Awareness on Lead Poisoning among College Students

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Authors’ contributions

This work was carried out in collaboration among all authors. Author MVS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors VVP and RG managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Lead is a highly toxic heavy metal. Chronic exposure to lead levels is responsible for significant health effects, particularly in children. Prevention remains the best option for reducing childhood lead exposure, however the knowledge, attitudes and practices to lead exposure is mainly in developing countries. The aim of this study is to create awareness on lead poisoning among college students. A questionnaire survey was conducted among college students through an online survey planet link. A total of 165 students have responded to the survey, a validated questionnaire consists of 20 questions distributed to assess their knowledge and awareness on lead poisoning among the college students. 67% of the participants were aware of lead poisoning and 33% not aware of it. 60% of the participants agreed that water contains lead. The responses have been taken and results were statistically analysed. Seminars and workshops may be conducted to create awareness on the risk factors of lead poisoning in the community.

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1. INTRODUCTION

Lead is a heavy metal which is widely distributed throughout the environment. Children’s are particularly affected by lead poisoning because their bodies are in an ongoing state of growth and development [1]. Globally it is important and dangerous to an environment which is filled with chemicals, the properties of lead are softness, malleability, ductility, poor conductivity etc. Lead is non-degradable and continuous usage of lead leads to various health problems. When lead is affected in the human body there will be almost no function in it. Lead is highly persistent in the environment as it is a continuous product used in every country. Lead is a toxic product which affects many organs and tissues such as the central nervous system, cardiovascular system and it has no beneficial effects. Usage of lead leads to serious problems [2]. Lead also can affect fetal growth, psychological problems in teenagers, learning disability, hearing, and speech problems etc. Lead is more effective to the infants in which they have low lead levels in their body[3]. Lead is a toxic substance which affects many organ systems, among them developing erythrocytes, the kidneys, and the nervous system [4]. The WHO Organization said that 120 million people are overexposed to the lead, 99% of the people are in serious condition. The higher level of leads are affected by the children in various countries.

The sources of the lead exposure are mainly lead related products, lead based paints, and lead contaminated foods and beverages. The best way to reduce Lead exposure in children, avoid usage of lead related toys, lead contained paints[5]. Lead may be released as particles into the atmosphere or as dissolved compounds in water. Lead is also released from natural sources such as windblown dusts and forest fires. Lead poisoning can be screened by determining the level of lead in finger prick blood samples. Changes in the bones of the children can be checked by using X-ray. There are techniques that have been used to check for lead poisoning in blood cells (10 μg/dL for adults and 5 μg/dL for children of the whole blood). Since children are in the stage of development, they are more susceptible toward lead poisoning. Wherever contamination is feasible, regular checkup and lead levels of blood have to be set [6].

The major sources of children’s exposure to lead are: 1) lead added to petrol in many countries, 2) lead from an active industry, such as mining , 3) lead-based paints and pigments, 4) lead solder in food cans , 5) drinking-water systems with lead solder and lead pipes, 6) such as herbal and traditional medicines, folk remedies, cosmetics and toys,7) lead in electronic waste (e-waste) these are the various sources of the lead [7]. Previous studies on cancer biology, nano materials, herbal products [8,9,10,11,12,9], have motivated me to pursue this current research which is useful to our community. The aim of the study is to assess the knowledge and create awareness on lead poisoning among the college students.

2. MATERIALS AND METHODS

This survey questionnaire was conducted among college students through an online survey planet link. A total of 165 students have responded to the survey. Participants have been randomly enrolled in the online survey through survey planet. A validated questionnaire consisting of 20 questions was distributed to assess their knowledge, and awareness on lead poisoning among the college students. The responses have been taken and results were statistically analysed. This study is approved by the Institutional Review Board, Saveetha Dental College.

