„OVIDIUS" UNIVERSITY CONSTANȚA

FACULTY OF DENTISTRY

SUMMARY OF PhD THESIS

”ORAL HEALTH RELATED QUALITY OF LIFE IN CHILDREN AGED 6-12 YEARS LIVING IN THE DANUBE DELTA BIOSPHERE RESERVE”

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LITERATURE REVIEW

Key Words: Quality of life, Oral Health, oral Health related Quality of life, Danube Delta, Child OIDP

INTRODUCTION

Starting with year 1995, the concept of Quality of Life became by definition one of the most multidisciplinary terms in current use. The term was considered to represent an evaluative concept resulting from reporting the living conditions and daily activities to the needs of human values and aspirations.

Currently, the concept of Quality of life is found in a broad context of fields such as philosophy, geography, economy, media, all medical fields, social science and even politics.

At the beginning of XXI century, the relationship between Quality of Life and Oro-Dental Health (OHrQOL) has become a priority in health policies, particularly in the developed countries. Definition of health in the preface of the Constitution of the World Health Organization (WHO) states that "health is a state of physical, mental, and social well-being and not merely the absence of disease of infirmity"[1].

In the Oro-Dental Health (OH) field this new approach suggests that the ultimate goal of the oro-dental treatments is not just the absence of caries or periodontal problems; the mental and social well-being of the patient should also be taken into account.

Prolonging human life and continuous improvement of their quality of life are two central objectives of health systems. These considerations are reflected in the policies developed by the World Health Organization (WHO). These new objectives lead to major changes in the relationship between the dental treatment, itself and the patient, putting the patient at the center. Clinicians and researchers direction changes from the oral cavity towards patient as a whole.

The assessment of quality of life – oro-dental health (OHrQOL) relationship was facilitated by describing a series of indices analysis. The field of research aimed initially only the adults. Subsequent however, specific assessing measures have been developed for children. [2-4]

The Quality of Life (QOL) term has a wide range of definitions. Some of them refer to "the level at which a person enjoys the important possibilities of life"[5] or "an individual's perception of their position in life in the context of the culture and value system in which they live, in relation to their goals, expectations, standards and concerns". [6]

On the other hand, fundamental elements of the oro-dental health are established since childhood. Therefore, the existence of an optimal oro-dental status of the child creates the premises of its perpetuation to the teenager and finally to the adult. Knowing health condition determinants and their risk factors have great importance in establishing efficient methods of improving oro-dental health condition, with a significant impact on the quality of life of the individual.

In the past decades there has been a significant decrease in the prevalence of carious lesions. These positive evolution trends have been noticed in some East-European countries, but the prevalence in dental caries at children continues to maintain at higher levels in comparison with West Europe. Generally in developed but also in under development countries, increased prevalence of carious lesions and periodontal disease is particularly common among population groups with low socio-economical status.

In Romania, the socio-economic transition process was translated through objective modification of life conditions of the inhabitants and through the deterioration of health state indicators. The oro-dental diseases is thus a public health problem, through the prevalence and the limited capacity of the health system to systematically control this diseases, by providing services, especially preventive ones.

The present thesis aims to highlight oro-dental health problems in children with ages between 6 and 12 years old living in the Danube Delta Biosphere Reserve, and also how oral pathology reflects their quality of life. The Danube Delta Biosphere reserve is a natural paradise, with floating reed islands, forests and sand dunes, an area about 3000 square kilometres which houses a fascinating mixture of different cultures of people and wild life. From the economical point of view the area is slightly developed and living conditions and limited access to dental services are major risk factors for oral health status, both in general population and especially among children. In the conditions exposed above the research theme of the PhD thesis is of great importance for the acknowledgement of the oro-dental health status of children aged 6-12 years old in the Danube Delta, of the risk factors, as well as of the impact on their quality of life.

A detailed knowledge of the distribution of oro-dental diseases and its determinants in the analyzed population is a milestone for the development of possible stages to improve prevention and planning of dental services programs.

CHAPTER I
CONCEPTUAL MODELS OF QUALITY OF LIFE (QOL)
BASIC CONCEPTS, DEFINITIONS, APPLICABILITY IN HEALTH

Quality of life (QOL) refers to both the objective conditions of human life and the subjective one through which each individual evaluates his own state of satisfaction, freedom, happiness and fulfilment. In scientific literature there is a wide range of definitions of quality of life. On the other hand, health state was defined by WHO as "a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity". [1]

Quality of life (QOL) is an overall assessment of welfare or, it can also be expressed as the discrepancy between a person's expectations and achievements [7], being rather a subjective concept. Quality of life (QOL) is defined by the evaluator group of World Health Organization (WHOQOL), as "individual's perception of his position in life, in the context of culture and value systems in which he lives, in relation with the objectives, expectances, standards and his concerns". [8]

Health related quality of life is a new branch of study (HrQOL). The HrQOL concept reflects the point of view of patients on the illness and treatment impact on personal life; it does not directly reflect the actual illness state or the clinical measures of severity, but "the value attributed to current or future health status and life expectancy modified by affection, functional states, social perceptions and opportunities, which in turn are influenced by disease, lesions, treatment and policy" [9]. This definition (although not universally accepted) highlights the multidimensional nature of quality of life and the influence of various diseases, treatment and policys [10]. As for HrQOL, the concept of oro-dental health related quality of life (OHrQOL) advanced when traditional epidemiologic methods have failed to cover all the potential outcomes of the effects of oro-dental diseases in the lives of individuals. Evaluation indicators of oro-dental diseases commonly used, such as caries index DMFT (Decay, Missing, Filling-Tooth) or some periodontal indices reflects a certain aspect of oro-dental health (OH), not offering an overview of it, or a valid measure of what the individual has experienced or perceived in terms of illness. OHrQOL include self-perceived oro-dental health and need for treatment, estimation of oral pain or discomfort, the disease impact on the mechanical operation of the mouth (such as

speech or opening and closing of the mouth), self-care capacity (for example, brushing or flossing), psychosocial problems (such as social discomfort in a conversation or appearance concerns), limitation of activities related to human role (such as the capacity to work or other tasks) [11].

