral morbidity for rural older adults.

The main factors that determined an *avoidance of health services by male patients* are: lack of money, difficulties in walking, negligence, fear of pain and low educational level.

The *avoidance of health services* profile for female patients is linked to the same factors identified in the case of male gender also.

The *access to health services* is critical for rural geriatric population. In Romania, accessibility of geriatric population (especially the population from the rural environment), [157] to the healthcare services is influenced in a negative way by factors related to organizing and functioning of the health system, by the insurance status of each individual within the national health insurance system, by the education level, but also by the low level of individual income [158].

The rural elderly may have more difficulties in accessing effective interventions to prevent and control oro-dental diseases than do urban individuals. One major barrier is the lack of money [159].

The *general morbidity* in our studied group made from older adults from rural environment is dominated by chronic and degenerative diseases. The burden associated with these conditions in geriatric population is generally far higher in low- and middle-income

countries , also in Romania. The geriatric population has multiple health needs (primary and specialized), for the solving of which dental, as well as medical and social aspects need to be combined.

∗ Conclusions

From the results of our research the following conclusions are drawn:

(1) Geriatric population in rural environment has a precarious oral health status. During the ageing process, the structural and mechanical characteristics of the dental structures are changing this influences both the anatomic aspect of the teeth, as well as their functionality; older adults are at increased risk for root caries because of both increased gingival recession that exposes root surfaces and increased use of medications for NCDs that produce xerostomia.

(2) The solutions proposed by the public health specialists for improving oral health status in rural geriatric population are effective as long as they are integrated together with the solutions for the NCDs within certain public health programs integrated at a community level.

(3) Knowing the health status of the rural older adults, the policy makers (the Health Ministry and the Health and Social Insurance Houses) can estimate the necessary resources for implementing the community integrated health programs designed for the geriatric population.

(4) Increasing access to health services in rural area includes a multifaceted approach by rural health providers and residents who desire to end the oral health disparities in rural population.

(5) The high morbidity revealed by the present study suggests that is needed to develop public health services for the geriatric population from rural area of the North-Eastern region of Romania.

Individual risk factors for oral disease are largely equivalent to the risk factors for other NCDs: diet, tobacco and alcohol use, stress, accidents/injuries, ineffective oral hygiene and limited exposure to fluoride. In addition, several oral diseases are linked to NCDs, such as periodontal disease and diabetes, dental caries and obesity (fig. 6).

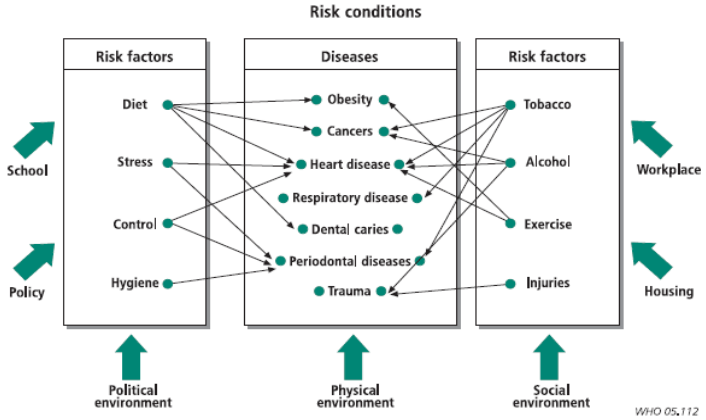


Figure 6. **The common risk factor approach for optimal oral/general health** [160, 161- modified]

In common with many other NCDs, many of these risks are patterned by socialeconomic factors.

Opportunities exist to expand oral disease prevention and health promotion knowledge and practices among the public through community programmes and in health care settings.

Oral health care providers can play an important role in promoting healthy lifestyles by including tobacco cessation programmes and nutritional counselling into their practices.

There are significant **oral health disparities** worldwide. Most commonly reported are oral health disparities for caries and cancers of the head and neck, as well as for receipt of preventive dental visits, sealants, tooth loss, and quality of life. Moreover, the increase in dental caries and periodontal disease, particularly among the elderly and children, indicate that the causes of those diseases are not being controlled. Hence, there is an urgent need for oral health policy to emphasize translational research and reinforce public health approaches to tackling the 'causes of the causes' addressing common risk factors. Several definitions of health disparities exist, but they all have a profound connection with the social determinants of health, as these health differentials are closely linked with social, economic, and/or environmental disadvantages, and, in some countries, to race, and education.

Taking into consideration the constellation of proximal and distal determinants of oral health, it has been suggested that population level approaches may be superior to high-risk group identification and targeting, though combinations of strategies can be most valuable.

There is a fundamental need to integrate initiatives to improve oral health with more general interventions to support good physical health. Primary care is the first point of contact with the health service and is the setting in which most general and oral healthcare is provided [160]. Oral health teams have the largely unexploited potential to be important enablers, and mediators for oral and general health and for the reduction of disparities because the risk factors for oral and general health are the same.

Economics of social inequalities in oral health from an economic perspective, there are many reasons why reducing social inequalities in oral health may be worthwhile. First, there may be efficiency gains, the direct treatment costs due to the excess morbidity of those socio-economically worse off may be reduced.

For example, emergency department visits for preventable dental conditions often imply substantially higher costs than those associated with disease prevention [161]. Second, excess oral health morbidity among the worse off may have detrimental impacts in terms of outcomes on the labour market.

Also, oral health inequality (fig. 7) is increased in disabled people, because they and their families experience even greater poverty and fewer opportunities for education, employment and independence compared to the general population.

Disabled people have fewer teeth, more untreated tooth decay and more gum disease compared to the general population. This has important consequences for general nutrition, communication, self-confidence and participation in society.

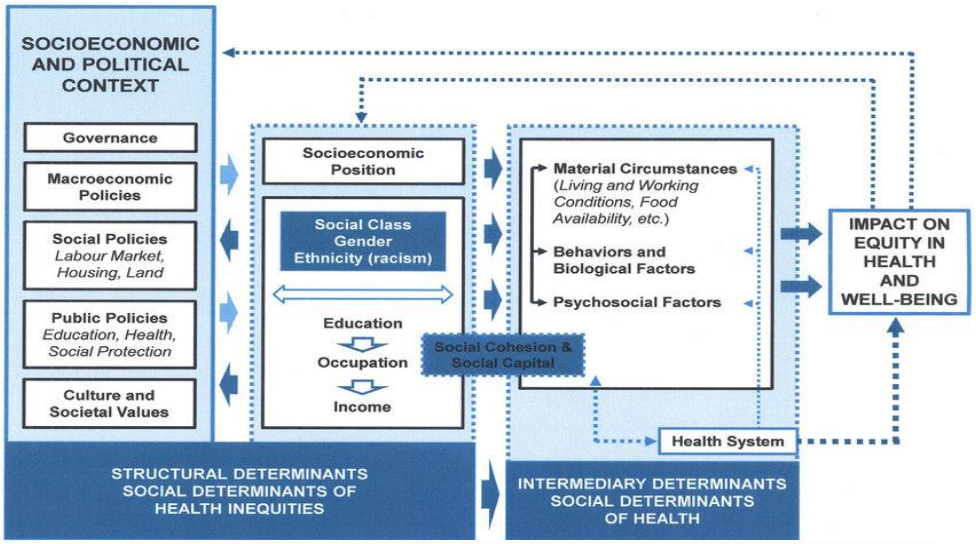


Figure 7. **Social determinants of health and health inequities** [160]

II.2.2 Oral Diseases as Major Issues of Public Health Dentistry

Oral diseases are important components of noncommunicable diseases (NCDs), which continue to be a leading public health problem in the WHO European Region.

Oral health problems and access to primary oral health care show high disparities across Europe. Severe oral disease may cause pain and discomfort and often impairs quality of life. The major oral diseases afflict people of all ages, implyhigh loss of school and work hours, and they are a considerable economic burden to the individual and to society [159].

Public health solutions for oral diseases are most effective when they are integrated with those for other NCDs and with national public health programmes.

The WHO Global Oral Health Programme aligns its work with the Global NCD agenda and the "Shanghai Declaration on health promoting in the 2030 Agenda for Sustainable Development" [168].

The *burden of oral diseases*, and other NCDs, in the European Region can be decreased by population-directed prevention which simultaneously addresses the shared risk factors [160].

Effective evidence-based preventive strategies are needed to address the major public health problem in dental medicine.

Public health strategies should tackle the underlying social determinants of oral health through the adoption of a common risk approach.

Dental Caries as Public Health Dentistry Issue

Dental caries continues to be one of the most prevalent chronic diseases worldwide.

Dental caries continues to pose an important public health problem across the world.

Dental caries is considered an endemic disease, in the sensealmost everyone is affected.

The WHO emphasizes that the disease affects about 60–90% of schoolchildren, the vast majority of adults and that dental caries contributes to an extensive loss of natural teeth in older people globally [161].

A multi-factorial disease that involves tooth structure, oral microbiota, and dietary carbohydrates, "tooth decay" results in the dissolution of the mineral content of teeth and must be thought of as dependent on its key contributing factors.

The socio-behavioural risk factors in dental caries are found universally and they play significant roles in children, adults and older people.

With ramifications ranging from societal to psychological to medical, dental caries can have serious consequences at individual level and for population also.

Dental caries has its own bearing on the quality of human life [162].

Research on *Public Health Dentistry* is vital particularly to the future of the oro-dental health, and the general health of the population. Past discoveries have enabled people today to enjoy far better oral health than generationsa century ago. However, not all people have achieved the same level of oral health and well-being [163].

The burden of dental caries disease influences the finances, the physical, mental, and emotional states of the individual and their families.

Professionally, the loss of work force, throws the system into a bit of disarray. This in turn leads to disturbances down the line due to the cascading affect.

One metric of measuring the burden of this disease is through its *economic impact*.

The economic burden due to dental caries is already burgeoning. It is indeed nedded to reduce the economic implications of this disease.There are many causative and risk factors responsible for the dental caries outcome. One of the primary factors is the economic background of the family. The level of *family income* governs the entire structure of the family on the physical, emotional, sociological and health planes. Thus family income is invariably considered in Public Health Dentistry studies as an important *independent variable* [164].

When the morbidity of dental caries is studied in any population, it is seen that a few in the population experience a lot of decayed teeth and most do not experience any at all or experience very little. Detailed analysis on the situation of morbidity determined by dental caries disease in many countries shows that there is a skewed distribution of caries prevalence-meaning that a proportion of twelve-year-old still has high or even very high values even though a proportion is totally caries free.

Clearly, in such instances, the mean DMFT value does not always accurately reflect this skewed distribution. This leads to an incorrect conclusion that the caries situation for the whole population is under control, while in reality several individuals still have high caries afectation. So, the introduction of the *Significant Caries Index* (SIC) in the year 2000 was in order to bring attention to the individuals with the highest caries afectation in each population under investigation [165].

Significant Caries Index was introduced to enable one to identify the magnitude of dental caries morbidity amongst the children who suffer from it the most. This new aproach was required since Dmft index, being an average value, was not providing a true picture of the *morbidity of dental caries* in the population.The tried and trusted method of measuring caries with DMFT Index (Decayed, Missing and Filled Teeth) gives out average or mean value of caries in the population.

What makes dental caries especially important is the fact that the consequences last for a lifetime. This is indeed a public health major issue as *dental caries is a preventable disease*, not an inevitable one.

The findings of the 2015 Global Burden of Diseases study revealed that dental caries of the primary dentition was the 12th most prevalent disease (560 million children) in all ages combined. The significance of the dental, medical, social and economic costs of Early Childhood Caries (ECC) has increased in all regions of the world.

So, *education for oral-dental health in children* is that component of general health education aimed at creating cultural health models, cultivating in the young generation a healthy behaviour and outlying the opinions about the ways dental disorders can be prevented and treated.The most important goal of *oral-dental* health education is to contribute to the preservation/improvement of children's oral health status.

The ***use of fluoride*** is a major breakthrough in dental caries prevention. The use of fluoride for population based prevention of dental caries has been endorsed officially by WHO since the late 1960s.

The Technical Report Series 846 (TRS846) on “Fluorides and Oral Health” is the existing authoritative WHO publication offering advice and technical support [166].

Various countries are in the process of developing fluoridation programmes while other countries are adjusting existing programmes.

Fluoride is most effective in dental caries prevention when a low level of fluoride is constantly maintained in the oral cavity.

Fluoride mouth rinses incorporated in school health programmes have been available for decades with various degrees of success in caries prevention.

Fluoride has been made available in products for professional application, including gels, varnishes and restorative materials.

Fluoride in toothpaste has also been available for decades and it is considered a main contributor to the decline in dental caries observed among people of industrialized countries; unfortunately, toothpastes are not universally used due to the cost factor which inhibits poor population groups from accessing such preventive measure.

A potential risk of fluoride use is the development of fluorosis, which may occur when excess levels of fluoride are ingested during tooth development. Fluorosis varies in appearance from white striations to stained pitting of enamel.

The side-effects of fluoride use were examined from biological, clinical and public health perspectives [166].

Effectiveness of Dental Caries Prevention Programs

The approach of WHO Oral Health Programmes at global and regional levels emphasizes that oral disease intervention is a significant component of NCDs prevention.

The Resolution "Oral Health: Action Plan for Promotion and Integrated Disease Prevention" [167] urges EU Member States to ensure that populations benefit from *appropriate use of oral disease prevention programs*.

High relative risk of oral disease relates to socio-cultural determinants such as poor living conditions; low education; lack of traditions, beliefs and culture in support of oral health.

Communities and countries with inappropriate exposure to fluorides imply higher risk ofdental caries and settings with poor access to safe water or sanitary facilities are environmental risk factors to oral health as well as general health [166]. Moreover, control of oral disease depends on availability and accessibility of oral health systems but reduction of risks to disease is only possible if services are oriented towards primary health care and prevention.

- **The PhD thesis** entitled **"Comparative Study of the Efficacy of Methods of Prevention of Dental Care in Children"** was presented publiclly on the 18th of December, 1997.
  Doctor's Degree in Medical Sciences- M series, no. 000944/05 May 1998, according to Ord. CNATDCU no. 428/26 febr. 1998, confirmed by ord. MEN nr. 3428/17 March 1998.

In addition to the distal socio-environmental factors, the model (fig. 8) emphasizes the role of intermediate, modifiable risk behaviours, i.e. oral hygiene practices, sugar consumption (amount, frequency of intake, types) as well as tobacco use and excessive alcohol consumption. Such behaviours may not only affect oral health status negatively as expressed by clinical measures but also impact on quality of life.

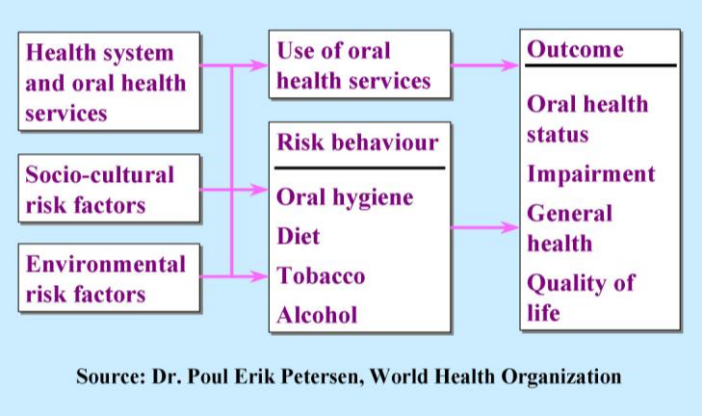


Figure 8. **The risk-factor approach in promotion of oral health** [166]

However, optimal intervention in relation to oral disease is not universally available or affordable because of escalating costs and limited resources.

The current paradigm for clinical management of dental caries is evidence-based and favors non-invasive therapies to prevent and/or arrest the progression of the disease, with traditional surgical intervention reserved for circumstances of irreversible tooth structure loss [162]. Thus, non-invasive therapies is the modern approach in the clinical management of carious disease.

Oral Cancer as Major Issue of Public Health Dentistry

Oral cancer is a major and growing global public health problem, and it remains the major cause of death from oral disease worldwide. Oral (International Classification of Diseases and Related Health Problems ICD10 version 2010) and pharyngeal cancer (ICD11-2014) isthe 8th most common cancer and the 11th leading cause of cancer-related mortality in Europe.

Data on oral cancer (ICD10: C00-C09) morbidity and mortality are stored in the Global Oral Health Data Bank.

There are differences in oral cancer burden across Europe, between Western European and Eastern European countries [167].

In the past two decades, a significant increase of the incidence of oral cancer (~ 300,400 new cases every year) was registered worldwide, which determined a lot of countries to place it in the main public health problems of Dental Medicine [168].

These cancers are highly lethal, incapacitating and disfiguring. The survival rates are improving gradually in well-resourced treatment centres, but many of the cases around the world come late to treatment and fare badly.

The WHO Global Oral Health Programme has established a *global surveillance system for oral cancer* in order to assess risk factors and to help the intervention programmes. So, an effective partnerships at national, regional and global levels are essential for sustainable prevention and control of oral cancer.

The WHO Oral Health Programme is committed to work for building capacity in oral cancer preventionat national level, inter-country exchange of information and experiences from integrated approaches in prevention and health promotion, and the development of global surveillance systems for oral cancer and risk factors.

Regarding oral cancer, *Romania* occupied 5-th place on a European level, having for male gender a total of 3.320 new cases and a standardized incidence rate of 29.6 new cases at 100,000 inhabitants and for female gender 240 new cases and a standardized incidence rate of 3.3 new cases at 100,000 inhabitants. From the data provided by the International Agency for Cancer Research in 2017, *in Romania*, the number of new cases of oral cancer and deaths caused by it registers a more increased growth rate than the regional and global average. It is noted that Romania ranks 9th in Europe in terms of the number of new cancers of the lips and the oral cavity and in the 7th place, taking into account incidence rates and mortality through these conditions. Although, 12.88% new more cases of oral cancer were identified in our country than in the previous years, many of these cases were discovered in late stages of evolution. This determined a high standardized mortality rate (of 17.9 at 100,000 inhabitants for male gender and respectively 1.6 for female gender).

Concerning the evolution of the standardized mortality rate (SMR) through oral cancer (oral cavity, lips and pharynx) on age groups, the data offered by the International Agency for Research on Cancer (IARC) reveal a slightly increasing tendency for the female gender in Romania, while the trend for the male gender is moving upward.

Oral Cancer Foundation calls attention to the fact that, when it discovered in early stage, oral cancer has an 80% survival rate. Unfortunately at this time, the majority of new cases are found as late stage cancers, and this accounts for the high death rate, of about 43% at five years from diagnosis (for all stages and combined at time of diagnosis), and high treatment related morbidity in survivors.

Oral potentially malignant lesions such as erythroleukoplakia and erythroplakia have similar causes and may increase the risk of oral cancer substantially [169, 170].

The majority of head and neck cancers are associated with the major risk factors as high tobacco use in all forms,over-consumptionof alcohol, poor diets, and persistent infections of the upper aerodigestive tract with human papilloma virus (HPV16). So, prevention should be based on appropriate hygiene and control of major risk factors.

Oral cancer represents a current debated public health issue in Romania too (table 13), with large perspectives in the research regarding: morbidity, risk factors, etiologic factors, lethality, pathophysiology, and not in the least important, the treatment.

Table 13.
MORBIDITY AND MORTALITY OF THE OROPHARYNX CANCER IN ROMANIA, Eastern Europe and world- *by gender*

	MALE gender			FEMALE gender		
Indicators	Romania	Eastern Europe	World	Romania	Eastern Europe	World
INCIDENCE:						
-Annual number of new cancer cases	1,160	8,477	74,472	152	1,965	18,415
-Crude incidence rate (per 100,000 inh. per year)	12.2	6.2	1.9	1.5	1.3	0.5
-Age-standardized incidence rate	7.8	4.1	1.8	0.8	0.71	0.4
Cumulative risk (%) at 75 years old	0.9	0.5	0.2	0.1	0.1	0
MORTALITY:						
-Annual number of deaths	608	4,970	42,116	61	738	8,889
-Crude mortality rate	6.4	3.6	1.1	0.6	0.48	0.2
-Age-standardized mortality rate	4.0	2.4	1.0	0.3	0.25	0.2
Cumulative risk (%) at 75 years old	0.5	0.3	0.1	0	0	0

(estimates data for 2018, Includes ICD-10 codes: C09-10), Source [171].

Without a comprehensive understanding of risk factors, efforts to prevention, diagnosis and manage diseases such as oral cancer and oral potentially malignant disorders are likely to be ineffective in terms of outcomes and use of resources.

Publications on this topic:

- **Cărăuşu Elena Mihaela**,Checherița LE, Stamatin O, Albu A (2016). Study of serum and saliva biochemical levels for Cooper, Zinc and Cooper/ Zinc imbalance in patients with oral cancer and oral potentially malignant disorders and their prosthetic and DSSS (Dysfunctional Syndrome of Stomatognatic System) treatment. REV.CHIM.(Bucharest); 67(9): 1832-6, IF (2016)= **1,232**. ISSN: 0034-7752. Accession Number WOS:000385266600037
- **Cărăuşu Elena Mihaela,** Checherița LE, Stamatin O, Manuc D (2016). Study of biochemical level for Mg and Ca-Mg imbalance in patients with oral cancer and potentially malignant disorder and their prostetical and DSSS (Dysfunctional Syndrome of Stomatognatic System) treatment. REV.CHIM. (Bucharest); 67(10): 2087-90, IF (2016)= **1,232**. ISSN: 0034-7752. Accession Number WOS:000388359900040

II.2.2.1 Study of serum and saliva biochemical levels for Cooper, Zinc and Cooper/Zinc imbalance in patients with oral cancer and oral potentially malignant disorders

∗Introduction

Oral Cancer Foundation calls attention to the fact that, when it discovered in early stage, oral cancer has an 80 to 90% survival rate. Unfortunately at this time, the majority of new cases are found as late stage cancers, and this accounts for the very high death rate of about 43% at five years from diagnosis (for all stages and combined at time of diagnosis), and high treatment related morbidity in survivors. These are the few of arguments for which oral cancer is considered to be one of the most important public health issues in Dental Medicine.

Oxidation-reduction reactions in tumours and surrounding tissues influence intracellular free Zn concentrations and Zn levels may be an early intracellular reporter of reactive oxygen species and subsequent biologic responses.

The decrease in the level of Zn and the decrease of the Cu-Zn serum balance were identified as predisposing factors for the reduction of immunity and appearance of malignant tumours. Biochemical levels of Zn in serum and malignant tissues of patients with cancer are abnormal, supporting the involvement of Zn in cancer development.

The *aim* of our study was to highlight possible variations of serum and salivary concentrations of Zn and Cu in patients with oral cancer and oral potentially malignant disorders by comparison to a control group comprised of healthy volunteers. The present study settled the following *objectives* in order to reach the proposed aim:

-determining serum biochemical levels for Zn, Cu, and serum Zn/Cu *ratio*;

-determining saliva biochemical levels for Zn, Cu and saliva Zn/Cu *ratio*;

-testing statistic significance of the noticed differences related to variation of the analyzed biochemical parameters;

-highlighting the possible correlations (by means of calculating the coefficients of correlation) between the analyzed biochemical parameters.

