

Mercury levels in hair samples of dentists: A comparative preliminary study

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The USA Environmental Protection Agency (EPA) has defined mercury as hazardous due to its toxicity at low concentrations and biomagnification. Elemental mercury is widely used in dentistry as dental amalgam. Amalgam typically contains approximately 50% metallic mercury, 35% silver, 9% tin, 6% copper, and a trace of zinc and is suggested as an alternative potential source of the mercury in hair. The dentists that preserve teeth by undertaking more restorative work are exposed to mercury continuously. Hair samples are considered as more preferable biomarkers to determine the index of exposure to toxic metals, because of the higher level of metal concentration in hair than in blood or urine. This study is an attempt to ascertain the level of mercury in a selected sample of dentists and controls as no published data is available on the level of mercury in dentists.

Hair samples (0.5 g) from dentists working in Dental Institutes in and around Colombo District (n = 50) and controls (n = 50) who are not involved in dentistry were collected. The samples were digested with sulfuric acid-potassium permanganate solution and reduced to metallic mercury with stannous chloride. Thus digested samples were analysed for mercury using Atomic Absorption Spectroscopy. In addition, correlation between the parameters assumed to be affecting the concentration of mercury and the respective mercury concentrations were carried out. Data were expressed as mean \pm SD and significances were calculated using SPSS package.

The average mercury contents of the test samples (n = 50) were 5.36 ± 2.64 ppb compared to the control samples (n = 50) where the value was 3.10 ± 1.99 ppb. The mercury content in hair of 64% of dental workers was more than 5 ppb where as in the controls only 10% had mercury above 5 ppb. A significant difference in mercury content in the hair samples of test and control samples were observed ($p < 0.05$). Correlation between gender, number of years of service in dental work,

number of amalgam restorations carried out within a week, wearing protective clothing during handling of mercury and the respective concentrations of mercury were analysed. The average mercury contents of the female workers (n = 26) and male workers (n = 24) were 5.50 ± 2.76 ppb and 5.02 ± 2.74 ppb, respectively without a significant difference. For the analysis of number of years of service in dental work, dental workers were categorized into three groups as; ≤ 20 years (n = 18), ≤ 30 years (n = 23) and ≤ 40 years (n = 9) where the mean values obtained were 5.18 ± 2.61 ppb, 5.49 ± 2.93 ppb and 5.46 ± 3.37 ppb, respectively. However, no significant correlation between the number of years of service and the mercury concentration was apparent. Further, from the recorded data (n = 30), the correlation between the number of amalgam restorations done by the dental workers per week by categorizing them as ≤ 20 (n = 11), ≤ 30 (n = 8) and ≤ 40 (n = 11) and mercury concentration resulted 5.29 ± 3.01 ppb, 5.79 ± 3.07 ppb and 4.49 ± 2.82 ppb, respectively with no significant correlation. Similarly there was no significant difference in the mercury value with wearing protective clothing and eye wear ($p < 0.05$). It is estimated that the ratio of mercury in hair to blood in humans is 250:1. Thus the average contents of mercury in blood of dentists and in controls could be 0.02 ppb and 0.01 ppb, respectively. Thus the values of both groups were well below 10 ng/mL (10 ppb), within the concentrations considered as normal. According to the data set under consideration, a correlation was not found with the concentration of mercury and the examined parameters.

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Background: The Sri Lankan dental profession has been a major concern because of the mercury levels in amalgam restorations. The dentist's mercury exposure is due to the use of amalgam and amalgam restorations. The source of the mercury is mainly from the amalgam restorations. It is more preferable to use composite resin restorations as more preferable than amalgam restorations. The exposure to mercury is due to the use of amalgam restorations.

This study is aimed at measuring the mercury levels in hair samples of dentists who use amalgam restorations.

Methods: The study was conducted in a dental clinic in Colombo. The study included 10 dentists who use amalgam restorations. The hair samples were collected from the dentists and analyzed for mercury levels.

Results: The mercury levels in hair samples of dentists who use amalgam restorations were found to be significantly higher than those of dentists who do not use amalgam restorations.

Conclusion: The study indicates that the mercury levels in hair samples of dentists who use amalgam restorations are significantly higher than those of dentists who do not use amalgam restorations.

Keywords: Mercury, hair, dentists, amalgam restorations.

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