CHAPTER II
ORAL HEALTH (OH)
MEANING, EVALUATION, IMPACTS ON QUALITY OF LIFE

In 1988, Locker envisioned a conceptual model of oro-dental health. Through this, the oro-dental health is not defined just as the absence of the disease, but functional aspects are also included, as well as aspects related to the social and psychological comfort. [12]

Clinical determinants responsible for lowering the quality of life level are considered to be in order of frequency: dental caries, gingival and periodontal problems, malocclusions, hypodontia, and developmental malformations such as cleft lip and/or palate. Other factors that contribute to the incidence of impacts in pre-adolescent children include sensitive teeth and oral ulcers. Dental caries is the most common chronic disease of childhood. The W.H.O. estimates that 60–90% of all school-age children are affected [13]. Some studies claim that, despite the high frequency of dental caries, if found in early stages, these seem not to affect the child's oro-dental health related quality of life (COHrQOL) [14]. Other studies [15] claim the exact opposite: despite low levels of dental caries, children experienced appreciable negative impacts on OHrQOL. These findings speak of the presence of other factors that influence the relationship between dental caries and OHrQOL , including culture. [16]

Gingival problems are among the most important oral conditions affecting children's OHrQOL. [17] Periodontal diseases are multifactorial diseases, but the main etiological role refers to the microbial factor.

Clinical and epidemiological studies have established a direct correlation between dental plaque and the development of inflammation in the marginal periodontal tissue, as evidenced particularly in young subjects [18]. There are differences in periodontal health status between industrialized countries and those under development, and these are linked to the differences regarding the state of oral hygiene. [19], [20]

Socio-economic level is one of the key-indicators of oral health status causing significant inequalities (subjects from families with low socio-economic level have a greater number of carious lesions than those with high level).

CHAPTER III

DIMENSIONS OF ORAL HEALTH RELATED QUALITY OF LIFE (OHRQoL)

In determining an individual's quality of life multiple factors act and interact. Based on specialized literature I shared the dimensions of the quality of life in functional and psycho-social. From the functional dimensions we can mention eating and sleeping.

Eating (refers to the ability to chew, the appetite and implicitly the complexity of diet in terms of quality).

Quality of life clearly suffers when people are forced to limit their food choices and the chosen foods do not provide optimal nutrition. Auto reporting of the ability to eat, the satisfaction of eating and the avoidance of certain foods are widely used to assess the effects of tooth loss and replacement.

Sleeping. Sleep disorders associated with oro-dental diseases seem to be most closely related to chronic pain (direct or indirect) and in some cases where pain and insomnia are exacerbated by depression.

Culture. Cultural habits and believes have a major influence on the psycho-social effects of oro-dental diseases on individuals.

Social function. Given the importance of mouth and teeth in verbal and non-verbal communication, diseases that disrupt their functions can damage self-image and can modify the ability to sustain and to build social relationships. Social functions of individuals contain a variety of roles, from the most intimate such as having meetings, couple behavior, to other interpersonal contacts, up to the participation in social activities or in the community. Dental diseases and disorders can interfere with these social roles at any level or at all levels. [9] Whether because of social embarrassment or functional problems, people with oral disorders can avoid conversation or laughter, smiling, or other nonverbal expressions that expose their mouth and teeth. The facial aspect is very important in social interaction and there is a positive relation between facial attractiveness and popularity, as well as favorable evaluation of others about one's personality, about the social behavior, perceived intelligence and intellectual expression. [21], [22]

For school students, oro-dental traits considered unattractive can be a common and continuous source of teasing by colleagues. [23] Children with certain malocclusions are more likely to be the victims of aggressions , such as teasing, nicknaming and physical bullying.

The effects of oro-facial pain. Acute pain caused by dental caries presents improvements over time, if are treated efficiently. Chronic pain in the orofacial region presents a different situation. In this case, it can not be removed and the treatment focuses on pain management.

Assessing children's OHrQOL needs. Traditionally, research in the OH field was based on clinical measurements to assess oro-dental health of children. However, quantification of diseases and oro-dental conditions provided a superficial image on the quality of life in children. Thus, in many respects, traditional measurements of orofacial health represent a one-dimensional limited aspect on oro-dental health in children.[12] In addition, there is a weak correlation between patient's perception about his own health and the traditional clinical evaluation.[24] Therefore, the development of indicators to measure OHrQOL has become increasingly important in evaluating oro-dental and general health. OHrQOL assessments reflect the perceptions of patients on their own health, and thereby can improve communication between patients, parents and the team of dentists. For researchers, OHrQOL assessments provide a valuable measure for assessing treatments outcomes, and for the decision makers in the healthcare system is a tool for planning and evaluation. Evaluation of an abstract phenomenon such as the impact of HRQOL is a challenge. It takes an appropriate theoretical and conceptual framework to guide the evaluation process, existing two general approaches; a hermeneutic approach and a functional one.

The functional approach seeks to measure those traits based on preconceived assumptions about health related quality of life and uses numerical measurement systems, which have tried to cover all relevant domains of life that may be affected by health using self-administrated questionnaires and assisted interviews closed pre-coded. Summing up the obtained results from administrating questionnaires can generate a total quantitative score global health related quality of life or to sub-domains that follow to be used.

As main advantages we mention data comparability (in studies where same instrument was used) and time saving, and as disadvantage we mention limited response to those elements listed in the questionnaire, being able to "escape" individual aspects of quality of life.

The hermeneutic approach in assessing HQoL attempts to measure the meaning and significance of health and disease through the individual perspective and it very much relies on qualitative observations, involving the use of open questions in personal interviews or in the format of the questionnaire. Despite the rich date that can be obtained from qualitative measurements, data interpretation and statistical analysis are laborious. Thus, the combination of qualitative and quantitative measurements was suggested for a more comprehensive approach. [25]

McGrath and Bedi (2002) [26] have analyzed the impact of oro-dental health related quality of life by addressing both the functional and the hermeneutic approach and reported that both methods have had results. However, by using the hermeneutic approach the respondents quoted lesser domains in which is involved oro-dental health compared to the functionalist approach.

There are two broad categories of OHrQoL measurements: generic and specific instruments.

A generic instrument provides a summary of overall health related quality of life and is designed to assess OHrQoL regardless of disease or treatment status.

In contrast to generic measures, specific measures systems focus and address a particular aspect of primary interest. The instrument may be specific for a disease, population, function and problem. [27], [28] The narrow focus of specific instruments has the potential to make them more sensitive to clinically important changes in health. An example is the Child – OIDP Questionnaire (Oro-dental impacts on daily performance). [21], [29] Theoretically, specific assessments are the ideal choice to compare the health status within groups, being considered by some authors more sensitive and more relevant from the clinical point of view than those generic. It is generally accepted that condition specific measures are not comprehensive and do not facilitate cross-condition comparisons. In addition, the importance of other domains on the influence of the overall health-related quality of life may be omitted.