∗Methodology

Out of 342 new cases of oral cancer reported in 2015, for the area of Moldavia, there were chosen a representative group (Cases 1), which was comprised of 35 patients. A group (Cases 2) which included 28 patients with oral potentially malignant disorders was comprised in order to make the comparison. 43 healthy volunteers who freely and being previously informed expressed their consent regarding the particpation to the study were enrolled in the control group. The mean age for the control group was 51.95±17.13 years. Out of the total oral cancer reported cases, there have been considered for study only those new clinical cases of illness, which at the time the diagnostic was established, they were in the first or middle stages of evolution (TNM II, respectively III) and for which the inclusion criteria were met: adult patients who expressed their consent in writing, to participate to the study.

The *exclusion criteria* were:

-patients who were administered medication containing minerals or medication which alter significantly the homeostasis of Zn and Cu, one month prior to participation to the study;

-patients who were administered diuretics (prolonged use of diuretics could deplete Zn tissue levels and increase urinary Zn excretion) one month prior to participation to the study;

-diseases whocan interfere with of Zn and Cu homeostasis.

The reported disease cases, which were also coded from C01-C09 according to the International Classification of Diseases (ICD10-2013) were comprised in cases 1 group, with oral cancer.

The calculated mean age for group cases 1 was 55.07±16.35 years, the minimum age was 29, and the maximum was 78 years. The same approach was applied to group cases 2, for oral potentially malignant disorders. The mean age for group cases 2 was 52.07±15.45 years, the minimum being 30 years and the maximum, 80 years.

Our study protocol followed the methodology of the case-control studies.

Detailed history and clinical examination was done for each of the study subjects. The diagnosis was based on the medical history and physical exam, and the certainty diagnosis was established based on the histopathology examination.

Standard pre-investigative protocol was followed for the collection of biological material (saliva and blood) in order to perform dosing of Zn and Cu. Blood was collected by venipuncture and saliva was collected by Holmes method, which involves aspiration (for 5 min), 2 ml saliva was collected from cases and controls. The collected saliva samples suffered a cold centrifugation process for 10 min, then the supernatant was pipetted in clean tubes, which were stored in the freezer (at -20^{o}C), until the moment the respective tests were done. Biochemical levels of Zn and Cu in serum and saliva were determined using the same protocol and method for healthy subjects from the control group, as well as for patients from the two groups considered for study.

Atomic absorption spectroscopy (AAS) was used as a method for testing serum and saliva biological samples, for dosing Zn and Cu. The assays were performed in an accredited

laboratory.

A database was generated using Microsoft Excel 2010 for Windows, in order to perform the statistical processing of data. The data were analyzed using SPSS 18.0 version for Windows.

Main statistical indicators were calculated using the module of descriptive statistics: mean value, standard deviation and confidence interval (CI 95%). Data were expressed as mean value ± standard deviation. Statistical comparisons were done by paired „t" test and Mann Whitney U test. The variability factors were also taken into consideration. The type of interdependency between the studied variables and the intensity of the respective correlation were highlighted by means of calculating the coefficient of correlation r Pearson.

∗Results

The trace elements, like Zn and Cu, plays an important role in the anticarcinogen defense system of the human body.

Serum Biochemical levels for Zinc and Copper

Modifications of trace elements levels (like Zn and Cu) appear in the neoplastic process, not only from a quantitative point of view, but also alterations of balance and interdependence between them (table 14). The main statistical indicators were calculated in order to evaluate serum levels of Zn and Cu in the studied groups, the results being presented by comparison to the controls.

From the results, the following can be noticed:

-statistically significant differences (*p* value = 0.031) regarding serum levels of the studied trace elements (of -6.73% for Zn and +19.34% for Cu) were highlighted in group cases 1, with oral cancer, by comparison to the control group;

-statistically significant differences (p=0.017) regarding serum levels of the studied trace elements (of -3.65% for Zn and of +6.01% for Cu) were highlighted for group cases 2, with oral potentially malignant disorders, by comparison to the control group.

The serum level of Zn is reversely correlated with the tumour development, being in opposition to the serum Cu level. A significant decrease of serum Zn may be considered an element of prediction for unfavorable evolution and it can be noticed in patients found in late stages of the disease (III, IV).

Table 14.

SERUM BIOCHEMICAL LEVELS FOR ZINC AND COPPER

Indicators	**Zinc**(in µg/dl)			**Copper** (in µg/dl)			**Zinc / Copper *ratio***		
	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls
	Oral Cancer	Oral potentially malignant disorders		Oral Cancer	Oral potentially malignant disorders		Oral Cancer	Oral potentially malignant disorders	
Absolute No. (n)	35	28	43	35	28	43	35	28	43
Mean value	93.91	101.72	105.57	100.07	88.89	83.85	0.93	1.15	1.26
Standard deviation	±27.06	±35.62	±29.81	±24.09	±20.64	±21.82	±0.32	±0.35	±0.38
Minimum value	63.83	67.81	70.49	76.91	66.80	69.60	0.6231	0.7340	0.7395
Maximum value	137.11	146.81	160.09	152.36	135.45	129.61	2.3140	2.1957	2.6667
Coefficient of variation (%)	28.81	35.01	28.84	24.07	23.22	26.02	34.41	30.43	30.16
95% Confidence Interval (95% CI)	89.51-97.13	101.80-109.76	101.84-113.31	72.41-109.07	84.71-95.08	77.33-90.37	0.9125-1.3402	1.2775-1.5636	1.2392-1.5264
p value (*Statistically Significant)	Cases 1 *vs.* Controls $p = 0.031$* Cases 2 *vs.* Controls $p = 0.027$* Cases 1 *vs.* Cases 2 $p = 0.050$*			Cases 1 *vs.* Controls $p = 0.021$* Cases 2 *vs.* Controls $p = 0.017$* Cases 1 *vs.* Cases 2 $p = 0.010$*			Cases 1 *vs.* Controls $p = 0.011$* Cases 2 *vs.* Controls $p = 0.005$** Cases 1 *vs.* Cases 2 $p = 0.001$**		

Reference values for serum zinc in adults: 46-150 µg/dl. Conversion factor: µg/dl x 0.153 = µmol/l; µmol/l x 6.54= µg/dl. Reference values for serum copper in adults: – Female: 76-152 µg/dl; – Male: 70-140 µg/dl.
Conversion factor: µg/dl x 0.157 = µmol/l; µmol/l x 6.37= µg/dl.

Serum level of Cu is rising significantly in patients with oral cancer (regardless of the location: lip, tongue, gingival and jugal mucosa etc.), the mean value being 101.12 ± 31.08 4 μg/dl, and in patients with adenocarcinoma, the mean value is 113.78 ± 34.24 μg/dl, by comparison both to patients with oral potentially malignant disorders and to the controls.

The statistical calculation of Pearson r coefficient reflects a mean negative correlation (r is -0.48 for oral cancer and -0.52 for oral potentially malignant disorders), statistically significant (*p* value < 0.05) between serum Cu and serum Zn.

Our results, represented as mean values of serum Zn and serum Cu, reveal the decrease of serum Zn in the oral cancer cases by comparison to oral potentially malignant disorders and the controls.

The serum level of ceruloplasmin is rising in the case of some clinical forms of oral cancer (42.76 ± 3.45 mg/dl) by comparison to oral potentially malignant disorders and the control group.

On applying the "U" statistic test indicates significant statistical differences for ceruloplasmin, between oral cancer and the control group ($u_c = 10.17 > u_t = 1.96$; *p* value <0.05).

The increase in the serum level of ceruloplasmin in oral cancer may be interpreted as a balancing reaction to the production of reactive oxygen species.

By analyzing the relationship between ceruloplasmin and serum Cu, one may state that ceruloplasmin serum level can be considered a relatively faithful indicator of Cu concentration in serum in patients with oral cancer. On the other hand, the decrease of Cu-Zn SOD (Cu-Zn Superoxide Dismutase) would influence the excessive accumulation of superoxide anion with its role in stimulating the growth and pathologic cellular differentiation in patients with oral cancer.

Salivary biochemical levels for Zinc and Copper

The main statistic indicators were calculated in order to evaluate the salivary levels of the trace elements investigated in the two groups taken for study, the results being presented by comparison to the controls (table 15).

Table 15.
SALIVA BIOCHEMICAL LEVELS FOR ZINC AND COPPER

Indicators	**Zinc** (în μg/dl)			**Copper** (în μg/dl)			**Zinc / Copper *ratio***		
	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls
	Oral Cancer	Oral potentially malignant disorders		Oral Cancer	Oral potentially malignant disorders		Oral Cancer	Oral potentially malignant disorders	
Absolute no. (n)	35	28	43	35	28	43	35	28	43
Mean value	22.01	23.26	24.07	73.71	62.52	57.37	0.36	0.37	0.39
Standard deviation	±7.12	±5.26	±8.32	±4.56	±5.49	±5.16	±0.13	±0.14	±0.15
Minimum value	9.97	16.81	1.06	47.91	50.81	44.04	0.31	0.32	0.02
Maximum value	46.08	34.81	47.02	76.36	72.32	71.06	0.72	0.59	0.83
Coefficient of variation (%)	33.45	29.47	24.05	13.71	14.75	12.65	36.11	37.84	38.46
95% Confidence Interval	20.13-25.02	21.80-24.17	21.44-26.42	62.41-75.07	60.17-67.08	58.95-63.07	0.3125-0.4028	0.3351-0.4173	0.3413-0.3957
p value (*Statistically significant)	Case 1 *vs.* Control *p* = 0.041* Case 2 *vs.* Control *p* = 0.05* Cases 1 *vs.* Cases 2 *p* = 0.001**			Case 1 *vs.* Control*p* = 0.001* Case 2 *vs.* Control *p* = 0.027* Cases 1 *vs.* Cases 2 *p* = 0.01*			Case 1 *vs.* Control*p* = 0.015* Case 2 *vs.* Control *p* = 0.024* Cases 1 *vs.* Cases 2 *p* = 0.05*		

From our results, there can be noticed the following:

-in group cases 1, with oral cancer, there were highlighted significant statistical differences (at *p* value =0.041), regarding salivary concentrations of studied cations (of -8.56% for Zn and of +28.48% for Cu) by comparison to the control group;

-for cases group 2, with oral potentially malignant disorders, there were noticed significant statistical differences regarding salivary levels of studied cations (of -3.37% for

Zn and of +8.97% for Cu) by comparison to the controls, and statistically significant differences (at *p* value = 0.027).

The increased excretion for Cu through saliva can be seen as a mechanism involved in the homeostasis of this trace element and adjusting the Copper-Zinc imbalance for patients with oral cancer and oral potentially malignant disorders.

Our results, represented as mean values of Zn and Cu in saliva, reveal the decreased values of salivary Zn in oral cancer by comparison to oral potentially malignant disorders and the control group.

The calculation of Pearson r coefficient of correlation for the groups taken in the study reflects the existence of a mean negative correlation (r being -0.31 for oral cancer, and -0.47 for oral potentially malignant disorders), statistically significant (at *p* value < 0.05) between salivary Cu and Zn.

Copper-Zinc imbalance

Copper and Zn are antagonists, the balance between them is an example of biological dualism, aspect revealed by serum Zn/Cu *ratio*, which registers statistically significant decreases in the case of both groups in the study (of -26.19% for oral cancer and respectively of -8.74% for oral potentially malignant disorders) *vs*. the control group (fig. 9). Also, in the case of salivary Zn/Cu *ratio* there were highlighted statistically significant decreases in both groups of study (of -7.69% for oral cancer, and respectively of -5.13% for oral potentially malignant disorders) *vs*. controls.

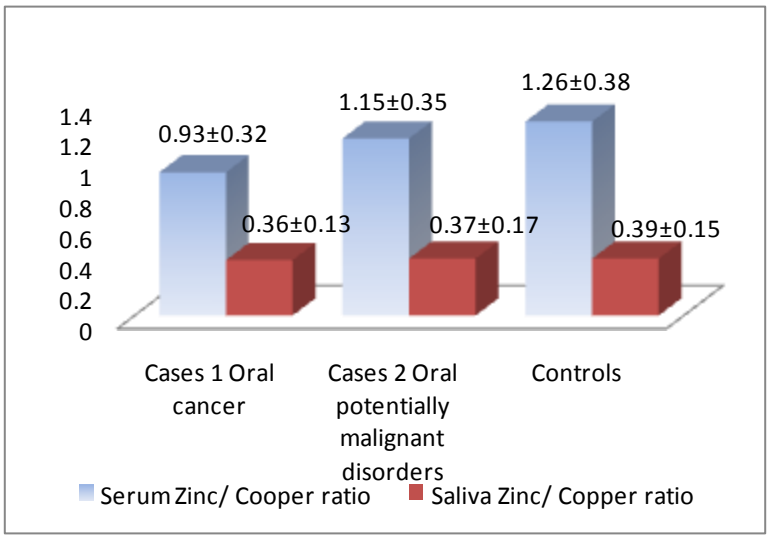


Figure 9. **Copper-Zinc imbalance**

∗Discussions

In oral cancer, serum Cu/Zn *ratio* reflects the antagonism between them inside the body, and the role they play in the neoplazic processes.

The association between increased serum level of Cu and oral cancer can be explained through its implication in the processes of cellular proliferation, in tissue damage through the influence of Cu over collagen and elastin, in oxidative stress as main inductor, in bringing injuries to genetic material, and probably through its ability to activate the apoptotic signaling channels into the tumour cells.

∗Conclusions

Within the limitations of this study, the following conclusions were drawn:

(1) Statistically significant differences were highlighted in the group comprised of patients with oral cancer by comparison to the control group, concerning serum concentrations, as well as salivary concentrations of Zn and Cu.
(2) Statistically significant differences regarding serum and salivary concentrations of Zn and Cu were highlighted also in the group comprised of patients with oral potentially malignant disorders, for the studied cations, by comparison to the control group.
(3) The Zn/Cu *ratio* is an important indicator for the characterisation of these two trace elements in the human body. There were highlighted statistically significant decreases for Zn/Cu *ratio*, in serum, as well as in saliva, in both study groups *vs.* control group.
(4) A statistically significant, positive correlation was highlighted in the case of the group comprised of patients with oral cancer, between serum Cu and salivary Cu.
(5) Serum level of Zn is reversely correlated with the tumour growth, thus being in contrast with the level of serum Cu. So, the variation of biochemical levels of Zn and Cu in serum and saliva can be used for monitoring the evolution of oral cancer and oral potentially malignant disorders.

II.2.2.2 Study of biochemical level for Mg and Ca-Mg imbalance in patients with oral cancer and potentially malignant disorder

∗Introduction

Carcinogenesis induces Mg disturbances, which cause Mg mobilization through blood cells and Mg depletion in non-neoplastic tissues.The carcinogenesis process involves a highly complex and co-ordinated series of events, including increased vascular permeability, matrix degradation, endothelial cell proliferation, migration, survival and differentiation. Many of these steps are affected by Mg in different ways. So, without a comprehensive understanding of these factors, efforts to prevention, diagnosis and manage diseases such as oral cancer and oral potentially malignant disorders are likely to be ineffective in terms of outcomes and use of resources.

∗Methodology

The estimation of serum levels of trace elements, like Mg and Ca, can help us in detection of early cancerous changes or even the occurrence of oral potentially malignant lesions in population. These elements represent a great value for public health because they can be considered as potential markers of neoplasic process.

From this perspective, *the aim of the study* was to highlight changes of the serum and salivary biochemical levels of Mg and of Ca in patients belonging to the two studied groups, compared to the control group with healthy subjects, and revealing any possible correlations between the analysed biochemical parameters and the demographic variables (gender and age).

Our study followed several *specific objectives* in order to accomplish the aim target:
(1) evaluation of the biochemical levels of total Mg and total Ca in serum, and investigating the inbalance between these two trace elements using serum Ca/Mg *ratio*; (2) study of the salivary concentrations for Mg, Ca and salivary Ca/Mg *ratio*.

The study design respected the methodology of the control-case studies.

Out of the total of 342 new cases of oral cancer reported in 2015, a representative group was chosen for the Moldavian area (cases group 1), which comprised of 35 adult patients.

The calculated average age for group cases 1 was 55.07 ± 16.35, the minimum age was 32 and the maximum 78 years.

Comparisons were made with cases group 2, which included 28 patients, having oral

potentially malignant disorders, and a control group, which comprised of 43 healthy individuals.

The average age for group cases 2 was 52.07 ± 15.45, the minimum was 30, the maximum 80; the average age for the control group was 51.95 ± 17.13 years.

For all cases, the initial diagnostic was established based on the medical history and physical exam, the certainty diagnostic being confirmed by the results of the histopathology exam.

The diagnostic was established in agreement with the clinical, radiological and laboratory criteria for all the cases.

The control group comprised 43 healthy adults who expressed their free consent, not without previous being informed about it, regarding the participation to our study.

The process of collecting the biological material was conducted according to the procedures. Blood and saliva samples were collected before any therapeutic intervention.

The serum assays were conducted in an accredited laboratory.

Evaluating Mg levels is challenging because Mg is largely intracellular; a deficit of total Mg can easily be present with normal serum.

Atomic absorption spectroscopy (AAS) was used in order to perform the quantitative automatic test for the biochemical levels of total Mg and total Ca in serum.

The database was created using Microsoft Excel 2010 for Windows and the computer statistic processing was performed using SPSS 18.0 for Windows.

The descriptive statistics module was used, which allowed the calculation of the main statistic indicators (mean value, standard deviation and confidence interval CI 95%).

Statistical significance tests (t Student test) were applied in order to check the statistical significance of the noticed differences.

∗Results

The relationship between carcinogenesis and Mg is complex and multifactorial; Mg is necessary in the neoplastic cellular processes, malignant disorders biology is characterized by high energy requirements due to rapid proliferation, dedifferentiation, and cell immortality.

Study of biochemical levels of serum Magnesium and serum Calcium

Determination of biochemical levels of serum Mg and serum Ca was followed by a calculation of the main statistic indicators, the results being presented for the groups taken for study, *vs*. to the control group (table 16).

A significant increase (at *p* value = 0.0027) was highlighted for patients with oral cancer, regarding serum total Mg (of +11.53%) by comparison to the control group.

There is also a statistically significant increase (at *p* value =0.019) regarding serum total Mg (of +11.48%) in the case of the group comprised of patients suffering from oral potentially malignant disorders, by comparison to the control group.

One needs to take into consideration that, although these increases of serum Mg are statistical significant by comparison to the control group, they are still relatively close to the upper limit of the normal reference values in the laboratory (the comparison to the upper limit not being statistical significant at *p* value = 0.09).

A close attention must be given when interpreting this data since the increase of the Mg serum level can be correlated either with a decrease in the renal excretion of the Mg or with an increase in its tubular reabsorption.

Although, an increase of 2.64% was highlighted, regarding total Mg in patients suffering from oral cancer *vs.* oral potentially malignant disorders, this increase was not registered as having any statistical significance (at *p* value =0.15).

There are no significant statistical differences regarding serum variation of total Ca in the studied groups by comparison to the control one.

Table 16.
SERUM BIOCHEMICAL LEVELS FOR MAGNESIUM AND CALCIUM

Indicators	**Magnesium** (in mg/dl)			**Calcium** (in mg/dl)			**Calcium / Magnesium *ratio***		
	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls
	Oral cancer	Oral potentially malignant disorders		Oral cancer	Oral potentially malignant disorders		Oral cancer	Oral potentially malignant disorders	
Absolute no. (n)	35	28	43	35	28	43	35	28	43
Mean value	2.448	2.362	2.119	8.305	8.449	8.602	3.49	3.58	3.35
Standard deviation	±0.159	±0.207	±0.211	±0.697	±0.703	±0.621	±0.37	±0.46	±0.43
Minimum value	2.157	2.123	1.782	7.091	7.416	8.031	2.65	2.57	2.73
Maximum value	2.927	2.634	2.482	9.896	9.874	10.017	3.98	4.02	4.27
Coefficient of variation (%)	6.49	8.76	9.96	8.39	8.32	7.22	10.91	12.85	12.81
95% Confidence Interval	2.237-2.574	2.124-2.415	2.016-2.203	7.402-8.735	8.015-8.862	8.017-9.713	3.025-3.596	3.191-3.602	3.278-3.691
p value (*Statistically Significant)	Cases 1 *vs.* Controls p =0.0027* Cases 2 *vs.* Controls p =0.019* Cases 1 *vs.* Cases 2 p =0.15			Cases 1 *vs.* Controls p =0.10 Cases 2 *vs.* Controls p =0.053 Cases 1 *vs.* Cases 2 p =0.60			Cases 1 *vs.* Controls p = 0.017 Cases 2 *vs.* Controls p = 0.012 Cases 1 *vs.* Cases 2 p = 0.11		

Conversion factor serum Mg: mmol/l x 2.43 = mg/dl; mEq/l x 0.5 = mmol/l; mEq/l x 1.2 = mg/dl.
Reference value: 1.7-2.2 mg/dl (18-20 years old); 1.6-2.6 mg/dl (21-60 years old); 1.6-2.4 mg/dl (60 years old and over). Conversion factor serum Ca: nmol/l x 4 = mg/dl; mg/dl x 0.25 = mmol/l. Reference value: 8.6-10 mg/dL (18-60 years old).

Study of salivary biochemical levels of Magnesium and Calcium

Our results reveal a statistically significant increase (p value < 0.001) regarding salivary biochemical level of Mg (of +10.75%) in patients with oral cancer by comparison to the controls (table 17).

Also, there is a statistically significant increase (at p value = 0.045) regarding salivary level of Mg (of +6.10%) in patients with oral potentially malignant disorders as well, by comparison to the control group. Therefore, an increase of 2.38% was noticed, regarding salivary level of Mg in patients with oral cancer *vs.* patients with oral potentially malignant disorders.This has not proved to be statistically significant (at p value = 0.11). Magnesium salivary excretion does not statistically correlate at a significant level with the serum level of Mg (at p value = 0.09).

There are no statistically significant differences regarding the variations of salivary Ca in studied groups by comparison to the control group.

Table 17.
SALIVA BIOCHEMICAL LEVELS FOR MAGNESIUM AND CALCIUM

Indicators	**Magnesium**(in mg/dl)			**Calcium** (in mg/dl)			**Calcium / Magnesium *ratio***		
	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls	Cases 1	Cases 2	Controls
	Oral cancer	Oral potentially malignant disorders		Oral cancer	Oral potentially malignant disorders		Oral cancer	Oral potentially malignant disorders	
Absolute no. (n)	35	28	43	35	28	43	35	28	43
Mean value	0.381	0.365	0.344	5.401	5.314	5.362	14.07	14.55	15.58
Standard deviation	±0.041	±0.043	±0.036	±0.487	±0.472	±0.461	±2.462	±2.343	±2.011
Minimum value	0.311	0.317	0.301	4.016	4.029	4.508	9.79	9.16	11.03
Maximum value	0.492	0.473	0.407	6.805	6.731	6.987	17.64	16.19	17.81
Coefficient of variation (%)	10.76	11.78	10.69	9.01	8.89	8.59	17.49	16.10	12.91
95% Confidence Interval	0.370-0.379	0.359-0.368	0.330-0.352	5.206-5.697	5.011-5.543	4.908-5.611	12.623-15.916	12.729-15.082	14.271-16.001
p value (*Statistically significant)	Cases 1 *vs.* Controls p = 0.001** Cases 2 *vs.* Controls p = 0.045* Cases 1 *vs.* Cases 2 p = 0.059			Cases 1 *vs.* Controls p = 0.15 Cases 2 *vs.* Controls p = 0.11 Cases 1 *vs.* Cases 2 p = 0.10			Cases 1 *vs.* Controls p = 0.017* Cases 2 *vs.* Controls p = 0.012* Cases 1 *vs.* Cases 2 p = 0.11		

Calcium-Magnesium imbalance in serum and saliva

The Ca/Mg ideal *ratio* (4-13.5) is difficult to be settled (fig. 10) in patients with oral cancer, on the one hand due to the main disease and on the other hand due to the difficulties to eat properly, as is the case of these patients.

