UNDERGRADUATE ORTHODONTIC EDUCATION AND DENTAL STUDENTS' PERFORMANCES. A SURVEY

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Abstract

The aim of the study was to evaluate, by means of a questionnaire, students' opinions on the practice and orthodontic curriculum, the methods of assessing knowledge, as well as the final marks obtained, in order to appreciate the efficiency of the orthodontic university education. The study was conducted on 273 students, aged 23-35 years, from the public Faculty of Dental Medicine in Iasi, Romania. Anonymous questionnaire consisted of 16 items with multiple answers. Students' knowledge was evaluated during final exams. Statistical analysis was performed with SPSS 16.0. Students' opinions were positive. Significant correlations between answers according to gender and study years were found ($p<0.05$). The average final marks earned by the students of the 6th year were higher than of those of the 5th year. The study demonstrates that the standard of undergraduate orthodontic education is quantified according to students' results, but the teachers must take into account their opinions, for improving the teaching-learning process.

Keywords: *dental medicine, undergraduate orthodontic education, students, teaching-learning process, exams.*

1. INTRODUCTION

Higher education, as an integral part of the educational system, can contribute both directly and indirectly to the progress of the society [1], providing the intellectual and moral standards of the society, the attitude codes and values of guidelines [2]. The mission of higher education is focused on some directions, such as learning to know, to do and to act for reaching pragmatic competence in a particular field of activity, and for dealing with some diverse and complex social situations; learning to be and to valorise one's own personality and responsibility for one's own actions [3]. The current context of competitiveness in higher education institutions creates multiple concerns for the specialists, for increasing the quality of education, for granting the effectiveness of teaching, learning and assessment in universities [1].

The most visible mission of dental medical education is to produce future specialists. The advances in science and technology and the increasing needs of the patient impose a change of responsibility towards society. That is why, teachers have to take the responsibility to train dentists that should provide care to patients. The absence of competent dental education can lead to a lack of confidence in future dentists as to their ability to effectively treat patients, which could affect the availability and quality of medical care [4-6].

The objective of the present study was to determine the relationship between the quality of orthodontic undergraduate education and the professional attitude and practical skills reported by students of the last two years of a public dental medicine faculty. The aim was also to evaluate students' interest in orthodontic practice, their views on the structure of the orthodontic curriculum and on the methods of evaluation of the theoretical knowledge they agree, in relation to the final marks obtained, in order to appreciate the standard of orthodontic undergraduate education.

2. MATERIALS AND METHODS

An analytical cross-sectional study was conducted by a team of teachers from the Faculty of Dental Medicine, "Grigore T. Popa" University of Medicine and Pharmacy Iasi Romania, along a university year.

The sample consisted of 273 students, 94 boys and 179 girls, aged 23-35 years: 143 students (49

boys and 94 girls) from the 5th year and 130 students (45 boys and 85 girls) from the 6th year of the public Faculty of Dental Medicine, "Grigore T. Popa" University of Medicine and Pharmacy Iasi Romania. Participation was optional, students being informed about the goals and aim of the study, conducted in accordance with the Helsinki Declaration of 1975, revised in 2000.

After study of the orthodontics modules (practical works and courses) in the curriculum, the students were invited to answer an anonymous questionnaire on orthodontic discipline. The questionnaire, consisting of 16 items, provided the following information: social-demographic status of students (age, gender and study year) (3 items); interest in orthodontic practice (4 items); evaluation of the structure of the orthodontic curriculum (6 items); effectiveness of knowledge assessment methods (3 items) (Table 1). The questionnaire has multiple answers, the selected variant (v) being evaluated with score=1, according to Likert scale [7].

Students' practical knowledge was evaluated by an oral exam, and their theoretical knowledge by a final written exam (students of the 5th year with Multiple Choice Questions - MCQ test, and students of 6th year - with an essay). The examination results were quantified with marks from 1 to 10.

Statistical analysis was performed using the SPSS 16.0 package (SPSS Inc., Chicago, IL) for Windows. We identified the score of answers to each of questionnaire's items and we aggregated the items score based on theme of questions. We used Pearson's chi-square (χ^2) test to compare students' answers with the socio-demographic variables. We considered the $p \leq 0.05$ value as statistically significant.