Self-report is dealing with subject's own perception of health. It is the only direct method for obtaining appropriate information from the individual regarding their health. The data regarding the quality of life should be based on self reports in order to reflect the participant perspectives.[30]

Self report data of children regarding their QOL (C-OHRQOL) raises a series of challenges. Children are "moving targets" and childhood is a period with changes in

psychosocial awareness Also children's dental and facial features change rapidly.[31] Therefore additional answers may be necessary to assess the quality of life (when the subjects can not provide useful ratings themselves (ex. very young children, the physically ill or disabled people)), because the main problem refers to the accuracy with which the instrument captures the reality experienced by a child. Additional rates are usually clinicians, parents or guardians, and their views may be alternative or complementary sources of information.

Quality of life and orthodontics

Orthodontic disorders, although non-painful are considered to have a negative impact on quality of life both for adults and for children. Although non fatal, most of them, such as malocclusion, induce multiple effect consequences in physical, social and psychological well-being on the individual. Traditionally, the medical act placed the patient on the second place, after the clinical context. Due to the development of the subject quality of life, the patient has reoccupied the central position in the philosophy of orthodontic health concept, and his perceptions, thoughts and feelings about the treatment performed are taken into considerations. In the current context, of the XXI century society values, which gives a greater attention to the facial appearance, malocclusion, unfortunately, represents a quite common oro-dental disorder.

Understanding the relationship between malocclusion and its impact on physical, social and psychological well-being of the individual is a growing domain.

Orthodontic treatment is different from the majority of medical interventions in that it aims to correct a variation from an arbitrary norm [22],[32]. Shaw et al (1996) found that one of the reasons frequently stated for initiating orthodontic treatment was to improve aesthetic appearance and only then the psychosocial state of well-being.[23],[33]

Apparently, malocclusion do not have the same impact on the quality of life such as pain or discomfort since are considered asymptomatic and it's just about aesthetics. However, several arguments contradict this statement: the comprehensive definition of health (which includes physical and social well-being), the changing social values(including physical appearance that becomes increasingly important) and the etiology of oro-facial pain (which is multifunctional, therefore malocclusion may generate indirect pain , also temporo-mandibular disorders or dental trauma).

CHAPTER IV
AIMS

The aims of this study was to investigate the oral health status of children aged 6 to 12 years old living in the Danube Delta Biosphere Reserve and explore its relationship with the quality of life.

In order to achieve these specific aims, the the following general and specific objectives were defined:

GENERAL OBJECTIVES:

1. Descriptive assessment of oro-dental health status from the clinical point of view (presence of dental caries, periodontal health, oral hygiene, malocclusions and the need for orthodontic treatment and the presence of fluorosis);

2. Oral health related quality of life analysis.

SPECIFIC OBJECTIVES:

For the general objective 1:

1.1. Assessing the prevalence of dental caries (tooth decay, missing teeth, treated teeth);

1.2. Assessing periodontal health status in terms of gingival bleeding;

1.3. Clinical assessment of oral hygiene, in terms of presence of calculus and bacterial plaque;

1.4. Assessing the prevalence of malocclusion and the orthodontic treatment need;

1.5. Assessing the prevalence of dental fluorosis.

For the general objective 2

2.1. Assessing oral health related quality of life using specific instruments previously validated in Romania (Child-OIDP questionnaire);

2.2. Exploratory analysis of the use of international instruments for assessing oro-dental health related quality of life (validation) - Michigan Oral Health-Related Quality of Life (MOHRQoL) – version for parents and version for children.

CHAPTER V
MATERIAL AND METHODS

A cross-sectional study was conducted in the Danube Delta Biosphere Reserve, targeting all children between 6 and 12 years of age.
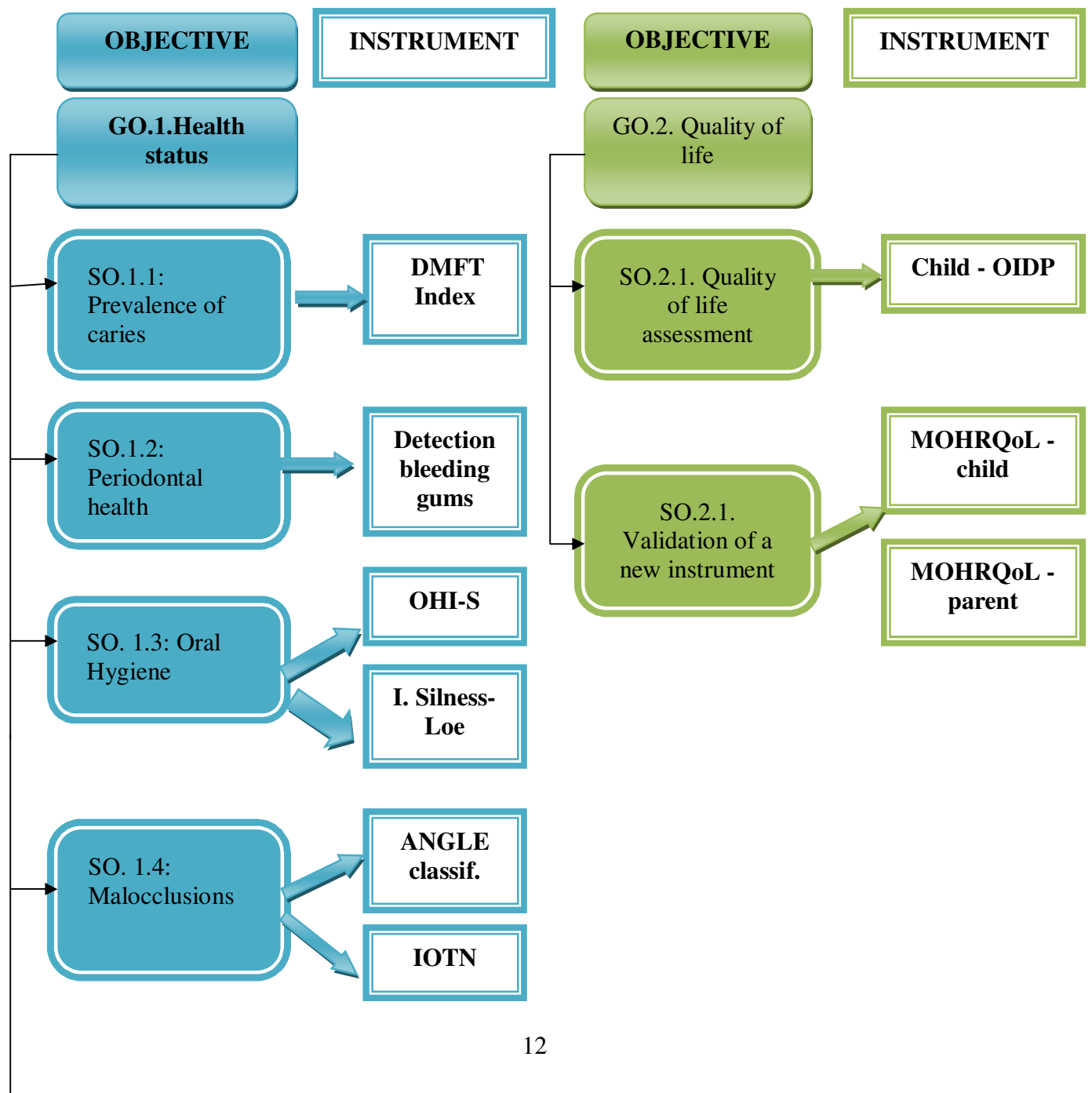
Exhaustively, the general population of children was included. This age group was chosen because of the age of enrolment in primary schools in Romania and also based on the WHO recommendation. [34] Study exclusion criteria were: lack of consent from the parent, lack of compliance of the child at the clinical exam or the absence from school of the child in the days of examination.

