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Proiect cofinanțat din Fondul Social European prin Programul Operațional Sectorial Dezvoltarea Resurselor Umane 2007 – 2013

Axa priorității „Educația și formarea profesională în sprijinul cresterii economice și dezvoltării societății bazate pe cunoașteri”

Domeniul major de intervenție: 1.5 „Programe doctorale și post-doctorale în sprijinul cercetării”

Titlul proiectului: „Burse doctorale pentru creșterea competitivității în domeniul medical și farmaceutic”

Numărul de identificare al contractului: POSDRU/88/1.5/S/58965

Beneficiar: Universitatea de Medicină și Farmacie „Gr. T. Popa” Iași

Partener: Universitatea de Medicină și Farmacie „Iuliu Hatieganu” Cluj Napoca

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PhD Thesis

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Iași
2013
Oral health promotion in Romania. Strategies and requirements at European standard.

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Iaşi
2013
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Introduction

Health promotion is the process of providing individuals and communities the opportunity to increase the control over the determinants of health and thereby to improve their health. It is an unifying concept for those who recognize the fundamental need to change both the lifestyle and living conditions.

Health promotion represents the mediation strategy between the individual and the environment, combining personal choice with social responsibility and aiming to provide a better future health status (1).

Chapter I

Evolution of oral health status in the age group 6-12 years old children in Europe in the last two decades

Health is defined by the World Health Organization in 1946 as "a state of complete physical, mental and social, and not merely the absence of disease or infirmity." [1] By this definition was intended tincting that an individual who shows no sign of disease is not necessarily in a good general state because it involves mental and social factors.[2, 3] Oral health is an important component in maintaining the physical, mental and social comfort, being necessary to evaluate it permanently and establishing new methods of restoring and maintaining it in normal limits.

An important aspect of the current concerns in the field of dental public health is the disparities in health status of the population, caused mainly by differences in socioeconomic status. [7,8, 9, 10] In children, oral health inequalities are caused by socio-economic status of the families from which they come [811], despite the fact that all children receive free dental services to offices where there is a contract with the National Health Insurance. Besides the social aspects, an important role in this situation is held by the parents' educational level regarding oral health. [9, 12]

Although the oral health status of populations around the world has seen a marked improvement, oral diseases, however, continue to be a major public health problem, especially in communities belonging to disadvantaged groups in developed countries and developing ones, who are still experiencing high levels of impaired oral health status.
Chapter II

Inequalities in oral health status of children

Social structure is a fundamental theme of sociological knowledge, with major implications in social practice. The concept of social structure reflects "all classes, collectivities, communities and social groups, as well as the whole social material, community and group relations in society that is established and corresponding their collective life and work styles of the people" (78). Social structure covers configurations of roles or expectations crystallized around the social positions: the company is structure, rules and guardian of the regulations, and people are agents of social structure, even when they break the rules (79). The most important indicators of socioeconomic status are occupational status, educational level and income, each covering different aspects of social stratification.

Socio-economic level is considered to be one of the key indicators of oral health in children being demonstrated that subjects from families with low socioeconomic status have a higher number of carious lesions than those with high socioeconomic status.

The need and demand for clear scientific evidence to support the oral health policy making is higher than ever. Field of social determinants of health is very complex and challenging. It covers key aspects of the life of individuals, such as working conditions and lifestyle (80). Also is studying the implications of social and economic policies on health status and the benefits from investing in health policies (81). In Europe, there is evidence indicating that people with poor socioeconomic status have more serious oral health problems compared to the wealthier strata (82). These differences in the degree of oral health status is a major challenge for health policies, not only because these differences are not fair, but also because improving the health of disadvantaged population groups increases the average level of oral health status of the population as a whole (83.84).
Chapter III

Indicators used to describe oral health status

The concept of health or disease expresses relative states, extremely complex, difficult to identify separately, to define and to quantify. The evaluation of health status as a very complex biological phenomenon stems from the fact that health has a past, a present and a future that it prints some staging. The health of a community is the synthesis of the various individual states. Difficulties in assessing the health indicators based on available population studies determines the tendency to measure the absence of health expressed synthetically by disease prevalence [110,111].

Chapter IV

Research Methodology

Knowing the determinants of health, oral health trends and risk factors involved are of real importance to establish effective methods to improve oral health, with significant impact on quality of life of the individual.

IV.1. The aim of the thesis

The aim of this thesis is the national evaluation of dental status through the DMF index in schoolchildren aged 6 to 14 years in Romania, compared with the national study conducted in 1992 by PE Petersen, I. Danila, A. Delean, G. Ionita M. Popa and association between socio-economic status of the family, behavioral variables, including the child feeding practices, frequency of tooth brushing, degree of knowledge and information in oral health and the clinical status existing in the oral cavity in children.

IV.2. Objectives of the thesis

The objectives of this thesis are:
- Changing prevalence of oral diseases in children and implementing prevention programs in kindergartens and schools.
- Changing perceptions, behaviors and attitudes regarding oral health care to the child, to the parents and to the teachers.
- Establishing of preventive measures including maternal education both in terms of their health as well as their child about artificial feeding practices, an early caries prevention, implementation of behaviors that ensure a good oral health: daily oral
hygiene, dental checking routinely, use of fluoride, food hygiene, regular visits to the
dentist, as mothers influence on the practices and habits of their children.
- Monitoring the association between socio-economic status of the family, behavioral
variables, including the child feeding practices, tooth brushing frequency, degree of
knowledge and oral health information, and current clinical status in the oral cavity in
children.
- Training in basic skills and their habits between the ages of 6-14 years which fall
within the overall basic features of character which will later form.