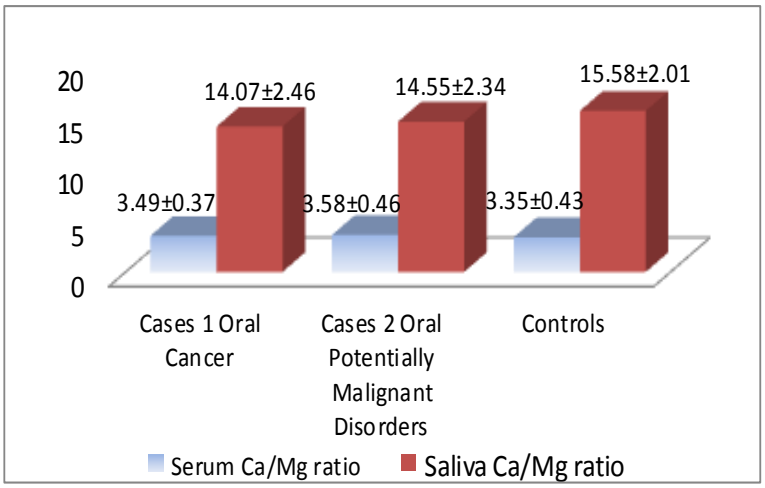


Figure 10. **Calcium-Magnesium imbalance**

∗Discussions

Calcium and magnesium have a complicated relationship that is not fully understood.

The human body needs adequate levels of Mg in order to properly use Ca, and Mg affects Ca homeostasis and alters levels of certain hormones that regulate Ca in the body. The two minerals may also compete with other and interfere with the other's function.

The increasing of prevalence rate in oral cancer, high rate of fatality, the decrease in the age of debut, adverse prognosis, and last but not least, high costs for diagnostic and treatment are few of the arguments for which oral cancer is considered to be one of the most important Public Health Issue in Dentistry [171, 172].

The oral cancer burden can also be reduced by early detection of cancer and management of oral cancer patients [173].

A better knowledge and understanding of this pathology offers to the public health dentistry the necessary modern methods for a more efficient prevention of oral cancer diseases at a population level [174].

∗Conclusions

The following conclusions were emphasized from our study results:

(1) Oral malignant disorders induces Mg disturbances; in the study groups there were highlighted statistically significant increases of serum total Mg for patients with oral cancer, as well in patients with oral potentially malignant disorders, by comparison to the control group. The results of the study reveal a statistical significant increase regarding salivary biochemical level of Mg in patients with oral cancer, as well as in patients suffering from potentially malignant disorders by comparison to the controls. The Mg salivary excretion does not statistically correlate at a significant level with the serum Mg level for neither of the study groups taken into consideration.

(2) There are no statistically significant differences concerning serum variations of total Ca in the studied groups, by comparison to the control group. There are no differences statistically significant as regarding variations of salivary Ca in studied groups by comparison to the control group.

(3) Statistically significant increases of serum Ca/Mg *ratio* in patients with oral cancer, as well as in patients with oral potentially malignant disorders by comparison to the controls.

(4) A better knowledge and understanding of this pathology offers to the public health dentistry the necessary modern methods for a more efficient prevention of diseases at a population level.

Periodontal Diseasesas as Main Issue of Public Health Dentistry

Periodontal disease is defined as chronic inflammatory diseases of bacterial aetiology that affect the tooth-supporting soft and hard tissues. Among the different conditions included within the term of periodontal diseases, plaque-induced gingivitis and periodontitis are of special relevance to periodontal healthcare and general health [175].

Even though it is largely preventable, periodontal disease remains a major public health issue in all countries around the world [176], because it is one of the major causes of tooth loss.

Periodontal diseases are highly prevalent, the WHO estimates nearly 15–20% of the adult population 35 and 44 years suffers from an advanced form of periodontal disease [177].

A 2017 study found an alarming value for global prevalence of periodontal diseases: 25.4% of the world population; severe periodontitis is the 6th most prevalent disease worldwide, with an overall prevalence of 11.2% and around 743 million people affected.

The overall prevalence of periodontal diseases increases with age and the incidence rises steeply in adults aged 30–40 years. Intercountry and intracountry variations are found in the prevalence of periodontal disease, and these variations relate to socio-environmental conditions, behavioral risk factors, general health status of people (e.g., diabetes) and health systems [178].

The Center for Disease Control (CDC) reported that approximately 50% of the general population (aged 30 or older), have periodontitis, the more advanced form of periodontal disease,this equals approximately 64.7 million Americans.

The global cost of lost productivity from severe periodontitis alone has been estimated to be 54 billion USD/year, while the total economic impact of periodontal diseases accounts for a major component of the 442 billion USD, direct and indirect cost of oral diseases, incurred in 2010 [176].

Periodontitis is a chronic NCD that shares risk factors and social determinants with the major NCDs that cause around two-thirds of deaths such as heart disease, diabetes, cancer and chronic respiratory diseases. Tobacco smoking, obesity and poor nutrition (both in terms of caloric intake and quality of the nutritional components) and physical inactivity have all been associated with an increased risk of periodontal diseases.

Trends in risk factors are likely to impact the burden of periodontal diseases, and the rise of smoking in developing countries combined with the obesity/diabetes epidemic will further drive incident periodontal disease [178].

Periodontal disease disproportionately affects the vulnerable segments of the population and is a source of social inequality.

Besides the shared risk factors with major NCDs, accumulation of dental biofilms due to inadequate selfperformed oral hygiene procedures (as tooth brushing and/or use of inter-dental cleaning aids), accounts for the initiation and progression of periodontal disease in the population. These biofilms, if not well controlled, interact with the susceptibility profile of each individual and may become dysbiotic, thereby initiating and sustaining the disease process which is characterized by the inflammatory destruction of the tooth-supporting apparatus and alveolar bone.

Periodontal diseases can be prevented, easily diagnosed and successfully treated and controlled following appropriate professional care and long-term secondary prevention.

Periodontitis is preventable through effective management of gingivitis and promotion of healthy lifestyles at both population and individual levels.

National public health initiatives for the control and prevention of periodontal diseases should include integrated disease-prevention strategies based on common risk-factor approaches. This can be accomplished through: (1) professional instruction of self-performed effective oral hygiene such as tooth brushing and inter-dental cleaning and (2) an integrated and population-oriented approach in health education programs, based on the Common Risk Factor Approach.

A critical element is that prevention should be tailored to individual needs through diagnosis and risk profiling.

So, each individual should play a proactive role in awareness of oral health, self-care measures, health promotion and disease prevention for optimal oral health in the course of life [176].

Capacity building of oral health systems must consider the establishment of a financially fair service in periodontal care. Oral health systems research is needed for the evaluation of population-oriented oral health programs [178].

Dental Public Health Issues of Infectious Diseases

Oral infections are also recognised as a problem for individuals suffering from a range of chronic conditions, including cancer and infection with human immunodeficiency virus, as well as patients with ventilator-associated pneumonia.

This considers the systemic consequences of odontogenic infections and the possible mechanisms by which oral infection and inflammation can contribute to cardiovascular disease, as well as the oral conditions associated with medically compromised patients.

Oral infections have become an increasingly common risk-factor for systemic disease, which clinicians should take into account [179].

On this topic, 1 scientific paper were published *in extenso.*

- **Cărăuşu Elena Mihaela**, Trandafir V, Ghibu L, Stamatin O, Checherița LE (2017). Study of Electrolyte Serum Disturbances and Acid-base Status in Patients with Oral-maxillofacial and Dental Sepsis. REV.CHIM.(Bucharest); 68(7): 1552-6; **IF** (2017)=**1,412**. ISSN:0034-7752. Accession Number WOS:000409234600029

II.2.2.3 Study of Electrolyte Serum Disturbances and Acid-base Status in Patients with Oral-maxillofacial and Dental Sepsis

∗Introduction

Septicaemia is an important public health issue and a clinical challenge with a major impact on healthcare expenditure and resources. Septicaemia is a severe and debilitating clinical condition that substantially alters the lives of those afflicted; this is a potentially life-threatening medical condition that's associated with an infection. The infection's signs and symptoms must fulfil a minimum of two criteria of a Systemic Inflammatory Response Syndrome (SIRS). The SIRS is a progressive, patho-physiological process which may be caused by a variety of clinical precursor events including local or generalised infection, or non-infective inflammatory processes (such as trauma or burns). The sepsis syndrome is defined as SIRS with an identifiable source of infection, and is caused by the interplay of microorganism virulence factors with the inflammatory response of host.

Severe septicaemia (defined as a sepsis case associated with organ dysfunction), is associated with a high mortality rate and is caused by an infection induced immune response and as a result it has a major impact on healthcare expenditure and resources.

Sepsis, which has a dental or oral-maxillofacial entrance gate of the pathogen agent, became in the last decade, an important public health issue in dental medicine due to the increasing prevalence of this pathology, high rate of fatality, adverse prognosis and high costs for diagnosis and treatment [180].

Oral infections have become an increasingly common risk-factor for sepsis and systemic diseases, which clinicians should take into account. The relationship between oral and general health has been increasingly acknowledged during the past two decades [181].

Many public health studies, including a number of meta-analyses and systematic reviews, have linked poor oral health with various systemic diseases: cardiovascular disease, diabetes and metabolic syndrome, endocarditis, chronic kidney disease, obesity and even cancer [180].

Recently, special attention has been given to new biomarkers associated with sepsis. Biomarkers are molecules that are correlated with disease states or states of altered physiology and may be used for early diagnose of the disease and for direct therapies.

In patients with sepsis, electrolytes abnormalities should be considered in the context of water balance. Hydroelectrolytes balance is one of the key issues in maintaining homeostasis in the body and it also plays important roles in protecting cellular function, tissue perfusion and acidbase status in patients with sepsis that have a dental or oralmaxillofacial as entrance gate of the pathogen agent.

∗Methodology

The aim of our study was to monitor the serum hydro- electrolyte disturbances and acid-base status in patients with oral-maxillofacial and dental septicaemia. The main objective was to find the occurrence of disturbances among the different grades of sepsis and assess the type of dysfunction encountered.

Our retrospective study was conducted on 768 cases of sepsis registered in 2006-2016 period. Out of 127 (16.53%) cases with oral-maxillofacial and dental sepsis, 82 (10.68%) cases, that show a dental or oral-maxillofacial condition as entrance gate of the pathogen agent, was chosen as a representative group for the area of Moldavia, Romania. Out of the reported cases, there have been considered for study only those new cases of illness, for which the diagnostic was established. It can be noticed that the dental entrance gate of the pathogen agent is rather frequent and most of the times neglected in the diagnosis of sepsis.

Inclusion criteria were: patients over 18 years of age with sepsis diagnosis confirmed by positive findings on clinical exam, laboratory tests (biochemical, bacteriologic, hematologic) and imaging. Suspected or proven infection was associated with SIRS and sepsis diagnosed by the presence of organ dysfunction (as renal, respiratory, cardiac failure, neurologic impairment, disseminated intravascular coagulation or shock). The link between dental or oralmaxillofacial disease as entrance gate of the pathogen agent and sepsis was historically documented.

Patients who received treatment with antibiotics in the last 14 days were thus *excluded*.

The strains were isolated from different biological or pathological products: blood, pus, seeding on catheters.

Standard pre-investigative protocol was followed for the biological products collect [182]. Blood was collected by venepuncture in first 12 hours of hospitalization [183] and samples were analyzed in an accredited medical laboratory.

Biochemical laboratory examinations have a fundamental role in sepsis. For monitoring the electrolytes disturbances, the serum levels of sodium, potassium and chloride were dosed. The sodium and potassium were measured using a standardized chemistry analyzer for electrolyte levels (an ion-selective electrode analyser) [182]. The alkali reserve and the arterial pH changes were used for monitoring the acid-base status.

A database was generated using Microsoft Excel 2010 for Windows and the SPSS statistical software package (version 18.2 for Windows; SPSS, Inc., Chicago, IL, USA) was used in order to perform the statistical processing of data and statistical analysis [184].

Biochemical serum levels of main electrolytes (Na^+, K^+ and Cl^-) and acid-base status (pH and alkali reserve) have been expressed as mean ± S.D. [185]; there were used the "t" Student test, in order to check the statistical significance (SS) of the noticed differences.

The following indicators were calculated: prevalence (%), Odds Ratio (OR- relatively estimated risk) with its confidence interval (CI 95%) and attributable risk (AP). Also, we used the Pearson χ test; the statistical significance was considered at p value less than 0.05. The interdependency between the studied variables and the intensity of the correlation was highlighted by the Pearson coefficient of correlation (r) [184].

∗Results

Considering the 127 cases of our study, 82 cases (64.57%) were cases of sepsis that have a dental or oralmaxillofacial entrance gate of the pathogen agent (infections with oral-dental origin showcase the fact that an oral focus of infection can act as the site of origin for dissemination of germs to distant body sites; this is controversial since it is difficult to prove the oral origin of germs responsible for an extra-oral infection).

General caracteristics of patients

The mean age of patients was 45.21 ± 21.57 years (CI 95%: 40.39-49.73). In the present study it was found that the disease was more common in male subjects (55.91%); M/F *ratio* = 1.27/ 1.

Most of the patients, 51 (62.20%) came from the rural area and 31 (37.80%) from the urban area.

Male gender, recent medical history (previous hospitalization and antibiotic therapy) and rural area were significantly correlated ($\chi_{calculated} = 8.17 > \chi_{tabular} = 3.84$, $p<0.05$, SS) with the dental and oral-maxillofacial involvement, which draws attention on the outpatient follow-up of moderate and severe oral infections.

The explanation can be related to the fact that patients from the rural area have a low standard of living, limited access to specialized medical services and a precarious dental health [179].

The period of hospitalization varied between 1 and 38 days, a mean period of hospitalization being 14.07 ± 8.54 days (CI 95%: 13.12-16.38).

Patients with sepsis frequently have underlying comorbidities which predispose them to infections and may have an additive contribution to increase the fatality rate.

Out of the chronic diseases reported in the medical history of studied patients we mention the following, in order of their prevalence: cardiovascular diseases (29.27%), diabetes mellitus (21.95%), kidney diseases (19.51%), haematological (14.63%), respiratory (8.54%), liver diseases (4.88%), obesity(3.66%), chronic alcoholism (3.66%), malignancies (2.44%).

From 82 sepsis cases that have a dental or oral- maxillofacial entrance gate of the pathogen agent, the oralmaxillofacial involvement was recorded in 31 (24.41%) of them (OR = 3.22; CI 95%: 1.81-5.71;*p* value<0.05; AP=0.6894) maxillary sinusitis of dental origin- 3 (9.68%) cases; mumps/parotid space abscess- 2 (6.45%) cases; suppuration of submandibular lodge- 3 (9.68%) cases; surgery/fractures- 6 (19.35%) cases; soft tissue injuries/cellulitis- 5 (16.13%) cases; phlegmon of the mouth floor 4 (12.90%)cases; multiple traumatic lesions 4- (12.90%) cases; implanted such a central venous catheter- 2 (6.45%) cases; mandibular osteitis and neoplasm of the palate- 1 (3.22%) case.

Dental involvement was recorded in 37 cases (prevalence rate=29.13%): dental infections (post-extraction alveolitis, endodontic foci of infection with sub-periosteal abscess, pericoronitis) in 17 (45.95%) cases (OR = 0.97, CI 95%: 0.44-2.11, *p* value< 0.001) and fungal infections of the oral cavity in 9 (24.32%) of the cases (OR = 2.56; CI 95%: 1.07-6.09; *p* value<0.05; AP=0.6093).

Other infectious complications were recorded in 33 (25.98%) cases (OR = 1.22; CI 95%: 0.66-2.27; *p* value< 0.05; AP=0.1803).

The *Carmeli score* was used to assess *therisk of infection*. The cases were stratified into the following risk groups: low risk (Carmeli score 1– community-acquired sepsis), 63 (76.83%) cases; medium risk (Carmeli score 2 – healthcare-associated sepsis), 17 (20.73%) cases and severe risk (Carmeli score 3 – nosocomial sepsis), 2 (2.44%) cases.

The severity of sepsis was frequently underdiagnosed.

In our study, the *fatality rate* was 29.27% (24 deaths).

In 71 (86.58%) cases the blood cultures were positive, whereas for the rest of the cases the pathogen agent was revealed in seeding on catheters (4.88%) or pus (8.54%).

The main causal agents incriminated in the development of oral-dental sepsis in deceased patientswere: anaerobic Gram-negative bacilli (20.83%), S. aureus (12.50%), methicillin-resistant Staphylococcus + Enterococcus spp. (4.16%), Acinetobacter Baumannii (8.33%), Proteus spp. (8.33%), oral Viridans group streptococci (in 16.67% of cases they are involved in the genesis of infective endocarditis), E. Coli (41.67%)and normal oropharyngeal flora (12.50%).

Biochemical levels of sodium, potassium and chloride in serum

Electrolytic modifications were evaluated in the group of patients taken in the study, with the help of sodium, chloride, and potassium level assay.

The prevalence of electrolytes disturbances was: 15.85% for sodium, 69.15% for potassium and 55.50% for chloride.

After measuring the level of serum sodium in patients within the studied group, the following were noticed: the mean value of sodium in the group of patients who survived was 131.94 mEq/l; normal natremia (139.14 ± 1.78 mEq/l), registered prevalence was 84.15% (69 cases); hypernatremia was registered in 6 (7.32%) cases, 2 (2.44%) of them, who had severe hypernatremia (over 150 mEq/l), deceased (OR=0.87; CI 95%: 0.16–4.61; *p* value<0.05).

Measuring the serum potassium level in the studied group revealed the following aspects: the mean value of potassium in patients with sepsis who survived was 3.668 mEq/L, and 3.840 mEq/L in the group of the deceased patients; normal potassemia (3.89 ± 0.31 mEq/l) prevalence is 29.27% (24 cases); out of the 33 (40.24%) cases with hyperpotassemia, 10 (12.19%) of them registered values higher than 5.3 mEq/l and 3 (3.65%) patients with severe hyperpotassemia deceased (OR=4.71; CI 95%: 1.30–17.09; *p* value <0.05; AP=0.7876); 24 (29.27%) of the patients had hypopotassemia (under 3.5 mEq/l), 8 out of them (9.76%) being registered as having severe hypopotassemia (under 2.5 mEq/l), of whom 4 (4.89%) died afterwards (OR=2.07; CI95%:0.64–6.69; *p* value < 0.05; AP=0.8505).

The correlation between the pH value and the serum potassium value was evaluated for the entire studied group.

The calculated value of Pearson coefficient of correlation was r = 0.37, thus revealing a weak to moderate correlation, at *p* value < 0.05. For the group of patients with sepsis who survived, the Pearson coefficient was r = 0.43 (moderate correlation) and r = 0.40 in the group of the 24 deceased, at the statistical significance threshold *p* value< 0.05.

The value of serum potassium did not influence the fatality rate, but associating it with acidosis signals the gravity of sepsis and the increase of death risk.

Measuring serum chloremia revealed the following results: mean chloremia in patients with sepsiswho survived was 100.89 mEq/l and 112.71 mEq/l in the group of the deceased patients; normal chloremia had a prevalence of 44.44% (32 cases); hyperchloremia (over 106 mEq/l), which determines the emergence of hypercloremic metabolic acidosis, was present in 19 (26.39%) cases, 2 (2.44%) of them being registered with severe hyperchloremia, in the case of which the patients died afterwards (OR=3.05; CI 95%: 0.64-14.14; *p* value<0.05; AP= 0.6721); hypochloremia (under 95 mEq/l), which determines alkalosis, was present in 21 (29.17%) cases, 3 (3.65%) of them, with severe hyperchloremia, died afterwards (OR=2.47; CI 95%: 0.66-9.28; *p* value<0.05; AP=0.5951).

Serum levels of pH and alkali reserve

The acid-base imbalance was evaluated in patients of the study group using the alterations of the pH value and alkali reserve.

The value of the serum pH normally varies between 7.36- 7.44 (pH lower than 6.8 or higher than 7.8 is usually fatal). It is considered to be an acidosis when the pH registers values under 7.36, whereas in the case of alkalosis, the pH value is over 7.44. As a result of measuring pH in the studied group of patients, the following can be noticed: the mean pH value of the patients who survived was 7.468; normal pH (7.36- 7.44) had a prevalence of

34.48% (10 cases); acidosis, an important change in the acid-base balance, occured in 6 (20.69%) cases; this may be caused either by the increase in partial pressure of the carbon dioxide in arterial blood (respiratory acidosis), either due to an increase in the concentration of organic or anorganic acids (metabolic acidosis).

Monitoring the alkali reserve (HCO_3^-) in the studied group revealed the following aspects: the mean value in patients with sepsis who survived was 22.51 mEq/l; normal alkali reserve (22-26 mEq/l) had a prevalence of 24.14% (21 cases); out of the 13 (16.05%) cases with values over 25 mEq/l; there were registered moderately increased values (26-27 mEq/l) in 4 cases (4.94%) with multiple organ dysfunction, and 9 (11.11%) patients having hepato-renal dysfunction registered high values (28-30 mEq/l), 4 (4.94%) of them died afterwards (OR=1.82; CI 95%: 0.45– 7.31; *p* value=0.039; AP=0.4505); in 47 (58.02%) cases there were registered moderately low values (under 21 mEq/l), 8 (9.88%) of these cases having severely decreased values (under 18 mEq/l) and 3 of them died (OR=1.43; CI 95%: 0.34 – 5.99;*p*value = 0.013; AP=0.3006).

As the metabolic acidosis is characterized by the decrease of arterial pH under 7.35 as a result of primary decrease of bicarbonate (HCO_3^-) concentration under 21 mEq/l, the correlation between arterial pH and bicarbonate was therefore evaluated. Thus, it was found that there is a slight to moderate correlation between their values, Pearson coefficient of correlation being r = 0.41, at *p* value< 0.05.

For the group of patients who survived, there was a moderate correlation between the 2 values with a Pearson coefficient r = 0.44.

In the group of the deceased patients, the Pearson coefficient value was r = 0.37 at *p* value< 0.05 statistical significance threshold.

∗Discussions

In dental medicine, oral-maxillofacial and dental sepsis is an important public health issue and clinical challenge with a major impact on healthcare expenditure and resources.