For conducting the research the following null hypothesis were considered:

a. there is no difference in the prevalence of dental caries (assessed by DMFT index) in age groups;

b. there is no difference in the prevalence of dental caries (assessed by DMFT index) by gender;

c. there is no difference in periodontal health status in age groups;

d. there is no difference in periodontal health status by gender;

e. there is no difference in oral hygiene in age groups;

f. there is no difference in oral hygiene by gender;

g. there is no difference in the prevalence of orthodontic anomalies and orthodontic treatment need in age groups;

h. there is no difference in the prevalence of orthodontic anomalies and orthodontic treatment need by gender;

i. there is no difference in the prevalence or the intensity of fluorosis in age groups;

j. there is no difference in the prevalence or the intensity of fluorosis by gender;

k. there is no difference in oro-dental health related quality of life in age groups;

l. there is no difference in oro-dental health related quality of life by gender;

The instruments used are summarized in fig.1. Technical details on the parameters assessed by each instrument, and the interpretations are described in detail in the thesis (Chapter V).

Aim: to investigate the oral health status of children aged 6 to 12 years old living in the Danube Delta Biosphere Reserve and explore its relationship with the quality of life.

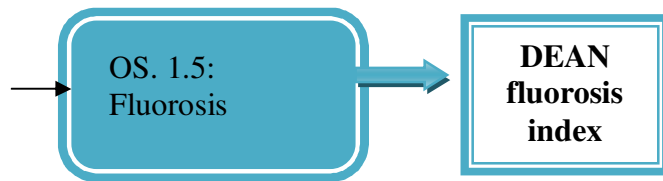| OBJECTIVE	INSTRUMENT	OBJECTIVE	INSTRUMENT
GO.1.Health status		GO.2. Quality of life	
SO.1.1: Prevalence of caries	**DMFT Index**	SO.2.1. Quality of life assessment	**Child - OIDP**
SO.1.2: Periodontal health	**Detection bleeding gums**	SO.2.1. Validation of a new instrument	**MOHRQoL - child**
SO. 1.3: Oral Hygiene	**OHI-S** / **I. Silness-Loe**		**MOHRQoL - parent**
SO. 1.4: Malocclusions	**ANGLE classif.** / **IOTN**		

Fig.1. Instruments used

The **DMFT index** was assessed. Average DMFT was calculated, the percentage of subjects with DMFT 0 and SiC Index (Significant Caries Index) [35], which points to the individuals with the highest scores for caries.

The **clinical examination** was conducted according to WHO methodology for the identification and diagnosis of dental caries [34], in the medical office of the school, in daylight, after dying and isolating the tooth, using dental probe and a plane mouth mirror. The study was conducted by one examiner.

Detection of gingival bleeding was based on clinical examination of the upper central incisor, upper lateral incisor and the upper first permanent molar with a dental probe, pressed with a force of 20 grams. [34] Children were expressed as a percentage (with or without gingival bleeding).

Oral Hygiene Index-Simplified (OHI-S) measured the area covered by soft deposits of bacterial plaque and calculus [36]. OHI-S score was calculated, with central and dispersion tendency indicators and the proportion of children by oral hygiene status (good, convenient, poor).

Sillness & Loe Gingival index identified the presence of bacterial plaque on the surface of the teeth. [37]. The percentage of children without bacterial plaque was calculated, as well as of children with bacterial plaque highlighted with the probe..

Classification of ANGLE anomalies (ANGLE key) evaluated the occlusion morphology according to the relative position of the first permanent maxillary molar.[38] The prevalence of various classes of Angle was calculated.

Index of Orthodontic Treatment Need – (IOTN) – analysis of orthodontic treatment need was classified into three grades, according to the IOTN score (without treatment need, borderline need, normative treatment need) [39-41].

DEAN Fluorosis index –two of the most affected teeth were examined and the prevalence of children with different grades of fluorosis was calculated. [34], [42]

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Child OIDP Questionnaire – evaluates oral health related quality of life throughout 8 dimensions (eating, speaking, cleaning, sleeping, smiling, studying, emotions, and social contact). The proportion of children affected globally and per activity: indicators of central tendency for OIDP scores, intensity and scale of the effects was calculated. [17], [29]

Michigan Oral Health Related Quality of Life Questionnaire – C (MOHRQoL – C) child version [43] is used to assess the quality of life in children and includes 18 questions related to 4 dimensions of quality of life (pain, temporomandibular joint disorder, oral hygiene consequences, attractiveness). 1. The proportion of children with affected quality of life by each item, 2. the total score and scores on each item, 3. indicators of central tendency and dispersion 4. inter-item correlation coefficients, 5. Sperman correlations between sub-scores, 6. total score and 7. oral health indicators and correlations between MOHQL-C and Child OIDP on dimensions and age groups were calculated.

Michigan Oral Health Related Quality of Life Questionnaire –A (adult version) - (MOHQoL – A) – version for parents (tutors) included 10 questions. [43] The average score on each item and the total score were analyzed.Also the correspondence between scores given by the parents and the children's answers, as well as between scores given by the parents and children's oral health indices were calculated.

