

Evaluation of urinary mercury levels in dentists of Dentistry department of Ahvaz oil industry's health care, in 2010

Daghayeghi Amirhushang², Esharaf Hengameh¹, Dormiani^{2*}

1. Associate Professor of Endodontic, Shahid Beheshty College of Dentistry ,Tehran
2. Endodontics Resident, Shahid Beheshty College of Dentistry ,Tehran

* *Corresponding author email:* soheiladarmiani@yahoo.com

ABSTRACT: Background: Occupational exposure to dental amalgam, could exposes them to Inhalation of mercury vapor; If Mercury accumulation exceeds the allowed limit(overloads) in the body, their health would be at risk, that it is considered as a problem. Measuring urinary mercury is a sensitive and reliable method for determining the amount of exposure to that. The present study was performed with the objective of measurement urinary mercury in dentists of Dentistry department of Ahvaz oil industry's health care,with work experience more than two years, in 2010.In this descriptive-analytical and cross - sectional study, 37 dentists with work experience at work more than two years, were studied. Urine samples were collected in the considered day and a questionnaire containing questions about individual characteristics , such as age, work experience, number of teeth restored with Amalgam in the mouth, was completed. Urine samples were Analyzed using Atomic Absorption Spectrophotometry. In order to analyze the data, Corel indicators and Distribution were used, Descriptive statistics was used for data description, Kolmogorov-Smirnov test to investigate the distribution of the data and Spearman and Pearson correlation coefficients also were used to evaluate the amount of relationship (linear) between the variables.Also T-Test Analysis used in order to compare urine mercury levels between men and women ;and Analysis of variance used for comparison between various levels and groups. Analysis of variance was utilized with Tukey Post Hoc test and a Significance level of 0.05 was considered,for all statistical analysis procedures.The mean urinary mercury in dentists was 3.4 ± 2.2 micrograms per liter. No statistically significant correlation between urine mercury levels with variables such as : age, work experience, number of teeth restored with Amalgam, was observed.Based on the findings of this study, the mean urinary mercury Dentists, in dentists of Dentistry department of Ahvaz oil industry's health care, was lower than the Allowed job threshold(35 micrograms per liter). Among the studied variables (age, work experience, number of teeth restored with Amalgam) ,none had significant with urinary mercury levels .

Key words: Dental amalgam, urine analysis, dentist , Mercury toxicity

INTRODUCTION

Amalgam is the main material which is used for dental restoration yet and has been used and is over 150 years. Although this matter compared to tooth-colored restorations, in order to beauty , is located at a lower level, but is still used , as a restoration material , in the posterior teeth and especially is preferred in the areas which are under stress in the jaw. Success of amalgam fillings is attributed to some factors such as durability, sealing between restoration and tooth, easy operating steps and payment. In the recent years using amalgam because of the mercury in that,had been more cautious. Mercury Is involved in immune system disease, periodontal disease, cardiovascular disease , membranes Chronic eye, digestive system, nervous system disease and hormonal problems(2,3) . Other studies have also shown that chronic exposure to mercury, could lead to symptoms such as: insomnia, irritability, - increase the amount of saliva and loss of sensation (2-4). Dentists may expose to inhalation of mercury vapor in different stages of work. Peak exposure to mercury is during work, such as preparation, placement and removal of amalgam

restorations (5, 6). Dentist's individual characteristics (age, diet, work experience and number of restoration at the week), are factors which are involved in the body's intake of mercury(7-9). Various measuring methods was conducted, including assessment of mercury levels in blood, urine and respiratory air, to determine the relation between personal factors with the amount of dentist's exposure to mercury. Studies indicate that measuring urinary mercury is the most practical and the most sensitive method to demonstrate Mercury exposure (10, 11). According to this, the present study was performed with the aim of determining the concentration of mercury in urine of dentists of Dentistry department of Ahvaz oil industry's health care, in 2010 .

MATERIALS AND METHODS

The present study, was done by descriptive-analytical and cross - sectional method. Studied community Consists of dentists of Dentistry department of Ahvaz oil industry's health care. Persons entered the study ,whom at least, had 2 years of work experience in tooth restoration, and stated to work with amalgam.

Preparation biological samples (urine): After obtaining informed consent from the studied community, urine samples, urine samples of the dentists, were collected in the considered day and at the initiation of work time; because sampling during work, would effect on mercury levels. Urine samples in order to protect, were then brought to 1-2 using hydrochloric acid, was keeping in freezers - 20 ° C ,at the interval t between sampling and analysis. Urine samples analysis was done by Flameless Atomic Absorption Spectrophotometry in the Occupational Medicine Laboratory of, in the Industrial Medicine Center of Research Institute of Petroleum Industry.

