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ABSTRACT

OCCUPATIONAL MEDICINE RESEARCH REGARDING THE INFLUENCE OF RISK FACTORS ON ORAL HEALTH

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CONTENT

A. GENERAL PART

Chapter 1: **CONSIDERATIONS REGARDING GLOBAL HEALTH STATUS AND THE INFLUENCING FACTORS**

1.1. Concepts regarding health status and its global promotion

The concept of health has been undergoing continuous change due to the development of present society and to the multiple possibilities offered by the constant progress of technologic processes. This concept has known several adjustments in the past two hundred years. A century ago, health equaled the "lack of disease"; according to some existential, phenomenological, physiological or mechanical theories, a person showing no signs of illness was considered healthy. Illness could easily be acknowledged from a clinical point of view, and back then most of the diseases would lead to death. The thorough study of medicine's biological bases and the development of the first prophylactic initiatives by immunization, as well as the analysis of social and work environment have led to a new positive definition of health, seen not just as "the absence of illness", but as a "physical state of well-being" in the context of social progress during the first part of the current century. This gradual change of health notion has been approved and supported by the large part of society, especially by the healthcare professionals. This period is also characterized by the beginning of the debates between the healthcare professionals and the working class regarding the acknowledged definition of health status. The concept of health as postulated by the World Health Organization in 1948 is actually the basis of the official definition of the term "health": "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." (Quote from Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19–22 June 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100, and entered into force on 7 April 1948.) [1,2].

1.2. Determining factors related to workers' health status

There are a series of specific factors which influence the health status of individuals and collectivities. Health status of population and individuals alike is determined by the circumstances and their environment. Particularities such as the lodging, the environment, the genetic factors, the income and the educational level, as well as relationships with friends and family have a major impact on the individual's health. On the other hand, other factors more frequently approached, such as access to health services, often have a lower impact on health. The literature mentions five categories of intermixing factors with crucial implications in the health status of population. Healthy life habits also have a deep effect on all the other categories of factors, as shown in figure no 1 [1,3,4]:

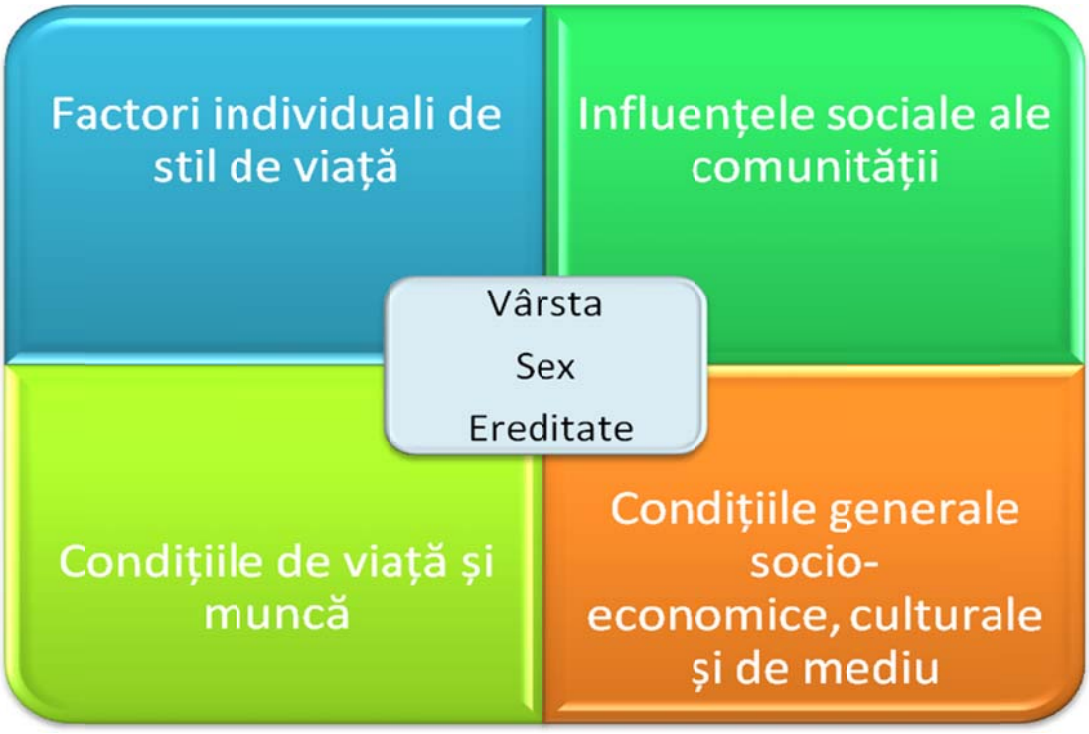

Fig. no.1: Factors influencing health status (source: Massanotti G., Griffiths J., Lisabona, 2012 [1])

Besides age and sex, heredity is a key factor when it comes to the health of an individual. Our DNA genes contain information codes which predetermine everything in our body, from the color of hair and eyes to the structure of chemical components; therefore, a genetic anomaly can have important effects on the health status. The similarities between the individuals residing in the aspect and the structure of our body are the most suggestive examples of how the genes work. Also, it is important to identify those healthy life habits able to change the effects of genes. Therefore, counseling individuals about the major effects of a healthy life in order to prevent illness plays a crucial part in establishing a persisting health status.

1.2. Working conditions and their effects on health

Working conditions generating a high level of stress may lead to an increased risk of work accidents, disorders such as high blood pressure, heart diseases, depression or mental conditions, and acceptance of unhealthy habits (smoking, alcohol consumption) [5]. The researchers have demonstrated that the stress level at the place of work is a predisposing factor for the occurrence of various conditions such as cancer, neurological disorders, complications of pregnancy, and affections of marginal periodontium [6, 7, 8]. It has been demonstrated that physical or intellectual overload at work may be related to the occurrence and augmentation of coronary disease [9]. In 2007, Boedeker and his collaborators [10] obtained data supporting the idea of association between overwork and employees' cardiac conditions, and there were also found differences between workers and intellectuals, as well as between men and women [1,11] .

The identified specific consequences on working conditions are the following [1, 12, 13]: job insecurity, the physical working environment, work rhythm, stress control, the duration of work shifts, implication and work relationships, the balance between life and work, and the increase of responsibilities.

Chapter 2: OCCUPATIONAL HEALTH AND ITS ESSENTIAL COMPONENT, OCCUPATIONAL MEDICINE

2.1. Organization of Occupational Health

Occupational health is based on the concept of the adaptation of work to man and of each man to his job, according to the definition in the literature: "the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities" [14].

There are three main areas of occupational health focused on the following objectives:

- The quality and adaptability of a system of work organization and work culture which is conducive to promoting a positive social climate;
- Improvement of working environment in order to ensure work safety and health;
- Maintenance and promotion of workers' health and working capacity [14, 15].

In order for these objectives to be met, there is a well-defined organizational institutional form represented by distinct institutions, such as:

- Institutions on international level: the International Labour Organization, World Health Organization or the European Commission Directory of Health and safety at Work.

