

ENVIRONMENTAL AND HEALTH PROTECTION IN DENTAL LABORATORIES FOR FIXED AND MOBILE DENTURES

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ABSTRACT

Environmental and occupational health protections are moral and legal obligation. Dentistry profession must not ignore the potential environmental risks and occupational health risk of any member of the team. If the dental technicians do not use appropriate protection parts of metal filings, ceramic and acrylate dust and other filth, which is present in the air of the dental laboratory, during making of dental fixed and mobile dentures, can damage their health as well as the environment.

The paper focuses on investigation of the protective measures performed in every day work in dental laboratories. Results of analysis of the working conditions in ten dental laboratories in Novi Sad are presented.

Key words: occupational health, environmental protection, dentistry

INTRODUCTION

Environmental and occupational health protections are moral and legal obligation [1]. Dentistry profession must not ignore the potential environmental risks and occupational health risk.

If the dental technicians do not use appropriate protection, parts of metal filings, ceramic and acrylate dust and other filth, which is present in the air of the dental laboratory, during making of dental fixed and mobile dentures, can damage their health. In the first place, the respiratory system can be injured. While grinding the metal framework of fixed and partial dentures dust and particles of precious and non-precious alloy are dispersed in the air [2]. Precious alloy usually consists of gold, palladium, silver, and copper, platinum and of small quantities of zinc, indium and tin. While grinding non-precious castings particles of cobalt, chroma and molybdenum alloy can be found in the air. Beside the inhalation of the dust, the aspiration of toxic vapours of low fusing alloy could occur if that kind of alloy is used [3, 4, 5].

Long time exposure to inorganic dust could lead to pneumoconiosis, pulmonary fibrosis, lung cancer, cancer of the paranasal sinus and throat cancer [2, 4, 5, 6]. The dust that originates from the cobalt-chroma alloy and cobalt-chroma-molybdenum alloy can lead to pneumoconiosis and lung cancer [7]. While grinding the esthetic part of the fixed partial denture ceramic dust can be found in the air. Particles of ceramic dust, carbide and metal particles can lead to pulmonary silicosis and other pathological changes in airways [8].

Allergic contact dermatitis is considered one of the most common occupational caused illnesses of the dentists, dental technicians and dental assistants [9]. The interval from the contact with the causing substance till the first clinical manifestations is usually 12-48 hours. Allergic contact dermatitis usually occurs after the direct contact of the skin with the allergen. While making the mobile dentures dental technician uses the acrylate monomers, which can cause contact dermatitis. It usually occurs on distal phalanges and palmar surfaces of the fingers [9, 10].

Also, there is a risk of mechanical injury in dental laboratories. Eye injuries vary on the intensity of the causing noxa, time of exposure and the extensity of exposure. Eye injuries can be mechanical and chemical. Erosion of cornea is the most common eye injury in the dental laboratory and it occurs when mechanical force destroys epithelium of the cornea. In that part of cornea remains tissue and distal parts of nervus ophthalmicus without protection of epithelium. Because of that, every

movement of the eyelid causes pain. Beside pain photophobia, epiphora and hiperemia occurs. Larger erosion can be seen with the bare eyes [11, 12].

This paper presents results of investigation of the protective measures application in every day work in ten dental laboratories from the territory of the city of Novi Sad.

INVESTIGATION METHOD

The aim of the work was to investigate were the protective measures performed in every day work in dental laboratories. For that purposes working conditions in 10 dental laboratories in Novi Sad and its suburbs, have been investigated. It is important to note that the dental laboratories have been chosen unintentionaly (Fig. 1).



Fig. 1. One of the investigated dental laboratories

Investigation was conducted through the questionnaire presented in Table 1.

Table 1. Structure of the used questionnaire

Question	Offered answers		
	male	female	
Sex	male	female	
Age of the dental technician			
How long do you work in the dental laboratory?			
Does the air dust aspirator exist in your laboratory?	Yes	No	
If the air dust aspirator exists, do you use it while grinding?	Yes	No	Sometimes
Do you have protective masks?	Yes	No	
If you have protective masks, do you use them while grinding?	Yes	No	Sometimes
Do you have protective gloves in your dental laboratory?	Yes	No	
If you have protective gloves, do you use them while working?	Yes	No	Sometimes

All dental technicians who were in charge gave the permission for this investigation. Information about the presence of ventilation system have been collected by on-site inspection of the each laboratory (Fig. 2).

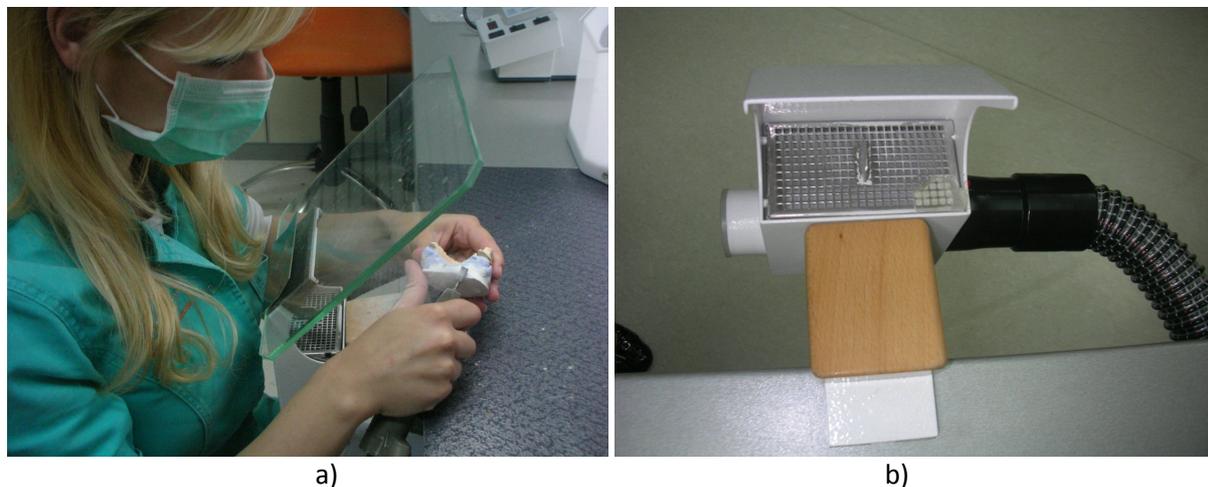


Fig. 2. Dental technician in work (a) and ventilation system (b) in one of the investigated dental laboratories