3. RESULTS

Students' opinions about orthodontic practice were appreciated by the answers to questions 4-7. Answers' versions to question 4 were: v1=64 (23.44%), v2=132 (48.35%), v3=71 (26.01%) and v4=6 (2.20%) answers. Question 5 provided the following versions of answers: v1=65 (23.80%), v2=161 (58.98%), v3=44 (16.12%) and v4=3 (1.10%) answers, while question 6 gave the following versions of answers: v1=5 (1.83%), v2=175 (64.10%), v3=89 (32.50%) and v4=4 (1.47%) answers. Question 7 had the following answers of students: v1=200 (73.26%), v2=67 (24.54%)s, v3=6 (2.20%) and v4=0 answers (Table 1, Fig. 1).

Table 1. Correlations between students' answers about orthodontic practice and the statistical variables

Orthodontic practice				Gender		Years of study	
n	n	n	M	χ^2	p	χ^2	p
4. My interest for orthodontic practice is:							
very high	high	low	not at all				
64	132	71	6	2.005	0.571	16.216	0.001*
5. My collaboration as a dentist with an orthodontist will be:							
very frequent	frequent	sometimes	not at all				
65	161	44	3	4.972	0.174	14.907	0.002*
6. Orthodontic practice seems to me:							
easy	acceptable	difficult	very difficult				
5	175	89	4	6.020	0.111	5.485	0.140
7. The role of the dentist in early detection of malocclusions is:							
very high	high	low	not at all				
200	67	6	0	6.456	0.040*	6.674	0.036*

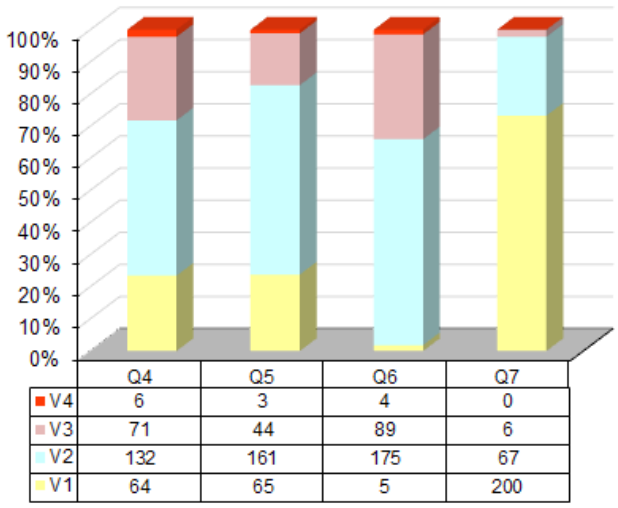

Fig. 1. Students' answers about orthodontic practice

Students' views on the topics and structure of the orthodontic curriculum were assessed by answers to questions 8, 9, 13-16. Answers' versions to question 8 were: v1=109 (39.93%), v2=148 (54.21%), v3=13 (4.76%) and v4=3 (1.10%) answers. Question 9 provided the following versions of answers: v1=142 (52.01%), v2=4 (1.47%) and v3=127 (46.52%) answers, while question 13 had the following versions of answers: v1=79 (28.94%), v2=154 (56.41%), v3=37 (13.55%) and v4=3 (1.10%) answers. Question 14 had the following answers versions: v1=10 (3.66%), v2=96 (35.16%), v3=108 (39.56%) and v4=59 (21.62%) answers. Question 15 registered the following versions of answers: v1=164 (60.08%), v2=99 (36.26%), v3=7 (2.56%) and v4=3 (1.10%) answers, while the answers to question 16 were: v1=86 (31.50%), v2=166 (60.80%), v3=21 (7.70%) and v4=0 answers (Table 2, Fig. 2).