To achieve the goals and objectives we used two types of studies:
- **A cross-sectional study** was set to assess the national dental status through the DMF index among schoolchildren aged 6 to 14 years in Romania, compared with the national study conducted in 1992 by E.P. Petersen, I. Danila, A. Delean, G. Ionita, M. Popa
- **Transversal study** concerning the relationship between family socioeconomic status, caries experience and behavioral variables in schoolchildren aged 6 to 13 years from Romania

**IV.3. Materials and methods**

Cercetarea a cuprins 2 studii clinice dar și studii bazate pe chestionare:
- **Study I** - National assessment of dental status through the DMF index in schoolchildren aged 6 to 14 years in Romania, compared with the national study conducted in 1992 by P.E. Petersen, I. Danila, A. Delean, G. Ionita, M. Popa
- **Study II** - Study concerning the relationship between family socioeconomic status, caries experience and behavioral variables in schoolchildren aged 6 to 13 years from Romania

**IV.4.1. Formation of the study collectivities**

**Study I:**

For the national evaluation of dental status through the DMF index in schoolchildren aged 6 to 14 years in Romania, compared with the national study conducted in 1992 by P.E. Petersen, I. Danila, A. Delean, G. Ionita, M. Popa, study sample consisted of 1096 children aged 6 to 14 years from five university centers (Iasi, Cluj-Napoca, Timisoara, Targu Mures, Bucharest) from Romania.

The group was divided into 2 groups based on age criteria: group 1 aged 6-11 years and group 2 aged 12-14 years.


**Study II:**

Initially the group was formed by 548 children of 6-8 years and 592 children 11-13 years.

After data collection group included 501 children from first grade and 562 children from sixth grade, those who have provided incomplete information to the questionnaire being excluded.

**4.4.2. Methodology**

The study method involved calculating morbidity indicators of oral disease and the elements that contribute to the determination of caries risk

**IV.5. Data and statistical methods used**

Since the study involved a large amount of information, their processing has been achieved through the creation of a database necessary for secure data storage and manipulation. We used SPSS 14.0 (Statistical Package for Social Sciences) which can provide an interface necessary for entering and accurate processing of the information in the database.

**Chapter V**

National evaluation of dental status through the DMF index in schoolchildren aged 6 to 14 years from Romania

**V.1. Introduction**

Oral health status of the population has experienced in recent years, significant improvements globally. However, many communities belonging in particular to the disadvantaged groups in developed countries and from those in developing countries are still experiencing high levels of impaired oral health.

**V.2. The aim of the study** was the national evaluation of dental status through the DMF index in schoolchildren aged 6 to 14 years in Romania, compared with the national study conducted in 1992 by P.E. Petersen, I. Danila, A. Delean, G. Ionita, M. Popa.
V.3. Materials and methods

The study group consisted of 1096 children aged 6 to 14 years from five universities (Iasi, Cluj-Napoca, Timisoara, Tg. Mures, Bucharest), Romania.

The group was divided into 2 groups based on age criteria: group 1 aged 6-11 years and group 2 aged 12-14 years.

V.4. Results and Discussion

Group of children aged 6-11 years

Distribution of the children from age group 6-11 years by cities was as follows: 118 subjects from Bucharest, Cluj Napoca 108, 137 Science, 130, Tg. Mures and Timisoara 99 (Fig. 5.1). Of this group 476 subjects were in the first grade, 92 in second grade and only 25 in third grade (Fig. 5.2)

Group of 6-11 years was formed of 48% female and 52% male subjects (Fig. 5.3), participating in the study 70 boys and 48 girls from Bucharest, in Cluj Napoca in equal proportions (54 subjects), in Iasi 67 boys and 70 girls, at Tg. Mures 60 girls and 70 boys and in Timisoara 49 boys and 50 girls (Fig. 5.4).

Socio-economic status of parents affects the level of oral health knowledge and attitudes of the young population, which is sustained by previous studies (Evghenikos, Mihailovich, Maxim) that parents with high socioeconomic status have children with oral status noticeable better than children coming from poor socio-economic families.

Subjects participating in the study were questioned regarding the frequency of visits to the dentist by the age of 6 years and the reason for the visit. Most subjects (89, 87%) responded affirmatively, subjects in Tg. Mures with the higher percentage of positive responses (21, 95%) and the lowest in Timisoara. There were 1.47% of the participants who have never had a dental checkup by the age of 6 years (Table V2)

Regarding the reasons for the last visit to the dentist most subjects answered that it was for routine dental check-up (50, 17%), most being in Tg. Mures (86 subjects), followed by those from Cluj Napoca (61) and Bucharest (53). Another reason for presentation to the dentist was the dental treatment (27, 02%) and to a lower percentage for pain (12, 33%). It is worth noting that although subjects are enrolled in schools with dental offices there is a percentage of 10, 47% of subjects who did not have a dental examination until the time of the study (tab2, Figure 5.8).

Subjects participating in the study showed no general disease nor follow any medical treatments.