- National institutions that also exist in our country and are part of the Ministry of Health and of Ministry of Labour, and Social Protection, and of the State Inspectorate for Labour Protection. These organizations have advisory and methodological purpose, as well as executive, educational and coercive ones.

- Regional or local institutions serve educational and labour quality control purposes: Labour Territorial Inspectorate and the County Public Health institutions.

2.2. Reciprocity and correlation between health status and work

The potential effects of labour and working conditions on the health status, as well as the methods of detection and prevention of health disturbances are little known in the countries with an underdeveloped network of occupational medicine, our country included. Since 1713, Ramazzini (as quoted by Contiu) recommended that a connection should be made between the symptoms and the patient's occupation, in order to emphasize certain pathological processes that may be related to the work environment and that may be overlooked during clinical examination. Thus, he asserted the seriousness of morbidity due to occupational diseases [14].

Contemporary medicine has promoted the principle of specialized efficiency, according to which it is extremely important to identify the individual that has the symptoms and afterwards the symptomatology, along with the implementation of the concept of active or passive nursing.

Chapter 3: OCCUPATIONAL HAZARDS AND THEIR ACTION

Occupational hazards represent distinct factors in the working environment with possible adverse effects on health of the people exposed to toxic settings and which may determine the occurrence of diseases or the decrease of working capacity. A component or factor of the working environment is considered an occupational hazard if a certain exposure limit is exceeded over a long period of time. Both factors that determine the working conditions and lead to occurrence of disease, as well as the factors which cause the decrease of working capacity are considered occupational hazards. Therefore, it is compulsory to apply prophylactic measures in order to diminish their effects. [16, 17, 18]

3.1. The course of action of the occupational hazards

The main etiologic factors of occupational hazards have a crucial action on human organism and create a cause-effect link between the occupational hazard and disease; they can actually interfere in the genesis of the disease. Occupational hazards may be favored by certain etiologic factors of some diseases not related to a specific profession. Also, occupational hazards may represent a secondary etiologic factor in non-professional diseases with high frequency where the main etiologic factor is represented by another type of occupational hazard. The elements that aggravate specific professional related illnesses also influence the spreading of non-professional existing conditions. The action of occupational hazards is monitored by means of collaboration between the family physician and the dentist; the doctors are responsible for the dispensarization of the patient and his or her adaptation to the new working conditions; it is very important that the patient be monitored through periodic medical examination in order to benefit from an efficient, curative and prophylactic treatment for any type of condition. [16, 19, 20, 21, 22].

Chapter 4: SOURCES AND METAL ALLOYS USED IN INDUSTRY WITH IMPLICATIONS ON ORAL CAVITY

4.1. Exposure to nickel and its compound in occupational intoxication

Two distinct forms of occupational intoxication are mentioned in literature: metallic nickel and nickel carbonyl intoxication. [16, 23, 24]. At the level of the oral cavity, nickel stomatitis may occur.

In professional intoxication with metallic nickel the main etiologic factor is the nickel, an extremely hard white silver metal, which becomes flexible when re-melt and is highly resistant to acids, salts and corrosion. [16].

4.2. Exposure to zinc, copper and their compounds in occupational intoxication

Zinc is a bluish-white metal with a 420^0C melting point. It is naturally found in the form of zinc sulphide (blende), as shown in figure no.6 or zinc carbonate. The chemical data of this particular metal are presented in figure no 10, and the ore is shown in figure no 11. [25, 26].

In the case of workers in the zinc electrolytic industry there could be seen distinctive processes at the level of dental crown and dystrophic periodontal processes, followed by the loss of teeth, an effect equally proportional to the concentration of toxicity and the length of exposure.

Chapter 5: THE INFLUENCE OF OCCUPATIONAL RISK FACTORS ON ORAL HEALTH STATUS

In the clinical context of occupational intoxication, the following conditions may occur at the level of the oral cavity: [27, 28, 29, 30, 31, 32]:

- Gingival lizereum, dental discolorations, different degrees of edentulism, scubs or placards, stomatitis, dental erosion, dental bleeding, aggravation of existing parodontopathies, arthralgia (on temporomandibular joint level), marginal or deep parodontopathies, xerostomia (dry mouth syndrome), increased salivary viscosity, hyposialia (low salivary secretion), hypersalivation (abundant salivation) etc.

In time, depending on the severity of the condition, all these symptoms induce certain manifestations on gastro-intestinal level, such as: esophageal stenosis, esophageal ulcer, gastric hypo or hyperacidity, gastric hemorrhage, gastric ulcer, stomach perforation, intestinal ulcer, paralytic ileus, ulcerous colitis, etc.

Each of the above mentioned symptoms occur depending on the occupational hazard the organism is exposed to, on the type of exposure and on other general conditions already existing, as follows:

a) Gingival lizereum is a pathognomonic symptom in various intoxications and is characterized by the apparition of a colored line which cannot be removed. The staining is specific for each contaminant involved; therefore, the substances that determine the occurrence of the lizereum are also the chromatic correspondent of the toxic emissions, as follows: [27, 29, 33]

- Mercury: bluish-gray, lead: gray-blue-violet; antimony: black-violet; gold: yellow-brown; arsenic: dark violet-black; bismuth: black, cadmium: yellow; copper: brown.

b) Dental discolorations occur in the case of cadmium occupational intoxication and have the aspect of yellow stain, while the fluoride intoxication is visible through brown spots of various intensities.

c) Edentation caused by the loss of several dental units and closely related to chronic marginal parodontopathies may be triggered by occupational hazards such as arsenic, barium (in soluble combinations without barium sulphate), hexavalent chromium, mercury, lead and its compounds.

d) Stomatitis occurs in numerous diseases produced by occupational hazards and they are an extremely common symptom in the clinical manifestations. Among the chemical substances responsible for the occurrence of stomatitis and gingival stomatitis the following can be mentioned: arsenic, barium and their combinations, as well as chromium, dimethyl sulfate, mercury, nickel, organic and inorganic lead, ionizing radiations, thallium. The ulcerous stomatitis is mainly triggered by substances such as the hexavalent chromium and inorganic mercury. [27, 28, 32, 33].

e) Marginal parodontopathies, be they superficial or deep, are a certain sign of occupational disease evolution and aggravation on oral health level. The intraoral clinical picture of occupational intoxications progressively includes the symptomatology from gingivitis to gingival stomatitis, as well as developing parodontopathies emphasized by the quality of saliva. Thus, parodontopathies mainly occur in patients diagnosed with an occupational disease. Worth mentioning are the following risk factors: arsenic, barium, benzene, beryllium, and their compounds and derivatives, as well as cadmium, hexavalent chromium, copper, mercury, lead and their combinations, next to mixed organic solvents such as diluent, carbon sulfide, and trichloroethylene. [27, 32, 33].

f) Xerostomia or the dry mouth syndrome may be caused by toxic professional substances such as arsenic, barium or their water solvent combinations, cyanides, acids in the form of vapors, etc.

g) Industrial dental erosion occurs due to the hydrocarbons or mineral acids intoxication.