Oral-maxillo-facial and dental sepsis represents a current and a much debated public health problem for Romania too, with large perspectives in the research regarding morbidity, etiologic factors, pathophysiology, risk factors and, not in the least important, the treatment.

The physician should pay attention to the electrolyte abnormalities and disturbances on acid-base status in patients with oral-maxillofacial and dental sepsis because it can lead to fatal consequences [186].

Early recognition of acidbase status and main serum electrolytes disturbances has high importance for clinical management since it signals the gravity of the disease and the increase of death risk [187].

The physician should pay attention to the administered fluid and medications potentially associated with electrolyte abnormalities and acid-base status disturbances in patients with oral-maxillofacial and dental sepsis [188].

Clinicians should increase their knowledge of oral diseases, and dentists must strengthen their understanding of general medicine, in order to avoid unnecessary risks for infection that originate in the mouth.

∗Conclusions

(1) Our study revealed a medium prevalence of sepsis with dental and oral-maxillofacial point of entry and the most affected persons were males from rural area.
(2) So, the key to winning in the *campaign* to combat oral-maxillofacial and dental sepsis is improved understanding of the public health aspects, epidemiology, sepsis pathogenezis and discovery of new therapies.

Temporomandibular Disorders and Dysfunctional Syndrome of the Stomatognathic System as Public Health Issues

Temporomandibular disorders (TMDs) are a set of joint and muscular dysfunctions in the cranio-orofacial area. They are primarily characterized by joint and/or muscular pain, noise in the temporomandibular joints (TMJ) and limited or irregular mandibular function; TMDs can considerably affect quality of life, and became an important *public health issue* in the field of dental medicine in the last decade, due to the increasing prevalence of this pathology.

Temporomandibular joint, one of the frequent affected elements of the stomatognathic system from the dysfunctional syndrome (SDSS), is mainly based on the modification of the patterns of the articular moves and on the inflammation of the micro-traumatisms that appear in cases of dysfunctions with a starting point in the TMJ.

In the last decade, SDSS became an important issue of public health in the domain of Dental Medicine due to the increasing trend of this pathology of prevailing once with aging (from 10% in the adults to almost 40% in people of 65 years old and over). Thus, SDSS represents a current and a much debated problem, with large perspectives in the research regarding incidence and prevalence, etiologic factors, pathophysiology, risk factors and, not the least important, symptomatic and etiologic treatment [189].Triggering SDSS is the result of cumulative intra- and over-systemic factors. Although, the onset can be done on one element of the stomatognatic system, further homeostasis disorders trigger the other elements [190].

Publications on this topic:

- Checherița LE, Rezus E, Leon MM,Stamatin O, **Cărăușu Elena Mihaela** (2017). Impact of Medication with Diclofenac Sodium vs. Etoricoxibum in Patients with Inflamatory Reumatic Pathology, Prostetic Complications and Algodisfunctional Syndrome. REV.CHIM.(Bucharest); 68(5): 977-81; IF (2017)=**1,412**. ISSN: 0034-7752. Accession Number WOS:000405816300019
- Checheriță LE, Stamatin O, Constantinescu A, **Cărăuşu Elena Mihaela**, Bulancea BP, Lupu IC, Manuc D. The study of biochemistry on myorelaxation of manducatory muscles by influence of botulinic toxine in the context of oral rehabilitation in SDSS patients; REV.CHIM. (Bucharest), 2019; 70(4): 1218-22. ISSN: 0034-7752; Impact Factor (2018)=**1, 605**. Accession Number WOS:000469387200022

II.2.2.4 Impact of Medication with Diclofenac Sodium vs. Etoricoxibum in Patients with Inflammatory Reumatic Pathology, Prosthetic Complications and Algo-dysfunctional Syndrome

∗Introduction

Affections of TMJ can lead to imbalances and disfunctions named algodisfunctional syndrome. In the context of rheumatoid arthritis as the underlying disease, the TMJ is affected in 18% of patients.

The SDSS presents not only a complex etiopathogenesis, but also a complicated symptomatology, in which the signs of the dysfunctional affection of the stomatognatic system are countless, as well as the associated signs which incorrectly conduct the diagnosis to the nearby area [189].

∗Methodology

The *aim* of this study is to investigate the drug treatment of TMJ and *the main objective* is to realize a comparison between I-st generation derivate, Diclofenac sodium and Etoricoxibum, a II-nd generation derivate.

The TMJ affections we will take into consideration in this study, which is, in fact, the frequent pathology at this level, and to which we will measure the pain before and after the administration of the antiinflammatory therapy.

This is a prospective study, based on data obtained from 531 patients with rheumatoid

arthritis, 96 (18.07%) of them with SDSS, hospitalized, between 01.01.2015 to 31.12.2016, at the Clinic of Rheumatology, Clinical Rehabilitation Hospital Iasi.

The endpoints of interest were pain, physical function and patient global assessment of disease status. Data concerning physical health were retrieved from patients with painful temporal-mandibular disorders (TMDs) according to the research diagnostic criteria.

The inclusion criteria for the patients in our study were: all patients had to have experienced pain complaints in the temporal-mandibular region for at least 1 month; the presence of muscular tonus and muscular contraction alterations muscular dysfunction (pain at the level of stomatognatic system and cephalic extremity; limitation of mouth opening, and deviation of mandible from the medial line during the opening; fatigue of cephalic extremity muscles and functional alteration of stomatognatic system). Participants admitted or keeping follow-up appointments were also included.

The exclusion criteria of the patients were represented by the presence of: joint affliction, of the third molar pathology, osteoarthritis and neoplasm.Exclusion criteria were also: refuse of the patient to participate, uncooperative patients or those who did not respect the prescribed treatment. In addition, patients with confirmed congestive heart failure, ischemic heart disease, peripheral arterial disease and cerebrovascular disease were excluded from the group treated with Diclofenac sodium.

Patients were introduced in the Mihail Kogalniceanu Clinical Education Base, of Iasi for prosthetic and gnathologic treatment, the methodology of clinical and paraclinic examination being applied, including the TMJ and occlusion examination, as well as TMJ tomography. An objective examination of the TMJ has been realized.

For this study there were taken into consideration the symptoms of the patients, which determined their addressing to the doctor. The most common symptom is the pain, which appears in front of the ear or near to it, with propagation towards the cheeks, neck, shoulder, which is present in all patients considered in this study.

In our study, we administered two anti-inflammatories frequently used in the TMJ treatment. Diclofenac sodium and Etoricoxib have been used to relieve pain and inflammation of the joints and muscles. For all patients, we used the lowest effective dose and shortest treatment duration to control the symptoms.

Statistical analysis

The obtained data were allowed for the classification of patients with respect to gender, age groups distribution, area or origin, clinical aspects, type of treatment instituted and pain appreciation.

∗Results

Thereby, we classified the patients included in this study on age groups: 20-29 years– 9 (9.37%) patients, 30-39 years- 15 (15.63%) patients, 40-49 years- 60 (62.50%) patients and 50-59 years-12 (12.50%) patients. A significant statistical difference between the medium age groups, 40- 49 years and the other groups (p value < 0.001). Our results are consistent with the data found in the literature, the *gender ratio* being F/M = 66/30 = 2.2/1. Also, the study patients are divided depending on the social environment. Thus, in our study there were 56 (58.33%) patients from the rural area and 40 (41.67%) patients from the urban area.

The articular affectation

Pain and articular noises affect in a high percentage the studied group, which is due both to edentation grade (complications of it) and the chaotic, uncoordinated, functioning of the stomatognathic muscle system, especially of the external pterigoid.

The muscular affectation

The examination of the muscles is made by inspection and palpation in order to determine the painful points and the irradiation areas. Any painful areas, trigger areas with

determinations at distance, as they are noted in the observation paper, circumscribing the painful area at direct palpation, trigger area, irradiation area. The examination of the muscles in dynamic aims to detect the pain provoked by contraction, symmetric and equal participation in the realization of the mandibular dynamic.

Signs and muscular symptoms are predominant in the clinical table, but, is almost impossible to clearly establish the cause of the signs and symptoms, such as rheumatoid arthritis pathology or as a consequence of edentulous.

The clear influence could be studied after prosthetic patients, when the influence would remain only in patients with rheumatoid arthritis pathology.

Affectation of the muscular factor, important milestone in the correctitude of the fundamental cranial-mandibular relations will implicitly generate the installation of cranial-mandibular relations.

Modification of the cranial-mandibular relations

Examination of the centric relation has a major impact in establishing the diagnosis of the stomatognathic system's dysfunctions.

Interarcardic reports registered in centric relation will serve to detect the premature contacts (where applicable) in centric relation or at fitting models in the articulator.

In case of dynamic occlusion the testing movement is realized, testing position with contact at the level of all the incisors (normal) and a distal occlusion (Cristhensen sagittal). It is observed the way in which dynamic occlusion is in compliance with mandibular dynamic, articular dynamic or muscular contraction.

Another variable taken into consideration is the articular mobility, and the third obvious sign are the crackles produced when using the articulation, which can be heard by the patient and also by the ones around him, but which are not significant in the absence of the pain and articular immobility. From the mobility point of view, in our study articular hypermobility can be found in 41(42.71%) patients, which is much more frequent that the limitation of the mandible movements, which is present in 24 (25%) patients. Between the two parameters there is a statistically significant difference ($p<0.001$).

Making proper medical history of the patient revealed a history of bruxism, trauma, local infection, stress and rheumatoid arthritis.

For the treatment of the pain it was used Diclofenac at a dose of 150 mg and Etoricoxib, in doses of 30 and 60 mg. Each group included 32 patients each.

They were questioned and evaluated immediately after the treatment (4 h), after two days and after two weeks of treatment about the pain threshold according to Visual Analogue Scale (VAS).

Etoricoxib (60 mg) demonstrated a significantlygreater benefit within 4 h of the first dose on the first day of therapy (p value < 0.001) as evaluated by the percentage of patients with good or excellent responses (values 1-3, VAS).

The second interrogation of the patients took place after two days. It seems that the effects have been similar, no matter what anti-inflammatory was used, the patients declaring that they felt a moderatepain, significantly lower than the one they felt in the initial moment of the administration. Even though, it can be noticed that the patients who were administered Etoricoxib 60 mg were predominant in the group with the lack of pain and minimum pain.

The last evaluation was conducted after two weeks of treatment. Etoricoxib 30 mg determined a moderate reduction (maximum number of patients) of the pain threshold.

So, the Etoricoxib demonstrated at least moderate clinical improvements.

The effects of the anti-inflammatories were preserved throughout the administration, without any significant changes. It can also be mentioned that improved outcome was not only in terms of pain but also in terms of clinical function of the TMJ (fig. 11).

Another important parameter that we took into consideration was the side effects. In our

study there were no usual side effects during the administration of any of the used drugs, with the condition of respecting the basic rules.

The economic evaluation demonstrated that Etoricoxib (60 mg) is an economically superior treatment to that of Diclofenac (150 mg) for both QALY gains and cost savings.

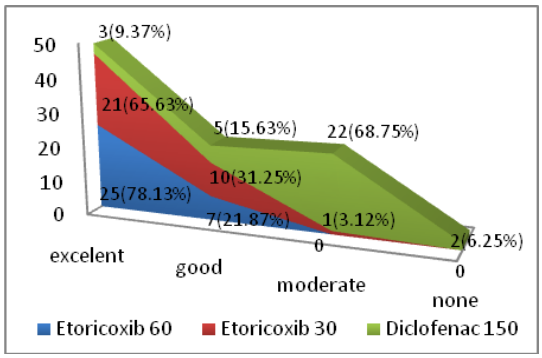


Fig. 11a Effect of the NSAIDs after 4 hours

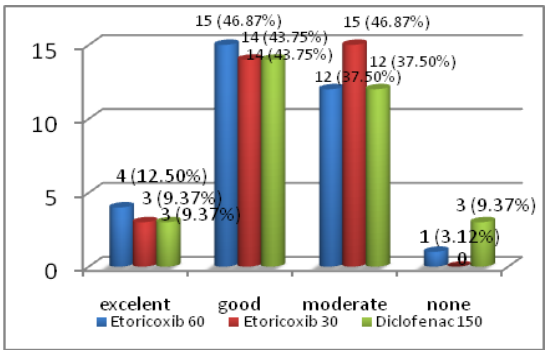


Fig. 11b Effects of the NSAIDs after 2 days

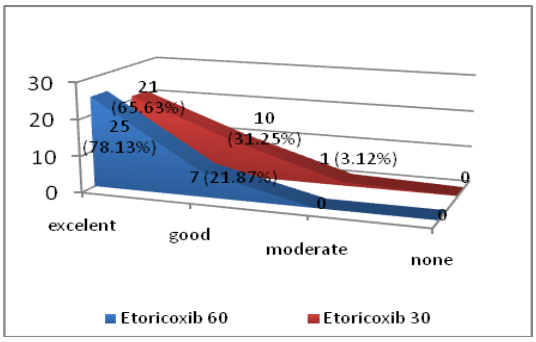


Fig. 11c Comparison of the effect of Etoricoxib

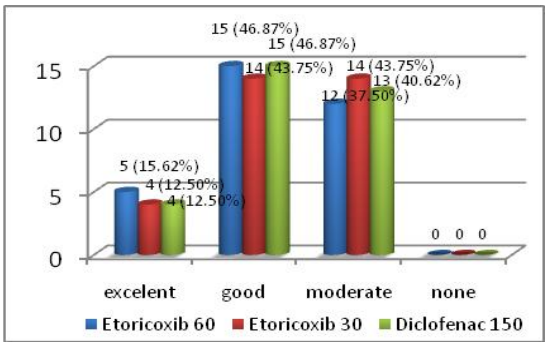


Fig. 11d Effects of the NSAIDs after 14 days

∗Discussions

Modification of the main functions: masticatory, deglutition, physiognomic, phonetic and latching occurs in the whole group of patients, so the prevalence is high, each patient being total or subtotal edentulous, showing damage physiognomy, a self-maintaining circuit, speaking problems, masticatory issuesor dysphagia for liquids and solids [189].

Articular pain is of variable intensity, starting with dull vivid pains, up to real uni- or bilateral pain, it appears at rest and can be exacerbated in motion, usually in the morning, disappearing after a few moves. It can also appear after lunch, as a result of the fatigue and joint solicitation. It is a TMDs, which frequently determines patients to ask for treatment, because they usually do not realize the existence of the crackles or other functional disorders.

In considering the risk associated with NSAIDs, it is important to consider three factors: safety at low doses, with short durations of treatment, and in populations with a low background risk of events [190].

∗Conclusions

(1) Both treatments were generally well tolerated. Etoricoxib is clinically effective in the therapy of TMJ providing a magnitude of effect comparable to that of the maximum recommended daily dose of Diclofenac.

(2) The onset of clinical benefit with Etoricoxib on day one is more rapid than that of Diclofenac, both were generally well tolerated. It should also be mentioned that the improved outcome of the patients was not only in terms of pain but also clinically, meaning in the TMJ function.

Public Health Issues of Mandible Fractures and/or Zygomatic-maxillary complex

The fractures of mandible and/or zygomatico-maxillary complex, injuries within the facialpart of the skull, are among others, factors that could generate SDSS [190].

The SDSS is the 4th disease of the Dental Medicine to be considered a public health issue due to its widespread prevalence and chronicity.

Publications on this topic:

- Checherița LE, Trandafir V, Stamatin O, **Cărăușu Elena Mihaela** (2016). Study of biochemical levels of Magnesium in serum and saliva in patients with Stomatognatic System Dysfunctional Syndrome determined by compromised bone integrity and prosthetic treatment. REV.CHIM. (Bucharest); 67(7):1415-20, **IF** (2016/2017)= **1,232**. ISSN: 0034-7752. Accession Number WOS:000385513000038
- Checherița LE, Trandafir D, Stamatin O, **Cărăușu Elena Mihaela** (2016). Study of biochemical levels in serum and saliva of Zinc and Copper in patients with Stomatognatic System Dysfunctional Syndrome following bone injury and prosthetic treatment. REV.CHIM. (Bucharest); 67(8): 1628-32, **IF** (2016/ 2017)= **1,232**. ISSN: 0034-7752. Accession Number WOS:000384514200046

II.2.2.5 Study of biochemical levels of Magnesium in serum and saliva in patients with Stomatognatic System Dysfunctional Syndrome determined by compromised bone integrity

∗Introduction

The realization of the present study has been motivated by the need of finding proofs which attest the significant modification of the Mg homeostasis and medically justify the administration of mineral supplements at patients with SSDS, due to mandibular fractures or zygomatic-maxillary complex,even in the first 48 hours from the fracture.

∗Methodology

From this perspective, the *aim* of the study was to underline the changes of the serum and salivary biochemical levels of the Mg and, implicitly of the Ca, in patients from the study group compared to a control group formed of healthy subjects and the revealing of the eventual correlations between the analyzed biochemical parameters and the studied demographic characteristics (gender and age).

In order to achieve the proposed aim, the present study has the following objectives: (1) the evaluation of the serum Mg, serum Ca and Ca/Mg *ratio* in the considered groups; (2) evaluation of the salivary levels of the Mg, Ca and the Ca/Mg *ratio*; (3) testing the statistical significance of the differences observed regarding the variation of the biochemical parameters analyzed and the main demographic characteristics (age and gender) studied; (4) evaluation of the correlations highlighted between the biochemical parameters analyzed and the main demographic variables by calculating the correlation coefficient r Pearson.

Our study respected the methodology of the case- control studies. Out of 615 cases of mandible fractures and 173 cases of zygomatic-maxillary complex fractures reported in 2015 for the area of Moldavia, there was chosen a representative group.

In the study group (Cases 1) were included patients with SDSS produced as a result of the damage of the bone integrity of the stomatognat system by mandible fractures or of the zygomatic-maxillary complex, admitted in the Oro-MaxilloFacial Clinic of the "St. Spiridon" University Hospital of Iasi.

In the cases there were *included* ill people who had the following criteria simultaneously met: - minimum age of 18; - existence of the written informed consent regarding participation in the study; - patients in which the collection of biological samples (blood and saliva) could be achieved prior to any therapeutic intervention (after at least 6 and maximum 48 hours from

the producing of the fracture).There *were excluded* from the study group (cases): -patients who were administered, by any route, drugs containing Mg and/or Ca, 4 weeks prior to entering the study; -patients who received diuretic medication 4 weeks before entering the study; -patients who were administered drugs/substances (eg., patients treated with EDTA or who have received radiological contrast substances) that can significantly alter Mg and Ca homeostasis, 4 weeks before entering the study; - subjects with other conditions (acute or chronic) that can significantly alter the homeostasis of Mg and/or Ca. For each case, the initial diagnosis has been established based on the history and physical examination, the correct diagnosis being confirmed by the radiological findings. In all the cases, the diagnosis was made according to clinical, radiological and laboratory criteria.

In this study there were respected the requirements of Good Clinical Practice (GCP) [165]. At the subjects from the study group, the saliva was harvested by the Holmes method which involves aspiration (for 5 minutes). At the subjects in the control group, the collection of biological material (blood and saliva) was performed before any therapeutic interventions addressed to the underlying disease, before any other method was used (12 hours after the last meal, between 7-8 ante-meridian, *á-jeun*), and for saliva it was used the atomic absorption spectrophotometry (AAS). Serum determinations were performed in an accredited laboratory for medical tests.

After fulfilling the inclusion criteria, the study group consisted of 69 subjects, including 22 females and 47 males. The control group was formed of volunteer adults (who expressed their informed and freely consent regarding their participation in the study). In the control group there were included 52 healthy subjects of which 28 female and 24 male gender.

The database was created using Microsoft Excel 2010 for Windows and computerized statistical processing was realized with SPSS 18.0 for Windows.

It has been used the descriptive statistics module which permitted the calculation of the main statistical indicators (medium value, standard deviation, confidence interval CI 95%).

In order to check the statistical significance of the differences found, there were applied tests of statistical significance (t Student test).

In order to assess the correlations between serum and salivary concentrations of the divalent cations considered in the study and other demographic *independent variables* investigated, it was calculated the correlation coefficient r Pearson. The interpretation of the correlation coefficient value was realized according to the classic grid.

∗Results

The values of main statistical indicators (table 18) have shown a good correspondence between the structures of the studied groups in the main demographic characteristics analyzed.

Table 18.
STRUCTURE OF THE GROUPS CONSIDERED IN THE STUDY

Age (years)	**Female gender**		**Male gender**		**Total**	
	Study group	Control group	Study group	Control group	Study group	Control group
Absolute no. (n)	22	28	47	24	69	52
Medium age	46.41	45.85	47.72	54.78	47.03	50.18
Standard deviation (σ)	±16.13	±16.75	±15.12	±15.71	±15.79	±16.13
Minimum value	19	18	19	20	19	18
Maximum value	79	78	76	79	79	79
Variation coefficient (%)	34.01	35.70	34.29	34.61	34.11	35.13
Confidence Interval (CI 95%)	37.59-55.84	40.96-56.15	42.76-57.69	49.32-62.15	39.19-57.74	41.02-60.23
p value (cases *vs.* controls)	*p* = 0.06 - NS		*p* = 0.11 – NS		*p* = 0.10 - NS	

In table 19 it is shown the location of the bone fracture in the study group.

Table 19.

LOCALIZATION OF THE FRACTURE

Localization of the fracture	Female gender		Male gender		Total	
	No.	(%)	No.	(%)	No.	(%)
Mandible fractures	17	77.27	35	74.45	52	75.36
Zygomatic-maxillary complex fractures	5	22.73	12	25.55	17	24.64

Evaluation of biochemical levels of M and Ca in serum and saliva provides useful information on bone metabolic processes and bone healing process.

Serum concentrations of the total magnesium, total calcium and the Ca/Mg ratio

Results of the calculation of the main statistical indicators for the biochemical levels of the serum Mg and serum Cain the two study groups considered are presented comparatively in table 20.

Table 20.
SERUM LEVELS OF THE MAGNESIUM, CALCIUM AND THE Ca/MgRATIO

Indicators	**Mg**(in mg/dl)		**Ca**(in mg/dl)		**Ca/Mg***ratio*	
	Cases group	Control group	Cases group	Control group	Cases group	Control group
Absolute no. (n)	69	52	69	52	69	52
Medium value	2.381	2.297	8.197	7.917	3.44	3.45
Standard deviation (σ)	±0.204	±0.247	±0.781	±0.647	±1.42	±0.92
Minimum value	1.807	1.791	7.179	7.104	2.77	2.53
Maximum value	2.732	2.804	9.507	9.427	4.42	4.75
Variation coefficient (%)	9.07	9.87	8.71	8.23	12.08	14.30
Confidence interval 95% (CI 95%)	2.293-2.487	2.301-2.515	7.995-8.519	7.528-8.209	3.36-3.60	3.07-3.82
p value(cases *vs.* controls)	*p* = 0.27 - NS		*p* = 0.07 – NS		*p* = 0.11- NS	

Conversion factor serum*Ca*: nmol/l x 4 = mg/dl; mg/dl x 0.25 = mmol/l. *Reference values:* 8.6-10 mg/dl (18-60 years).Conversion factor serum *Mg*: mmol/l x 2.43 = mg/dl; mEq/l x 0.5 = mmol/l; mEq/l x 1.2 = mg/dl. *Reference values:* 1.7-2.2 mg/dl (18-20 years); 1.6-2.6 mg/dl (21-60 years); 1.6-2.4 mg/dl (60 and above).