For the Michigan Oral Health-Related Quality of Life (MOHQoL) Questionnaire – C the validation from the linguistic and psychometric point of view was realized (reproducibility, internal consistency).

The main steps in conducting the study are listed below and have been described in detail in the paper (cap V):

a. documentation step;

b. study protocol development;

c. obtaining approval of the involved parties;

d. planning the evolution of the study on the field;

e. implementing the study on the field, data collection;

f. processing and statistical analysis, interpretation of the results.

Database

The database for the study was made in Excel format, with the principle of listing all variables in columns and registering patients in rows. The data for the study were entered by one person, but for ensuring data quality, 10% from the packets of study was checked, selected

trough mechanical step. No registration errors were identified. For calculation of the composed scores formulas in Microsoft Excel were edited.

Statistical analysis plan. Statistical analysis was performed on a personal computer, using SPSS v. 17.0 and Open Epi programs. For normal variables indicators of central tendency (medium, median, modal value, if it was of interest) and dispersion (standard deviation, amplitude, coefficient of variation) were calculated. In certain cases of interest proportions for the study population located in certain variation ranges (eg the proportion of children with DMFT index = 0).were calculated

Quantitative variables with abnormal distribution were analyzed as median and amplitude. Both for the abnormal quantitative variables, and for the qualitative variables proportions were calculated, quartile and deviation coefficient of quartiles, according to the interest derived from the study.

Statistic comparisons were performed, using test t student for variables with normal distribution and nonparametric tests (Mann Whitney U, Chi-square or Fischer,) for variables with abnormal distribution and for qualitative variables. To analyze the links between quantitative variables the Spearman correlation was used. The statistical signification was considered for values of the p-value smaller than 0.05 (two lines). Variables of interest were addressed globally (for all the population of the study and in subgroups according to: gender of the subject; age groups, orthodontic treatment need.

Ethical considerations on the study

The research protocol was approved by the Public Health District Authority, College of Dentists, County School Inspectorate and by each local administration and management of school. Informal letters were sent to parents/tutors regarding the aim of the study and their consent was asked. Only children with parental consent were included in the study (there were no refusals).

The study was conducted with own resources. Clinical exams were performed by the PhD student.

CHAPTER VI
RESULTS: SURVEY I (THE EVALUATION OF ORAL HEALTH STATUS)

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The Danube Delta population consists of under 15000 inhabitants, spread in 24 small rural communities, organized in seven communes. Locals come from many ethnic groups – Romanians (majority), Lipovans, Ukrainians, Turks, living together for the past century. The general economic level of the population is precarious, also their living conditions and access to health services (including oro-dental health)..

In 2010, the population of children aged 6 to 12 years old, in the Danube Delta localities was represented by 837 children, of which 50.3% males. In the study were included 595 children, which were present in schools in the days of examination. The response rate was of 71.08%. 242 remained unexamined (of which 108 children aged 6 (probably not registered in school during the examination). Children aged 6 not included in the study represented 44.6% of the total non-responses. The remaining 134 children, aged 7 to 12 years old, were not included in the study because they were absent from school on the days of the examination. We did not return for these children due to economic feasibility reasons.

Each child had an informed consent from the parent. There were no cases of refusal for the inclusion in the study.

There were no statistically significant difference in the structure by gender or by annual age groups between the general population and the population in the study, except for the age of 6 years old, who had a very low representation (11.47% of the 6 years old population included in the study). The average age of the studied subjects was 9.43±1.75 years.

Percentage of children without caries

One of the most common and relevant WHO indicators mentioned in strategic documents since the 80s is the percentage of children without caries at the age of six years. The WHO standards was 50% for the year 2000 and 80% for the year 2020. Globally 32.9% of the studied children had no damage or dental treatment (DMFT = 0). The proportion of children without caries decreased with age, from 78.6% for six year old children and 60.2% for 7 years, to 11.1% for 12 year old children. Situation also persists on gender. The prevalence of dental caries (considering as statistical unit a child with caries) was complementary to the proportion of children without caries and increased with the growth of the age of children. Globally, 67.1% of the studied children have had DMFT different than 0.

DMFT index in the studied population

Median DMFT was 2 in the entire batch, but also separately by gender. In the age groups the median DMFT was 0 for the ages of six and seven years, but starting with age eight

the median DMFT was 2 and kept this value in the 9, 10, and 11 years old batches. At the age of 12, median DMFT was 3, without significant statistical variations from previous age. Statistically significant differences between boys and girls were found in the batch of 9 years old (1 for boys and 2 for girls).

SiC Index The great majority of children presented a DMFT score of 0, 1 or 2, but there were cases with high DMFT (max. value= 13). DMFT extreme values occur with predilection at the newer generation (up to the age of 10). At the generations of 11 and 12 years old, the maximum DMFT stops at the value of 7. Without minimizing the seriousness of the situation for the 11 and 12 years old groups, arises the suspicion of worsening the oro-dental general health status for the newer generation, with the appearance of very serious cases (DMFT 8-13).

Periodontal health status

32.77% of the studied children had gingival bleeding at the examination, the proportion being significantly higher among boys (33.42% compared to 27.99% for girls, p=0.014). The most affected generation was the 9 and 10 years old, among which there were no statistically significant differences, but the proportion of cases of gingival bleeding was statistically higher than the 8 and 11 year old generation. The analysis on age groups and gender revealed significant differences between boys and girls only at the age of 8 years old (on boys' disadvantage). Also, in boys was found out a significant increase in the proportion of gingival bleeding between the batches of 8 and 9 years old. For the girls, gingival bleeding was significantly higher at the age of 9 years old, compared with the neighboring ages.

Features of oral hygiene (presence of dental calculus and bacterial plaque)

Oral hygiene index simplified (OHI-S)

The simplified oral hygiene index had non symmetrical distribution (p=0.000, Kolmogorov- Smirnov test) both globally and on age groups. Globally 27.1% of the examined children had a good oral hygiene, 57.6% convenient and 15.3% poor. There were no significant differences on gender linked to the proportion of subjects in different categories of oral hygiene (p = 0.3170, Chi^2 test). The level of oral hygiene seems to worsen with age, from 12,5% at 7 years old to 28.3% at 12 years old. The analysis of the level of oral hygiene by gender revealed significant statistical differences between girls and boys at ages of 8 years old (more favorable situation for boys) and 9 years old (more favorable situation for girls).

Sillness and Loe bacterial plaque index.