5.1. Other intra-oral clinical manifestations of occupational intoxications

1. Antimony poisoning triggers the occurrence of gingival lizereum similar to that caused by lead poisoning, associated with stomatitis and antimony gingival stomatitis. At the level of fixed gum there may appear gray-white necrotic plaque that cannot be detached and are usually accompanied by xerostomia or, in rare cases, by black colored gingival lizereum. [27].

2. Manganese poisoning does not lead to specific intra-oral manifestations, yet they are associated to the overall clinical picture; sialorrhoea, lips involuntary trembling or gingivitis may occur.

3. Vanadium intoxication triggers purulent lacrimal and nasal discharge, sudden chronic sinusitis, pulmonary edema and sometimes (but not as a particularity, pathognomonic) a black-greenish tongue coloration with deposits that cannot be removed, but disappear a few days after the exposure has stopped.

4. At the level of oral cavity, zinc intoxication produces a clinical picture similar to acute and chronic cadmium professional intoxication. Salivary disorders with sialorrhoea may occur, including taste changes, which at first will be sweet, then bitter. In patients working in electrolytic – galvanization industry (similar to cadmium intoxication) erosive processes of enamel may occur, with exposure of dentine islands and pulp (2^{nd} and 3^{rd} degree Brocca), accompanied by the progressive damage of teeth supportive periodontal, leading to generalized chronic marginal parodontopathies, followed by teeth loss and prevalence of complete or partial edentulism.

5. Silver occupational poisoning rarely determines clinical intra-oral manifestations, but certain non-pathognomonic symptoms can be noticed, such as gingivitis, fetidity, halitosis, brown lizereum, and sialorrhoea.

6. Chromium occupational intoxication determines at enamel level yellow coloration accompanied by yellowish gingival lizereum. However, as in other occupational intoxications, this may occur on the background of parodontopathy.

7. Occupational intoxication with carbon monoxide. According to Dechanme and Garlopean this kind of intoxication produces cherry-like red coloration of lips. [34]

8. Occupational intoxications with mineral acids (sulfuric acid, hydrochloric acid, azotic acid, etc.).

Inhalation of these toxic emissions triggers serious respiratory infections: rhinitis, laryngitis, glottis edema, necrosis of tracheal mucosa, epistaxis. [27, 35]

At the level of oral cavity there can occur: stomatitis and gingival stomatitis, ulcerations, bleeding stomatitis, xerostomia, oral mucosa burns, acid necrosis in teeth with enamel erosion defects and exposure of dentine islands. Enamel loses its shine and becomes opaque and porous; the teeth become yellowish-gray. Against the background of dental lesions caused by occupational intoxications with mineral acids, dental erosion is progressive and it often reaches the pulp, triggering a specific pulpit pathology which later evolves into periapical processes and periodontal lacerations. Due to the degeneration of capillary epithelium there can occur gingival hemorrhages and even necrosis of oral mucosa, which – if left untreated – may evolve in much severe maxillary necrosis. [27, 32, 33]

Strong acids in solution may cause ulcerations, while as vapors they may lead to necrosis. The most severe clinical picture is in the case of hydrochloric acid poisoning, followed by sulfuric and azotic acid. [17, 29, 35, 36]

PERSONAL RESEARCH

Chapter 6: WORK HYPOTHESIS, MATERIAL AND METHODOLOGY

6.1. Work hypothesis

The work hypothesis of the current research assumes that the exposure of the human body to a toxic working environment may determine the occurrence of occupational or work-related diseases, as specified in literature. [16, 24, 37] The hereby research intends to specify the specific effect and details of the intra-oral clinical picture of various conditions determined by toxins such as: copper cyanide, zinc cyanide, nickel cyanide, hydrochloric acid vapors, sulfuric acid vapors and various combinations of these toxins encountered in complex technological processes. Knowledge of the occupational hazards effects on workers who are systematically exposed to a toxic environment would provide occupational health specialists, dental specialists, family physicians and other specialists the instruments to take the necessary actions.

Another starting point was the idea that oral health is influenced by occupational risk factors; moreover, by applying efficient preventions measures the short, medium and long term effects can be eliminated. It has also been taking into account the necessity of a detailed study concerning the effects of chemical toxins of various metals and acid vapors on human body, and particularly on oral and odonto-periodontal health, as not much is known about the influence on this specific body segment.

6.2. Study material

From clinical and statistic point of view, the study material used in the hereby research in order to assess the occupational exposure to specific professional hazards (yet to be detailed) covers two distinct groups of workers. [38]. The groups include a total of 204 subjects and have been structured as follows:

I. A group of investigation (referred to as the C group) represented by a number of 102 male subjects who have been exposed to professional hazards such as cyanides, vapors of acids able to affect oral health, but also exposed to noise – a type of risk factor that has not been proven to have an impact on oral health. The subjects are galvanizing workers in the metal plating department of a private company from Sibiu, whose name must be kept confidential since some of the results may have an undesirable impact on the employees.

The investigation group is exclusively composed of male subjects exposed to the toxic environment caused by the galvanizing process. Despite the fact that the company has specific regulations regarding labor protection, health and work security, with explicit rules on wearing protective equipment like masks and goggles, workers do not comply and choose to protect their hands by wearing only gloves, thus risking daily exposure to various toxins like cyanides and acid vapors.

Workers in the investigation group work five days a week in two shifts of 8 hours, according to the following schedule: the first shift from 7 to 15.00, and the second shift from 15.00 to 23.00. Should the economic events or the beneficiaries require the employees may be solicited to work in three 8 hour shifts no more than one month per year. Each galvanizing employee benefits from compensatory time off after at the end of each shift; they work one week in the first shift and another in the second shift. The actual exposure time to toxins is of seven hours and fifteen minutes during the 8 hour shift.

The age of the subjects ranges between 26 and 65, with a period of one to forty years of seniority; the period of working experience in the galvanizing department ranges from one to thirty years.

II. The second group is the so called witness group (referred to as the M group). It is also formed of 102 male subjects working in the glassware department, in the glass melting and processing section of a private company from Sibiu. Confidentiality forces us not to mention the company's name within the present research. Subjects included in the M group are exposed to other types of professional hazards which lead to no intra-oral clinical manifestations and which have no significant impact on oral health. These employees have a

similar working schedule to the previously mentioned subjects from the investigation group, namely two 8 hour shifts.