The results presented in above table reveal the following aspects:

-even though in case of SDSS due to mandible fractures or of zygomatic-maxillary complex there were noticed differences regarding the biochemical levels in serum of +0.80% for Mg and of +0.48% for Ca compared to the control group (but also differences towards the reference values of the laboratory (of +0.082 mg/dl for Mg and of +0.082 mg/dl for Ca), these differences did not prove to be statistically significant (p>0.05);

-also, there were not noticed significant statistical ifferences regarding the ratio between biochemical levels in serum of the Ca and Mg in cases of SDSS determined by andible fractures or by zygomatic-maxillary complex *vs.* the control group.

Salivary concentrations of the magnesium, calcium and the Ca/Mg ratio

There were calculated the main statistical indicators for the biochemical levels in the saliva of the Mg and Ca in the wo groups considered, the results being comparatively presented in table 21.

Table 21.
BIOCHEMICAL LEVELS IN SALIVA OF THE MAGNESIUM, CALCIUM AND THE Ca/Mg *RATIO*

Indicators	**Mg** (in mg/dl)		**Ca** (in mg/dl)		**Ca/Mg** *ratio*	
	p	Control group	Study group	Control group	Study group	Control group
Absolute number(n)	69	52	69	52	69	52
Medium value	0.373	0.341	5.294	5.426	14.19	15.91
Standard deviation (σ)	±0.071	±0.063	±0.537	±0.481	±1.87	±2.58
Minimum value	0.341	0.309	4.198	4.617	8.47	10.38
Maximum value	0.493	0.482	6.772	7.118	19.34	22.27
Variation coefficient (%)	10.67	11.35	10.54	8.96	13.07	15.58
Confidence interval 95%	0.314-0.397	0.305-0.372	5.107-5.816	5.218-5.789	14.03-15.76	14.31-16.79
p value(cases*vs.*controls)	*p* = 0.15 - NS		*p* = 0.11 - NS		*p* = 0.06 - NS	

When analyzing the results, it can be noticed that: -even though in cases when SDSS is

determined by mandible fractures or of zygomatic-maxillary complex, there are differences regarding the biochemical levels in the aliva of -0.68% for Mg and of +1,63% for Ca, compared to the control group, these differences hadn't proven to be statistically significant (*p* value >0.01).

Analysis of the correlations

In order to measure the interdependence between the biochemical levels in serum and saliva of the Mg and Ca and te demographic values considered in the study it was calculated the correlation coefficientr Pearson. Regarding the eventual correlations between the tested parameters and age, we may notice significant (*p* value <0.05)medium negative correlations between the total serum Ca and salivary Mg (r = 0.32) and between the serum total Mg and salivary Mg (r= 0.24) in patients from the study group.

From the results of the feminine gender there may be noticed medium negative correlations, statistically significant (*p* value< 0.05) between age and the biochemical levels in saliva of the Mg (r of -0.502) and respectively Ca (r of -0.407), in patients with SDSS determined by mandible fractures or by zygomatic-maxillary complex, compared to the control group made of healthy patients.

Even though in cases with dysfunctional syndrome of the stomatognathic system due to mandible fractures or zygomatic-maxillary complex fractures there are differences of the biochemical levels in serum (of +0.80% for Mg and +0.48% for Ca) as well as in the saliva (of -0.88% for Mg and of +1.63% for Ca) compared to a control group formed of healthy subjects, these differences did not prove to be statistically significant (*p* value >0.05); therefore, we consider that it is not medically justified the decision of administrating mineral supplements (with Mg and Ca) immediately post-fracture in SSDS cases of medium severity take into consideration in the study.

∗ Discussions

Fracture of the zygomatic complex is one of the most common facial injuries in maxillofacial trauma, and its prevalence increases from 10% in the young adults to almost 30% at people of 65 and over [191]. So, the management of surgical cases of facial fractures and broken facial structures is high important because ineffective function can lead to a deterioration of health status.

∗ Conclusion

The results obtained have shown, that in patients considered, there are no significant statistical differences regarding the biochemical levels in serum and saliva of Mg and Ca, compared to the control group formed of healthy persons, in the present study the eventual variations of the biochemical levels of the serum and saliva of the Mg and Ca were seen as a result of the fracture healing process.

II.2.2.6 Study of biochemical levels in serum and saliva of Zinc and Copper in patients with Stomatognatic System Dysfunctional Syndrome following bone injury

∗Introduction

Zinc (Zn) is abundant in bone tissue and is needed to maintain bone mineral density and bone metabolism. Taking into consideration the antagonism between Zn and copper (Cu), it is appreciated that the biochemical levels in serum and saliva of any of them, as well as in the Zn/Cu *ratio* are important in the homeostasis of these trace elements in patients with bone injury [192].

∗Methodology

The *aim* of this study is to check whether the presence of some Zn and Cu variations in SDSS patients determined by the affectation of bone integrity by mandible fractures or by zygomatic-maxillarycomplex.In the present study we are concerned if in patients with SDSS, following mandibular fractures or zygomatic-maxillary complex, there are statistical significant differences regarding serum or saliva biochemical levels of Zn and Cu, compared with a control group consisting of healthy subjects.

In order to reach the proposed *aim*, the present study has fixed the following *objectives*: (1) determination of serum biochemical levels for Zn and Cu and of the serum Zn/Cu *ratio* in the study groups included; (2) determination of saliva biochemical levels for Zn and Cu and the saliva Zn/Cu *ratio*; (3) testing the statistical significance of the differences noted regarding the variation of the biochemical parameters analysed and the main demographic characteristics (gender and age) of the subjects in the study groups; (4) emphasizing the eventual correlations (by calculating the "r" correlation coefficients) between the variation of the biochemical parameters analysed and the main demographic characteristics of the subjects in the study groups.

Our study respected the methodology of the case-control studies.

Out of 615 cases of mandible fractures and 173 cases of zygomatic-maxillary complex fractures reported for the area of Moldavia, there was chosen a representative group. In the study group 1 (cases group) there were include patients with SDSS, as a result of the damaging of the bone integrity by mandible fractures or of zygomatic-maxillary complex, admitted in the Oro-Maxillo-Facial Clinic at the „St. Spiridon" University Hospital of Iasi.

In the cases group there *were admitted* subjects who simultaneously met the following conditions: -minimum age of 18 years old; -existence of the written informed consent regarding the participation in the study; -harvesting of the biological samples (blood or saliva) could be realized prior to any therapeutic intervention; -collecting of the biological samples could be realized at minimum 6 hour and maximum 48 hours from thetrauma which affected the integrity of the stomatognathic system.There were *not admitted* in the cases group: -persons with affections that may interfere with the Zn and Cu homeostasis; -patients who were administered drugs containing minerals or which change significantly the homeostasis of Zn and Cu, 4 weeks prior to the participation in the study; -patients who were administered diuretic medication 4 weeks prior to their participation in the study (diuretic medication increases urinary Zn excretion by as much as 50%; prolonged use of diuretics could deplete Zn tissue levels, so clinicians should monitor Zn status.

For each case, the initial diagnosis was based on clinical history, physical examination, the correct diagnosis being radiology confirmed. In all the cases the diagnosis was made according to clinical criteria, radiological and laboratory. In this study we respected the rules of GCP (Good Clinical Practice).

At the subjects considered, the saliva was harvested through the Holmes method which consists of aspiration (for 5 min). Determinations were conducted in an accredited medical laboratory.

For the analysis of the biological samples of serum and saliva in order to dosage the levels of Zn and Cu it was used, as a method, the spectrometry with atomic absorption (AAS). Biochemical levels in serum and saliva of Zn and Cu were established using the same protocol and method, also for the healthy subjects from the controls, but also for the SDSS patients determined by mandible fractures or zygomatic-maxillary complex.

For the statistical processing of the data it was generated a database using Microsoft Excel 2010 for Windows, and for the computerized statistical processing it was used SPSS 18.0 for Windows.

∗Results

After fulfilling simultaneously the inclusion criteria, the cases group was comprised of 69 patients (22 female gender). The mean age in the cases was 48.07 ± 16.35 years, the minimum age was 19 years and the maximum of 79 years; the meam age for males was 48.12 ± 16.30 years and 47.94 for female ± 17.02 years. Of the total number of cases considered in the study, it can be noticed that the most frequent localization of the fracture was the mandibular one (52 cases), followed by the zygomatic-maxillary complex one (17 cases).

The control group included adult volunteers who have expressed their consent freely on their participation in the study. In the control group there were included 43 healthy subjects, of which 28 females and 24 males.The mean age in the control group was of 50.95 ± 18.13 years, the minimum was 18 years and the maximum 78 years. The mean age for male gender was 56.47 ± 17.87 years and 46.58 for female ± 17.47 years.

The structure of the study groups on the main demographic characteristics has revealed a good correspondence between them.

Study of the serum concentrations of the Zn, Cu and the Zn/Cu Ratio

About the serum levels of the Cu and Zn, there were measured the main indicators in order to evaluate their serum levels in the two groups considered in the study, the results being presented in table 22 comparatively.

From the results presented it can be noticed that: -even though in cases with SDSS due to mandible fractures or zygomatic-maxillary complex there are differences regarding the serum levels of the studied cations (of -3.09% for Zn and of +0.73% for Cu) compared to the controls, these differences did not prove to be statistically significant (*p* value >0.05); -also, there were not emphasized significant statistical differences regarding the serum Zn/Cu *Ratio* in patients with SDSS *vs.* controls.

Table 22.
SERUM CONCENTRATIONS OF Zn, CuAND THE Zn/Cu *RATIO*
BETWEEN THEIR SERUM LEVELS

Indicators	**Zinc** (μg/dl)		**Copper** (μg/dl)		**Zn/Cu *ratio***	
	Cases	Controls	Cases	Controls	Cases	Controls
Absolute no. (n)	59	43	59	43	59	43
Mean value	106.27	107.57	80.89	83.85	1.42	1.38
Standard deviation (σ)	±15.66	±19.18	±21.64	±21.82	±0.50	±0.48
Minimum value	70.41	70.49	36.80	49.60	0.7340	0.7395
Maximum value	160.81	168.09	150.45	129.61	3.1957	2.6667
Median value	105.60	105.06	82.41	86.47	1.25	1.27
Variability coefficient (%)	14.74	17.83	26.75	26.02	35.22	34.74
95% Confidence Interval (95% CI)	101.80-110.76	101.84-113.31	74.71-87.08	77.33-90.37	1.2775-1.5636	1.2392-1.5264
p value(cases *vs.* controls)	*p* = 0.35		*p* = 0.24		*p* = 0.14	

Reference values for the serum Zinc in adults: 46-150 μg/dl.Conversion factor: μg/dl x 0.153 = μmol/l; μmol/l x 6.54 = μg/dl. Reference values for the serum Copper in adults: – Female: 76-152 μg/dl; – Male: 70-140 μg/dl. Conversion factor: μg/dl x 0.157 = μmol/l; μmol/l x 6.37= μg/dl.

Although, there were also noticed relatively reduced values of the serum Zn (7.041μ/dL) in a few cases with febrile state and sepsis, these values were not excluded.

The Zn deficit is accompanied usually by a decrease in its excretion (urinary, salivary). However, the reduced serum values may also be correlated with urinary loss which may appear in chronic kidney and liver affections (as cirrhosis) associated to the disease in the study.

The concentration of serum Cu reflects both the Cu bound to the ceruloplasmin, as well as the free Cu bound weaker to the albumin or to the small circulator peptides.

Ceruloplasmin is an acute phase reactant and because this protein binds a large amount of Cu, both the serum Cu, as well as the ceruloplasmin, grow in pathological conditions associated to inflammation. On the other hand, serum Cu levels may be low in affections accompanied by hypoproteinemia, without necessarily reflecting reduced hepatic Cu deposits (malnutrition, malabsorption).

Study of saliva biochemical levels of Zn, Cu and saliva Zn/Cu Ratio

In the second part of the article we presented the data regarding salivary concentrations of the Cu and the Zn.

There were calculated the statistical indicators for their salivary levels in the groups considered, the results being presented comparatively.

Analyzing the results synthetically presented in table 23, we can notice that:-even though in cases of SDSS determined by mandible fractures or zygomatic-maxillary complex there are differences regarding the saliva's biochemical values of -6.30% for Zn and of +1.07% for Cu compared to the controls, these differences did not prove to be statistically different.

Table 23.
BIOCHEMICAL LEVELS IN SALIVA OF Zn, CuAND Zn/Cu *RATIO* IN SALIVA

Indicators	**Zinc** (µg/dl)		**Copper** (µg/dl)		**Zn/Cu *Ratio***	
	Cases	Controls	Cases	Controls	Cases	Controls
Absolute no. (n)	59	43	59	43	59	43
Medium value	23.88	23.93	61.12	60.93	0.3907	0.3763
Standard deviation(σ)	±6.80	±8.32	±6.93	±6.26	±0.1099	±0.1507
Minimum value	11.01	10.06	47.02	45.04	0.1667	0.0141
Maximum value	46.09	47.02	77.10	74.06	0.7077	0.8103
Median	24.08	24.50	60	61	0.3871	0.4
Variability coefficient (%)	28.45	34.75	11.34	10.27	27.99	37.62
Trust interval95% (CI 95%)	21.94-25.82	21.44-26.42	59.14-63.10	59.06-62.80	0.3615-0.4244	0.3556-0.4457
p value (cases *vs.* controls)	*p* = 0.38		*p* = 0.14		*p* = 0.27	

Correlation study

In order to measure the interdependence rate between the concentrations in serum and saliva of the Zn and Cu and the different demographic variables investigated (at the controls *vs.* the cases with SDSS and mandible fractures or zygomatic-maxillary complex), there was calculated the statistical correlation coefficient *r* Pearson.

The interpretation of the r correlation coefficient values was made according to the classic grid. The Pearson r correlation coefficient reveals a relatively strong negative correlation (r correlation coefficient of -0.78), statistically significant (*p* value < 0.05) between the serum levels of Cu and the serum Zn/Cu *ratio* in the group of patients with SDSS determined by mandible fractures or of zygomatic-maxillary complex.

Our results also reveal medium negative correlations (*p* value < 0.05), in feminine gender, between age and the salivary concentration of the Zn (r of -0.40), Cu (r of -0.42) and of the Zn/Cu *ratio* in the saliva (r of -0.32), and between age and salivary concentration of the Cu (r of -0.24) in masculine gender.

In patients with severe trauma, there can be also seen changes if the serum levels of the Cu and Zn. Copper aids in the formation of bone, collagen and is important to the bone healing process. The body's demand for both Zn and Cu rises according to the trauma severity.

In cases with SDSS generated by mandible fractures or zygomatic-maxillary complex were emphasized differences of the serum biochemical levels (of -3.09% for Zn and of +0.73% for Cu) as well as the salivary biochemical levels (of -6.30% for Zn and of +1.07% for Cu) of the divalent cations studied, compared to the control group formed of healthy subjects, but the differences did not prove to be statistically significant (*p* value >0.05).

∗Discussions

The SDSS is an important disease of the Dental Medicine to be considered a public health problem due to its widespread prevalence and chronicity [193].

Attempts to explain the prevalence of SDSS on female gender patients have identified several potential predisposing factors, including the effects of gonadal hormones such as estrogen, progesterone, and relaxin. These hormones are believed to have a degenerative

effect on the disc and/or bone of the mandibular condyle.

The risk was higher for patients with ear problems/tinnitus, migraine, snoring and muscle problems, but the differences were not significant.

Also, the multifactorial etiology of SDSS makes hard for our study to isolate trauma as a sole cause of it.

*In *conclusion*, all these variations do not justify the medically administration of mineral supplements in the cases of medium SDSS severity considered in the study, in the first 48 hours post-fracture.

II.2.3 Public Health Issues of Nanotechnologies in Dental Medicine

Nanotechnology is the art and science of material engineering in a scale of less than 100nm. It revolutionized the medical and dental fields by improving mechanical and physical properties of materials, helped introduce new diagnostic modalities and nano-delivery systems [194].

Ethical Implications of Nanotechnology

After the research and development phase of any medical or dental nanoproduct, it undergoes extensive preclinical in vitro testing to investigate its mechanical, toxicological, and immunological properties.

However, developing a multidisciplinary regulatory framework to assess and control nanotechnology and resolve ethical concerns that fall under the next categories: equity, privacy, and security is a constant legislative challenge [195].

Therefore, must understand the level of risk associated with the exposure to novel materials and data and safety monitoring boards must be appointed in every clinical trial, to carefully track and record any adverse side effects early on, pick up inconsistencies in data handling, and insure the safety and wellbeing of test subjects.

The unpredictability of nanomaterials create an ethical dilemma for dentists when faced with a wide range of materials to choose from, some having very long track records supporting their clinical use such as hybrid- or micro- filled composite resins and others such as the nanofilled composite resins that are appealing in concept and supported by short term clinical studies [195].

Applications of nanotechnology in dentistry

Public Health Dentistry researchers developed a nano-toothbrush, by incorporating nanogold or nanosilver colloidal particles between tooth brush bristles [196]. In addition to its ability to improve upon mechanical plaque removal, researchers reported an antibacterial effect which could ultimately lead to a significant reduction in periodontal disease.

Oral hygiene products such as toothpastes and mouthwash solutions were also nano-modified according to recent reports.

Nano-calcium fluoride, for instance, was added to mouthwash products to reduce caries activity, reduce dentine permeability, and increase labile fluoride concentration in oral fluid.

Toothpastes containing calcium carbonate nanoparticles and 3% nanosized sodium trimetaphosphate have been reported to promote remineralisation of early carious lesions in comparison to a conventional toothpaste with no nano-additives [197].

The higher reparative capacity of nanomaterials in comparison to the same material in a micro- or macro- scale, might be attributed to the fact that the inorganic building blocks in enamelare 20–40nm in size, making it logical to assume a higher affinity to nanosized particles. This isimportant to consider when attempting to develop new materials to improve mechanical, physical, and reparative characteristics.

Now, the scientists were able to create a novel drug delivery system for the treatment of periodontal disease, through triclosan or tetracycline loaded nanoparticles.

The nanoparticles are dispersed uniformly within a matrix, which gradually biodegrades, releasing loaded drugs in increments to provide a longer contact duration with the diseased

site. Niosomes, for instance, are chemically stable non-ionic vesicles, which offer a controlled and targeted drug delivery with enhanced penetration through biological tissue especially when the particles are less than 100nm in size [198]. Tooth whitening agents were additionally nano-modified to increase their whitening efficiency and minimise their harmful side effects [199]. Calcium-peroxide nanoparticles, for instance, were able to penetrate deeper into the tooth structure through micro and nano cracks, leading to a longer surface contact and therefore an increase in the effectiveness of the whitening agent as its deeper penetration into the tooth structure allows for a longer action time and ultimately a significant improvement in aesthetics when compared to a whitening agent with micro or macro- particles.

The science and applications of nanotechnology are constantly evolving as we witness new products being introduced into the market. This comes with great responsibility to insure the safety, efficiency, and applicability of such new technologies [200, 201].

Publications on this topic:

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II.2.3.1 Antibiotic-anionic Clay Matrix Used for Drug Controlled Release

∗ Introduction

Anionic clay matrix acting as drug controlled release system have shown in last years a potential for delivery of bioactive molecules and chemical therapeutics. This organic-inorganic nanohybrid system is high efficient offering an good protection of intercalated compounds from degradation. Compared to other nanoparticles used in medical area, anionic clays type layered double hydroxides have found to be biocompatible according to toxicology studies.

It is well known that clay minerals have been used as therapeutics due to their special properties at nanometric scale. Selecting the suitable anionic clay as matrix for different pharmaceutical formulationsfacilitates the administration of an active principle, improves their

efficacy and assures a better stability. Furthermore, because of their biocompatibility, anionic clays type hydrotalcites or layered double hydroxides are used as active principles in various formulations requiring sterilizers, adsorbent products, antiinflammatory or antimicrobial agents. In addition, most of layered double hydroxides used in pharmaceutical domain can be good host for active molecules intercalated in the interlayer space actingas drug delivery carriers thus improving the drug release profile. These nano-sized materials exhibit unique physicochemical properties due to the ease of tailoring the synthesis conditions. Layered double hydroxides (LDHs) are presented by general formula $[M^{II}_{1-x}M^{III}_{x}\ (OH)^{2\ x+}(A^{m-})_{x/m}\cdot nH_2O]$ ($x = 0.2– 0.4$; $n = 0.5–1$), where M^{II} is a divalent metal cation, M^{III} a trivalent metal cation and A^{m-} represents anions located between two layers that can counterbalance the positive charge of layers by electrostatic interactions. Biologically active molecules intercalated into interlayer space include antibiotic anions with antibacterial activity.

The intercalation of antimicrobial drugs as ampicillin can be performed as long as the new formulation can maintain its pharmacological action for a longer period, to delivery and release the drug in a controlled manner while avoiding adverse effects of drug administration. Ampicillin is one of the largest broad spectrum antimicrobial agents used for years because of its irreversible bactericidal effect.

This drug is clinically useful although its action fights with bacterial resistance thus motivating the researchers to design new stable modified formulations.

The increased bacterial resistance determines us to develop new effective compounds consisting in broad-spectrum antibacterial agents.Therefore, our work focused on synthesis and characterization of nanomaterials type antibiotic-anionic clay matrix used for ampicillin controlled release improving thus oral health by limiting bacteria colonization or treating microbial infections in oral cavity.

∗Methology

MgAlLDHs and ZnAlLDH samples using magnesium nitrate, aluminum nitrate and zinc nitrate precursor salts in a 3:1 and 2:1 molar ratio were prepared by coprecipitation route. Metal salts dissolved in 700 mL deionized water were added drop wise to a NaOH/Na2 CO3 solution under stirring to a pH value of 9.5-10. The resulting gel was aged for 24h at 60°C, separated by filtration and dried at 60°C for 12h. An amount of these samples were calcined at 550°C for 5 h in order to be used for ampicillin intercalation by rehydration. Drug intercalation into anionic clay gallery was carried out by using anion exchange method MgAlLDHs and ZnAlLDHs parent samples and by reconstruction using calcined samples.Thereby, 1 g of MgAlLDHs and ZnAlLDHs respectively and 1 g of each calcined ones was added to a 100 ml solution containing 0.5 g ampicillin dissolved in deionized water. The obtained samples type antibiotic-anionic clay matrix denoted as ampicillin -MgAlLDHs and ampicillin- ZnAlLDHs were stirred for 24 h at room temperature, separated by filtration and dried at 40°C for 24h. Finally, the structure and morphology of products were analyzed using specific characterization techniques.

∗Results

All samples shape and sizes were performed through scanning electron microscopy (SEM). Nanoparticles with hexagonal platelet shape were noticed for Mg(Zn)Al anionic clays while aggregates shapes were found for corresponding antibiotic- anionic clays.

Morphologies of pristine samples are specific to anionic clays structures type layered double hydroxides containing Mg(Zn)Al as well as for thermally treated ones and their sizes are around 90 nm. It can also be observed that their shape and agglomeration degree modifies when ampicillin is present in the interlayer gallery.