Most of the examined children, were identified having bacterial plaque .Globally: 26.39% of the subjects did not have bacterial plaque. The analysis on generations revealed a situation significantly worsened for the batch of 8 years old, compared with the 7 years old one (a significant increase of the proportion of cases with bacterial plaque highlighted with a probe, in the detriment of cases without bacterial plaque, p=0.002), an also for the batch with the age of 12 years old, from which 36.36% of the subjects had visible bacterial plaque (p=0.000, Fig. VI.25). The analysis on generations for boys and girls, distinctly revealed the following:

a. **for boys** – the proportion of children without bacterial plaque has decreased with age, from 42.86% for the 6 years old batch, to 10.71% for the 12 years old batch. It was noticed a significant difference at ages 8 to 9 years old (p=0.026, Chi^2 test).

b. **for girls** – the proportion of children without bacterial plaque has decreased with age, from 85.71% for the 6 years old batch, to 4.65% for the 12 years old batch. There was a significant difference from 7 to 8 years old and from 11 to 12 years old (p=0.001, respectively 0.000, Chi^2 test).

The comparative analysis of generations within the same gender has revealed significant differences between genders at the age of 8 years old (for boys) and 9 years old (for girls).

Prevalence of orthodontic anomalies

The malocclusions were assessed using the Angle classification. 64.03% of the subjects were classified in class I Angle, 29.92% in class II Angle and 6.05% in class III Angle. The situation was similar by genders, without significant statistical differences (p=0.807, Chi^2 test).

Orthodontic treatment need

50.6% of the children had IOTN = 1, 41.5% IOTN = 2, 7.6% IOTN= 3 and 0.3% (2 cases) IOTN= 4. Overall, 92.1% of the children did not need orthodontic treatment (IOTN 1 and 2), and the rest had the borderline need (IOTN 3), without differences by age groups and gender (VI.32, VI.33).

Prevalence of dental fluorosis

Overall, 19.5% of the examined children seemed to have a form of fluorosis, most questionable**.** Slight forms were rarely found(no gender differences). By age groups, was found that at the age of 8 years old fluorosis appeared in significantly higher prevalence compared to the age of 7 years old, and at the age of 11 years old, significantly smaller than at the age or 10 years old.

CHAPTER VII
RESULTS: SURVEY II - QUALITY OF LIFE EVALUATION

Child-OIDP questionnaire – Romanian version, was applied to children aged 9 to 12 years old. [44,45]. Of the 595 examined children, 390 were aged 9 -12 years old (representing 82% of the total population of children of this age living in the Danube Delta). There were no significant differences by age or gender groups in the assessed population of 9 to 12 years old, compared with the total population of 9 to 12 years old.

The examined population consisted of 207 boys (53.1%) and 183 girls (46.9%). In the examined population there were no differences by age groups between genders (p=0.85). The average age was of 10,47±1,13 years, and the median one was of 10 years old for both genders.

Frequency of oro-dental health problems

The frequency of oral health problems reported by children was analyzed globally and by genders. The most common problems revealed by children were dental decay and bad breath, reported by over half of the children. These were followed by sensitive teeth, bleeding gums and toothaches, reported with a frequency of 40-50%. The rarest problems found were the presence of calculus, permanent tooth extracted and malformations of the mouth, reported by less than 15% of the subjects. The gender analysis revealed some statistically significant differences for the unpleasant color, painful sores and malformations reported with a higher frequency by the girls. In terms of problems reported by the same child, 8.2% of the children did not report any oro-dental problem in the last 3 months, 46.13% reported 1-3 problems, 40.26% reported between 6-10 problems and 5.38% reported more than 10 problems.

The proportion of children globally affected and in daily activities, based upon the frequency score.

Child-OIDP questionnaire assesses 8 daily activities. Overall, 37.69% of the children stated that at least one daily activity was affected in the past three months. The most frequently affected were : eating, oral hygiene and speaking, and the least affected were studying and social life. **Gender analysis** showed that boys seem more affected than girls for most of their daily activities, but statistically significant differences were recorded only for oral hygiene (boys – affected in a significantly higher proportion).

Age group analysis revealed the increasing number of affected children, both globally and in daily activities, from one generation to another.

Globally, the proportion of children affected increased from 26.21% for the 9 years old to 64.65% for the 12 years old.

On daily activities, the proportion of affected children also was double or triple at the age of 12 years old compared to the age of 9 years old. At the age of 9 years old the most affected was eating (14.56%), followed by speaking (12.62%) and by emotional stability (11.65%).

The proportion of children who reported the eating activity as affected due to the orthodontic problems has doubled for the age of 12 years old (42.42%). For the speaking activity the scores increased from 12.6% for the age of 9 years old to 30.3% at the age of 12 years old. Emotional stability increased in small limits between 9 to 11 years old, but has doubled from 11 to 12 years old, (from 15.56% to 27.27%), probably due to the emergence of puberty and the signs generated by it. At the age of 9 years old differences were noticed from the global order, in which oral hygiene ranked second, but at the age of 12 years old the situation overlaps the global order. (Table 1)

9 years		10 years		11 years		12 years	9-12 years	
Eating	≈	Eating	↑	Eating	≈	Eating	Eating	↑
Speaking	≈	Speaking	↑	Speaking	≈	Speaking	Speaking	↑
Oral hygiene	≈	Oral hygiene	≈	Oral hygiene	↑	Oral hygiene	Oral hygiene	↑
Emotional stability	≈	Emotional stability	≈	Emotional stability	≈	Emotional stability	Emotional stability	↑
Smiling	≈	Smiling	≈	Smiling	↑	Smiling	Smiling	↑
Relaxation	≈	Relaxation	≈	Relaxation	≈	Relaxation	Relaxation	↑
Studying	≈	Studying	≈	Studying	≈	Studying	Studying	↑
Social life	≈	Social life	↑	Social life	≈	Social life	Social life	↑

Total	≈	Total	≈	Total	↑	Total		Total	↑

Table 1. Synthesis of the statistically significant variations in the proportion of children affected, by age.

Extending the effects on daily activities.

As previously stated, 40% of the children (156) have reported at least one daily activity affected. **The relative frequency analysis** of affected subjects reveales that a quarter of the affected children reported 1 daily activity with problems, 16.67% 2 activities and 13.46% with 3 activities. In total, 57.05% of the affected children reported as affected 1-3 daily activities (slight affectation). Also, 16.03% of the affected children reported 4 - 5 activities (extensive affectation) and 27% of the affected children report 6-8 daily activities as being affected (very extensive affectation).