3. RESULTS AND DISCUSSION

57% of the participants were aware about the heavy metal poisoning and 43% were unaware of it (Fig. 1). 67% of the participants were aware of the lead poisoning and 33% not aware of it (Fig. 2). By recycling the battery lead has been dispersed to the environment - 83.6% of the participants agreed and 16.4% of the people disagreed to this (Fig. 3).

The parents working at lead related companies can carry lead particles through their hair, skin, clothes which was agreed by 71% of the participants and 27% of the participants disagreed with it (Fig. 4). 34% of the participants said that lead can be removed by water and 67% of the participants said no (Fig. 5).

87% of the participants were aware and 13% were not aware that the exposure of lead to pregnant women will affect the foetus (Fig. 6).
72% of the participants agreed that toys contain lead and 28% said no (Fig. 7).

The lead poisoning can damage the brain which was agreed by 63% of the participants (Fig. 8). 72% of the participants said lead exposure >80 ug/dl is dangerous to health (Fig. 9). 28% of the lead was excreted through urine, 9.9% of the lead is excreted through feces and 62% of the participants said both (Fig. 10). Lead poisoning will affect the immune system for which 84.6% of the participants agreed and 15% of the participants disagreed (Fig. 11). 59% of the participants agreed that food contains lead and 42% said no (Fig. 12). 75.6% of the participants said that lead can cause cancer and 24.4% participants disagreed (Fig. 13).

80.6% of the participants said that lead poisoning causes unconsciousness which leads to death and 19.4% of the participants disagree with it (Fig. 14). 71% of the participants agreed intake of diet food decreases the absorption of lead poisoning 29% disagreed (Fig. 15). 43% of the participants said that root and tuber contain lead and 57% of the participants disagreed (Fig. 16). 60% of the participants were aware that water contains lead and 30% disagreed (Fig. 17). 67% of the participants are aware of the lead dust and 33% are not aware (Fig. 18). 85% of the participants agreed that paints contain lead and 15% disagree with it (Fig. 19).

In previous literature the author mentioned that even our daily consuming products, vegetables and rice also contain 63% of lead in it, meat 8%, fish 7% and milk 7%. In a previous study the author also said that soil also contains some amount of lead which is approximately 6% [13]. 95% of the children in Kabwe of them are affected by high lead level >10mg/dl and 50% of the children are affected by low lead level >45mg/dl. By comparing the previous literature the research has been done with the lead related diseases and the awareness about the lead toxicity. In previous articles the author said that most of the childrens and their parents are affected by lead related diseases for various reasons which are similar to our study [14]. The level of lead in the blood should be > =100 microgram [15]. The previous study said the health effects associated with elevated blood and bone lead levels are reductions in hyperactivity, shortened concentration spans, poor performance at school, anaemia, violent or aggressive behavior, and lowered lifetime achievements. Many of the health effects of lead are irreversible [16] In a previous study author had mentioned that awareness about the implications of lead poisoning is spread by the World Health Organization and other international health organizations, many countries are attempting to decrease lead exposure by reducing the usage of lead contaminated products[17]. The author also said that nowadays, lead poisoning is seen in developing countries, but it still represents a major environmental problem in certain areas [18]. The previous articles said, some symptoms that children with BLLs >45 μg/dl may complain of headaches, abdominal pain, loss of appetite, or constipation or they may be completely asymptomatic. Children displaying clumsiness, agitation, or decreased activity and somnolence are presenting with premonitory symptoms of central nervous system (CNS) involvement that may rapidly proceed to vomiting, stupor, and convulsions [19]. The previous articles explained that lead also accumulates in soft tissue, the liver being the largest storage site, and is stored in the kidneys, pancreas, ovaries, spleen, prostate, adrenal glands, brain, fatty tissue, testicles, heart, and skeletal muscle. It appears that lead concentrations in soft tissue remain similar throughout one’s lifetime[20].