Intercalation of ampicillin into anionic clay interlayers was also confirmed by comparing FTIR spectra of drug intercalated samples with pristine anionic clays nanoparticles. Pristine anionic clays spectrum shows intense broad band around 3445 cm^{-1} assigned to stretching vibration of –OH groups and interlayer water molecules. The band at 1630 cm^{-1} is associated

with bending vibration of water molecules present into interlayer space of anionic clay. Stretching vibration of anionic nitrate groups can be observed at around 1385 cm^{-1}. The peak at around 550 cm^{-1} is attributed to M-O and MO-H stretching vibration in the hydrotalcite layers. MgAl anionic clay has a characteristic band at around 445 cm^{-1}. FTIR spectra of ampicillin intercalated samples present an absorption peak at around 1750 cm^{-1} attributed to C=C stretching, at 1665 cm^{-1} is the result of C=O amide stretching and 1560 cm^{-1} belong to N-H amide groups. Carboxylate groups present stretching vibration at around 1590 cm^{-1} and 1390 cm^{-1} respectively.

∗Discussions

Nanomedicine offers many opportunities to enhance the efficacy of currently used antibiotics in order to destroy pathogen resistance mechanism.

Nanotechnology [201] facilitated the advanced design of new nanomaterials type antibiotic-anionic clay matrix having uses in pharmaceutical area thus improving *public health dentistry* by limiting and successfully treating bacterial infections [202].

Drug intercalated anionic clays having specific properties as drug carriers have revolutionized nanodentistry particularly in drug controlled release systems [203].

∗Conclusions

(1) Due to their special ability to penetrate biofilms and pathogen bacteria, nanoparticles type layered double hydroxides intercalated with antibiotic molecules acting as antimicrobial agents have gained a high reputation for controlling infectious diseases.
(3) Ampicillin loaded MgAlLDHs and ZnAlLDHs exhibiting antibacterial properties can be used successfully in medicine applications especially in dentistry.

II.3 RESEARCH CONTRIBUTIONS IN DENTISTRY MANAGEMENT

Traditional dentistry has changed over the past 25 years. More challenges face the dentist today than ever before. Dentistry has become competitive [204].

While it's still a healthcare profession in many ways, there are many indications that the dental healthcare is also becoming an industry [205].

Nowadays, dental practice is a competitive world where the skills as a manager are as important as the skills as a dentist [206].

The different health care delivery systems are play a major role in the different countries.

The dental health care is delivered majority by the private practitioners all around the globe [207, 208].

II.3.1 Quality Management of Dental Health Services

Healthcare professions have undertaken significant efforts to improve their quality of care, thereby responding to the public's ever-increasing demand for improved safety, higher quality and more transparency.

This applies equally to dental practitioners, who want to improve the outcomes of care in the interest both of their patients and of public health [209].

All stakeholders share a joint responsibility for defining the fundamental principles of quality to achieve the desired outcomes for patients, bearing in mind that dentists have the primary responsibility [210].

Quality in dentistry- is an iterative process involving dental professionals, patients and other stakeholders to develop and maintain goals and measures to achieve optimal health outcomes.

Continuous quality improvement cycle- recurrent planning, executing, measuring, interpreting, evaluating and then acting on results.

Outcome- is a measured output of a healthcare delivery system.

Main Principles:

-Improving quality in dentistry is a universal aspiration.

-Quality safety and transparency are inseparable.

-Quality is influenced by political, ethical, social and economic context and, as such, imposition of a universal set of standards is not always appropriate.

-Quality improvement is the collective responsibility of many stakeholder groups, which need to communicate and work transparently and collaboratively.

-Improving quality should reflect the best available evidence applied in accordance with the expertise of clinicians and the expectations of the patient.

-A global understanding of quality, along with open processes, would encourage shared learning and building a knowledge base for quality improvement.

-Quality improvement requires expenditure of resources, e.g. intellectual, educational, research, financial and time.

-Adoption of a continuous quality improvement cycle shall result in better and more cost-effective health outcomes for patients.

-Quality management should be an integral component of dental education and training.

Les is known about how to improve quality of organizational aspects of primary sector dental care.

Effective quality improvement programs seek to continuously improve oral health care delivery systems. These programs should consider the service delivery process, quality of staff and resources, sustainable business practices and desired optimal outcomes for patients that integrate prevention-focused care and disease management into the system.

Most dental practices' quality management programs shared a vision of six specific aims for improvement. These aims are built around the core need for health care to be:

Safe: Avoiding injuries to patients from the care that is intended to help them.

Effective: Providing services based on scientific knowledge to all who could benefit, and refraining from providing services to those not likely to benefit.

Efficient: Avoiding waste, including waste of equipment, supplies, ideas, and energy.

Patient-centered: Providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions.

Timely: Reducing waits and sometimes harmful delays for both those who receive and those who give care.

Equitable: Providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.

The majority of literature and the evidence base for defining and measuring quality in primary care come from general medical practice and not from oral health care settings [211].

Publication on this topic:

- **Cărăuşu Elena Mihaela**, Dascălu CG, Lupu IC, Anistoroaei D, Zegan G (2019). The quality of dental care services provided by the private offices in Iasi- Pilot study results. Romanian Journal of Oral Rehabilitation/RJOR; 11(1): 208-14. ISSN 2066-7000, ISSN-L 2601-4661. Accession Number WOS: 000472600400019, IDS Number: IE8CB

II.3.1.1 The quality of primary dental medicine services

∗Introduction

The practice of dentistry is demanding and constantly evolving. In Romania, dental medicine is predominantly a primary health service. Worldwide evidence indicates that the primary health care approach leads to better health outcomes for lower costs [212].

The concept of quality is defined as a multidimensional one. Maxwell suggested six dimensions of quality (access, effectiveness, efficiency, equity, relevance and social acceptability)

and Donabedian suggested seven dimensions (acceptability, effectiveness, efficacy, efficiency, equity, legitimacy and optimality). Such dimensions or attributes, in whatever combination, or taken in isolation, constitute a definition of quality of care. Also, the classical triad of *structure*, *process* and *outcome* has been conceived as: "*approaches to obtaining information about the presence or absence of attributes that constitute or define quality*" [213].

Also, the quality of dental care from the perspective of the individual patient should be considered separately from the perspective of the general population or the dental services providers. Campbell and colleagues [214] summarised the quality for individual patients as '*whether individuals can access the effective care they need with a patient-centred focus on maximising the health outcomes*'. So, to provide for dental medicine the right environment for *quality assurance* a focus on quality across the health system is required [214]. This is because dental primary health care operates within a healthcare system provided by teams within dental practices and organisations, even though it is delivered by and to individuals [212].

In modern dental medicine, quality assurance is a systematic process, focused on the performance of dental services provided to the patients [215]. This is the starting point for improving the oral health of the population. In this complex context, quality management, through its mechanisms, aims to provide the quality dental services and also to continually improve their quality, taking into account the scientific and technical progress, the available resources and their efficient use. So, in dental medicine, achieving *quality improvement* therefore requires an understanding of the need for multilevel approaches to change. These levels are: (1) The individual one (for example, general dental practitioner), (2) The group/ team (for example dental team in a dental clinic/dental office), (3) The overall organisation (for example, Local Professional Network), (4) The larger system (*for example*, the health system) in which individuals and organisations are included. While recognising the independence of each level, quality improvement strategies need also to consider the inter-dependence of these levels [216].

The reason for choosing this theme is complex and is based on the following premise: knowing the level of patient satisfaction with the quality of dental care received is a particularly important component of the dental services provided and allows for appropriate measures to improve their quality.

The *aim* of this paper is to know the degree of satisfaction of patients about quality of dental care who have received in the private dental medicine practices. Our study proposed four specific objectives: (1) quality evaluation of local dental medicine services, (2) clinical quality evaluation (3) infrastructure quality evaluation, and (4) professional communication quality evaluation.

∗Methodology

We tested a representative sample of 144 randomly selected patients with different professions and ages.

Our study is an opinion survey. The working instrument was a structured questionnaire aimed to investigate patients' level of satisfaction with the dental medicine services provided by local private practices. The questionnaire was anonymous and fully complied with the legislation on personal data protection. The questions in the first part of the questionnaire followed strictly the collection of socio-demographic data, such as age, gender, social environment and occupation/ profession. The second part of the questionnaire included a set of questions, the purpose of which was to assess the quality of dental medicine services, from the patient's perspective. The questions were grouped according to the interest of our research in the following main categories: (1) addressability of the population to the local dental medicine services, (2) evaluation of clinical quality and quality of diagnosis of oro-dental diseases, (3) accessibility of the population to local dental medicine services (financial accessibility, accessibility to dental medicine emergency services, temporal accessibility to

dental medicine services, accessibility to specialized dental medicine services, as surgery or orthodontics (4) the quality of the dental office/ dental clinic infrastructure, (5) the quality of professional communication between the dentist and patient.

The answers to each question were evaluated according to a Likert scale with 5-steps: the first two (5-total agreement, 4- agreement), express patient's satisfaction with the quality of the dental services received, the latter two (2- disagreement, 1- total disagreement), reflect the patient's dissatisfaction, and the third step (3- indifferent) expressed the patient's indifference to respective statement.

The study was conducted at the Management and Public Health Discipline and Orthodontics Discipline of Dental Medicine Faculty at Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania, in 2018, between January to December.

Our study had a transversal design with a quantitative approach.

The *independent variables* were the demographic ones as: gender (Male/ Female), age (in years), social environment (Urban area/Rural area), and the occupation/profession.

The *dependent variables* were the items of the questionnaire.

The Social Science Statistical Package (SPSS), version 19, was used to analyze data collected from study participants.

Ethical statement

Informed consent was obtained from all patients; also, a prior consent was obtained from the dentist. After obtaining their consent, the subjects were asked to take part in our study during the time they spent in the waiting room.

∗Results

The demographic characteristics

The study group comprised 144 patients, aged between 12 and 74 years old, 59 male gender subjects and 85 females, in figure 12 is shown the gender structure of studied group. In the study group have prevailed the patients aged from the 20-29, followed by those aged 30-39 and under 20 years, the structure on the age groups being presented in figure 13. From all patients, 79 of them were from urban area and 65 from rural, the structure on social environments being presented in figure 14.

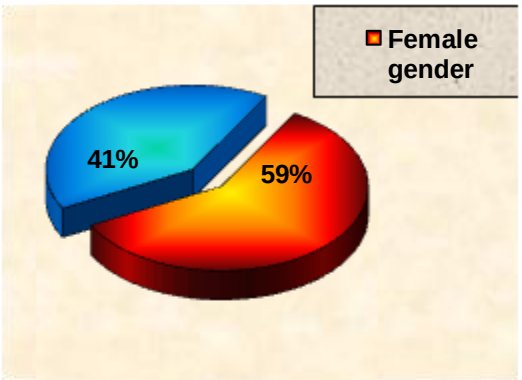

Figure 12. **The structure of studied group**- *on gender*

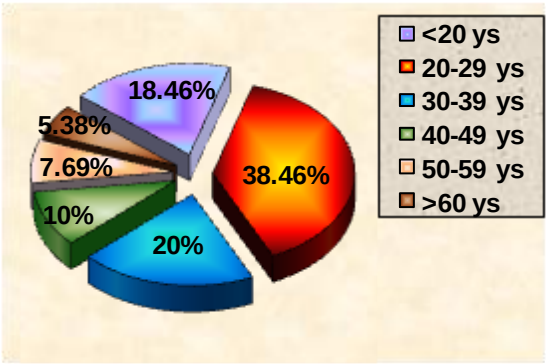

Figure 13. **The structure of studied group**- *on age groups*

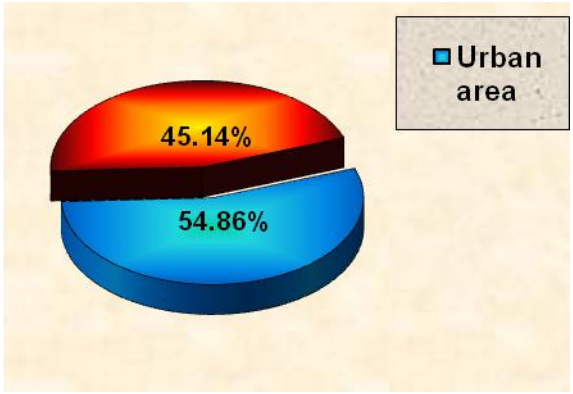

Figure 14. **The structure of studied group**- *on social environments*

Regarding the structure of occupations of the studied group, we observe that they were: 58 students (40.27%), 51 workers (35.42%), 18 pensioners (12.5%), 17 intellectuals (11.81%), 3 unemployed (2.08%) and 7 (4.86%) did not specify the occupation.

We present the synthesis of the main results obtained about *addressability of the population to local dental medicine offices* in the table 24. Analyzing the answers, we find that female patients have an informed choice of the dental practitioners and have a greater addressability to dental medicine services when they have an oro-dental health problem (80.00%), compared to male gender patients (72.88%).

Table 24.
ADDRESSABILITY OF PATIENTS TO DENTAL MEDICINE OFFICES

Gender	Total agreement		Agreement		Indifferent		Disagreement		Total disagreement		χ^2_c LD=4	*p* value
	No.	%	No.	%	No.	%	No.	%	No.	%		
Female	46	54.12	22	25.88	12	14.12	4	4.71	1	1.17	1.1899	0.879758
Male	28	47.46	15	25.42	12	20.34	3	5.08	1	1.69		
Total	74	51.38	37	25.7	24	16.7	7	4.86	2	1.38		
*Statistically significant differences when $p<0.05$												

The synthesis of the main results obtained about *evaluation of clinical quality in dental medicine* is presented in the table 25.

Table 25.
EVALUATION OF CLINICAL QUALITY

Gender	Total agreement		Agreement		Indifferent		Disagreement		Total disagreement		χ^2_c LD=4	*p* value
	No.	%	No.	%	No.	%	No.	%	No.	%		
2.Degree of involvement of the dentist in the examination and treatment of patients												
Female	28	32.94	34	40.00	18	21.18	2	2.35	2	2.35	1.7917	0.774001
Male	23	38.98	19	32.20	13	22.03	3	5.08	2	3.39		
Total	51	35.42	53	36.81	31	21.53	5	3.47	4	2.77		
3.Patient satisfaction with dental care received from the dentist												
Female	25	29.41	23	27.06	29	34.12	8	9.41	1	1.17	2.3469	0.672245
Male	13	22.03	21	35.59	16	27.12	7	11.86	1	1.69		
Total	38	26.39	44	30.56	46	31.94	15	10.42	2	1.38		
4.Do you consider that your dentist work superficially sometimes?												
Female	8	9.41	10	11.76	31	36.47	19	22.35	15	17.65	4.8047	0.307929
Male	8	13.56	11	18.64	13	22.03	18	30.51	11	18.64		
Total	16	11.11	21	14.58	44	30.56	37	25.69	26	18.06		
*Statistically significant differences when $p<0.05$												

The majority (74.31%) of patients, regardless of gender, are pleased with the professionalism with which the dentist consults, puts the diagnosis and treats them. 25.69% of patients believe they are superficially treated, but do not refuse the treatment.

The lack of dental education of the population makes that only 11.80% of all patients to recognize, in real time, and refuse a dental treatment of improper quality.

Evaluation of *population accessibility to local dental medicine services* is shown in table 26.

Table 26.
POPULATION ACCESSIBILITY TO DENTAL MEDICINE SERVICES

Gender	Total agreement		Agreement		Indifferent		Disagreement		Total disagreement		χ^2_c LD=4	*p* value
	No.	%	No.	%	No.	%	No.	%	No.	%		
5.Financial accessibility of the population to the private dental medicine services												
Female	42	49.41	17	20.00	15	17.65	4	4.71	9	10.59	2.6567	0.616818
Male	24	40.68	12	20.34	7	11.86	5	8.47	9	15.25		
Total	66	45.83	29	20.14	22	15.28	9	6.25	18	12.50		
6.Financial accessibility of the population to the expensive dental medicine services												
Female	44	51.76	16	18.82	14	16.47	5	5.88	7	8.24	3.899	0.419842
Male	24	40.68	15	25.42	7	11.86	6	10.17	8	13.56		
Total	68	47.22	21	14.58	21	14.58	11	7.64	15	10.42		
7.Population accessibility to an emergency dental medicine treatment												
Female	26	30.59	25	29.41	19	22.35	13	15.29	2	2.35	2.1054	0.716388
Male	19	32.20	16	27.12	17	28.81	5	8.47	2	3.39		
Total	45	31.25	41	28.47	36	25.00	18	12.50	4	2.77		
8.Population accessibility to the specialist dentist												
Female	35	41.18	21	24.71	13	15.29	8	9.41	6	7.06	4.5524	0.336384
Male	18	30.51	17	28.81	13	22.03	4	6.78	9	15.25		
Total	53	36.81	38	26.39	26	18.06	12	8.33	15	10.42		
9.Temporal accessibility of the population to the dental medicine services												
Female	32	37.66	22	25.89	26	30.59	3	3.53	2	2.35	7.6293	0.106141
Male	19	32.20	9	15.25	21	35.59	3	5.08	7	11.86		
Total	51	35.42	31	21.53	47	32.64	6	4.17	9	6.25		
10. Waiting time												
Female	15	17.65	17	20.00	35	41.18	6	7.06	13	15.29	5.5372	0.236479
Male	10	16.95	8	15.25	23	38.98	11	18.64	6	10.17		
Total	25	17.36	25	17.36	58	40.28	17	11.81	19	13.19		
11.Dentist's respect for treatment scheduling of patients												
Female	27	31.76	29	34.12	21	24.71	7	8.24	2	2.35	4.0879	0.394242
Male	23	38.98	21	35.59	9	15.25	2	3.39	3	5.08		
Total	50	34.72	50	34.72	30	20.83	9	6.25	5	3.47		
*Statistically significant differences when $p<0.05$												

Our study revealed that patients financial accessibility to usual dental medicine services is 65.97% and, 17.36% of our studied patients can not afford more expensive treatments. Population accessibility to local dental medicine services in an emergency situation is 59.72%. Also, accessibility of the patients to a specialist dentist is 63.19%. Although, our study revealed the gender differences, these are not statistically significant.

In table 27 is shown *the evaluation of local dental medicine infrastructure*.

Table 27.
EVALUATION OF THE QUALITY OF THE DENTAL MEDICINE INFRASTRUCTURE

Gender	Total agreement		Agreement		Indifferent		Disagreement		Total disagreement		χ^2_c LD=4	*p* value
	No.	%	No.	%	No.	%	No.	%	No.	%		
12. The quality level of dental medicine services infrastructure												
Female	24	28.24	32	37.65	26	30.59	2	2.35	2	2.35	0.581	0.96515
Male	14	23.73	21	35.59	19	32.20	2	3.39	2	3.39		
Total	38	26.39	53	36.81	45	31.25	4	2.78	4	2.78		
13. The need to improve the infrastructure of local dental medicine services												
Female	27	31.76	32	37.65	20	23.53	5	5.88	3	3.53	0.9327	0.919819
Male	15	25.42	20	33.90	16	27.12	3	5.08	3	5.08		
Total	42	29.17	52	36.11	36	25.00	8	5.56	6	4.17		
*Statistically significant differences when $p<0.05$												

The quality of the infrastructure is considered good by 63.19% of patients, but 65.28% of them reveal that the infrastructure requires improvements also.

During 2018, the rate of complaints made by patients was low, 4.86%.

In table 28 is shown the evaluation of professional communication in dental medicine.

Table 28.
THE QUALITY OF PROFESSIONAL COMMUNICATION IN DENTAL MEDICINE

Gender	Total agreement		Agreement		Indifferent		Disagreement		Total disagreement		χ^2_c LD=4	*p* value
	No.	%	No.	%	No.	%	No.	%	No.	%		
Female	17	20.00	23	27.06	20	23.53	16	18.82	10	11.76	3.3508	0.500925
Male	16	27.12	18	30.51	10	16.95	11	18.64	3	5.08		
Total	33	22.92	41	28.47	30	20.83	27	18.75	13	9.03		
*Statistically significant differences when $p<0.05$												

∗Discussions

From the literature of recent years we know about the existence of a causal relationship between the quality of the dental care, the patient's satisfaction regarding the dental care and the profitability of the private dental practices [212]. In the competitive environment of the dental services market, the patient's dissatisfaction with the quality of care received determines the ulterior behavior. If the patient is satisfied with the quality of the dental care received, the probability that he will return to the same dentist to solve subsequent oro-dental health problems will be higher [214].

One of the most important ways to highlight and promote a private provider of dental medicine services is based on a better quality compared to competition. To achieve this, he must provide dental care to the level of quality desired by the patient and even overcome it. Patients' expectations [215] regarding the quality of dental care are determined by their previous experiences, the reputation of the dental medicine services provider and the public information about it and the quality of the services, as perceived by the patient. The patient will choose a dentist or another according to these criteria, and after completing the dental treatment, he will compare the quality of the dental care, he has actually received and paid, with the ones he wished. If the level of quality of dental care received is inadequate (does not meet its expectations), the patient will give up and turn to another dentist who has a better quality of dental medicine services provided. If the dental care received is of the quality required by the patient, or better, it will return to the same dentist in the future to solve other oro-dental health problems.

Starting from these simple findings about patient behavior and how it responds after receiving inadequate dental care, management specialists have recommended to the private providers the introduction of quality management in health services in dental medicine also [215]. Thus, the dentist will be able to provide for each patient the good quality dental care and will respond to level of exigency requested by the patient.

∗Conclusions

In conclusion, our study offers useful information for introduction of quality management in local dental medicine services.

Our results show that the majority of the surveyed patients are satisfied with the clinical quality of the dental care received.

The questioned patients believe that dentists with private practice have the necessary equipment and materials to provide dental services at the proper quality.

Also, our results show the proper quality of professional communication in surveyed local dental medicine offices.

Although, our study found the gender differences, these are not statistically significant.

II.4 SCIENTIFIC CONTRIBUTIONS IN MARKETING FOR DENTISTRY

Today, an extraordinary diversity of marketing strategies can be seen. Through these strategies, dentistry entrepreneurs are looking to promote their business in an efficient way to profit, but also take into account the needs of patients. In the field of dental health is also promoted the idea of social marketing. Social marketing is based on two major concepts: the patient's needs and the desires of individuals or groups. Basically, this kind of marketing does not focus on profit, but on the medical needs of the patient [216].

In dentistry, it is important to change the general features of the marketing to adopt to the market conditions. One of the famous demand models for dentistry is known as the health production function model. This model, assumes that the health is the endpoint of individus desire. Individuals opt for services due to the need for those services to maintain their oral health.

The marketing mix is a set of marketing tools used by a company in order to implement a marketing strategy, in the pursuit of a positive response from the target market [217, 218]. The tools of the marketing mix for services are the 7Ps: Product, Place, Price, Promotion, People, Process, Physical evidence.

Product elements

In marketing, dental service is anything that can be offered to a patient that might satisfy a dental health need. Dental service takes the most important role in a dental office marketing strategy because this is the direct thing can meet the patient’s need and effect client’s relationship [219]. A poor-designed service cannot bring any meaningful value to the client. Poor service keeps damaging clinic’s value [220].