Gender analysis reveals unequal relative frequency of affected children according to the number of activities. The classification of slight affectation (1-3 activities), extensive (4 – 5 activities) and very extensive (6 – 8 activities) reveals significant statistical differences between girls and boys. The girls reported slight affectation while boys extensive and very extensive affectation (p=0.012). Age groups analysis reveals that there is the tendency for a greater number of affected activities to be reported by older children.

Global OIDP impact score

Overall, 37.69% of children reported an affected quality of life (OIDP score different from 0). The medium global impact score was of 5.21 ± 11.893. The median score was of 0, both globally and on daily activities. Comparison of the median values of OIDP score has revealed a significant difference by genders (greater affectation for boys), but comparable medians by age groups.

Intensity of affectation for the quality of life of children age 9 to 12 years old

Overall, a moderate, high or very high impact was registered for eating, followed by speaking and oral hygiene. The maximum intensity of impact was registered for smiling (2.56%) and relaxation (1.79%), while oral hygiene and speaking were not severely affected for none of the children. Gender analysis din not reveal significant statistical differences between boys and girls for any daily activity (p>0.05).

Analysis of the psychometrical properties of MOHQoL questionnaire – version for children

The MOHQL – C instrument has been shown to have adequate internal consistency. Inter-items correlations had low or acceptable coefficients. The weakest score seemed to correlate pain score and attractiveness score, and most prominent the pain score and total score, respectively consequences and total score (Table 2). The average of inter-items correlation of 0.414, showed a convenient correlation. The internal consistency of the scale was characterized by Cronbach Alpha coefficient of 0.752, which indicated good consistency. Relations between items and total scale revealed that all items had correlations with the others over 0.40 (minimum accepted step), so they must be kept. The Alpha Cronbach coefficient decreased (from the total value of 0.752) each time an item was removed (except the DMT score, for which it was registered a very slight increase, from 0.752 to 0.755).

Scores	Pain	DMT	Consequences	Attractiveness	Total score
Pain	1.000	.398	.335	.261	.716
DMT	.398	1.000	.273	.076	.535
Consequences	.335	.273	1.000	.181	.706
Attractiveness	.261	.076	.181	1.000	.660
Total score	.716	.535	.706	.660	1.000

Table 2. Inter-items correlation matrix

Determination of test-retest reproducibility was achieved by applying MOHRQL – C questionnaire and respectively MOHRQL – A on 20 children, respectively 10 mothers and repeating the application on the same subjects after 10 days. The concordance between the obtained results was compared, using Cohen Kappa for each question. The results were higher than 0.800 for all the questions, for both questionnaires, which reveals a very good concordance.

The concurrent validity was analyzed by correlating scale scores with oro-dental health indicators. It was expected that the pain score would specially correlate with DMFT, and the attractiveness score with IOTN. It was found that the total score was weak, but directly and significantly correlated with oral hygiene indicators and with orthodontic treatment need. The attractiveness score was correlated with most oral health indicators. Pain score was weak and direct correlated with DMFT .

Aspects related to the quality of life of children age 6 to 12 years old in the Danube Delta Biosphere Reserve.

Proportion of affected children

The affectation has varied between 10.59% and 36%. The percentage of affected children seems similar with the situation when we applied the Child-OIDP questionnaire .Most children responded affirmatively to the questions "10. Have you ever had a toothache when you were at school?", "9. Did you ever stop playing when you had a toothache?", "2. Do your teeth hurt when you eat something hot or cold?", "8. Do your teeth hurt when you chew or bite?" and "18. Are you pleased with your teeth?"

The lower affectations were reported to the questions "5. Does it hurt when you widely open your mouth?", "4. Do your teeth hurt when you chew or bite?", "11. Have you ever stayed home and not go to school when you had a toothache?", "1. Do your teeth hurt now?" and "16. Do children laugh at your teeth?".

The gender analysis revealed statistically significant differences for the questions "3. Do your teeth hurt when you eat something sweet?" and "17. Do you want to get braces?", both recorded higher proportions for girls. Age groups and questions analysis generally highlights an increasing tendency of affected subjects from 7 to 12 years old. Differences were tested between extreme groups of age (7 and 12 years old). Statistical significant differences were found only for the questions "6. Do you hear any noise when you widely open your mouth?", "10. Have you ever had a toothache when you were at school?" and "15. Do you like your smile?".

Parents/tutors perception regarding affectation of the quality of life of children

Parents/tutors have answered to MOHRQL – A version and have assigned scores from 1 to 5, according to the perceived gravity of affectation on their children quality of life. The concordance analysis was obtained by calculating the simple percent of concordance and the K Cohen coefficient. There was a weak concordance (K < 0.200) or acceptable (K between 0.200 and 0.400) between the answers of the children and those of the parents. The only question for which there was a moderate concordance was the one referring to toothaches at school.

Child OIDP correlations – oro-dental health

The OIDP total score and the performance score on all 8 daily activities have been correlated with the oro-dental health indicators: DMFT, gingival bleeding index, OHIS, Silness & Loe gingival index, IOTN, Dean fluorosis index. For the OIDP general impact score, significant correlations were obtained with all oro-dental health indicators, except periodontal health indicator, but this correlations were generally weak.

On daily activities significant correlations for most oro-dental health indicators were also recorded, but these correlations were weak or very weak.

IOTN score was also significantly, but weak correlated with all daily activities. OHI-S did non correlate with speaking. The Silness & Loe index did not significantly correlate with speaking and social life. Periodontal health index did not correlate with any daily activity (speaking - very weak reverse correlation). Also, the Dean fluorosis index din not significantly correlate with eating, speaking and social life.

CHAPTER VIII
DISCUSSION

Average DMFT in the studied population was 2.01, increasing with age, from 1.15 in 7 years old to 2.46 in 12 years old. These values are consistent with studies from other geographical areas in Romania (Harsova – 2.59, Bucharest – 2.01, Iasi – 2.36, all for the age of 12 years old) [44], [46], [47], and superior to the last known value for Romania (2.8 for the age of 12 years old, in the year 2000). [48]

In terms of comparison of DMFT in children in the Danube Delta towards the WHO targets (WHO targets for Europe, for the year 2020 an average DMFT score for the age of12 years old, not higher than 1.5 (3 for the year 2000)). [48-49].

In our study, at the age of 12 years old, the average DMFT = 2.46 (2.25 for boys and 2.74 for girls). These values exceed the WHO target, even for the year 2000. 50% of 12 years old boys and 60.5% of 12 years old girls present a DMFT score > 2.