Table 2. Correlations between students' answers to orthodontic curriculum and the statistical variables

Orthodontic curriculum				Gender		Years of study	
N	n	N	N	χ^2	*P*	χ^2	*p*
8. The best time for the orthodontic course is:							
9.30 - 11.30	11.30 - 13.30	13.30 - 15.30	15.30 - 17.30				
109	148	13	3	4.375	0.224	55.961	0.000*
9. The most useful method of teaching courses is:							
power point	to the board	Both					
142	4	127		3.214	0.201	5.669	0.059
13. The structure of the orthodontic course is:							
very good	good	Satisfactory	satisfactory				
79	154	37	3	5.945	0.114	26.965	0.000*
14. I want the orthodontic course to contain:							
more theoretical notions	more clinical cases	both	I am satisfied				
10	96	108	59	9.027	0.029*	20.282	0.000*
15. The orthodontics course has clarified my notions:							
much	little	Barely	not at all				
164	99	7	3	4.311	0.230	17.108	0.001*
16. The theme of the orthodontic course seems to me:							
very interesting	interesting	Acceptable	uninteresting				
86	166	21	0	1.026	0.599	25.131	0.000*
*statistically significant differences when $p<0.05$							

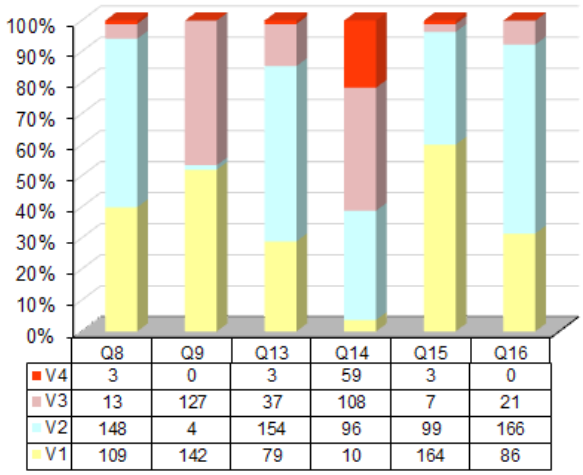

Fig. 2. Students' answers about the orthodontic curriculum

The effectiveness of assessing the methods of theoretical knowledge acquired by orthodontics courses and practical work was appreciated by answers to questions 10-12. Answers' versions to question 10 were: v1=177 (64.83%), v2=85 (31.14%) and v3=11 (4.03%) answers. Question 11 had the following versions of answers: v1=132 (48.35%) and v2=141 (51.65%), while question 12 provided the following versions of answers: v1=72 (26.38%), v2=178 (65.20%) and v3=23 (8.42%) answers (Table 3, Fig. 3).

Table 3. Correlations between students' answers about the assessment of knowledge and the statistical variables

Assessment of knowledge			Gender		Years of study	
N	n	N	χ^2	*p*	χ^2	*p*
10. Periodic testing of knowledge in practical work helps me:						
much	little	not at all				
177	85	11	2.972	0.226	25.131	0.000*
11. The most effective method of teaching in practical work is:						
individual training and discussions		teaching and seminar				
132		141	1.345	0.246	0.203	0.652
12. The most relevant method for evaluating theoretical knowledge is:						
essay type	MCQ with single answer	MCQ with multiple answers				
72	178	23	6.709	0.035*	0.006	0.997
*statistically significant differences when $p<0.05$						

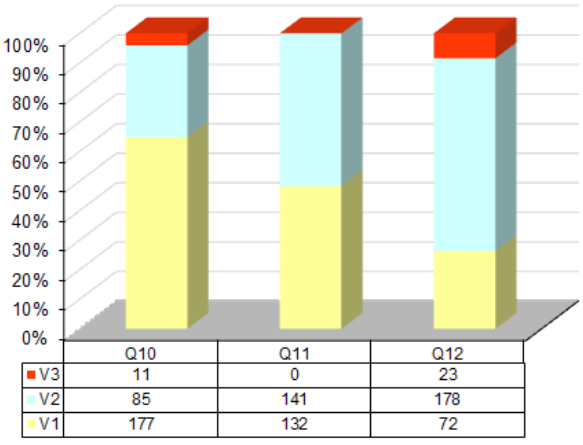

Fig. 3. Students' answers about the evaluation of orthodontic knowledge Statistically significant correlations were found between some answers according to the gender and study years of the students (Tables 1-3).

The distribution of students' final marks mean values follows a Gauss curve. Students in the 5st year had 39.40% mean marks 8-10, and students in the 6th year had 60.16% mean marks 8-10 (Figs. 4, 5).