Place and time

Most obvious characteristics of service are intangible [221]. Dental service delivery should consider both physical and electronic channels [222]. Today’s information sharing is increasingly conducted through electronic channels. Three inter-related elements deal with electronic distribution the process of making deal through the Internet: information and promotion, negotiation, and product flow. There is a need for the physical facility to deliver dental services by establishing the clinic. Hence, location for setting up clinic is important. In general, cost, productivity, and access to labor are the important factors. There is a complete transformation in trend in opening time of clinics from 40 to 50 h/week into 24/7 model in some places due to the high demand and increase in competition.

Price and other expenses

Price is the total of all the sum that client exchange for having dental services. This is themoney payable for the service.

Cost of the service is highly dynamic and dependent on various factors such as type of clients, time and place of dental clinic, level of demand and available capacity. Cost of the service and other expenses are the key elements that clients take into consideration while seeking the service [223]. Therefore, dental service pricing should be set with minimal other expenses or outlays to avoid the losing clients.

Promotion and education

Effective method of communication is important formarketing dental services to reach the three functional goals: (1) to provide required information and advice; (2) to influence the clients of the merits of the specific services provided by the clinic; (3) encouraging the clients at specific times.

In dental services marketing, providers sell different types of services provided by the clinics because clients have no idea about the different services that are worth paying [198].

Hence, dental clinics should use promotion method to achieve educational goal to convey the information of the benefit of certain service.

Physical environment

The first impression made by the clients to dental clinicsis normally from the physical environment which includes the appearance of buildings, interior furnishing, equipment, staff's uniform, signs, printed material, and other visible signals. The main purpose of dental services environment should include to influence client's experience, image positioning and differentiation, value proposition, and to enhance the productivity.

People

While delivering dental care, the interaction between staff and clients is not avoidable. This creates an impression among the client perception of the company. Hence, dental clinic should have a policy and comprehensive system of recruiting and training the staff.

Process

Even though there are many physical items involved in the process of delivering dental services, still the core value is from the intangible service process.

Delivering services include many tangible and intangible items. Dental clients care moreabout the attitude of the service provider rather than their personal attires such as fit of the uniform. However, clients tend to seek the physical evidence to assess the service quality. Hence, service should be made clearly visible by physical clues. Moreover,there should be advertising, glowing images, and branding to make services conspicuous.

Productivity and quality

One of the measures of efficiency of production is the productivity. Productivity refers to the ratio of what is produced to what is required to produce it. This is expressed in terms of average of total output divided by the total input. The cost of running the dental clinics can be minimized by improving the productivity of the services [224]. The quality of the service provided to the clients can enhance satisfaction and constancy toward the care provider [225].

Scientific paper on this topic:

- **Cărăușu Elena Mihaela**, Dascalu CG, Lupu IC, Burlea LS, Feier RD, Zegan G (2018). Marketing in Dentistry: Opinion Survey on Promotion of the Dental Office. Revista de Cercetare și Intervenție Socială/RCIS; 63: 346-58, IF (2018) = **1,076**.
  Accession Number WOS:000457127100022

II.4.1 *Marketing in Dentistry: Opinion Survey on Promotion of the Dental Office*

∗ Introduction

The image of the dental offices and their promotion has acquired an important role in creating an identity and in developing the praxis [216]. Along with the increasing dental services market also appeared a strong need for differentiation of dental offices/dental clinics.

The dentist can use simple and inexpensive methods and techniques of dental marketing to promote a dental office/dental clinic. Among them, we can point out the institutional visual identity, which includes all methods and means whose application allows a dental office/ dental clinic to stand out, in terms of visual competition.

Besides the differentiating factors, visual identity is intended to convey to potential patients/ customers a visual display on the main features of the dental office/dental clinic and through which they are different from other competitors.

Achieving proper visual identity a dental office/dental clinic must meet all the following requirements: (1) to stand out; (2) not to be confused with other visual identities from the branch and allow a clear distinction from the visual identity of the collaborating institutions with which they may be associated, in terms of the activity they perform; (3) ensure quick memorization; (4) allow easy reproduction of the components that form the visual identity; (5) be free from excess, in terms of colours and graphics; (6) convey the rational benefits in an understandable way.

Identity elements represent the business card of the dental office/dental clinic which ensures an easy identification and immediate recognition.

The visual identity fi rst determines the stability and also the coherent and consistent medium and long term development of a true-positive and honest image of the dental office/dental clinic concerned. This approach is significantly reflected in dentist's image and is also one of the important steps in promoting and building a proper and successful patient-dentist relationship. Also, the image of aprivate dental practice has a particular role in anticipating of the patient to the range of services offered by their status, type of care, professional conduct of dentist and not least, to the cost/benefits *ratio* [224].

∗Methodology

The study has set the goal of identifying the main promotion means and methods used in many of the dental offices/dental clinics faced with the negative effects of economic crisis such budget cuts and the significant erosion of profits. To achieve its purpose, our study has the following objectives: (1) Identify means and methods used to promote the dental office/ dental clinic under current regulations; (2) Assess the dentist's awareness on the importance of the image, identity and diff erentiation of the dental office/dental clinic in a highly competitive environment; (3) Identify methods of presentation of a treatment plan that dentists consider effective and which they apply; (4) Identify the components of professional communication used in the dental office/dental clinic that can lead to an effective dentist-patient professional communication; (5) Evaluation of dentist's awareness about the importance of quality services.

To achieve the goal and objectives set above, the type of study used was the opinion survey.

The study covered two stages: (1) A preliminary phase which included: the documentary study that aimed to clarify the main theoretical aspects of visual identity on the dental office/dental clinic and stage of drafting the survey (which ran from April to May 2017); (2) The actual investigation, which was conducted from May 2017 to May 2018, and included data collection, statistical processing, analysis and the results interpretation.

Participants

The study group included 360 subjects, graduates and young dentists, aged between 25 and 34, of which 183 (50.83%) female and 177 (49.17%) male gender. In terms of qualifi cation, 186 (53.30%) of those surveyed are graduates, and 174 (46.70%) are young dentists with licence to practice, activating in other offices and wishing that in the near future they could open their own dental office/dental clinic.

Data collection

The main tool used was an opinion survey whose questions wanted to be relevant to the research aim and objectives. In the opinion survey, the questionnaire was presented and explained to each subject separately, along with the research objectives. Our questionnaire included two types of questions: (1) Withopen answer- with which one intends to fi nd out the opinions of the people questioned; (2) Items/ questions whose answers were assessed using scales of Likert with 3 "x" steps that have been used to identify to what extent the study respondents know and use the methods, means and techniques related to promoting identity and differentiation in the dental office/ dental clinic in a competitive environment.

Variables

The qualification and gender were considered as *independent variables*.

The answers of the questionnaire items have been taken as *dependent variables*.

Statistical analysis

Data from the questionnaires were inputted to SPSS software (SPSS, Inc., USA) [225].

In order to perform the statistical processing of data and statistical analysis we used descriptive and inferential statistics.

We used the Pearson Chi square test (χ^2) to evaluate the statistical significance of differences; the statistical significance was considered at *p* value less than 0.05.

∗Results

From the answers provided by respondents to the open questions, in the first part of the questionnaire, we identified several important variables which were afterwards analysed.

Also, from the synthesis of responses on methods preferred/used by respondents to promote the dental office/dental clinic it follows that (table 29 and 30): (1) The majority of the respondents recognize the importance of promoting for any dental office/dental clinic on the market; (2) Promotion by IT technology using their websites and pages on various social networks has the highest share in the preferences of the respondents; (3) Also frequently used are direct recommendation of former patients, flyers, business cards; flyers are used mainly by graduates; (4) Graduates use more promotions to motivate patients than dentists, promotions carried out directly in the dental office; (5) Female subjects give greater importance to direct marketing methods.

Table 29.
METHODS USED TO PROMOTE THE DENTAL OFFICE/DENTAL CLINIC- *by qualification*

Method:	**Qualification**				χ^2(Degrees of Liberty = 1)		*Statistical Significance*
	Graduates		**Dentists**		χ^2_{calc}	*p* value	
	No.	%	No.	%			
Direct recommendation (former patients)	123	34.17	165	45.83	46.2764	*p*<0.0001	SS
Outdoor advertising	42	11.67	18	5.00	9.6908	*p*=0.001852	SS
Business card	153	42.50	81	22.50	2.0877	*p*=0.148491	NS
Flyers	185	51.39	79	21.94	134.3516	*p*<0.0001	SS
Promotions	183	50.83	87	24.17	112.2581	*p*<0.0001	SS
Web page	184	51.11	167	46.39	2.9895	*p*=0.083804	NS
Social page (Facebook)	182	50.55	162	45.00	4.7681	*p*=0.028992	SS

Communicating to the patients the treatment plan and the possible treatment options are importantaspects of marketing in dental medicine.

Delivering information to patients and setting expectations is an enormous opportunity in how patients view their outcomes and proceed through the process.

Table 30.
METHODS USED TO PROMOTE THE DENTAL OFFICE/DENTAL CLINIC- *by gender*

Method:	**Gender**				χ^2(Degrees of Liberty = 1)		*Statistical Significance*
	Male		**Female**		χ^2_{calc}	*p* value	
	No.	%	No.	%			
Direct recommendation (former patients)	117	32.50	171	47.50	42.0367	*p*<0.00001	**SS**
Outdoor advertising	27	7.50	33	9.17	0.5001	*p*=0.479439	NS
Business card	75	20.83	159	44.17	78.3613	*p*<0.00001	**SS**
Flyers	117	32.50	153	42.50	14.7041	*p*=0.000126	**SS**
Promotions	93	25.83	177	49.17	93.6593	*p*<0.00001	**SS**
Web page	170	49.17	181	50.27	3.0233	*p*=0.082074	NS
Social page (Facebook)	165	45.83	180	50.00	5.9538	*p*=0.014685	**SS**

Treatment planning helps patients understand the relationships between oral health, occlusion, temporo-mandibular joint function and systemic health.

Dentists inform patients of ever-changing treatment options. Understanding treatment options allows patients to make better, informed choices. More options lead to a higher level of care and more comprehensive dental treatment. Informed patients simply have better outcomes. Patients who know what to expect tend to be less dissatisfied and rant less in the dental office.

Summary of responses concerning the methods/preferred means/used by respondents to present the proposed treatment plan and therapeutic solutions to patientsare presented in table 31 and 32.

Table 31.
THE MAIN METHODS USED TO PRESENT THE TREATMENT PLAN- *by qualification*

Method:	**Qualification**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical Significance*
	Graduates		**Dentists**				
	No.	%	No.	%	χ^2_c	*p* value	
Orally (comparisons)	184	51.11	173	48.06	0.2726	*p*=0.060161	NS
Adapting the medical terms	183	50.83	173	48.06	0.8819	*p*=0.347688	NS
Models	111	30.83	159	44.17	48.1869	*p*<0.00001	**SS**
Drawings (sketches)	177	49.17	126	35.00	34.9072	*p*<0.00001	**SS**
Boards, pictures, images	180	50.00	150	41.67	13.1419	*p*=0.000289	**SS**
Internet	185	51.39	115	31.94	72.0801	*p*<0.00001	**SS**
Video presentations	177	49.17	105	29.17	64.2082	*p*<0.00001	**SS**

Table 32.
THE MAIN METHODS USED TO PRESENT THE TREATMENT PLAN- *by gender*

Method:	**Gender**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical Significance*
	Male		**Female**				
	No.	%	No.	%	χ^2_c	*p* value	
Orally (comparisons)	174	48.33	182	50.55	1.0801	*p*=0.298681	NS
Adapting the medical terms	171	47.50	181	50.28	2.1847	*p*=0.139388	NS
Models	96	26.67	174	48.33	116.9809	*p*<0.00001	**SS**
Drawings (sketches)	132	36.67	171	47.50	24.0317	*p*<0.00001	**SS**
Boards, pictures, images	174	48.33	162	45.00	13.8324	*p*=0.0002	**SS**
Internet	144	40.00	156	43.33	0.9803	*p*=0.322132	NS
Video presentations	102	28.33	180	50.00	87.9604	*p*<0.00001	**SS**

From data analysis one can see that: (1) In current practice, the majority of graduates and dentists attached great importance to the treatment plan presentation and therapeutic solutions; (2) Surveyed subjects used different methods/means (both classic and modern) for presentation of the of treatment plan and therapeutic solutions proposed; the majority of respondents believes that an oral presentation of the treatment plan, using a medical language adapted to each patient is sufficient; regardless of gender or qualifications, most of the respondents prefer to present the treatment plan orally, directly to the patient; also in verbal communication, young dentists frequently resort to comparisons with various aspects of everyday life to make it more understandable to patients; (3) Graduates frequently use additional methods/means (drawings, sketches) to explain to patients the treatment plan and the proposed therapeutic solution; the female subjects frequently use helping methods to explain the proposed treatment plan to the patients.

Nowadays, marketing and media have become an essential part of organizational growth- even for dental medicine practices. More and more people have transitioned to seeking health information onthe web, including dental health information.That means dentists, physicians, practices and hospitals, need to "keep up with times" and establish an online web presence. If not, they might be out of a job in no time.The web marketing platforms can generate exposure of the dental medicine practices and the type of services they offer by allowing patients and other referring physicians and dentists to find you onthe top pages of web search engines.

From the presentation pattern of answers to the questions about the impact that the first impression has on the patient about the dental office/dental clinic, the following aspects can be established: (1) For the majority of the respondents, the patient`s first impression about the dental office/clinic is the most important; (2) Graduates put greater emphasis on fi rst impressions, compared to the dentists interviewed; in our study there are subjects who believe first impression has an insignificant impact (3.33% of male respondents consider that the first impression is not significant to the patient); (3) The majority of female respondents believe

that the first impression about the dental office/dental clinic is important to the patient.

For justification of their answer, the questioned subjects gave arguments such as: (1) It is the first contact with the patient and it is important for them to form a positive opinion; (2) It is the image that the patient is left with; if they leave the dental office with a negative impression it is possible for that patient to be a lost one; (3) The first impression is virtually a "business card" of the dental office/dental clinic and even of the dentist.

From the submission of responses to the question on the main elements a patient retained at first impression of the dental office/dental clinic (table 33 and 34), we see that:
(1) The emphasis is on team attitude, on how to approach the patient, on appearance and overall atmosphere of the office/clinic dental, on professional clothing; (2) For a positive impression all the aspects listed above should betaken into account, but for the vast majority of respondents (both female and male gender) the following aspects are important: team attitude, the approach toward the patient and the atmosphere of the dental office;these issues have a roughly equal share for graduates and young dentists; (3) Following the feed-back of the subjects, the appearance of the dental office should be clean, airy, and the atmosphere of the cabinet should be calm; (4) Although for the subjects surveyed, clothing does not occupy an important place, it forms part of the factors remembered by the patient at first impression of the dental office/dental clinic; the majority of subjects who mentioned this element specified that it would be helpful the professional outfit to be composed of a uniform (trousers, robe) and special shoes.

Table 33.
THE MAIN ELEMENTS TAKEN INTO ACCOUNT BY PATIENTS AT FIRST IMPRESSION
of the dental office/dental clinic- *by qualification*

Items tracked:	**Qualification**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical Significance*
	Graduates		**Dentists**				
	No.	%	No.	%	χ^2_c	*p* value	
Team attitude	183	50.83	173	48.05	0.8819	*p*=0.347688	NS
The atmosphere in the dental office	96	26.67	84	23.33	0.4004	*p*=0.52686	NS
Politeness	180	50.00	168	46.67	0.0138	*p*=0.09064	NS
The appearance of the dental office	84	23.33	87	24.17	0.844	*p*=0.358242	NS
Professional outfit	30	8.33	84	23.33	42.934	*p*<0.00001	**SS**
The approach to the patient	102	28.33	126	35.00	11.9578	*p*=0.000544	**SS**

Table 34.
THE MAIN ELEMENTS TAKEN INTO ACCOUNT BY PATIENTS AT FIRST IMPRESSION
of the dental office/dental clinic- *by gender*

Items tracked:	**Gender**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical Significance*
	Male		**Female**				
	No.	%	No.	%	χ^2_c	*p* value	
Team attitude	175	48.61	180	50.00	0.1705	*p*=0.679695	NS
The atmosphere in the dental office	87	24.17	93	25.83	0.10	*p*=0.751796	NS
Politeness	174	48.33	171	47.50	5.3276	*p*=0.02991	**SS**
The appearance of the dental office	90	25.00	81	22.50	1.5646	*p*=0.210994	NS
Professional outfit	75	20.83	39	10.83	18.4443	*p*=0.000017	**SS**
The approach to the patient	132	36.67	96	26.67	18.9531	*p*=0.000013	**SS**

Summary of responses to the question on the methods used by respondents to keep in touch with the patient after completion of dental treatment is presented in table 35 and 36.

Table 35.
MAIN METHODS USED BY RESPONDENTS TO KEEP IN TOUCH WITH THE PATIENT
after completion of dental treatment- *by qualification*

Methods:	**Qualification**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical significance*
	Graduates		**Dentists**				
	No.	%	No.	%	χ^2_c	*p* value	
Ticket	144	40.00	126	35.00	1.2013	*p*=0.273055	NS
Call from the nurse	33	9.17	27	7.50	0.3204	*p*=0.571394	NS
E-mail	21	5.83	12	3.33	2.0844	*p*=0.148812	NS

Table 36.
MAIN METHODS USED BY RESPONDENTS TO KEEP IN TOUCH WITH THE PATIENT after completion of dental treatment- *by gender*

Methods:	**Gender**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical Significance*
	Male		**Female**				
	No.	%	No.	%	χ^2_c	*p* value	
Ticket	117	32.50	153	42.50	14.7041	*p*=0.000126	**SS**
Call from the nurse	24	6.67	36	10.00	2.4207	*p*=0.119744	NS
E-mail	15	4.17	18	5.00	0.2003	*p*=0.654474	NS

Analysing the answers we see the following: (1) The programming ticket holds the largest share, then the phone given by the nurse; (2) Most of those interviewed said that in practice they combine the first two methods (at the end of the dental treatment the patient receives a programming ticket and a few days before the patient is called to reconfirm it); (3) Because most elderly patients do not have access to technology, doctors cannot use e-mail.

Table 37 and 38 display the synthesis of responses to questions about the methods used by respondents for the dentist-patient relationship optimization.

Table 37.
METHODS USED BY RESPONDENTS TO OPTIMIZE THE DENTIST-PATIENT RELATIONSHIP

Methods	**Qualification**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical Significance*
	Graduates		**Dentists**				
	No.	%	No.	%	χ^2_c	*p* value	
Forms of address	96	26.67	48	13.33	21.624	*p*<0.00001	**SS**
Follow-up	60	16.67	54	15.00	0.0622	*p*=0.803052	NS
Session revalidation	9	2.50	45	12.50	31.164	*p*<0.00001	**SS**
Motivating patients (bonuses, free samples)	39	10.83	15	4.17	10.7492	*p*=0.001043	**SS**
Patient Satisfaction Questionnaire	0	0.00	6	1.67	-	-	-

From data presented above we see that: (1) 40.00% of the interviewed consider that forms of address are the most important; (2) 31.67% of the interviewees think the follow-up plays an important role in the dentist-patient relationship; (3) 15.00% believe that revalidation comes first and 15.00% still believe that motivating the patient with various bonuses creates a better relationship with them; (4) only 1.67% of the interviewed consider important filling in the patient satisfaction survey on the received dental care.

Table 38.
METHODS USED BY RESPONDENTS TO OPTIMIZE THE DENTIST-PATIENT RELATIONSHIP

Methods	**Gender**				Pearson's χ^2 (Degrees of Freedom = 1)		*Statistical Significance*
	Male		**Female**				
	No.	%	No.	%	χ^2_c	*p* value	
Forms of address	69	19.17	75	20.83	0.15	*p*=0.698496	NS
Follow-up	63	8.33	51	14.17	2.4809	*p*=0.115235	NS
Session revalidation	12	3.33	42	11.67	18.4541	*p*=0.000017	**SS**
Motivating patients (bonuses, free samples)	33	9.17	21	5.83	0.6265	*p*=0.056866	NS
Patient Satisfaction Questionnaire	0	0.00	6	1.67	-	-	-

∗Discussions

The dental office/dental clinic is the framework of the dentists' professional activities, so for the majority of the respondents it is important the way is it promoted, especially in this period, negatively influenced by the highly competitive market environment in dental services [216]. The competition that currently exists in the dental market has led to differentiation of dental offices/dental clinics and to creation of an identity for each one of them.

The efficiency and success in dentistry are mainly the result of the quality of dental services and patient satisfaction. This depends on the dentists` professional training of and dental office endowment with modern and quality equipment [223].

Optimizing dentist-patient relationship has become important because it determines the professional and financial success on a medium and long term [224].

∗Conclusions

(1) The image of the dental office/dental clinic and institutional visual identity influence the first impression that the patient remembers, and ultimately its "business card". A clear visual identity isimportant when creating a brand for a dental office/dental clinic. A visual identity is a combination of logo, type face, colors and words that represent a dental office/dental clinic's services and values. The visualidentity should be clear, and unique to office/dental clinic brand's identity. The office/dental clinic logo, website, offices and social media channels are all a part of office/dental clinic brand's visual identity.

(3) Oral communication is the main way of presenting the plan of treatment and therapeutic solutions suggested; second is the use of specialized leaflets, posters and pictures. Young dentists do not consider important to present the treatment by using technology (softs or video presentations) arguing that the time is relatively short and consider sufficient an oral presentation and the use of drawings or parts of the cabinet that could help exhibiting the treatment plan and the suggested therapeutic solutions.

II.5 PERSONAL SCIENTIFIC RESEARCH ACTIVITY

In my training as a researcher, I benefited from the guidance of prestigious personalities of Iasi's medical university life, among which I mention: Prof. Gheorghe Zamfir- under whose guidance we have completed the PhD thesis, Assoc. Prof. Réne Duda, Prof. Aurel Ivan and Prof. Ioan Danilă. With the help of them I was able to acquire few secrets of medical scientific research work.

My entire research activity includes original research, both population and experimental, with varied public health and management topics.

Although, my postdoctoral period (from 1997 to 2018), can be easily characterized by an enthusiastic involvement in a wide range of research topics, at least 2 main directions can be distinguished that address of different topics of public health and management, and interdisciplinary topics matter.

Thus, key initiatives in scientific research can be grouped intwo main directions:

(1) Public Health and Management: *priority issues of public health* (such cancer, diabetes, cardiovascular diseases, nutrition, the medical-social problem of the elderly, the problem of disadvantaged population groups, self-assessment of population health status using the SF 36 questionnaire- regional novelty, study of child mortality in a few counties as Iași, Suceava, Galați, Vrancea, study of maternal mortality in the counties of Moldova, study of female fertility in rural areas, study of female fertility in Suceava County, study of use of contraceptives in medicine students) and *health management* (quality management of health services, human resources management in the health sector, management of negotiation in Family Medicine- novelty in Iași, evaluation of quality of health services in Family Medicine- regional novelty);

(2) Public Health Dentistry and medical-dental management: *public health issues in dental medicine* (the interface between general and oral diseases, cariesdisease, oral cancer, periodontal disease) and *management and marketing of oro-dental health services* (management of dental office, marketing of dental office).