Much higher values of average DMFT for the age of 12 years old were reported in countries like Bulgaria (3.1), Albania (3.8) or Croatia (4.8) [48],[50],[51], while for the developed countries in Europe the average DMFT is much lower.[48]. The analysis by generations revealed a significant deterioration in DMFT at the age of 8 years old (for both genders) and a significantly difference of DMFT between genders for the age of 9 years old, in the detriment of girls.

One of the most common and relevant WHO indicators mentioned in strategic documents since the 80s is the **percentage of children without caries at the age of six years** (WHO Standard: 50% for the year 2000 and 80% for the year 2020). Globally, 32.9% of the children included in the study were nor affected or had any dental treatments, and the percentage of children without caries decreased with age.

SiC Index raises the suspicion of a worsened oral general health at the newer generations with the emergence of very serious cases (DMFT 8-13).

Regarding the **periodontal health**, one third of the examined children had gingival bleeding, the phenomenon being more evident for boys, globally. The most affected groups in terms of periodontal status were the groups of 9 and 10 years old.

Oral hygiene

OHI-S. Globally 27.1% of the examined children had a good oral hygiene, 57.6% convenient and 15.3% poor. There were no significant differences by gender linked to the proportion of subjects in different categories of oral hygiene (p = 0.3170, Chi^2 test). The level of oral hygiene seems to worsen with age, from 12,5% at 7 years old to 28.3% at 12 years old.

Globally, 26.39% of the subjects did not have bacterial plaque, for 58.82% presented a stage I(it was highlighted with a probe),while for 14.79% it was visible. There were no significant differences recorded by gender, but the situation worsened with age. The level of oral hygiene was poor compared with other studies and worsened with age, which indicates the need of health education interventions in primary school.

Orthodontic treatment need

The orthodontic treatment need was quantified in children using the Index of Orthodontic Treatment Need.. The obtained score was low: 7.9% of children presented a borderline need for orthodontic treatment. The recorded malocclusion status was obviously better than in other studies, which reported a high prevalence of normative treatment needs (8.3% in Bucharest and up to 39% in other studies.[39],[41],[44],[52].

The low prevalence of orthodontic treatment need, especially at the level of a population with low incomes may be related to some ethnical or behavioural factors which were not investigated in this study. This situation is a favourable on and considered as a natural advantage because the area is poor, the health insurance system does not provide such services, and, anyhow, children did not have access to correctional devices.

Quality of life analysis

Different studies using Child-OIDP questionnaire in children and adolescents reported a wide range of prevalence of children with difficulties in at least one activity, from 28.6% in Tanzania to 80.9% in Brazil or 89.8% in Thailand [17][53 - 55]. The prevalence in our study is of 37.69% is more similar to the one registered in Spain (36.5%), or England (40.5%) [56-57], but much lower to the one mentioned in a study from Bucharest of 57.4% [44].

The most affected activities in our study were eating, speaking and oral hygiene (brushing teeth) and the less affected were relaxation, study and social life. The intensity and the extent of the impact present a generally low prevalence, more than half of the affected children reported a very small or small impact on each activity and only 10.3% of all children reported suffering in more than 5 activities. Children with orthodontic treatment need reported significantly higher intensity scores, overall and by activity (except eating). They also presented a higher number of affected daily activities.

OIDP total score and the performance score of the 8 daily activities correlated significantly, but weak, with all oral health indicators, except periodontal health indicator. On daily activities significant correlations were also registered for most oral health indicators, but these correlations were weak or very weak.

MOHQL – C instrument was found to have an adequate internal consistency and reproducibility, but moderate validity. The total score correlated weakly, but directly and significantly with oral hygiene indicators and with orthodontic treatment need. The attractiveness score was correlated with most oral heath indicators. The pain score correlated with low and direct DMFT. Although correlations in the studied population are weak, sometimes statistically insignificant, we consider that the instrument can be used to assess quality of life in children. Our argument is that we used the DMFT score and not the DMFS or ICDAS and that the studied population was globally characterized by a high proportion of affected children, but with low DMFT. This fact can argue the significant correlation of the total score with poor oral hygiene, a fact that will contribute in the future to the progressive alteration of oro-dental health, as children grow.

The MOHQL-A questionnaire revealed a weak concordance (K under 0.200) or acceptable (K between 0.200 and 0.400) between the answers of the children and those of the parents. The only question for which there was a moderate concordance was the one referring to toothaches at school.

Limits of the study

There are no recent population data for Romania, which does not allow situating the studied population in a hierarchical level compared to the country.

Indicators had non-Gaussian distributions, which were kept after making the logarithms.The heterogeneity of the series makes the averages to have an orientation value, and from this point of view the median was considered being a better option for a better

characterization of the series. There are few studies that communicate the median DMFT so that is why comparisons were however made between average values.

Correlations between clinical indicators and quality of life indicators were generally weak. The 6 years old population was not representative for the general population of this age in the Danube Delta Biosphere Reserve.

Oral health determinants were not analyzed (nutrition, hygiene habits), as a level of attitudes or knowledge, among children, and parents, and that is why, the obtained results can not be associated to a particular nutrition style (ex. Consumption of sweets or juices) or certain oro-dental health related behaviours (ex. how often does a child washes his teeth).

CHAPTER IX
CONCLUSIONS

Our study is the first study on oral health in children in the Danube Delta Biosphere Reserve (a poor rural area, with inexistent or very few health care services, especially those preventive) and had two main directions - oro-dental health status analysis and quality of life analysis.

Oro-dental health status analysis, made based on basic clinical indicators revealed favourable results, consistent with other studies from different geographical areas in Romania, better than the national values (for the moment at which it was known) and superior compared to the neighbour countries (Bulgaria, Albania). Nevertheless, some of the indicators we found were lower than the WHO targets, even for the year 2000. Oral hygiene and periodontal health status were inferior than in other studies, and the orthodontic treatment need was found very low. All parameters have significantly worsened in older generations, which demand urgent interventions both therapeutic and also health educational (especially for ensuring oral hygiene).

Quality of life analysis was performed using the Child-OIDP questionnaire for the age of 9 to 12 years old and also using MOHRQL – C and MOHRQL – A questionnaires for the age of 6 to 12 years old.

Child-OIDP questionnaire revealed a lower affectation than in other studies (including Romania).

MOHRQ – C questionnaire had good reproducibility and internal consistency, but low validity. This instrument showed a higher proportion of children with affected quality of life, compared to the Child-OIDP.

MOHRQL – A questionnaire revealed a weak concordance between the answers of the parents compared with those of the children on all analyzed dimensions, except pain, where concordance was acceptable.

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