The consumption of sweets, especially refined sweets, is one of the most important factors involved in tooth decay in children. When asked “if you frequently consume candy?” 72.80% of children responded affirmatively (tab. V 3)
An important factor in the pathogenesis of dental caries is represented by the frequency of sweets consumption. In case of study, 61.7% of subjects consume sweets between meals, which can explain the increased prevalence of dental caries, this result supporting previous results of studies abroad and in Romania (tab.V4).

Another important element in assessing attitudes was the frequency of toothbrushing performed by children of 6-11 years old group. A large number of subjects from Tg. Mures (89), Bucharest (86) and Cluj Napoca (73) responded that they brush their teeth twice a day.

It is noted the small number of children who answered that they brush their teeth 3 times/day in all five centers and also that in Iaşi children responded in equal proportions (40) that brush their teeth twice/day and when they remember. In Iasi, most subjects (54) brush their teeth once/day and in Timisoara are a total of 32 subjects who responded "when they remember" (fig. 5.9).

**Dental status in the group aged 6-11 years**

- **The prevalence of dental caries = 73, 81%**
- **Mean dmft = 3, 24**

In comparison with the study conducted in 1992, there is a decrease in the dmft index in all 5 cities; the most marked decrease was recorded in Bucharest where the value decreased from 5,20 in 1992 to 2,65 in 2011. A significant decrease was recorded also in Tg. Mures where dmft value decreased from 4,9 in 1992 to 2,95 in 2011 (Figure 5.10).

Not the same can be said about the other three cities: Iasi, Cluj and Timisoara, where, although there are decreases in the values of dmft index, they are not statistically significant, they being small in relation to the time period passed between the two studies. Values remain high in relation to WHO objectives for 2010, stating that for the age of 5-6 years, 90% of the teeth have no caries.

Regarding the dmfs index (decayed, missing or filled surfaces) it is noticed a significant decrease of the surfaces affected by caries in children from Bucharest where the value of dmfs decreases from 15.5 in 1992 to 4.7 in 2011, and in children from Cluj the mean value decreases from 15.7 in 1992 to 10.19 in 2011. For the other cities there is a small decrease for Tg. Mures and even an increase of the mean value of dmfs index for Iasi and Timisoara (fig. 5.11; tab. V5).

In analyzing the distribution of dmft/s index components (decayed, missing, filled teeth/surfaces) it is noticed that the decayed component at both levels have the highest rate, in Timisoara being recorded a value of 2.25 for dt and 7 for ds component (fig. 5.12, 5.13).

Analysis of DMFT index (decayed permanent teeth, missing and shutter) in the age group 6-11 years was performed because it is a good predictor of the degree of the caries level of children over 12 years old. It appears that there are high levels of this indicator, particularly in Timisoara where DMFT index has the mean
value of 1.37, a value that is determined by the presence of caries at molar level erupted at the age of 6 years (Fig. 5.15).

The type of dental caries, especially their location may indicate the severity and extent of damage to the child's dental status. Thus, the presence of lesions in the 4 zone of severity (cavities on the incisors and / or smooth surfaces) indicates the presence of a child with high caries risk who in the future will require extensive restorative treatments.

Compared with the 1992 survey results, there is a significant reduction in the number of children with caries in the zone 4 of severity (approx. 50% less) (Table 6).

**Evaluation of dental health through the evaluation system ICDAS II**

The results of the clinical examination indicate that of all teeth examined only 7995 teeth (mean 13.51 ± 5.9) are without carious lesions. There has been a mean value of 7.69 ± 2.9 for the permanent teeth, mean value being higher in frontal teeth than those in the lateral (9.18 ± 5.62, 7.25 ± 6.5 respectively). In the case of temporary teeth only 4706 teeth (mean 7.95 ± 3.47) were free from dental caries, the mean value being higher in frontal teeth than those in the lateral (4.71±2.29, 4.39±.827 respectively) (tab.V7)

Unlike the assessment by WHO criteria, ICDAS II system is distinguished by the possibility to detect and diagnose incipient carious lesions, such as whitespot or brown spot (cod01, 02), which untreated can develop into enamel cavitated lesions (code 03).

Of the 47 784 areas examined, 19595 of permanent teeth surfaces and 28189 of deciduous teeth surfaces (tab.V8) 13499 surfaces were recorded as having whitespot lesions visible after drying them for 5 sec. of which 12204 were surfaces of permanent teeth, on lateral teeth more especially on their approximal surfaces (B, P, L) (tab.V8).

At the temporary teeth, the surfaces coded 01 were fewer, most occurring at the lateral teeth, on approximal surfaces (B, P, L) (tab.V10).

Carious lesions coded 02 ICDAS II can be identified even in areas not dried, being represented by the noncavitated demineralization lesions on the enamel surface. Clinical examination results indicate a number of 479 areas examined code 02, most being present on the lateral permanent teeth, especially on occlusal surfaces (tab.V 11). In case of temporary teeth were recorded 352 areas code 02 on lateral teeth most especially on the lateral surfaces (B, P, L) (tab.V12).
Code 03 in ICDAS II coding system represents cavitated carious lesions in enamel without exposing dentin. Identification of cavitated carious lesions strictly limited in enamel allows the implementation of preventive treatments in due time. The results indicate that 481 surfaces of permanent teeth were coded 03, the largest number of affected areas was recorded at the posterior teeth on occlusal surfaces (tab.V13). In case of temporary teeth the number of surfaces was smaller compared to the number of surfaces code 03 of the permanent teeth (324 surfaces, and 481 surfaces, respectively), the most surfaces code 03 being recorded for the lateral teeth (293 surfaces), on occlusal surfaces (277 surfaces) (tab.V14).