The doctoral research

The first line of valuable scientific research remains the PhD thesis, designed and completed under the direct supervision of Professor Gh. Zamfir, during 1993-1997 period.

I hold the title of PhD in Medical Sciences- Diploma M series, no. 000944/ 05 May 1998, according to Ord. CNATDCU no. 428/26 febr. 1998, confirmed by ord. MEN nr. 3428/17 March 1998.The date of public support of the PhD thesis was 18 dec. 1997.

In the PhD thesis titled "*Comparative study of the effectiveness of some methods of prevention of dental decay in the infantile population*", I made a synthesis of the main

scientific information in the field, bringing a series of personal contributions regarding:

-synthesis of the main theories and etiopathogenic hypothesis of dental caries;

- study of carious morbidity in children;

- studying the risk factors, highlighting the direct correlation between the consumption of sugar per inhabitant and the level of carious morbidity;

- presenting the epidemiological process of carious disease.

Through a modern approach to prophylaxis of this disease at the population level, I have achieved:

- presenting the preventive strategies with their advantages and disadvantages;

- presentation of cariopreventing policies and programs.

In the experimental-applicative plane:

-I watched the performance and periodically evaluated the effectiveness of three programs for the prevention of dental decay in the infant population, applied in children's homes, schools and respectively lyceums in Iasi;

-I evaluated the spread of fluoride in the drinking water sources, both on the territory of Moldova and Iaşi County;

-highlighting the inverse correlation between the fluorine level in the water and the carious morbidity level;

-I designed and realized a relational database for the dynamic evaluation of the oro-dental health of children, which enabled the computer-assisted statistical processing of the data and the calculation of the efficiency indicators of the cariopreventive programs, tested on different representative groups of children.

So, is the first study to track and quantify the effectiveness of combining two or more methods of dental caries prevention in children.

Introduction of the new techniques and metods of investigations in research

I have outlined the methodology, introduced and tested new techniques of investigation and evaluation of:

-working skills in the dental team (regional novelty);

-negotiation skills, in dentistry and family medicine (national novelty);

-managerial and professional communication skills, in dentistry and family medicine (regional novelty);

-diagnosis of managerial style (novelty in Iasi);

-quality assessment of health services, in dentistry and adult outpatient medicine (regional novelty);

-quotation for the Romanian population and pilot application of the SF36 self-assessment questionnaire (regional novelty).

I mention that the PC operating skills have been of great help in the research.

Valorisation of personal scientific research

Since post-doctoral contributions to scientific research, I have had different disciplinary and interdisciplinary topics, but well-defined, dominant ones.

Intermediate and/or final results of research, reflecting my sustained efforts for advancing in scientific research of public health and management specialty, have been presented at national and international scientific events and/or published in scientific journals.

Awards for research activity

I am the recipient of 2 awards:

(1) **Bronze medal** at EUROINVENT 2018- European Exhibition of Creativity and Innovation, 17-18 May 2018, Iasi, Romania,

(2) and **The Swiss Society of Periodontology Award** at EUROPERIO 3 (Al III-lea Congres European de Parodontologie), 8-11 june 2000, Geneva.

II.6 NATIONAL AND INTERNATIONAL SCIENTIFIC VISIBILITY

So, I will synthetically and objectively present the national and international scientific visibility as number of citations in the Web of Science, Google Scholar, Scopus, Research Gate, evidence based on the excerpts of the international databases of myarticles.

Hirsch index on platforms like: Web of Science, Google Scholar, Scopus and Research Gate.Excerpts from international database platforms include screenshots of:

-Hirsch = 9, in the Web of Science,with 83 citations;

-Google Scholar = 5, with 82 citations;

-Scopus = 6, with 77 citations.

In *conclusion,**valorisation of personal scientific research activity*** resulted in effective participation from 63 scientific manifestations (42 international, and 21 national level), to which I presented 213 scientific papers (as principal author of 116 oral communications: 46 internationally and 70 nationally presented; as co-author 97 oral communications). Out of these, 169 were published: 128 articles *in extenso* (of which: 19 in ISI journals with impact factor, 13 as lead author and 6 as co-author; 5 in ISI Proceedings; 29 IDB; 50 CNCSIS); 39 *in summary*, of which 26 were presented at international congresses, and 17 posters.

Chapter III.
BRIEF REVIEW OF EDUCATION, PROFESSIONAL BACKGROUND AND ACADEMICACHIEVEMENTS

My academic formation, scientific, teaching and professional is due to the Iași high medical school. In 1989, I graduated from the "Grigore T. Popa"University of Medicine and Pharmacy, Iași.

III.1 BRIEF REVIEW OF EDUCATION

➢ *Highschool Studies* (from 1977 to1981). I, undersigned, Cărăușu T. Elena Mihaela (Mihăilă) graduated from the Sanitary Highschool in Suceava, the medical profile, promoting the Bacalaureat exam in the session of June 1981, with the general mark of 9.66 (nine 66%)- the Baccalaureate diploma, B series, no. 10222, is dated July 4, 1981.

➢*University studies*. Between 1983-1989, I attended the courses of the Institute of Medicine and Pharmacy in Iasi, Faculty of Pediatrics, graduating in 1989, with the general mark 9.31 (nine 31%)- Matricol sheet no. 2032/1989; the diploma exam, which was held in September 1989, was promoted with the mark 10 (ten).

➢ *Postgraduate studies*. After graduating from university *studies*, I have been constantly concerned with improving my professional training, following and completing numerous postgraduate courses (at national and international level), of specialization, and advanced training as follows:

Courses of specialty attended and graduated (2):

-Starting with February 1, 1992, I attended the specialty course in the field of Hygiene, organized by "Grigore T. Popa" University of Medicine and Farmacy Iasi, Department of Hygiene, which I graduated with the general mean 10 (ten); diploma Series J, no. 7674;

-Starting 10.04.1993've come residency in the specialty of Social Medicine and Health Management, which I graduated with 10 (ten), diploma Series J, no. 7936.

Master degree (1- one):

-From 1.06.1995 to 1.06.1996, I attended the International Master Course in Health Management (organized by the Institute of Health Services Management in Bucharest, in collaboration with LumyMonreal University- Canada, New York University- USA, School of Hygiene and Tropical Diseases- UK) that I graduated with the mean 10 (ten).

International Training Courses (5)

III.2 PROFESSIONAL BACKGROUND

Medical Training Route

From the medical level, for 29 years I have evolved in the domain of public health and management, in which I obtained successively, all the professional degrees.

After the end of the internship, I participated to the contest of residency, organized by the Ministry of Health, in October 1991 session, which I passed with 139 points, position 199/country.

Medical Exams and Specialities

As a result of participating in *training courses of specialty*, I haveevolved in the medical career, obtaining successively, through competition, all the professional degrees into the following medical specialties:

In *Food Hygiene and Nutrition:*

-*Secondary physician in Hygiene,* confirmed by Ord. MS no. 1711/19 December 1991, on the basis of the national competition, promoted in the October 1991 session.

-*Specialist physician* in *Hygiene,* confirmed by Order of the Ministry of Health no. 2214/1994, on the basis of the specialist physician exam, promoted in December 1994, with

general mark 9.57 (nine 57%).

-*Medical Consultant* in Food Hygiene and Nutrition- confirmed by Order of the Ministry of Health no. 637/1999, on the basis of the exam of the primary physician, promoted in the June 1999 session, with general mark 9.88 (nine 88%).

In *Public Health and Management:*

- *Secondary physician* in Public Health and Management- confirmed by Order of the Ministry of Health no. 149/1995.

- *Specialist physician* in Public Health and Management- confirmed by Order of the Ministry of Health no. 1011/1998, on the basis of the specialist physician exam, promoted in October 1998, with general mark 9.89 (nine 89%).

- *Medical Consultant* in Public Health and Management- confirmed by Order of the Ministry of Health no. 846/2003, on the basis of the exam of the primary physician, promoted in the June 2003, with general mark 9.83 (nine 83%).

Competence in *Health Management*, on the basis of the master course, confirmed by Order of the Ministry of Health no. 2501-2502/1996.

Professional Degrees

Currently, I have the following Professional Degrees:

-*physician*- since 1989;

-*Medical Consultant* in Food Hygiene and Nutrition- since 1999;

-*Medical Consultant* in Public Health and Management- since 2003.

Professional Achievements

In the healthcare sector, I have successively occupied:

-Between 15.11.1989-25.04.1991, *physician,* general practitioner of pediatrics, at the Clinical Children's Hospital Cluj-Napoca.

-2002-2003, as a Public Health and Management *physicianspecialist* at the Directorateof Public Health of Iasi County, the Health Programs Department, I was: (1) the *county coordinator* of the Health Services Reform Program (National Program 4); (2) a *physicianconsultant* (inspector)in the Demographic Surveillance of the Population of the County Iaşi, and (3) *specialist referent* within the county drug program "It depends only on you". The reports made during this period were used by decision makers within the Directorateof Public Health of Iasi County, to establish the priority of health issues of the Iasi County, and to substantiation the public health interventions.

Professional Tasks at National Level

Between 2013-2017, I was a member of the *National Consultative Commission of the Ministry of Health for Public Health and Management specialty* (Order of the Ministry of Health no. 398/2013, reconfirmed by Order of the Ministry of Health no. 580/2015 and Order of the Ministry of Health no.1504/ 19.12.2016).

Professional Associations

I became a member of the following professional associations:

-1993-2018, in the Romanian Association for Public Health and Management;

-1997-2007, in the Association of Public Health and Management, "Moldova".

-since 1993, in the Society of Physicians and Naturalists, Iași, Romania.

III.3 UNIVERSITY CAREER ACHIEVEMENTS

Academic Progress

I started my university career in 1990 as university instructor of the *Social Medicine Discipline*, at UMF "Grigore T. Popa" Iasi.

I have evolved in the university career, obtaining successively, through competition, all the didactical degrees. So, between 1991-2003, I participated in the following competitions for filling the teaching positions:

-in September 1991 session, I participated in the contest for the post of university instructor;

-in February 1995 session, I participated in the competition for the post of university assistant;

-in February 1999 session, I participated in the contest for the teaching post of lecturer;

-in December 2003 session, I participated in the contest for the associated professor;

Since 1999, I coordinate the *Public Health and Management Discipline,* at the Faculty of Dental Medicine of "Grigore T. Popa" University of Medicine and Pharmacy, Iasi, Romania, as coordinator of didactic activity.

At the moment, I have a seniority in medical higher education of 29 years and 6 months.

SECTIONB.

FUTURE PLANS OF DEVELOPMENT ON SCIENTIFIC, ACADEMIC AND PROFESSIONAL CAREER

Chapter IV.
DEVELOPMENT OF SCIENTIFIC AND ACADEMIC CAREER

IV.1 CAPACITY TO COORDINATE ACADEMIC RESEARCH ACTIVITIES

My belief is that: Medical Higher Education needs to be based on sustained professional training, with continuous improvement of the academic teaching technique, evolving towards performance and excellence in the specialty.

I have seen the success of the 28 successive generations of students, master students and residents, as proof of my teaching skills and professional capabilities, adaptability and positive change. So, throughout this period, from 1997 to 2018, I have made strong efforts in educating them to *learn and understand*, I trained them not only to promote an examination, to complete some university courses and to obtain a diploma, but *to learn permanently, throughout life*.

Considering the responsibility required by my academic quality as coordinator of doctoral studies, I think I have to focus in the future on the need to harmonize scientific research with academic career.The sustained scientific research activity, corroborated with the didactic one, respecting the academic standards, is the basis for the *performance* and *excelence*, for the increase of scientific visibility and academic prestige.

The continuation of ongoing projects, the initiation of new ones, and the progress towards far-reaching research with a high degree of funding, apear to me, be closely related to the prioritization of future development plans, both at individually and institutional level. The running of on-going projects, and disseminating the results of research require,also the involvement of a well-motivated and trained team of researchers.

It is difficult to delimit the research activity from academic activity in the field of public health -dental health, part of the national public health strategy- but, in order to comply with the specific academic procedures, as the future coordinator of doctoral studies, I present below my purpose and objectives, which essentially have a unifying tendency, because in the end the doctoral studies must be both, a high-level exercise of scientific research and a high-level capitalization of knowledge and training within the educational system in Romania.

The aim and objectives of my future activity are to continue research in the directions presented previous in this thesis (in Chapter I and II) and in expand trough the new topics of interest.

IV.2 EUROPEAN ONGOING PROJECTS

The priority of thematic research areas, from the perspective of my ongoing projects, are topics in order to stimulate the interest of young doctors, and are feasable also. This can be used for the formation of new generation of PhD students.

In my ongoing european projects I will focus on a holistic, interdisciplinary vision of each topic. This is justified by the need for a pluralistic, but integrated and coherent, approach to concepts/theories, perspectives,information,techniques and tolos, belonging to several Preventive Medicine scientific domains, including Public Health and Management also.

This can be structured in:

(1) In December 2016, I won the European project COST CA16112 *"Personalized Nutrition in aging society: redox control of major age-related diseases"*. In same time, I have been designated as the representative of Romania in this project by the COST Romania Office and the University of Medicine and Pharmacy "Grigore T Popa", Iași, in accordance with the Regulation on participation in COST Actions. At the first European Project Conference, held

in Brussels in March 2017, I was included in the European Project Board as a coordinator for Romania. The European Management Committee for this COST action is led by Prof. Mustapha CHERKAOUI MALKI, from UNIVERSITE DIJON BOURGOGNE, France, who initiated the Project. As a national coordinator (equivalent *to a project director*) of the multidisciplinary national network of researchers, I chose as partners highly qualified academics, together with young researchers, representatives of the "Carol Davila" University of Medicine and Pharmacy, Bucharest, and of the Faculty of Chemistry at the Polytechnic University of Bucharest. So, I consider extremely important to continue my work as representative of Romania in 16112 COST Action **"**NutRedOx"Management Committee [226]. The importance of a *healthy ageing process* becomes apparent when considering that (a) the Generation 50+ (G50+) already has a share in population of around one third across Europe, with obvious regional variations, (b) this share is likely to increase further in the future, and (c) vitality at older age is not only an *important public health measure* of *quality of life* but also key to *participation* and *productivity*. The research theme "nutrition and ageing" has many different aspects and poses numerous challenges, which provide a fertile ground for many others research themes and networks. Among them, the "NutRedOx" network will focus on the impact of redox active compounds in food on healthy ageing, chemoprevention and redox control in the context of major public health issues as the age-related chronic diseases.The focus of the 16112 COST Action"NutRedOx"network is the gathering of experts from across Europe, including other Mediterranean countries, and from different disciplines that are involved in the study of biological redox active food components, and are relevant to the ageing organism, its health, function and vulnerability to age-related chronic disease. Together, these experts form a major and sustainable EU-wide cluster in form of the "NutRedOx Centre of Excellence" able to address the topic from different perspectives, with the long-term purpose to provide a scientific basis for (improved) nutritional and lifestyle habits, to train the next generation of multidisciplinary researches in this field, to raise awareness of such habits among the wider population, and also to engage with Industry to develop age-adequate foods and medicines.

As director of the Romanian team, I provide activities of: *project management, scientific advisory board and executive board capacity building, and for dissemination of results, also.*

(2)The second *ongoing* project, named: *Lights, Camera and Action Against Dating Violence*, **„Lights4 Violence project"**, acronym **L4V**, was won, in the 2016 European competition. It has received funding, under grant agreement No. 776905, from the European Comission Directorate-General Justice and Consumers Rights, Equality and Citizen Violence Against Women Programme 2016 [227]. The European Management Committee for this Project is led by Prof. Carmen Vives Cases, from Alicante University, Spain, who initiated the Project. At a national level Prof. Mocanu Veronica is the *coordinator*. In this european project, I am a *team member*. At this time, materials on research methodology are being prepared,the quality management system is implemented, and a pilot study is in progress.

In the future, I plan to apply for new european research grants addressed to school children. I have in view three research topics: (1) An internet/mobile application for sport, preventingobesity, and asociated oral-dental diseases, (2) Design of a personalized approach, based on my authorship of the previous interactive and incentives based counseling sessions in the L4V project– to provide effective support for quitting unhealty foods and beveridges in young population, (3) Design of a specific prevention program for general and oral health of adol by targeting new modern solutions, or new alternatives in trend.

IV.3 OTHER RESEARCH PROJECTS IN PROGRESS

Three studies are underway at this time, as part of the *Scientific Research Plan*, for the academic year 2018/2019, of the Public Health and Management Discipline, at the Faculty of Dental Medicine, Iasi and will be finalized by sept. 2019.These are:

(1) *Leadership in Dental Medicine*- In the last few years, the value of leadership skills development has increasingly been recognized for the impact that it can have on dental offices/clinics effectiveness, because it help a dentist to be prepared for times of financial uncertainty.Nowadays,practice management education is focus to provide the business and ethical context of healthcare delivery, and prepare dentists for the economic realities of the dental market services. So, I consider leadership and business management an important and underdeveloped area of the curriculum, which can be bether valued in the next years.

(2) *Negotiation skills in Dental Medicine*- Effective communication, in its many forms, is a requirement for success in every profession, including healthcare. There are discrepancies in communication skills among providers, which contribute to lack of patient engagement, medical errors, and potentially malpractice situations. Fundamentally, a good communication facilitates delivery of patient-centered care, integrating biomedical management of a patient's disease with attention to social, cultural, and other aspects of the patient to provide better treatment. In addition to effective communication, patient-centered care also entails problem solving, an equally important skill in dental medicine. On a broader level, situations in which medical advice, patient viewpoints, and administrativegoals may differ are opportunities for negotiation and conflict transformation which in turn may help patients and providers strengthen their relationships with one another.

(3) and *Burnout in Dental Medicine Absolvents*- Burnout is a prolonged response to chronic emotional and interpersonal stressors on the work, and it is a state of exhaustion, and inefficacy. Exhaustion is described as the feeling of not being able to offer any more of oneself at an emotional level, cynicism as a distant attitude towards work, and inefficacy as the feeling of not performing tasks adequately and of being incompetent at work. Dentistry is a profession with a wide range of possible stressors, and professional burnout is considered a risk to the dental profession. Burnout is strongly related with depression, anxiety, sadness, distraction and psychological discomfort. Early recognition, efficient coping strategies and prevention interventions of professional burnout are recommended. As burnout in dentistry has been investigated in a relatively small number of studies and countries, I considered it valuable to perform an initial survey to measure the professional burnout levels among dental medicine absolvents and young dentists in Iasi.

In terms of **student scientific research**, other two studies are ongoing, and will be finalized by sept. 2019 also: (1) *Professional Comunication in Dental Medicine*- The field of medicine is constantly changing. While knowledge can become obsolete, skills are adaptable. Dentists andYoung Physicians-in-training will always need strong communication skills to interact well with patients and providers, provide quality health care, prevent conflicts, and represent the medical community effectively, and (2) *Managing home care for patients with peripheral vascular disease*.

IV.4 DIRECTIONS FOR FUTURE RESEARCH DEVELOPMENT

It is well-known that in the actual context, the coordination of PhD studies is regarded as natural continuation if the previous studies in medical higher education sistem (licence and master) in Romania. So, I intend to continue my research activity in the Public Health and Management domain, promote a new topics and focus on:

(1) Create a research cluster that will include PhD students, so that we can offer the results of doctoral research as a real and valuable support, to develop and implement an innovative and cost effective approach, for the national public health policy in medicine and dentistry.

(2) Involvement of graduate students, master students and PhD students, in population health promotion projects in progress at our discipline.
(3) At personal level, besides engaging in research projects and delivering high quality work, I will continue to be interested in a constant presence, with scientific papers on new and exciting themes, in national and international high visible publications.
(4) I will focus on highlighting areas of interdisciplinary research within the priority on the public health issues, involving not only the members of the Discipline but also specialists in related fields.
(5) At national level, I intend to intensify the relations colaboration in both, scientific and academic teaching domains, with colleagues from similar disciplines in the other university centers.
(6)At international level, I intend to I intend to raise therelations,in academic domain and scientific research, with the Faculty of Medical Sciences of the Alicante University, Spain and the Lisbon University of Portugal.

IV.5 FUTURE PLANS FOR THE ACADEMIC PROGRESS

Development directions and perspectives are based on the academic activity priorities also. So, my future plans will include:

(1) Developement, together with my colleagues from the discipline, of several teaching materials, courses and practical works, for english series gratuates students, of the Faculty of Dental Medicine, at „Grigore T. Popa" University of Medicine and Pharmacy.
At this time, the *Health Management: Guide to Practical Works*, for VIth Year Students of the English Language Series, is under preparation.
(2) Not least, my involvement in the formation of a high quality human resource in Public Health and Management, through innovative research projects and development of post-graduate courses. At this level, the focus will be on health care professionals, So, I will propose the course, "*Professional Interactions: Negotiation and Comunication for Future Physicians, Dentists and other Healthcare Providers*" (PINC), to provide opportunities for structured learning time for physicians-in-training to develop strong communication and problem-solving skills. Such a course would add educational value through both its content and longitudinal arrangement, allowing for continual reinforcement and formal evaluation during the years of graduate medical school. This course's strengths would stem from a powerful combination of diversely sourced learning materials, inter-professional expertise and learning opportunities, and an active, engaging teaching and learning environment. Principles of communication and negotiation will be taught with a focus on application in clinical contexts, with the communication component ideally preceding the negotiation component to provide an appropriate foundation for the profesion in the future.

∗ **Final Conclusions**

Once I have decided to accomplish my habilitation thesis, I clearly understand that I have to make a step forward on the way to a holistic approach of my career from three different levels (academic, scientific research and professional) and that I have to correctly identify and address all the openings and challenges for a successful development. I believe that the defining elements of my academic career, research and university teaching activity, can be addressed in an intertwined manner.

One of my concerns will be to attract the new research projects at the university level, involving young teachers and residents too. Of the many areas of interest, I shall continue to identify new topics to be studied and subsequently published. With increasing and continuous interest in multidimensional and interdisciplinary research aimed at gaining national and international visibility, I anticipate the promotion of new topics of scientific research from the broad spectrum of priority public health issues, both in medicine and dentistry.

Also, the proposed research topics in Health Management are flexible and allow the

development of a wide range of personal, professional and transferable skills that can be valuable not only to career, but also give opportunities for the next PhD students to apply and make international connections with other researchers and their research teams.

I will focus on pointing out fields of interdisciplinary research within priority health programs, involving not only the members from the Discipline of Public Health and Management, but also from related fields, such as Epidemiology, Hygiene, Medical Informatics and Biostatistics etc.

At the national level, I intend to boost relations of cooperation on the scientific research and educational plan with colleagues in the related disciplines from other academic centers, developing, at the same time, the international cooperation with others universities.

Finally, because the academic career progress is not an end in itself but should lead to the development of the community, I will continue to be an active presence on public healt an management research, through the dissemination of knowledge concerning the health of the population and through practical initiatives, such as the prevention of non-transmissible diseases.

SECTION C.

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