The age of the workers range from 27 to 65, with a working experience of 1 to 39 years in the galvanizing department, respectively 1 to 34 years in the glass melting department. The structure of the study material is plotted in the following chart which altogether synthetizes and compares the two groups. (figure no.2):

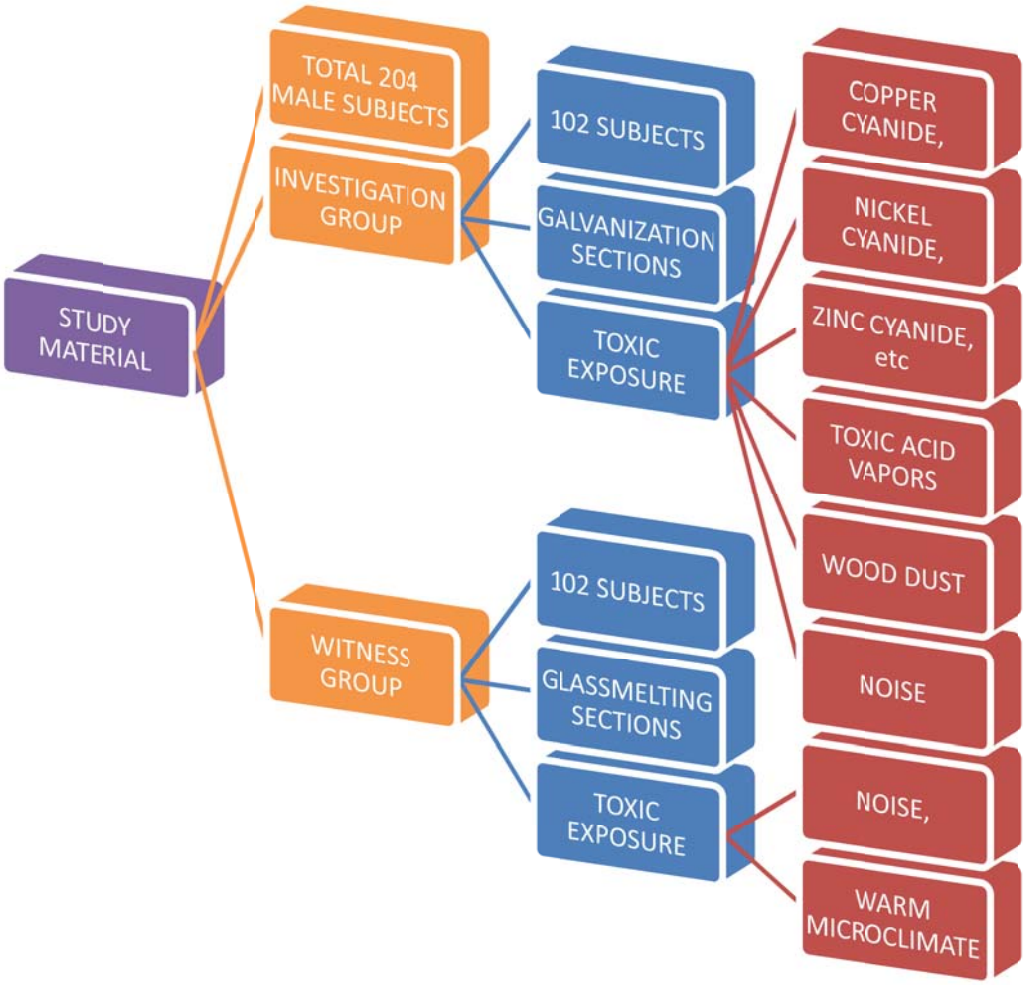

Fig.no. 2: Structure of study material

A comparative analysis of the two groups in terms of age and work experience is plotted in the following charts (fig. no 3 and 4):

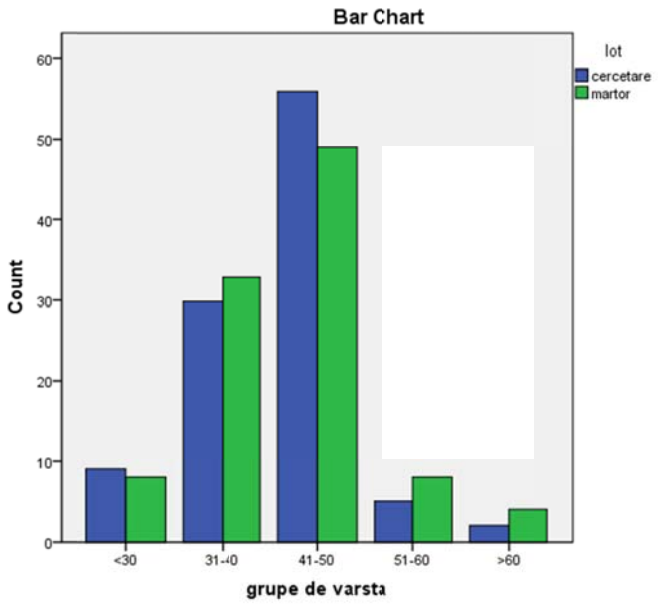

Fig. no.3: Comparison between the two groups in terms of age variable

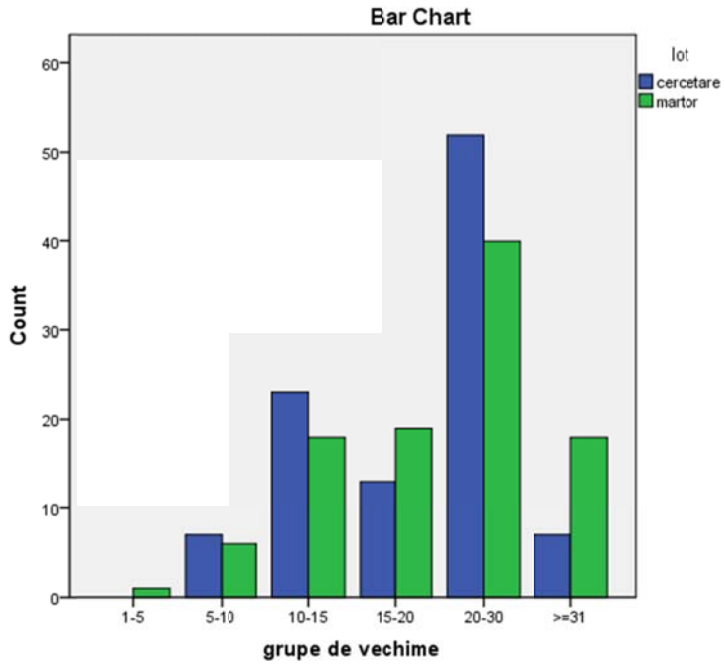

Fig. no.4: Comparison between the two groups in terms of work experience

Subsequent the comparative analysis of the groups we may assert that the studied groups may considered as homogeneous when considering age and work experience, but also when considering sex and training variables [39].

6.3. Working methodology

Working methodology includes the description of the studied companies, as well as the analysis of the occupational risk factors. The subjects have been investigated within the clinical background of exposure to the occupational risk factors and evaluated by means of specific methodologies which include the oral health assessment and the study regarding the prevalence of chronic and professional diseases [40].

6.3.1 Companies included in the study (investigation group and witness group)

The hereby research simultaneously and comparatively unfolded at two companies from Sibiu county and performed an examination of general oral and, oro-dento-periodontal health status of the subjects involved in the study material.

The investigation group included subjects from a company of metal plating with various anticorrosive substances in order to confer resistance and endurance over time.

The subjects included in the witness group were selected from a company of glass manufacturing and processing.

Detailed characterization of the two companies with an emphasis on technological processes and existing toxins is to be dealt with in chapter 14 (see Chapter 14: Characterization of studied companies – working conditions)

6.3.2 Research methods applied in the current study

The research methods applied within the current study and described in the following pages are:

1. Questionnaire of symptoms and syndromes

All subjects were required to fill in a questionnaire regarding their overall health status, as well as their oro-dental health.

