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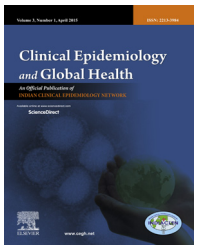

Original Article

Occupational stress among workers having exposure to lead

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ABSTRACT

Background and aim: Lead has been classified as a probable carcinogen, and ambiguity regarding its toxicity persists due to limited epidemiological evidences. The aim of this study was to investigate the association of occupational lead exposure and symptoms, which indicate malfunctioning in eye, digestive system, upper respiratory tract, chest and skin among men in a case control study.

Methods: Incident cases, which are occupationally exposed to lead ($n = 208$) and general healthy population controls ($n = 64$), were interviewed to fill a validated questionnaire for checking their health status. Body mass index (BMI) was also calculated. The cases consist of workers, who are employed in automobile repairing, tyre and tube maintenance, lead acid battery recycling etc. Comparison was done using t test and Mann Whitney's *U* test. Odds ratio was also calculated.

Results: The workers were having an increased prevalence of symptoms than normal healthy controls examined throughout this study. BMI was observed to decline continuously among workers with respect to increase in the years of exposure at workplace environment. This decrease in BMI was significant in comparison to healthy controls among group of workers having more than 15 years of exposure to their workplace environment. The symptoms studied throughout this study were also observed to increase in per cent frequency among workers with increase in exposure time.

Conclusion: Increase in the frequency of symptoms was observed among workers with increase in years of occupational exposure. BMI in workers was significantly declining with increase in years of exposure to work environment.

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1. Introduction

Lead is one of the most toxic heavy metals in the environment nowadays. It is abundant heavy metal, which is globally distributed, causes serious health effects, and is an important environmental toxin.[1] Human occupations related to lead and its compounds expose workers to such heavy metals and their ill effects. The exposure to lead causes mainly due to lead-related occupations like leaded gasoline, industrial process such as smelting of lead and its combustion, lead based painting, lead containing pipes, battery recycling, grids, bearing arm industry, pottery, pipes, boat building, pigments and printing of books, etc. On identifying its effects on health, its widespread use has been discontinued in many countries of the world. In several industries, it is still used vehemently in many sectors namely car repairing, battery manufacturing and recycling, refining and smelting, etc. Long exposure of lead also causes anaemia and an increased blood pressure mainly to old and middle aged people.[2,3] In pregnant women, an increased exposure can lead to miscarriage.[4] Severe damage to the tissues of brain and kidneys in both adults and children had been found associated with increased exposure of lead levels, which results in death.[5] A reduction in fertility results due to chronic lead exposure was reported in males.[6] Workers exposed to lead were found having an impairment in respiratory functions with elevated blood lead and zinc protoporphyrin concentration.[7] Lead does not have any physiological role in the body, and there is no threshold value for the level of lead in blood, below which its concentration can be considered as safe. Heavy metals including lead are also found in traditional medicines; hence a number of diseases have been reported due to consuming of traditional medicine.[8]

One of the major sources for lead poisoning in adults is by occupational exposure. An estimate made by the National Institute of Occupational Safety and Health (NIOSH) states that more than 3 million workers in the United States are potentially exposed to lead in the workplace.[9] Occupational exposure is the major concern and is also the main cause of lead poisoning.[10] Occupational workers such as, lead miners and smelters, plumbers and fitters, auto mechanics, glass manufacturers, construction workers, battery manufacturers and recyclers, firing range instructors, and plastic manufacturers are at risk due to lead exposure. Men involved in occupations such as welding and manufacture of battery recycle workers are also at a risk for lead exposure.[11] The children, whose parents are involved in the occupations, which expose them to lead at workplaces generally have dust containing lead with clothes or skin, which increases the chances of exposure in their children.[12] In addition to this, the other common places of occupations, where chances of lead toxicity are always a possibility are places, where works of lead–acid batteries or pipes, and metal recycling and foundries are generally taking place.[13] The other chance of lead exposure occurs through various ways such as inhalation, ingestion or skin contact. Lead exposure may also increase through direct contacts of lead or lead based compounds through mouth, nose and eyes and through cracks of skin. A total of 35–40% of inhaled lead dust in adults is deposited in lungs, and about 95% of that goes into the bloodstream.[14] The literature available on lead has studied mostly effects of its toxicity on human and other animal groups in haematological and genotoxic bases. However, no study is available to study the symptoms, but the current study focuses on. The study is designed to undertake survey and interview to examine the general account of health in workers, who are exposed to lead and involved in occupations such as automobile repairing, tire and tube maintenance, and lead acid battery recycling. This study can help making comprehensive diagnosis and adding up more symptomatology in the list of lead exposure–related symptoms. Besides this, the study thoroughly analysed the medical comorbidities in relation to the number of years of exposure. This study may also help to include broad range of symptoms during examination of patients, which generally come from the workplaces, where lead exposure is common.

2. Materials and methods

2.1. *Study population*

The study population consists of working men related to occupations at car garages, workshops, car repairing centres, lead acid battery recycle workers, tyre and tube repairing workers in the Aligarh region, which is a district of north Indian state of Uttar Pradesh and located at the coordinates of 27.88° N and 78.08° E.

2.2. *Ethics statement*

The study was approved by the Institutional Ethics Committee of Jawaharlal Nehru Medical College (JNMC), Aligarh Muslim University, India. An informed consent was obtained after discussing the objective of the study with participants.

3. Method

The study was designed to undertake an epidemiological survey regarding the medical comorbidity in workers, who are occupationally exposed to lead. A survey was undertaken among the workers exposed to lead by directly visiting to the car garages, workshops, car repairing centres, lead acid battery recycle workers, tyre and tube repairing workers. A medical report of general health status was taken by using a medical *pro forma*.

A total of 393 lead exposed participants and 75 normal general population controls were initially contacted for examining their general health status. Many confounding factors were taken into consideration including smoking, drug usage, pan and guthka chewing and alcohol usage, which reduce the final eligible participants among the workers to 208 and control participants to 64. Smokers, tobacco chewers or alcohol drinkers were not included in this study so to rule out any external factor, which may lead external induction of the variables included in the study. All participants were divided into five groups (groups 1–5) depending upon the years of exposure to occupational environment. In order to reduce or nullify age-related effects, the comparison (normal and healthy) group was chosen, in a way that it includes men