Research article

Evaluation of blood mercury levels and a few biochemical marker levels in obese car painters of Iraq

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ABSTRACT

Introduction and Aim: A greater total blood mercury level is associated with obesity; the present study sought to evaluate the association between blood mercury levels and other biological indicators related to.

Materials and Methods: The study population included 25 car painters and 25 healthy participants. The height and weight of each participant was recorded and their BMI calculated. Blood drawn from each participant was assessed for their serum levels of mercury and a few other biochemical markers such as TNF-α, MDA, Visfatin, Insulin, and Vitamin-D. The data obtained was subjected to statistical analysis.

Results: Compared to healthy controls, the mean levels of mercury in the blood as well as other biochemical indicators were found to be greater. On the other hand, the amount of vitamin D was discovered to be lower than average in the control group. A higher quantity of mercury in the blood was shown to be associated with abdominal obesity, as indicated by the findings.

Conclusion: Obesity increases the risk of mercury toxicity in car painters and is linked to higher TNF-α, visfatin, and MDA levels, as well as lower vitamin D levels.

Keywords: Mercury; obesity, inflammatory markers; car painters.

INTRODUCTION

Mercury is a metal element found to occur naturally in the earth’s crust. Mercury can be released into the atmosphere through natural processes that occur in soil and water, as well as through human activities such as the combustion of coal (in power plants and homes), the mining of metals, and the breakdown of products that contain mercury, such as fluorescent lamps, pharmaceuticals, and batteries (1). The majority of people are exposed to mercury through contaminated food sources, notably plant and fish products, which have a tendency to collect methylmercury. This is the manner in which the general population is exposed to mercury. Mercury exposure can have detrimental effects on a number of organ systems in humans, including the cardiovascular system, the neurological system, the endocrine system, and the renal system (1, 2). The direct effects that mercury has on a variety of human endocrine tissues, including the thyroid gland and the pancreas, are the reason that mercury is considered to be an endocrine disruptor (3). Furthermore, exposure to mercury has the potential to affect the metabolism of carbohydrates and lipids, which can result in increased oxidative stress and inflammation throughout the body. Because of this, there is a possibility that the chance of metabolic diseases developing in people is further increased (4). In recent years, a significant amount of study has been conducted to explore the relationship between mercury exposure and an increased likelihood of becoming overweight or obese. According to the findings of these research (5-9), mercury has been recognised as a possible obesogen.

Contrary to these studies, few reported no correlation between adiposity and overall blood mercury concentrations (10). Furthermore, limited studies focus on the pediatric population (11, 12). The objective of this study was to examine the correlation between blood mercury levels, obesity, and several biological markers including MDA, TNF, insulin, vitamin D, and visfatin in Iraqi car painters. All the participants were engaged in the automobile sector.

MATERIALS AND METHODS

The study population included 50 individuals, among which 25 were automobile painters and 25 random healthy non-painters. Based on weight (kg) and height (m), all the car painters included in the study were obese (BMI >30 kg/m², WHO (13)) which was calculated using the formula:

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\text{BMI}=\frac{\text{Weight (kg)}}{\text{Height (m)}^2}
\]

Blood (5 ml) collected aseptically from each of the participants was transferred into EDTA tubes. The serum obtained was subjected to determining the levels of mercury and other biochemical markers as given below.

Determination of mercury

We employed the gold–amalgam method to measure the total blood mercury concentrations using a Direct
Mercury Analyzer 80 (Milestone’s DMA-80 evo, Milestone Chemists, Italy). Each sample was centrifuged and 100 µL aliquots pipetted into the quartz sample boats and the absorbance measured at 253.7 nm as a function of mercury content.

RESULTS

Determination of biochemical markers

Using the ELISA technique, the levels of TNF, MDA, Visfatin, Insulin, and Vitamin-D were measured in the serum samples in accordance with the manufacturer's protocols (Sunlong Biotech®, China), which was same for all markers. Briefly, 50 µl of serum samples were added in wells of ELISA plates for 2 hr at room temperature. Then, 50 µl of detection antibody was added for 90 minutes, Followed by washing three times using a washing buffer. A spectrophotometer was used to measure the optical density of samples at 450 nm, and the standard curve was used to assess the concentration of samples.

Statistical analysis

The data was subjected to statistical analysis using the unpaired t-test, and the software GraphPad Prism 6 was employed (14).

Mercury concentrations in the study population

Fig. 1 displays the distribution of overall blood mercury concentrations among the individuals in the research. The average blood mercury concentration among car painters who are obese was 33.08 µg/L. On the other hand, the average value recorded in the group of healthy individuals was 6.547 µg/L.

Association between mercury concentration and biochemical markers

In this research study, participants dealing with overweight and obesity were found to have significantly higher mercury levels versus healthy controls ($P<0.0001$). However, the increase in the mercury levels was associated with other biochemical markers. As indicated by the results in Figs. 2, 3, 4, and 5 respectively, TNF, MDA, visfatin, and insulin levels were elevated. Conversely, the vitamin D level was lower than that of the healthy control group (Fig. 6).
DISCUSSION

Comparing the total blood mercury levels of obese car painters to those of a group of healthy persons is the focus of the current investigation. Moreover, the study investigated whether or not there was a connection between the growing prevalence of obesity and overweight and other biochemical markers. A number of studies that investigated the relationship between being overweight and having high levels of mercury in the blood have discovered a positive connection. In addition, a number of researchers have found that there is a correlation between the body mass index (BMI) and an increased likelihood of being overweight or having central obesity (15, 16). In the
adult population of Korea, the levels of mercury were already higher than average. The quantities of mercury found in hair were also shown to have a significant correlation with body mass index (BMI), according to research conducted in Russia. According to the findings of their research (7), high levels of mercury in hair are identified as being connected with an elevated risk of adult overweight and obesity.

Furthermore, several studies have investigated the potential correlation between mercury exposure and the development or exacerbation of obesity. Thus, the question of whether increased levels of mercury in the bloodstream and tissues have a role in or exert an impact on obesity is still a subject of debate. Obesity might impair the biliary excretion of methylmercury due to dysfunctional mechanisms and reduced levels of glutathione (17, 18). Consequently, methylmercury has the ability to build up in many organs and the bloodstream. The current study found that car painters who were overweight or obese had elevated levels of total blood mercury. There is limited research investigating the interrelationships between obesity, mercury exposure, and specific biological markers. The findings revealed significant associations between biological markers and the prevalence of obesity, as well as increased amounts of mercury in the bloodstream. The variation in fat distribution across genders might potentially be a significant factor. Sex hormones induce greater accumulation of visceral fat and less subcutaneous fat in males, resulting in observable physical distinctions between males and females. Studies have demonstrated that mercury tends to accumulate mostly in visceral adipose tissue, as opposed to subcutaneous adipose tissue (6).

CONCLUSION

Obesity heightens the likelihood of mercury poisoning in car painters and is linked to elevated levels of TNF-α, visfatin, and MDA, as well as decreased levels of vitamin D.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

REFERENCES


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