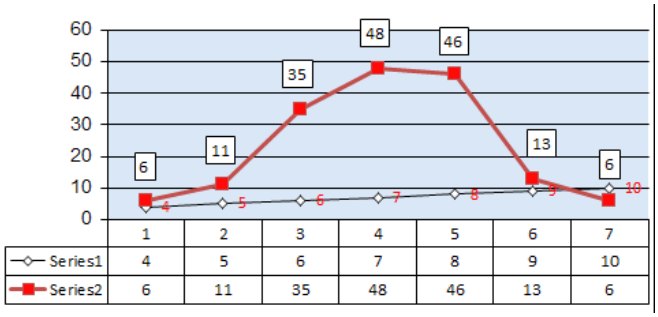

Fig. 4. Distribution of final marks for students in the 5st year

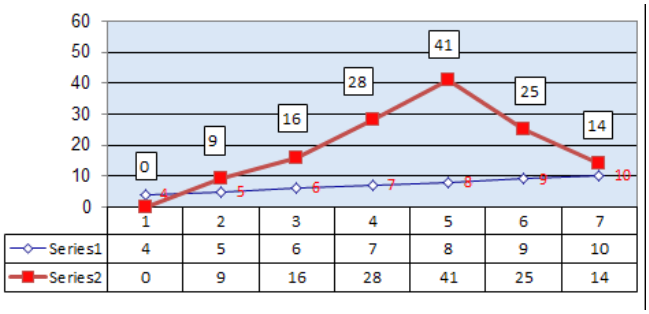

Fig. 5. Distribution of final marks for students in the 6th year

4. DISCUSSION

Our research has assessed the opinions of the students in the final years of a public faculty on the orthodontic practice and curriculum, to check the effectiveness of undergraduate education strategies in the field of orthodontics. It also assessed students' views on the methods of examining the knowledge gained during a university year and quantified their final results.

Our results are related to some aspects of orthodontic undergraduate education in students' preferences, by means of an original anonymous questionnaire. Thus, most of students' opinions on the orthodontic practice were positive, with variations between gender and study years, indicating: a great interest in this issue, a frequent collaboration with the orthodontist as a future dentist, an acceptable difficulty of the workouts (especially in students of the 5th year) and a greater role attributed to dentistry in the early detection of dento-maxillary anomalies in the population (especially girls).

Patient's orthodontic examination for establishing a diagnosis, developed in a clinical setting, represents a combination of didactic teaching and practical experience under the close supervision of the teacher [8]. The increased number of students in our faculty compared to the number of teachers reduced the teacher-student contact, so that the ratio is 1:8 (10) (1 teacher to 8 (10) students at clinical trials). Under such conditions, the literature proposed Computer-Assisted Learning (CAL) [9,10] and Objective Structured Clinical Examination (OSCE) [11], as adjuncts in classical clinical delivery and traditional seminars. Some authors believe that these methods are more beneficial for advanced orthodontic education during the residency program [12].

Dento-maxillary anomalies are usually identified by the dentist, who refer the patient to the orthodontist on the basis of his diagnosis, a competence also granted to the the dental graduate [13,14]. Managing orthodontic emergency (anterior crossbite) by assisting and referring to a specialist is also a competence of the graduate in dental medicine. The dentist becomes an active team member in orthodontic emergencies, *e.g.*, damage of a mobile or fixed orthodontic appliance. These final orthodontic competencies are established by the faculty. Several earlier studies have shown that dental medicine graduates are not convinced that they can successfully manage orthodontic patients [15] and their emergencies [16-19]. The study of Schueler *et al.* promotes an effective method for increasing student performance and individual guidance in learning both by individual structured and qualified feedback during clinical classes [20].

According to our study, most students had positive impressions about the subject and structure of the orthodontics curriculum, which agreed with day-to-day reality. Thus, the presentation of courses was indicated in the middle of the day and the best method of their teaching was by PowerPoint (especially for the students of the 5th year). The orthodontics courses were well- structured, interesting and clear, the future students requiring, for the future, more theoretical notions (especially girls), as well as more presentations of clinical cases (especially students from the 6th year).