Completing the questionnaire

The questionnaire was completed by the dentists. Questions considered in the questionnaire consisted: Name, gender, work experience and number of teeth which were restored By amalgam.

In this research the core indicators, distribution and descriptive statistics were used to describe the data, Kolmogorov- Smirnov Test to investigate data distribution, Pearson and Spearman correlation coefficients to study the amount of linear relationship between variables also were used. As well as to compare urinary mercury levels between men and women, t-test, and for comparisons between different levels and groups, analysis of variance with Tukey post hoc test, were used;and significance level of 0.5 was used for all the statistical analysis steps.

RESULT

Among 37 dentists of Dentistry department of Ahvaz oil industry's health care, 16 persons were female(43.2%) and 21 persons were male(56.8%). The data about age, work experience and number of amalgam restorations in the mouth of the dentist, is listed in Table 1.

Table 1. Descriptive information of demographic data; related to dentists of Dentistry department of Ahvaz oil industry's health care

Results	Average	Standard deviation	Minimum	Maximum
Variable				
Age(year)	42.5	7.5	27	59
Work experience(year)	11.5	6.5	3	30
Number of available amalgams	6.2	3.7	0	13

In each work shift,in the room, three dentists worked. The ventilation system were doors, windows, and ventilator. Average number of teeth, which were restored with amalgam in one day by the dentist, was about 5-7. Disposal of surplus amalgam was in radiographic fixing solution. No statistical significant correlations, observed between the mercury levels in the urine, with variables such as age, work experience, operating time and number of teeth with restored with amalgam. Although in men a significant correlation between the mercury levels and age, at the significance level of 0.5 was seen(P.V=0.03).Urine mercury levels in men and women had no significant statistical difference. Although in women it was somewhat higher(3.6 versus 3.3).By classification the work history variable to 5years groups, no statistically significant difference (total and according to gender), was observed in mercury levels between different classes. After classification number of restored teeth to 5members groups(3 classes), no statistically significant differences was seen between the mercury levels.

DISCUSSION

Due to occupational exposure, dentists are more exposed to mercury, and the most important route of exposure in these people, is the mercury vapor. Mercury vapor enters into the body through the lungs and is absorbed (10 and 12). Overload accumulation of mercury in the body, causes toxicity and adverse effects that the more is the accumulation, the symptoms would be more severe and more organs become involved. For this reason, the researchers measured the amount of dentist's exposure to mercury vapor due to amalgam at the dentistry work. These measurements included: experiments on mercury levels in urine, blood, plasma, nails and hair.

Many differences have been observed in the results of studies, that may be due to different study methods, or differences in the studied samples (blood, urine and plasma). Even in studies that identical factors are used (eg, urine), the results may be inconsistent, and as a result, it makes it difficult to interpret and analyze. Moreover, perhaps it is due to that, still there is not enough knowledge and information, about the factors which are involved in exposure to mercury (16).

In this study, mean urinary mercury levels in dentists of Dentistry department of Ahvaz oil industry's health care, were analyzed to measure the extent of exposure. Urine analysis method to determine the amount of mercury in body is a known method and its sampling is easier than blood sampling. In addition the urinary mercury concentration, reflects clearly primary chronic exposure to non-organic mercury which is the specially important in the case of studying exposure to mercury in dentistry (17 and 18). Mercury concentration in urine, is a sign of exposure to mercury in the past two to three months, so taking the samples in the sampling day, is valid enough (19).

Time to get a urine sample in the present study, like others studies was early at working time in sampling day (9).

Based on the results, the mean urinary mercury in dentists, was 3.4 ± 2.2 micrograms per liter, which was, less than the threshold limit (35 micrograms per liter). In Iran, in a study that was conducted in 2004, by Khamverdy et al, the mean urinary mercury in dentists of Hamadan, obtained 31.62, that compared to the results of this study, the number is very high.

Hosni Tabatabai et al, in 2006, announced the average urinary mercury of dentists City Tārin Tehran, to 3.1 ± 3.95 micrograms per liter, which is almost identical to this study. Also Akbari et al, in 2010, the mean urinary mercury dentists, achieved 9.26 ± 2.70 microgram per liter for general dentists and 9.13 ± 1.79 for restorative dentists. Significant reduction in urinary mercury levels of dentists, represents, better health environment, associated with mercury.