![Fig. 1. Pie chart depicts percentage distribution of responses on awareness of the heavy metal poisoning. 57.6% are aware (Violet) and 42.4% are unaware (Blue)](image-url)
Fig. 2. Pie chart depicts percentage distribution of responses on awareness of lead poisoning. 66.7% are aware (Violet) and 33.3% are unaware (Blue)

Fig. 3. Pie chart depicts percentage distribution of responses about awareness on battery recycling plants and industries disperse lead into the environment. 83.2% of the participants were aware (Violet) that Battery recycling plant and point preparing industries disperse lead into the environment and 16.8% of the participants were not aware (Blue)

Fig. 4. Pie chart depicts percentage distribution of responses about awareness on parents who are working at lead related industries carrying lead home by their hair, shin, clothes. 71.4% of the participants were aware (Violet) that parents who are working at lead related industries carry lead home by their hair, shin, clothes and 27 of the participants were not aware (Blue)
Fig. 5. Pie chart depicts percentage distribution of responses about awareness on removal of lead by water. 34% of the participants were aware (Violet) and 67% of the participants are not aware (Blue)

Fig. 6. Pie chart depicts percentage distribution of responses about awareness on exposure of lead to pregnant women affecting the fetus. 87% of the participants were aware (Violet) and 13.2% participants were not aware (Blue)

Fig. 7. Pie chart depicts percentage distribution of responses about awareness on toys contains lead. 72% of the participants were aware (Violet) and 28% of the participants were not aware (Blue)
Fig. 8. Pie chart depicts percentage distribution of responses about awareness of lead poisoning damaging the brain. 83.1% of the participants were aware (Violet) and 17% of the participants not aware (Blue)

Fig. 9. Pie chart depicts percentage distribution of responses about awareness on exposure of lead is dangerous. 72.2% of the participants agreed (Violet) and 29% of the participants disagreed (Blue)

Fig. 10. Pie chart depicts percentage distribution of responses about awareness on lead excretion. 28% agreed that lead is excreted through urine (Violet), 9.9% agreed that lead passes through faces (Blue) and 62.1% said both (Green)
Fig. 11. Pie chart depicts percentage distribution of responses about awareness on lead poisoning affects the immune system, 85% of the participants agreed (Violet) and 15.4% of the participants disagreed (Blue).

Fig. 12. Pie chart depicts percentage distribution of responses about awareness on foods containing lead. 59% of the participants agreed (Violet) and 42% disagreed (Blue).

Fig. 13. Pie chart depicts percentage distribution of responses about awareness on lead causing cancer. 75.3% of the participants were aware (Violet) and 25% of the participants were not aware (Blue).
**Fig. 14.** Pie chart depicts percentage distribution of responses about awareness on lead poisoning causes seizures unconsciousness and death. 81% of the participants agreed (Violet), 19.2% disagreed (Blue)

**Fig. 15.** Pie chart depicts percentage distribution of responses about awareness on intake of healthy diet food can decrease lead absorption, 71.3% of the participants said yes (Violet) and 29% said no (Blue)

**Fig. 16.** Pie chart depicts percentage distribution of responses about awareness on roots and tubers containing lead. 43% of the participants said yes (Violet) and 57.2% said no (Blue)
Fig. 17. Pie chart depicts percentage distribution of responses about awareness on water containing lead. 60% of the participants were aware (Violet) and 40.1% of the participants were not aware (Blue).

Fig. 18. Pie chart depicts percentage distribution of responses about awareness on lead dust. 67.3% of the participants agreed (Violet) and 33% of the participants disagreed (Blue).

Fig. 19. Pie chart depicts percentage distribution of responses about awareness on lead paints found in decorated houses. 85% of the participants were aware (Violet) and 15.4% not aware (Blue).
4. CONCLUSION

To summarize, most of the college students have a lack of adequate knowledge about lead poisoning and it has to be addressed immediately. A large proportion of students agree that usage of leads affects the growth of children. Hence measures need to be taken to make the students aware of lead poisoning and its disadvantages to lead a good healthy lifestyle.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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