In our curriculum, the 5th year courses provide basic orthodontic knowledge, from terminology and etiopathogenicity to the orthodontic treatment of the child with simple orthodontic appliances. In the 6th year, the courses provide in-depth orthodontic and interdisciplinary knowledge about the complex oral rehabilitation of the adolescent and young adult, based on the knowledge accumulated in the previous year. This undergraduate orthodontic education strategy has benefited from the learning process and agrees with the study of Yilmaz *et al.* [21]. Students' requirement for different theoretical

notions is not justified, once, in orthodontics, there exists a residency programme which will help them accumulate more notions. In this respect, future studies should assess the options of our graduates in choosing orthodontics as a career specialty, as other schools in the world do [22,23]. The fact that students want more case presentations at courses is justified, because dentistry is a practical field and by this method students could develop their knowledge and skills in the orthodontic planning of the cases, as shown by the study of Azeem *et al.* [24]. Opposite to this study, Heath *et al.* showed that additional training has a beneficial influence only on orthodontists who have acquired in time the knowledge necessary to recognize the complexity of cases [25].

In the present study, most of the students of the terminal years have considered that the most effective methods for evaluating the acquired theoretical knowledge are the currently used ones, namely teaching of new notions and more seminars, but also individual learning and seminar discussions, as well as a periodical, practical testing of knowledge. As to the written exam, most students peferred MCQ tests (especially boys) with just one correct answer. The specialized literature outlined students' profile correlated with the preference for the form of knowledge examination. Thus, emotional and introverted students prefer MCQ tests, and there is no correlation with intelligence levels [26-28].

Even if most students preferred the MCQ tests as the written test, the average marks of the final grades (8-10) of 5th year students (who had MCQ tests) were lower than those of 6th year students (who had witten essays). This situation may be due to either MCQ tests, that check a broad range of knowledge over a relatively short period of time (1.55 minutes per answer) [29], or to the essay that allows the student to organize his/her ideas on a well-defined subject, within a shorter concentration time (10 minutes per topic x 3 topics). Specialty literature proposed an evaluation system for detecting students' maturity skills and competences acquired during their training, the speed of their responses, the ability to improvise when faced with a new problem and the ability to concentrate on it.

The European Higher Education Area (EHEA) created in 2005 at Bergen facilitated the mobility of students and graduates between institutions, for promoting cooperation international exchange, as well as for an overall development of Europe. The objectives are to facilitate the mobility of students and graduates and to promote cooperation between higher education institutions. To achieve these goals, the scientific levels of different countries should be comparable and the skills acquired in higher education – well-established. Thus, all countries of the EHEA have redefined competency-based degree programs, where the total student work is estimated by the European Credit Transfer and Accumulation System (ECTS credits).

Considering the feedback received from our students, the present investigation is important for verifying our standards of excellence in the teaching, learning and training of practical skills in orthodontics, while providing guidance for improving the quality of this process.

5. CONCLUSIONS

The orthodontic practice, orthodontic curriculum theme and structure, and the theoretical knowledge evaluation methods received positive feedback from the students of the final years of our faculty, with variations between gender and years of study. The average marks of the final grades earned by students in the 6th year were higher than of the 5th year students. Their suggestions, submitted by an anonymous questionnaire, were justified from the perspective of their future orthodontic career.

Further studies should be carried out on other topics related to orthodontic university education, aimed at improving the didactic process and at increasing students' professional performance.

References

1. Mara D, Mara EL. Didactical competences formed for academic career. Procedia Soc Behav Sci. 2011;15:1410-4.
2. Neculau A, editor. University: values and its actors. [in Romanian]. Iasi: Polirom;1997.
3. UNESCO. Rapport a l'UNESCO de la Commission Internationale sur l'education pour le vingt et unieme siecle. In: L'education – un tresor est cache dedans. Paris: UNESCO & Odile Jacob;1996.