Areas coded 04 are represented by the surfaces with underlying dark shadow from dentin with or without localized enamel breakdown, the treatment in this case being a curative one. Of the 400 surfaces coded code 04 on permanent teeth the most were recorded on lateral teeth at MD surfaces (167 MD surfaces) (Table V.15). In case of temporary teeth were recorded less surfaces code 04 (n = 247), the most in the lateral teeth (n = 228) on occlusal surfaces (n = 228) (tab.V16).

Codes 05 and 06 represent distinct cavity with visible dentin less than half of the tooth surface and extensive distinct cavity with visible dentin more than half of the tooth surface, respectively. The analysis performed indicates an increased number of surfaces code 05 on permanent teeth, a sign of alarm because these lesions progress rapidly to 06 coded lesions to a relatively low age, explaining the current situation where many are record molars extracted until the age of 12 with eruptive complications installation of by the lack of dental units.

Most lesions were recorded on code 05 lateral teeth, the areas affected being the M and D of permanent teeth (tab.V 17). In case of temporary teeth the situation is similar (tab.V 18).

The analysis results indicate an increasing number of surfaces coded 06, more on permanent teeth (1460 surfaces) (tab.V 19) than on deciduous tooth surfaces (1372 surfaces) (tab.V 20). In case of the surfaces of permanent teeth code 06 have been recorded in the lateral teeth, especially on the surfaces M and D while on deciduous teeth the most affected area was the occlusal one (1130 surfaces). The analysis performed indicates the presence of a large number of retained roots of permanent teeth (n = 832 teeth) than deciduous teeth (n = 560 surfaces) (tab.V 21)

Regarding the restored surfaces evaluated in ICDAS II coding system it was found that the presence of sealants on the whole surfaces on 281 permanent surfaces and on 181 deciduous surfaces, partial sealing being more present on permanent teeth compared with deciduous teeth (139 and 88, respectively).

Composite restorations were recorded in a larger number on temporary teeth (n = 61) and amalgam restorations on permanent teeth (n = 48). The highest number of registered restorations was for those with temporary material (glass ionomers) in number of 270 teeth (tab.V 22).

Regarding the distribution of lesions by severity zones it is found that most lesions are in zone 1 for permanent teeth(the lateral side of the arch, on occlusal surfaces) and in the deciduous front teeth, on approximal surfaces (zone 3, n = 201) (tab.23, 24).
**Age group 12-14 years old**

The group consisted of a total of 504 (mean age 12.37) subjects with the following distribution: 145 subjects from Bucharest, 105 from Cluj-Napoca, 132 from Iași, 56 from Targu Mures, and 66 from Timisoara (Fig. 5.16). Distribution of subjects by gender was as follows: 47% of the subjects were male and 53% female (fig.5.17).

The socio-economic level of the parents was as follows: 41.5% had parents with high socioeconomic level, 26.8% with medium level and 26% with low level (Figure 5.18).

Distribution of answers to the question of whether subjects were for dental checks up to the age of 12 was as follows: 492 subjects (97. 61%) said yes and only 12 subjects said no (2. 39%) (tab.V.25).

Reasons for the last dental visit were extensively routine control (56.47%) and dental treatments (34.92%). Pain as reason for the last dental visit was found only for 5.95% of the subjects (tab.V 26); female subjects in a higher percentage due to pain (6.69%) than male subjects who had a higher percentage for dental treatment (38.29%) (tab.V 27).

Assessment of eating behavior was done by interviewing consumption of sweets and sugary schedule an also by assessing food preferences. The results indicate that 87.5% of children in the group aged 12-14 consume sweets in large quantities (tab.V 28), consumption occurring in most cases between main meals (tab.V 29).

Analysis indicates that most children do not eat hard foods that can make self-cleaning of the dental surfaces (87.5%) (tab.V 30).

Regarding oral health attitudes 66.7% of children brush their teeth once a day, 27.6% brush 2 times/day but there is a percentage of 2.6% of children who brush their teeth when they remember (tab.V 31). Only 1.8% of children use mouthwash (tab.V 32) and the floss is used by 21.8% of children aged 12-14 years (tab.V 33), most children coming from families with high socioeconomic level (tab.V34, V35)
Dental status in the group aged 12-14

• The prevalence of dental caries = 67.06.
• The mean DMFT = 3.48

The mean DMFT values obtained in 2011, compared to the results obtained in 1992 show a significant decrease in the cities like Bucharest (from 4.8 to 1992-1.38 2011) and Iasi (5.9-3.32). However, after about 10 years since the first survey, there are cities where this indicator has increased, such as Cluj Napoca where DMFT value in 1992 was 3.0 and in 2011 reached at 5.13 and Timisoara where the value was 3.3 and reached at 4.2 (Fig. 5.19).

The distribution of the DMFT components for the 5 cities was: DT (decayed permanent teeth) recorded the highest values in Timisoara (4.56) and Cluj Napoca (3.97), the lowest value being recorded in Bucharest (1.3). MT component (missing permanent teeth) shows a low value of 0.01 in Bucharest and in Cluj Napoca a higher value of 0.11, a value that is given by the extraction of decayed permanent molars up to age 14.