It was emphasized that the names of the laboratories and the names of the technicians would remain anonymous and that the information would be used in scientific purposes only.

OBTAINED RESULTS

The total of 54 dental technicians fulfilled the questionnaire and the obtained results showed the following:

- The average age of dental technicians was 39 years.
- There were 32 females and 22 male (Fig. 3).
- They were working in the dental laboratories for 19 years in average.
- None of the investigated laboratories had the optimal ventilation system.
- Three laboratories had the air dust aspirator. The technicians that had the aspirator gave us the information that they always use it when grinding.
- Protective eye-glasses, protective masks and gloves had all the technicians, while only (Fig 4):
 - 31 said that he/she always uses protective glasses,
 - 25 always uses protective masks and
 - 8 technicians always uses protective gloves.

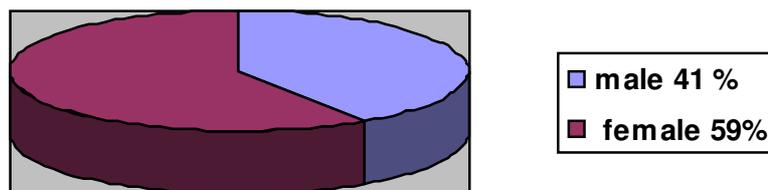


Fig. 3. The sex distribution of dental technicians

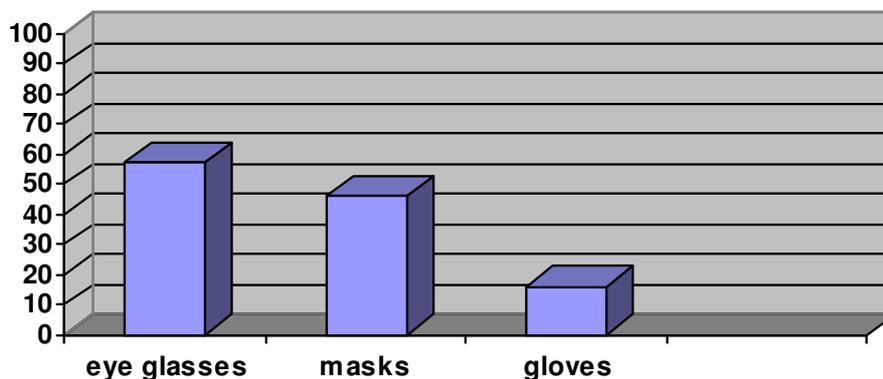


Fig. 4. The percent of technicians who are using the protective eye glasses, masks and gloves

DISCUSSION

Laboratory procedures and the exploitation of the dental materials involve some risks for the health of the dental technicians. Making fixed and removable dentures on the conventional way, despite all the advancement that had been made in recent years, remain hard and environmentally dirty procedure. Conventional way of manufacturing in dental laboratories includes "dirty technology". Sacrificial epoxy resin and wax patterns for removable or fixed partial denture frameworks have been fabricated [13, 14, 15], which entailed casting using the conventional method at a later stage. With recent innovations and improvement of the computer aided design and computer aided manufacturing (CAD-CAM) and layer manufacturing process such as selective laser melting (SLM), direct manufacture of removable and fixed partial dentures with lower risk for the health of dental technician is allowed [16, 17, 18, 19]. Not one laboratory included in investigation had CAD-CAM technology, nor SLM technology. In other words, in all ten laboratories fixed and removable dentures were manufacturing in conventional way.

There were slightly more female technicians in the investigation, but it was not found as significant in protective measures application.

The disappointing fact is that none of the laboratories had an adequate ventilation system. Nine laboratories had air conditioners that were intended for the apartments. They partially worked as air cleaners, but without possibility for exchanging the air in the laboratory with the fresh air. The dust aspirators (Fig. 5) were present only in 3 laboratories, but the technicians who had them said that they always used them.

The problem that there were no adequate ventilation system and dust aspirators was partly caused by the shortage of money. Oposite to the previous, all the laboratories had the protective eye glasses, masks and gloves, but the investigation showed that technicians did not always use them. That leads to the conclusion that the dental technicians were not well informed about the possible harmful effect if the protective measures are not undertaken. Articles related to this subject are very rare in scientific literature, probably because of the fact that the protective and preventive measures about the working conditions are determined by the law.



Fig. 5. The dust aspirator in one of the investigated dental laboratories

CONCLUSIONS

Required and legally obligated protective measures are not always completely performed. As a conclusion one can say that it is necessary to improve the performance of legally obligated protective measures to prevent environmental and health damage in dental laboratories.

Very important aspect is also the education of the dental technician about the risks for the environment and health that exist if the protective measures are not performed.

Also, introduction of new modern computer aided technologies in dental laboratories, such as CAD-CAM, that would highly lower the risks for the environment and health of dental technicians during the manufacturing of dentures.

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