The applied questionnaire is based on a standard type of questionnaire known as Euroquest [41] and it has been adapted and individualized through targeted items on oral health, in order to be relevant to the current research. The questionnaire offers data referring to age, working sector, overall work experience location, and work experience in the current department. Moreover, the questionnaire is numbered for each patient and the number will be kept for all the records used within the methods to be applied. The data provided for the questionnaire are confidential and they only mention the initials of the subjects. The items are structured and grouped in three distinct parts, with two or four choices of answer (the subjects were asked to tick one box for each question).

2. Clinical examination of oral cavity

In order to establish a complete and complex diagnosis, the subjects have been clinically examined in a dental medicine special ambulatory. The emphasis was put on general criteria (also supported by the data obtained by the health medicine specialist and the ENT specialist in their individual records of health medicine), and specific evaluation criteria recorded in an individualized dental examination adapted for the hereby research using as models standard dental records. [42, 43]

3. Radiological examination of orthopantomographies

Panoramic radiographies have been performed on all subjects involved in the present study. The same device, an Orthocep OC 200, has been used for these radiographies to make comparison efficient.

4. Testing saliva buffering capacity

The work method consists in using an in vitro test produced by the GC company, known as Saliva-Check BUFFER in order to check saliva quantity, salivary PH and saliva buffer capacity.

In order to collect and centralize the obtained data, a form has been elaborated to evaluate the salivary test Saliva-Check Buffer, as detailed in annex 7. These forms have been

numbered in such a way that each patient number corresponds to the number on the questionnaires, on the clinical examination and radiography examination sheets. The following sequence of images captures the composition and the details of the salivary test Saliva Check Buffer produced by GC. (figure no 5):

Fig. no. 5: Components of the salivary test box

5. Statistical data processing
6. Presentation of illustrative clinical cases

CHAPTER 7 RESULTS OF THE WORKING METHODS

7.1 Saliva testing method and its results

The salivary tests have provided statistically significant results regarding the difference between the investigation and the witness group, on all five salivary tests applied. [38]

Table no. 1

Descriptive analysis of the variable "saliva visual inspection test" for each group

Crosstab

			test de inspectie vizuala		
			scazuta	crescuta	Total
lot	cercetare	Count	93	9	102
		% within lot	91.2%	8.8%	100.0%
		% within test de inspectie vizuala	98.9%	8.2%	50.0%
		% of Total	45.6%	4.4%	50.0%
	martor	Count	1	101	102
		% within lot	1.0%	99.0%	100.0%
		% within test de inspectie vizuala	1.1%	91.8%	50.0%
		% of Total	.5%	49.5%	50.0%
Total		Count	94	110	204
		% within lot	46.1%	53.9%	100.0%
		% within test de inspectie vizuala	100.0%	100.0%	100.0%
		% of Total	46.1%	53.9%	100.0%

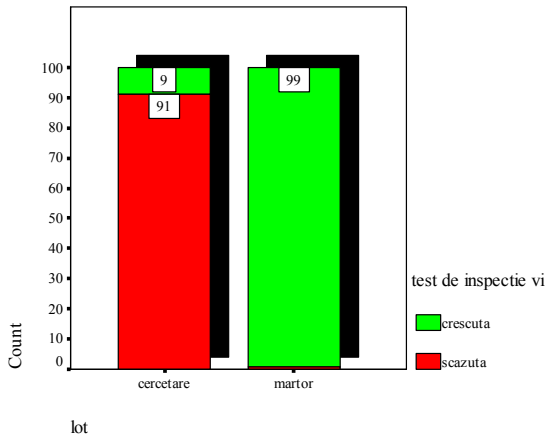

Fig. no. 6: Graphic analysis of variable "saliva visual inspection test" for the two groups

91.2 % (93 cases) from the investigation group recorded a low result, and just 8.8% (9 cases) registered an increased result. Within the witness group, 1% (i.e. 1 case) registered a decrease, while 99% (101 cases) registered increase.

The risk of having a low result is 93 times greater in the investigation group as compared to the witness group. (OR=93, CI95%: 13.215-654.497)

Table no. 2

Descriptive analysis of the variable "saliva consistency test" for each group

Crosstab

			test pentru consistenta salivei			
			scazuta	crescuta	normala	Total
lot	cercetare	Count	4	96	2	102
		% within lot	3.9%	94.1%	2.0%	100.0%
		% within test pentru consistenta salivei	100.0%	99.0%	1.9%	50.0%
		% of Total	2.0%	47.1%	1.0%	50.0%
	martor	Count		1	101	102
		% within lot		1.0%	99.0%	100.0%
		% within test pentru consistenta salivei		1.0%	98.1%	50.0%
		% of Total		.5%	49.5%	50.0%
Total		Count	4	97	103	204
		% within lot	2.0%	47.5%	50.5%	100.0%
		% within test pentru consistenta salivei	100.0%	100.0%	100.0%	100.0%
		% of Total	2.0%	47.5%	50.5%	100.0%

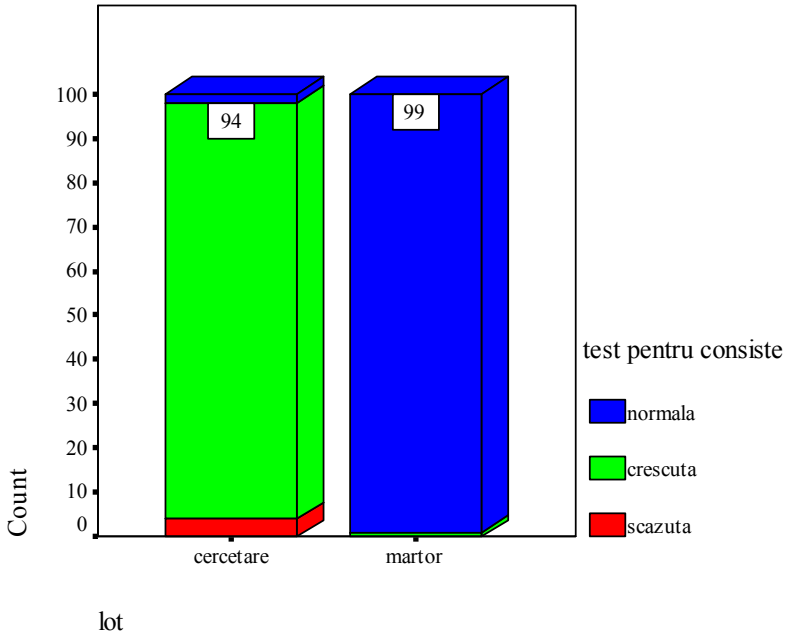

Fig. no.7: Graphic analysis of the variable “saliva consistency test” for the two groups

Subjects in the investigation group have a greater incidence of increased values (94.1%), while within the witness group records a high incidence (99%) of normal values (p=0.000).