Regarding the degree of impaired by decay is observed that the number of individuals with caries in the severity Zone 4 is in 2011 only one third of the number registered in 1992 (Table V36).

Evaluation of dental health through the evaluation system ICDAS II

There were examined a total of 13452 of teeth in the age group 12 to 14 years of which 13 016 were permanent teeth and 427 temporary teeth (tab.V37).

The results of clinical examination revealed a total of 10831 of teeth without caries, code 00 in ICDAS II system, of which 10.519 permanent teeth, most of the lateral side of the arch (n = 5694) and only 289 temporary teeth also from lateral area (tab.V38).
From a total of 59110 examined surfaces, 23600 were surfaces of the front teeth and the rest of the lateral permanent teeth, while from the deciduous teeth have been examined 1961 surfaces of which 1525 from the lateral teeth (tab.V39). 55539 surfaces of permanent teeth (93.59%) were free of caries (code 00 ICDAS II) and 1736 the temporary teeth surfaces have code 00 (88.52%) (tab.V40)

Code 02 ICDAS II was detected at 803 surfaces, 793 surfaces were recorded in permanent teeth and the rest of the deciduous teeth (tab.43). The code 02 was recorded more on occlusal surfaces at both deciduous and permanent teeth (tab.V44)

Code 03 was recorded on 889 surfaces of permanent teeth, most of them from lateral teeth on occlusal surfaceface (tab. V45, V46)

Code 04 was recorded on 421 permanent surfaces and 22 deciduous surfaces, most of them on the posterior teeth, on occlusal permanent surfaces and approximal deciduous surfaces (tab.V47,V48).

Clinical examination revealed that there are 158 tooth surfaces of permanent teeth with carious lesions in dentin coded 05, more on occlusal surfaces (tab.V49). For temporary surface only 26 showed lesions in dentin, more on approximal surfaces (tab.V50).

Regarding the distribution of the severity zones is observed that the highest percentage of teeth affected by caries is found in zone 2 (tab.V53).

Regarding oral hygiene status shown in Table 54, 61.1% of children have a good hygiene and 3.2% of them a poor oral hygiene.

**First permanent molar status as predictive element**

Regular assessment of dental status from an early stage age allows us to establish predictors of future oral health. An important element in determining the subsequent evolution is the health of the first permanent molar that makes the transition from temporary to the permanent dentition.

Permanent molars erupt on the arch around the age of 6 years, posterior to the temporary molars. The molar of 6 years has increased vulnerability to decay due to several factors: the eruption duration is long, from the moment of its appearance in the mouth until the meeting with the occlusal antagonist is needed on average, between 6 months and 1 year, period lacking in functionality; post eruptive maturation is done in difficult conditions because this molar is present with the deciduous teeth with cavities and mobile, which favors retentions and discouraging self-cleaning.

Due to increased cario activity of first permanent molar, poor oral hygiene that is present at age 6 as well as the lack of information of parents who do not bring their children to regular dental check, this tooth is lost early from the archways. Thus, an average of 30-40% in children aged 13-14 have one or more first permanent molar extracted.
Research shows that there is vulnerability in the pits and fissures caries to 8 times higher than the smooth tooth surfaces, even if their area is only 12% of all coronary surfaces. In this area we record 2/3 of the total number of cavities.

Vulnerability and sensitivity of the first permanent molar for caries:

1. This tooth mineralization is difficult in the stages of development: from birth and postnatal. Any imbalance in the first year of life is passed on mineralization of hard structures.
2. Its post-eruptive growing is under difficult conditions-it live with the deciduous teeth that are ready for change and that makes it hard and discouraging self-cleaning.
3. This tooth eruption duration is very long, even one year after the sub gingival occurs, which favors the deposit of plaque on it.
4. The relief-morphology of the tooth it disadvantages: it has deep fissures, deep pits, a ridge diagonally, retentive buccal dimples and even tubercles (Carabelli).

All this explains its vulnerability through increased sensitivity to caries and constrain us all to the constant supervision and a large volume of profilactice-curative procedures.

Figure 5.57 reveals that for all 1.6 tooth surfaces the highest values in terms of affecting by the dental caries was recorded for 02 code which identifies the presence of significant demineralization of tooth structure visible on wet tooth structure. Code 03 indicating superficial enamel caries was recorded more on occlusal and palatal surfaces of the first permanent molar 1.6 (12% and 2.6%). In return code 06 (extended dentine caries) was recorded more on distal surfaces of molars (0.2%) and occlusal surfaces (0.4%). On approximal surfaces (mesial and distal) were also detected carious lesions code 04 (caries in dentin without access hole) this value being equal with the value found on distal surface for code 06 (0.2%).

On the occlusal surfaces of 2.6 molar there are high values for codes 02 (10.9%), code 03 (10.8%) and 04 (3.5%). Distal surfaces no caries. Deep caries encoded by codes 05 and 06 have low frequency compared to the first permanent molars 1.6. Regarding the presence of restorations recorded on the 2.6 molar is observed that the highest is recorded for code 20 (sealed full surface) and only 1.1% of surfaces were restored with esthetic materials. The most restored area is the occlusal surface (Figure 5.60).

The permanent first molar 3.6 seems more affected by dental caries compared to upper molars recording for code 02 a value of 13.1% and code 03 - 12.6%. Also, it has increased the number of occlusal surfaces affected by caries code 05 (fig.61).