4. Terrell C, Beaudreau J. 3000 by 2000 and beyond: next steps for promoting diversity in the health professions. J Dent Educ. 2003;67(9):1048-52.
5. Dao LP, Zwetchkenbaum S, Inglehart MR. General dentists and special needs patients: does dental education matter? J Dent Educ. 2005;69(10):1107-15.
6. Smith CS, Ester TV, Inglehart MR. Dental education and care for underserved patients: an analysis of students' intentions and alumni behavior. J Dent Educ. 2006;70(4):398-408.
7. Jamieson S. Likert scales: how to (ab)use them. Med Educ. 2004;38(12):1217-8.
8. Johnson SN, Mays KA. A retrospective analysis of a cross-year peer tutoring program for oral health students. J Dent Educ. 2019;83(2):137-43.
9. Turner PJ, Weerakone S. An evaluation of a hypertext system for computer assisted learning in orthodontics. Br J Orthod. 1993:20(2):145-8.
10. Hobson RS, Carter NE, Hall FM, Atkins MJ. A study into the effectiveness of a text-based computer-assisted learning program in comparison with seminar teaching of orthodontics. Eur J Dent Educ. 1998;2(4):154-9.
11. Lai EHH, Chang JZC, Wang CY, Cheng YC, Tsai SL. Summative objective structured clinical examination as a reference of learners' need before entering their internship. J Dent Sci. 2018;13(4):350-3.
12. Fields HW, Kim DG, Jeon M, Firestone AR, Sun Z, Shanker S, Mercado AM, Deguchi T, Vig KWL. Evaluation of objective structured clinical examination for advanced orthodontic education 12 years after introduction. Am J Orthod Dentofacial Orthop. 2017;151(5):840-50.
13. Popat H, Rogers S, Eckhardt C, Knox J. Management of the casual orthodontic patient. Orthod Update. 2010;3(1):9-13.
14. Cowpe J, Plasschaert A, Harzer W, Vinkka-Puhakka H, Walmsley AD. Profile and competences for the graduating European dentist-update 2009. Eur J Dent Educ. 2010;14(4):193-202.
15. Yiu CKY, McGrath C, Bridges S, *et al.* Self-perceived preparedness for dental practice amongst graduates of the University of Hong Kong's integrated PBL dental curriculum. Eur J Dent Educ. 2011;16(1):E96-105.
16. Adamidis JP, Eaton KA, McDonald JP, Seeholzer H, Sieminska-Piekarczyk B. A survey of undergraduate orthodontic education in 23 European countries. J Orthod. 2000;27(1):84-91.
17. Fleming P, Dowling P. A survey of undergraduate orthodontic training and orthodontic practices by general dental practitioners. J Ir Dent Assoc. 2004;51(2):68-72.
18. Oliver R, Hingston E. Undergraduate clinical orthodontic experience: a discussion paper. Eur J Dent Educ. 2006;10(3):142-8.
19. Jones K, Popat H, Johnson IG. Dental students' experiences of treating orthodontic emergencies - a qualitative assessment of student reflections. Eur J Dent Educ. 2016; 20(3):156-60.
20. Schueler IM, Heinrich-Weltzien R, Eiselt M. Effect of individual structured and qualified feedback on improving clinical performance of dental students in clinical courses-randomised controlled study. Eur J Dent Educ. 2018;22(3):E458-67.
21. Yilmaz RBN, Nalbantgil D, Ozdemir F. Impact of discipline-based vs. interdisciplinary orthodontic courses on dental students' performance. Eur J Dent Educ. 2019;83(1):64-71.
22. Halawany HS, Binassfour AS, AlHassan WK, Alhejaily RA, Al Maflehi N, Jacob V, Abraham NB. Dental specialty, career preferences and their influencing factors among final year dental students in Saudi Arabia. Saudi J Dent. 2017;29(1):15-23.
23. Shin JH, Kinnunen TH, Zarchy M, Da Silva JD, Chang BMW, Wright RF. Factors influencing dental students' specialty choice: a survey of ten graduating classes at one institution. Eur J Dent Educ. 2015;79(4):369-77.
24. Azeem M, Ahmad M, Hussain M. Effectiveness of case based learning in orthodontics for BDS students. Pakistan J Med & Health Sci. 2018;12(2):762-3.
25. Heath EM, English JD, Johnson CD, Swearingen EB, Akyalcin S. Perceptions of orthodontic case complexity among orthodontists, general practitioners, orthodontic residents, and dental students. Am J Orthod Dentofacial Orthop. 2017;151(2):335-41.
26. Struyven K, Dochy F, Janssens S. Students' perception about evaluation and assessment in higher education: A review. Assess Eval High Educ. 2005;30(4):325-41.
27. Furnham A, Christopher A, Garwood J, Martin N. Ability, demography, learning style and personality trait correlates of student preferences for assessment method. Educ Psychol. 2008;28(1):15-27.
28. Furnham A, Batey M, Martin N. How would you like to be evaluated? The correlates of students' preferences for assessment methods. Pers Individ Dif. 2011;50(2):259-63.
29. Brady A. Assessment of learning with multiple-choice questions. Nurse Educ Pract. 2005;5(4):238-42.