Table no. 3

Descriptive analysis of the variable “test for pH measuring” for each group

Crosstab

			test pentru masurarea PH-ului			
			aciditate ridicata (5-6.8)	aciditate moderata (6-6.6)	saliva sanatoasa (6.8-7.8)	Total
lot	cercetare	Count	91	8	3	102
		% within lot	89.2%	7.8%	2.9%	100.0%
		% within test pentru masurarea PH-ului	100.0%	80.0%	2.9%	50.0%
		% of Total	44.6%	3.9%	1.5%	50.0%
	martor	Count		2	100	102
		% within lot		2.0%	98.0%	100.0%
		% within test pentru masurarea PH-ului		20.0%	97.1%	50.0%
		% of Total		1.0%	49.0%	50.0%
Total		Count	91	10	103	204
		% within lot	44.6%	4.9%	50.5%	100.0%
		% within test pentru masurarea PH-ului	100.0%	100.0%	100.0%	100.0%
		% of Total	44.6%	4.9%	50.5%	100.0%

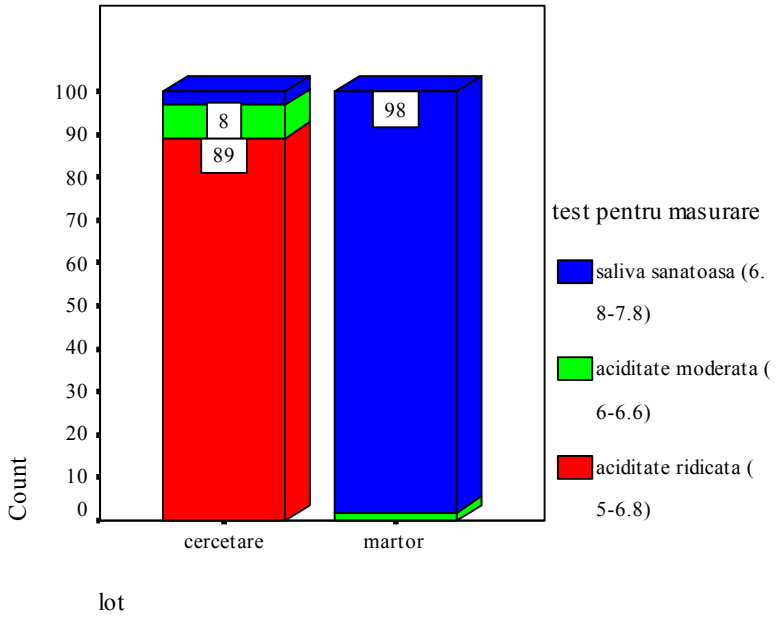

Fig. no.8: Graphic analysis of the variable “test for pH measuring” for the two groups

Subjects in the investigation group have a higher rate of increased acidity (89.2%), as compared to the 99 % high rate of healthy saliva (p=0.000) within the witness group.

Table no. 4

Descriptive analysis of variable “saliva quantity test” for each group

Crosstab

			test pentru cantitatea de saliva			
			foarte scazuta	scazuta	normala	Total
lot	cercetare	Count	37	62	3	102
		% within lot	36.3%	60.8%	2.9%	100.0%
		% within test pentru cantitatea de saliva	100.0%	96.9%	2.9%	50.0%
		% of Total	18.1%	30.4%	1.5%	50.0%
	martor	Count		2	100	102
		% within lot		2.0%	98.0%	100.0%
		% within test pentru cantitatea de saliva		3.1%	97.1%	50.0%
		% of Total		1.0%	49.0%	50.0%
Total		Count	37	64	103	204
		% within lot	18.1%	31.4%	50.5%	100.0%
		% within test pentru cantitatea de saliva	100.0%	100.0%	100.0%	100.0%
		% of Total	18.1%	31.4%	50.5%	100.0%

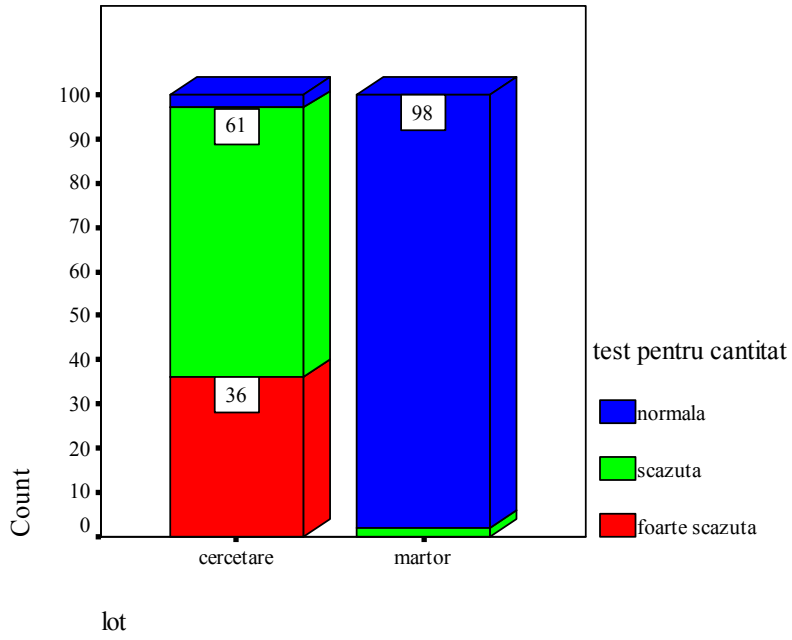

Fig. no.9: Graphic analysis of the variable “saliva quantity test” for the two groups

In the investigation group, the subjects had low or very low quantity of saliva (36.3%+60.8%=97.1%); in the witness group most of the subjects (98%) presented normal quantity of saliva (p=0.000)

Table no. 5

Descriptive analysis of the variable "testing salivary buffering capacity" for each group

Crosstab

			testarea capacitatii de tampon a salivei			
			foarte scazuta	scazuta	normala	Total
lot	cercetare	Count	47	53	2	102
		% within lot	46.1%	52.0%	2.0%	100.0%
		% within testarea capacitatii de tampon a salivei	100.0%	96.4%	2.0%	50.0%
		% of Total	23.0%	26.0%	1.0%	50.0%
	martor	Count		2	100	102
		% within lot		2.0%	98.0%	100.0%
		% within testarea capacitatii de tampon a salivei		3.6%	98.0%	50.0%
		% of Total		1.0%	49.0%	50.0%
Total		Count	47	55	102	204
		% within lot	23.0%	27.0%	50.0%	100.0%
		% within testarea capacitatii de tampon a salivei	100.0%	100.0%	100.0%	100.0%
		% of Total	23.0%	27.0%	50.0%	100.0%