First permanent molar 3.6 presents more restorations code 20 on occlusal and buccal surfaces (8% and 0.2%) but also esthetic restorations on occlusal surfaces code 30. There is a greater value for temporary restorations compared with upper molars 1.5% on occlusal and 0.2% on buccal surfaces (Fig.62).
The assessment of 4.6 molar indicates that the approximal surfaces are more affected than approximal surfaces of the other molars, being recorded equal values for the code 04 and 05. The number of occlusal surfaces coded 02 and 03 remains increased. (fig.63)

Regarding the assessment of restored surfaces is observed that the highest values were recorded for the sealing performed on the occlusal and buccal surfaces (7.8% and 0.4%, respectively) but also for esthetic restorations (fig.64).

Interception of caries in the permanent molars by conducting screenings population-would significantly reduce damage by decay of permanent teeth in adulthood. [132]

In central and south-east Europe countries, due to political and economical changes over the last 20 years, health care systems are in transition [73]. Oral health at the population level in these countries is below than of western and northern European countries [44], this mainly due to the socio-economic differences [32, 71].

Creating a database to enable computerized records of epidemiological data is one of the most important goals of the World Health Organization [76].

The prevalence of dental caries in children vary greatly by country and geographical region. Introduction after the Second World War the fluoridation of drinking water in the United States and northern European countries had profound consequences on the distribution of dental caries [25,29,38,74]. From the historical point of view, the data showed that the prevalence of dental caries was found to be 60% lower in areas that have benefited from fluoridation to areas where fluoridation was not introduced [24,64,65]. Today, this type of comparison is not as suggestive as children living in fluoride-deficient areas can benefit from other methods of fluoridation (fluoridated milk, oral rinses with fluoride solutions, etc.) [3,56] and consumption of tap water has dropped considerably in recent years, increasing the consumption of bottled water (mineral water)[1].

Both in Europe and the United States have been significant changes in the prevalence of dental caries in children [9, 26, 47, 50,54,58, 65, 69]. Particular attention is given to the age of 6 years, when permanent teeth begin eruption and 12 years of age when virtually ending their eruption period (without taking into account the wisdom teeth).

World Health Organization (WHO) conducted numerous studies to monitor the evolution of dental caries, particularly in children. The first global map DMFT index (decayed, missing, filled teeth) in 12 year old children was conducted in 1969 and showed that the prevalence of dental caries was very high in industrialized countries and generally low in developing countries [44]. Establishment of databases and increasing the number and types of epidemiological studies allowed assessment of the pattern of development of dental caries [5, 9, 11, 27, 37]. The latest studies show the decline in dental caries levels in industrialized countries and its growth in developing countries [44].

WHO report for the year 2001 a global value of DMFT index in 12 year old children of 2.21 and in 2004 a value of 1.61 (188 countries), 74% (139 countries, representing 86% of the world) have an DMFT index value <3.
The decline in dental caries in developed countries is the result of dental public health measures undertaken, accompanied by changes in the living and lifestyle conditions [53, 57, 59]. Should be mentioned that despite the improvements found dental caries as disease is not eradicated but kept under control to some extent [44].

In 2000, Petersen and Rusu found the DMFT index value = 2.7. After having performed the National Program for Prevention the DMFT index decreased in 2003 to a value of 2.35, as in 2005 the index value to reach at 2.27. We note that in 2005, reducing tooth decay by lowering the DMFT index value by 16% compared to 2000 [12]. Prevention programs should be made to promote health education. One reason for success in implementing prevention programs may be based on a combination of three factors: "school - parents - community" that seems to approach the child healthy behavior.

The aim of prevention programs and health education is to change behavior and attitudes to achieve a proper behavior towards oral health. Changes in behaviors and attitudes can be achieved only if the patient is motivated and properly trained. The ultimate goal of these tests is to increase the level and quality of life.

V.5 Conclusions

- There is an improvement of dental status in 2011 compared to 1992 survey results, but WHO targets are far from being achieved;
- However, the value of dmft/DMFT index remains high, therefore it is necessary to allocate funds required to develop and implement national oral health programs.

Chapter VI

Family socioeconomic status and caries experience in schoolchildren 6 to 13 years from Romania

VI.1 Introduction

Field of social determinants of health is perhaps the most complex and challenging. The main concerns are aspects of people's lives and work circumstances and their style of life [80] health implications of economic and social policies and the benefits that investment in health policies can bring [125,81]. There is consistent evidence across Europe that socio-economically disadvantaged people suffer a heavier burden of oral health problems [63].
Every society knows a certain degree of inequality. Literature is very extensive regarding the forms of stratification, indicating the existence of at least one social position distinct from the other individuals in other words, individuals may belong to a social class and / or have a social status. Socioeconomic status defines the place of the individual in society according to income and education. The social situation of children depends on that of their fathers in the higher social strata are more successful than those in lower strata (social reproduction). Economic capital is the factor with the strongest influence on the socioeconomic status of the children [126].

The concept of socio-economic inequalities in oral health can be defined as differences in the prevalence or incidence of oral disease among individuals with different socio-economic status.

Studies conducted up to the present indicate that differences in oral health among individuals with different socio-economic levels have skyrocketed. [99]

VI.2. The aim of the study was to assess the association between socioeconomic status of the family, behavioral variables, including the child feeding practices, toothbrushing frequency, awareness and oral health information, and current clinical status in the oral cavity, represented by the prevalence of dental caries in schoolchildren in Romania.