In this study, statistically significant correlation, between mercury levels in Urine and the work experience of the dentist, did not exist. Lack of relevance between work experience of a dentist, with urine mercury concentrations, is associated with the biological half-life of Mercury in the body (55 days). So, if with exposure do not occur too much, mercury exits the body and does not accumulate. In this study, no statistically significant correlation between mercury levels in urine, with variables such as age and number of teeth restored with amalgam, did not was observed. While in a study by Hasani Tabatabai et al, there was a significant relationship between dentist's age and the number of amalgam restorations in mouth with the urine mercury levels (7).

In a study by Khamverdy et al, the daily number of amalgam restorations had the most important role in determining the amount of mercury in dentist's urine [8]. Concerning the non-relevance between age and the number of amalgam restorations with the level of mercury in urine, the limited number of dentists could be noted. Performing researches similar to this study, with more samples and variables is necessary. However, it is recommended that dentists be evaluated biologically, in terms of the concentration of Mercury in the body. Measurement the amount of mercury vapor in the workplace could be helpful.

CONCLUSION

The mean urinary mercury in dentists of Dentistry department of Ahvaz oil industry's health care, was lower than the Occupational threshold (35 microgram per litre) Among the studied practical indicators (age, work experience and the number of teeth restored with amalgam), none had significant relationship with urinary mercury levels.

REFERENCES

- Akbari M, Velayati Moghaddam F, Ahmadi A. 2012. Factors effective on urinary mercury levels of dentists and restoration specialists of Mashhad in an one year time period. *Isfahan Dentistry School*, volume 8(7):652-661.
- Brownawell AM, Berent S, Brent RL, et al. 2005. The potential adverse health effects of dental amalgam. *Toxicol. Rev*; 24:325-327.
- Chopp GF, Kaufman EG. 1983. Mercury vapor related to manipulation of amalgam and to floor surface. *Oper Dent*; 8:23-27.
- Fung YK, Molvar MP. 1992. Toxicity of mercury from dental environment and from amalgam restorations. *J of Toxicology Clinical Toxicology*; 30:49-61.
- Gerstner HB, Haff JE. 1977. Clinical toxicology of mercury. *J Toxicol Environ Health*; 2:491-526.
- Hasani Tabatabai M, Golbabai F, Shariati B. 2006. Evaluation of urinary mercury levels of Tehran dentists and its influencing factors. *Dentistry journal, University of Medical Sciences and Health Services Tehran* ; Volume 19 (Num3):66-75.
- Jokstad A. 1990. Mercury excretion and occupational exposure of dental personnel. *Community Dent Oral Epidemiol*; 18:143-8.
- Kao RT. 2004. Human exposure to mercury is from three major sources: dental amalgams, fish consumption, and vaccines. *C.D.A. J*; 32:575-579.
- Khamverdy Z, Assari MJ, Maleki K. 2004. Evaluation of urinary mercury levels in dentists of Hamedan with work experience more than 4 yaers. *Islamic Dentistry Community Journal*; volume 16(2):42-48.
- Kishi R, Doi R, Fukuchi Y, et al. 1993. Subjective symptoms and neurobehavioral performances of ex-mercury miners at an average of 18 years after the cessation of chronic exposure to mercury vapor. *Environ. Res*; 62:289-302.
- Leinfelder K. 1993. Current developments in dentin bonding systems : Major progress found in today's products. *J Am Dent Assoc* ; 124 (5):40-42.
- Martin MD, Naleway C, Chou HN. 1995. Factors Contributing to mercury Exposure in Dentists. *J Am Dent Assoc* 126:1502-11.
- Morton J, Mason HJ, Ritchie KA, White M. 2004. Comparison of hair, nails and urine for biological monitoring of low level inorganic mercury exposure in dental workers. *Biomarkers*; 9(1):47-55.
- Nilsson B. 1986. Mercury in dental practice. II. Urinary mercury excretion in dental personnel. *Swed Dent J*; 10:221-32.
- Owell LV, Johnson GH, Xashar M, Bales DJ. 1994. Mercury vapor release during insertion and removal of dental amalgam. *Oper Dent*; 19:70-4.
- Powers JM, Sakaguchi RL, Craig RG. 2006. *Craig's Restorative Dental Materials*. 12th ed. Philadelphia, PA: MosbyElsevier; p. 255-9.
- Ritch KA, Eilmor WH, Macdonald EB. 2002. Health and neuropsychological function of dentist's exposed to mercury. *Occup Environ Med*; 59:287-293.
- Roberson TH, Heymann HO, Swift EJ Jr. 2006. *Sturdevant's art and science of operative dentistry*. 5th. Philadelphia, PA, Elsevier Health Sciences; p. 163-8.
- Xoshida M, Yamamura Y. 1982. Elemental mercury in urine from workers exposed to mercury vapor. *Inter Arch Occup Environ Health*; 51:99-104.