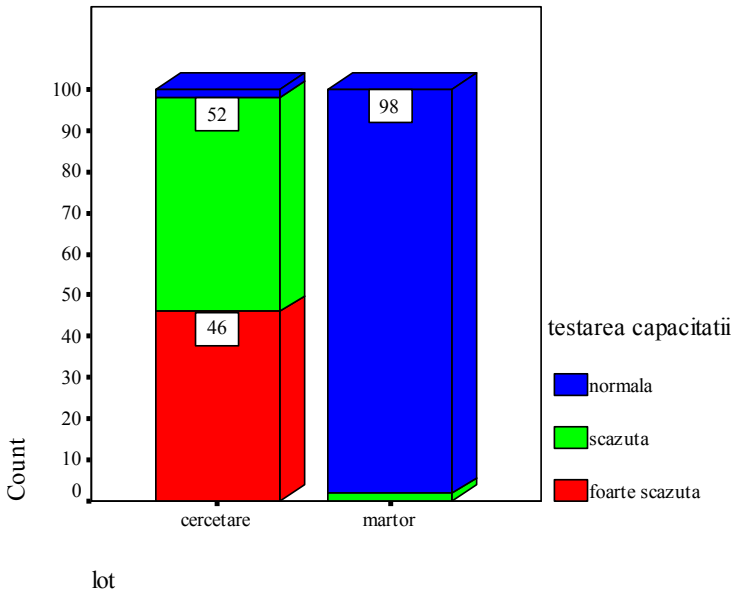

Fig. no.10: Graphic analysis of the variable "testing salivary buffering capacity" for the two groups

Saliva buffer capacity turned out to be low or very low within the investigation group (46,1%+52,0%=98.1%), and predominantly normal (98%) in the witness group (p=0.000).

CHAPTER 8: RESULTS OF STATISTICAL DATA ANALYSIS

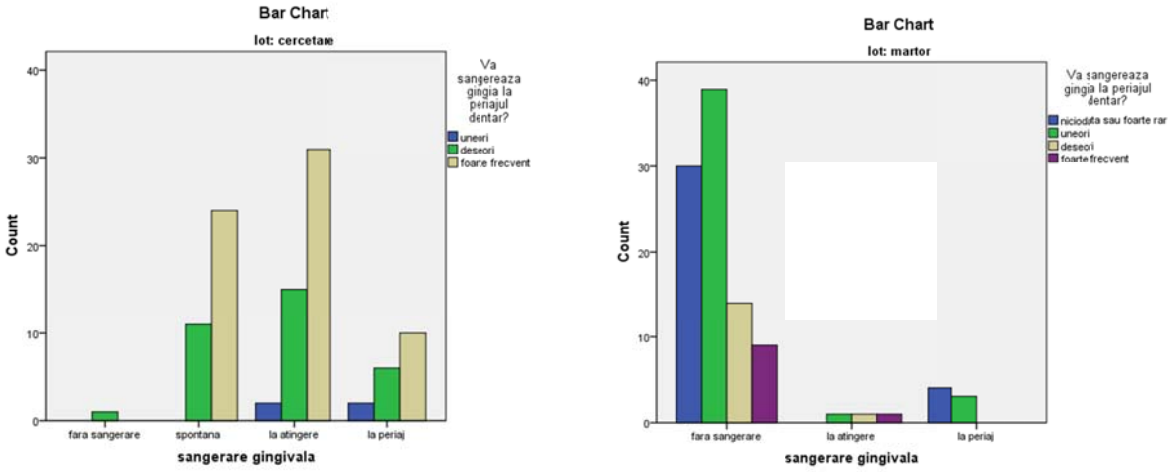

Fig. no. 11: The association between "Do your gums bleed from brushing?" inquiry in the questionnaire and gum bleeding present during the intra-oral clinical examination

Patients who presented gingival bleeding during clinical examination have also declared in the questionnaire that they have gum bleedings from brushing. Thus, in cases of spontaneous gum bleeding confirmation rate was of 31.4% often and 68.6% very frequent. In cases of gum bleeding on touch, the confirmation rate was of 31.3% often, 64.6% very frequent. In case of tooth brushing, the confirmation rate was of 33.3% often and 55.6% frequent. Within the witness group, 90.2% of the subjects presented no gum bleeding during brushing.

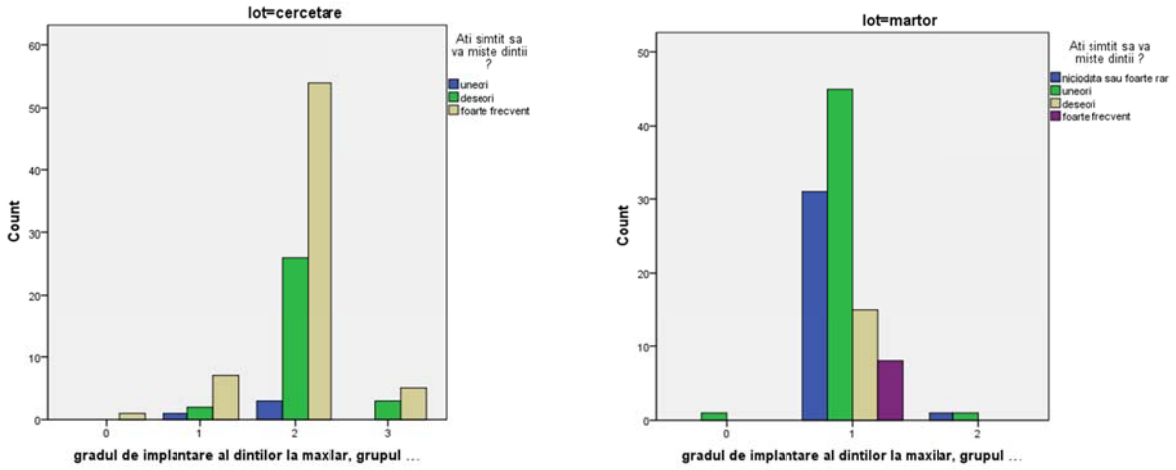

Fig. no.12: Association between the question "Have you felt your teeth moving?" and the variable "The teeth implantation degree in the maxillary lateral group" observed as a result of panoramic radiography examination.

Patients within the investigation group with a first degree of teeth implantation detected as a result of panoramic radiography examination (with implantation in the apical third) have noticed that their teeth move very often (70%), often (20%) and sometimes (10%). In cases of patients with 2nd degree of teeth implantation up to the medial third of the root have noticed teeth movement as follows: 65,1% very often and 31.3% often. Patients with third degree of teeth implantation have felt teeth movement 62.5% very often and 37.5% sometimes.

Patients within the witness group with first degree of teeth implantation detected as a result of panoramic radiography have felt teeth movement as follows: 45.5% sometimes, 31.3% never or very rare.