This study aims at the development of oral health in the school population by comparing the results with the results of the study conducted in 1992 by Petersen et al. and published in Community Dentistry and Oral Epidemiology in 1994.

VI.3. Material and methods
The sample population

Transversal study on the oral health of students was conducted in five major cities in Romania (Iasi, Timisoara, Cluj-Napoca, Targu Mures, Bucharest) in 2011. The students were selected through stratified sampling method, after the World Health Organization methodology. Cities were chosen to enhance the comparability of results from previous national pathfinder survey conducted in the same five cities. In each city, two schools were selected public schools that had a dental chair to achieve detailed oral clinical examinations. The study group was selected using stratified cluster sampling, according to WHO methodology.

All children from first grade (6-8 years) and sixth grade (11-13 years) in the selected schools were invited to participate in the study. There was obtained the approval of the Ethics Committee of the University of Medicine and Pharmacy "Gr.T.Popă" Iasi and parental consent for this study.
Initially the group was composed of 548 children of 6-8 years and 592 children 6-13 years.

After data collection group included 501 first grade children and 562 sixth grade children, who gave incomplete questionnaire were excluded. (fig.6.1).

Fig.6.1. Subject distribution by grade

The data collection

Data were collected through questionnaires and clinical oral examinations. Questionnaires were used to collect information on family characteristics (socio-economic position and who is the child's caregiver), the demographic characteristics and behaviors of the child. Data were entered in the observation form ICDAS. (Fig.6.2)

Socio-economic level of the family (SEP) is based on parental occupation: high (major group 1-2), medium (3-5 major group) or low (major group 6-9). (Tab.VI.1)

Information on the principal attendant when the child was not in school was classified into four categories (parents, relatives, and one other person).

Sanogene behaviors of the child were assessed by measuring the consumption of sugary foods between meals (yes or no) reason for the last visit to the dentist last (control dental treatment, dental pain has never been to the dentist) and frequency of tooth brushing (registered once a day or less twice daily or more).
All examinations were performed by one trained and calibrated dentist (DB), during normal school hours, in the schools’ dental office, where a dental unit with functioning operation light and pressurised air was available. Clinical examinations were conducted using plane mouth mirrors and CPI probes, following the ICDAS recommended protocol.

Dental caries was recorded according to the ICDAS II diagnostic criteria, which uses a two-digit coding method. The first digit refers to the presence of restorations and/or sealants (codes range from 0 to 8) and the second digit refers to the actual stage of the carious lesion (codes range from 0 to 6). Other four special codes are used to record missing tooth surfaces and those excluded from examination. No radiographs were taken.

Caries experience was described using the sum of decayed, missing and filled teeth (dmf/DMF index). The ICDAS II caries codes were classified in two groups of severity: non-cavitated enamel carious lesions –at d/D1-2 level (codes 1 and 2)– and cavitated carious lesions –at d/D3-6 level (codes 3 to 6)–. The f/F component included surfaces with fillings associated or not with early lesions (codes 1 and 2) on the same tooth surface. Fillings diagnosed in conjunction with cavitated carious lesions (codes 3 to 6) were added to the d/D-component for calculation of dmf/DMF index. Occlusal surfaces with full or partial sealants were considered as healthy (code 0) [ICDAS Coordinating Committee, 2009].

Intra-examiner reliability in caries diagnosis was determined by re-examining 92 children from first- and sixth-grade (a total of 9901 tooth surfaces) after a week. Kappa value was 0.95 at surface level.

**Data analysis**

Data were analyzed using IBM SPSS Statistics 20.0 for Windows. Each age cohort (6-8 and 11-13 year olds) was analysed separately. Caries experience (dmfs/DMFS index) was the outcome measure for analysis. Negative binomial regression was used for modeling caries experience as the latter was a count variable with over-dispersion. Rate ratios (RR) were therefore reported.

The modeling strategy was first to estimate the crude association between family SEP and caries experience, and then, gradually adjust for potential covariates. Following this approach, socioeconomic gradients in dmfs/DMFS were first estimated. Linear trends were assessed fitting the family SEP variable as a continuous variable in regression models. The association between family SEP and dmfs/DMFS was then sequentially adjusted for demographic factors (city and child’s sex and age) in Model 1 and caregiver when child not at school and dental behaviours (sugary food between meals, toothbrushing frequency and reason for last dental visit) in Model 2.
VI.4 Results

This study analysed data from 501 6-8-yr-old children (mean age: 7.4, Standard Deviation: 0.55) years and 562 11-13-yr-old children (mean age: 12.3 years, SD: 0.70), who have completed information on all variables selected for analysis. The characteristics of the analytical sample are presented in Table VI 1. Approximately 50% of children come from high SEP families in both cohorts (fig.6.3).

![Fig. 6.3. Distribution of subjects by gender and age](image)

![Fig. 6.4. Subject distribution by cities](image)
Caries experience in 6-8 years

- The prevalence of dental caries
  - Non-cavitated lesions \( (d_{1,6}mf) = 84.3\% \)
  - Cavitated lesions \( (d_{3,6}mf) = 82.7\% \)

Caries experience in 11-13 years

- The prevalence of dental caries
  - Non-cavitated lesions \( (D_{1,6}MF) = 83.1\% \)
  - Cavitated lesions \( (D_{3,6}MF) = 76\% \)

There were significant socioeconomic gradients in caries experience in both age groups, except for the number of carious lesions at early stages \( (d_{1,2}) \) among 6-8 year olds (Tab.VI 2) Thus, for group 6-8 years the \( d_{3,6}mf \) has progressive values as family socioeconomic level decreases the mean value being 5.82 for subjects with high socioeconomic level and 9.37 for those with low SEP.