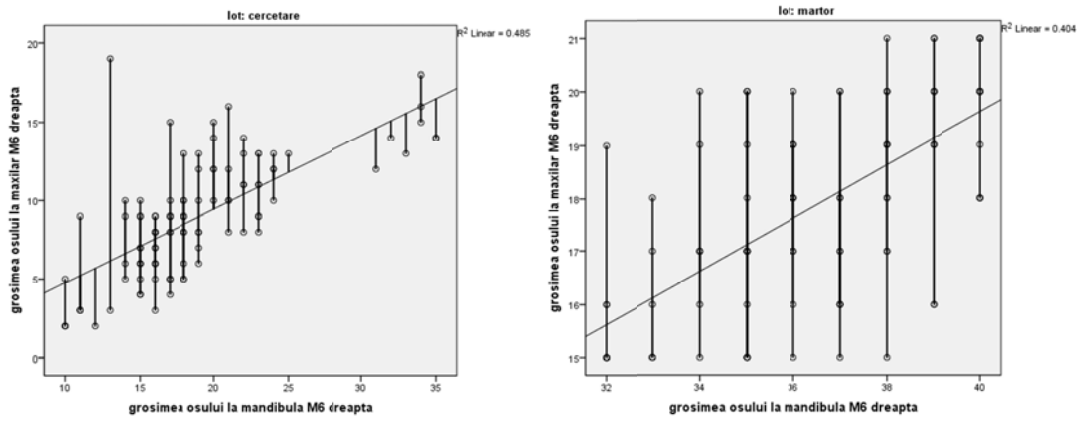

Fig. no.13: The association between the maxillary bone thickness at the 6-year right molar and the mandible bone thickness at the 6-year right molar. The data were obtained following the exam on panoramic radiographies.

The studies have demonstrated a significant and direct (positive) association measured on the panoramic radiographies between the thickness of the maxillary bone and the mandible bone on the right side, at the 6-year molar, in both the investigation group ($r=0.697$, $p=0.000<0.05$), as well as the witness group ($r=0.636$, $p=0.000<0.05$).

Smaller thickness on the right side of the maxillary bone is associated to smaller thickness on the right side of the mandible bone. Higher thickness on the right side of the maxillary bone entails higher thickness on the right side of mandible bone. These details have been observed in both the investigation group, as well as in the witness group.

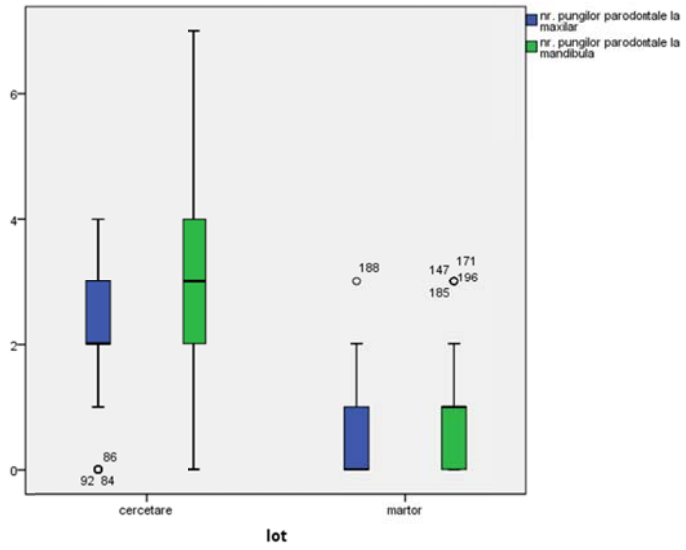

Fig. no.14: The association between the average number of periodontal pockets of the maxillary and the average number of periodontal pockets of the mandible, within the two groups.

The average number of the periodontal pockets of the maxillary is smaller than the average number of the periodontal pockets of the mandible in the investigation group (M=2,22, SD=1,13; M=3.11, SD=1,48), and also in the witness group (M=0,47, SD=0,656; M=0.78, SD=0,828)

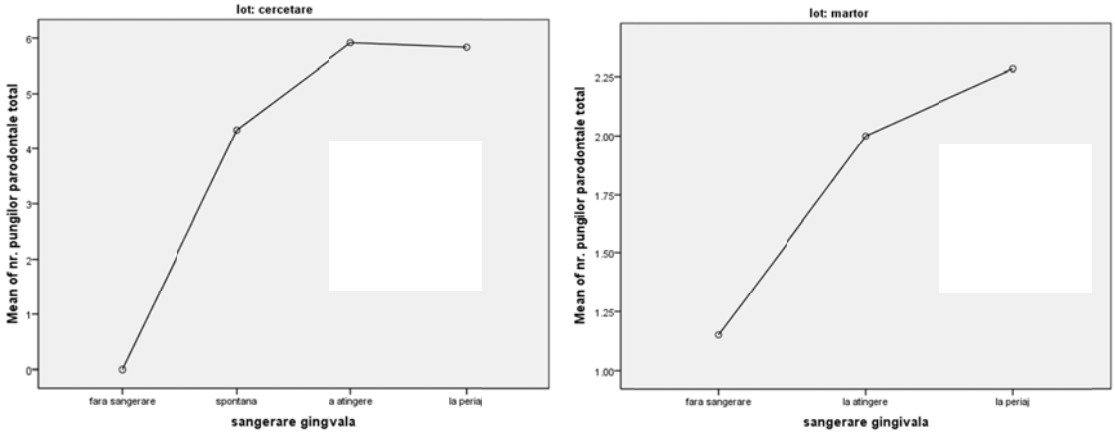

Fig.no.15: The association between the average total number of periodontal pockets detected at the panoramic radiography and gingival bleeding.

There is a statistically significant difference between the average number of periodontal pockets in patients with no gum bleeding as compared to the patients with gum bleeding, both in the investigation group ($p=0.000<0.05$), and in the witness group ($p=0.000<0.032$).

Within the investigation group, the average total number of periodontal pockets in patients with no gum bleeding was M=0.00, while in patients with spontaneous bleeding was M=4.34, SD=2.19; in patients with touch bleeding the average was M=5.92, SD=2.16; and with patients with bleeding from brushing it was M=5.83, SD=1.38.

Within the witness group, the average with the non-bleeding patients was M= 1.15, SD=1.17, while in cases of patients with touch bleeding the average was M=2, SD=1, and in patients with bleeding from brushing M=2.29, SD=1.38.

CHAPTER 9: CONCLUSIONS

1. Within the investigation group, the increase of salivary consistency is induced by long-time exposure of patients to occupational hazards such as cyanides and hydrochloric acid vapors.
2. Decrease of saliva quantity is strongly related to the increase of salivary viscosity and with the presence of tartar and mycobacterium plaque.
3. Salivary PH changes are determined by long-time exposure to occupational hazards and also they are favored by the refuse to wear proper protection equipment, which entails occurrence of dental corrosion at the enamel level.
4. Within the investigation group, hydrochloric acid vapors and cyanides determine the decrease of stimulated saliva quantity, interrelated to the increase of salivary viscosity.
5. In most patients included in the investigation group and subject to long-tima exposure to occupational hazards, there has been noticed the decrease of saliva buffer capacity, as well as an alteration of the defense function of saliva. It becomes more viscous and the mycobacterium deposits of plaque and tartar are more significant within the investigation group as compared to the witness group.
6. Patients who have been discovered during clinical examination to have gingival bleeding have declared in the questionnaire that they noticed gum bleeding during brushing often or very frequent.
7. The smaller the degree of teeth implantation in the dental alveoli, as observed due the panoramic radiography examination, the higher is the dental mobility, according to the patients.
8. The average number of periodontal pockets of the maxillary determined as a result of panoramic radiography examination is smaller than the average number of periodontal pockets of the mandible.
9. The presence of periodontal pockets at the level of maxillary bone increases the degree of spontaneous bleeding or bleeding on touch.

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