Caries trends in Romania 1986-2011

Levels of caries experience have remained constant over the last 25 years in both primary and permanent dentition, with a peak in the early nineties. There was a significant decrease in both the \( d_{3,6}mf \) and \( D_{3,6}MFT \) values between 1992 and 2011 \( (p<0.001 \) in both cases). Compared with the study conducted in 1992 by Petersen et al. linear evolution is observed caries experience in both age groups despite the National Programme for Prevention of oral disease expandable between 1999-2009 (Figure 3)
Table VI.4 shows the regression models for the association between family SEP and caries experience (d3-6mfs) in 6-8 year olds. The d3-6mfs increased by 41% and 46% in children from medium and low SEP families compared to those from high SEP families. This association was attenuated but remained significant after adjusting for demographic factors (Model 1) and child’s caregiver and dental behaviours (Model 2). Children in families with medium and low SEP families had 32% more primary tooth surfaces with caries experience than those in families with high SEP.

Children living in cities like Iasi and Cluj-Napoca have an increased d3-6mfs score by 63% and 71% than those living in the capital (Bucharest). This association was attenuated and remained significant after adjusting for demographic factors and child’s caregiver and dental behaviours for children living in Cluj-Napoca (53% and 45%). For children living in Iasi, this association was still significant after adjusting for demographic factors (43%), but no longer significant after adjusting for child’s caregiver and dental behaviours.

Eating sugary food between meals may be considered a risk factor for increasing the d3-6mfs values by 48% in unadjusted model, while this association was no longer significant after adjustment (Model 2).

Treatment and dental pain, as reasons for the last dental visit, were also associated with high levels of caries experience than those who went to the dentist for dental check-up, in which case d3-6mfs increased by 56% and 26%, respectively, and this association was attenuated but remained significant for treatment (46%), while dental pain was no longer significantly associated in Model 2.

Our findings show that children who never been to the dentist experience low levels of dental caries. Toothbrushing twice a day or more shows a significantly decrease in d3-6mfs scores in both unadjusted and adjusted models.

Table 4 shows the regression models for the association between family SEP and caries experience (D3-6MFS) in 11-13 year olds. The D3-6MFS increased by 109% and 118% in children from medium and low SEP families compared to those from high SEP families. This association was attenuated but remained
significant after adjusting for demographic factors (Model 1) and child’s caregiver and dental behaviours (Model 2). Children in families with medium and low SEP families had 53% and 31% more tooth surfaces with caries experience than those in families with high SEP. A strong association was found between age and D3-6MFS, the older children are the higher D3-6MFS score is. The increase of dental caries was by 68% and attenuated after adjusting but still significant, by 28% in Model 1 and 25% in Model 2. Children living in all four cities have an increased level of caries experience than those living in Bucharest, and attenuated but remained significant after both adjustments. The highest values were recorded in Cluj-Napoca, in which the caries experience at surface level increased in unadjusted model and adjusted models by 330%, 242% and 237%, respectively.

Eating sugary food between meals may be considered a risk factor for increasing the d3-6mfs values by 40% in unadjusted model, while this association was no longer significant after adjustment (Model 2).

Treatment and dental pain, as reasons for the last dental visit, were also associated with high levels of caries experience than those who went to the dentist for dental check-up, in which case D3-6MFS increased by 49% and 45%, respectively, and this association was attenuated but remained significant for dental (29%), while treatment was no longer significantly associated in Model 2.

Our findings show that children who never been to the dentist experience low levels of dental caries. Toothbrushing frequency is no longer significantly associated with the decrease in D3-6MFS score for those children who brush their teeth twice a day or more in both unadjusted and adjusted models.

VI.6 Conclusions

- There were high levels of dental caries in both children and adolescents.

- Differences between groups with different socio-economic levels favors those with better socio-economic indicators.

- The study results suggest that the lower socio-economic level the higher is the prevalence of dental caries.

- To reduce the cost of oral health and to eliminate inequalities in oral health, we must turn our attention and action on health determinants.
General conclusions

- We notice an improvement in dental status in 2011 compared to 1992 survey results; but WHO targets are far from being achieved.

- However, the value of dmft/DMFT index remains high, therefore it is necessary to allocate funds required to develop and implement national oral health programs.

- There were high levels of dental caries in both children and adolescents.

- Advanced carious lesions were the main contributors to children’s caries experience, indicating an increased need for preventive and restorative treatment in both age groups.

- Differences between groups with different socio-economic levels favors those with better socio-economic indicators.

- The study results suggest that the lower socio-economic level the higher is the prevalence of dental caries.

- To reduce the cost of oral health and to eliminate inequalities in oral health, we must turn our attention and action on health determinants.

- Therefore, there is a pressing and urgent need for strengthening of public health programmes through implementation of effective oral disease prevention measures and oral health promotion at both population and individual levels. The revitalisation of the school dental services would meet the need for preventive and curative care in children, and schools also provide an appropriate setting for systematic health promotion. Further research will be necessary to ensure comprehensive epidemiological monitoring of the population.
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