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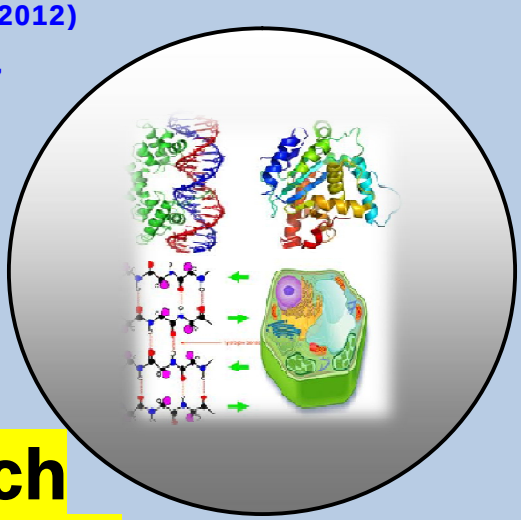

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Assessment of Lead Toxicity Awareness among Battery Charging Garage Workers of Jimma Town, Southwest, Ethiopia

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ABSTRACT

The paper has focused on assessing the awareness of lead toxicity among battery charging garages in Jimma town, Southwest, Ethiopia.

The research method employed in this research was the survey method. The data was collected using primary multiple data gathering instruments such as structured questionnaires, unstructured interviews, personal observations and secondary data by consulting literature sources including scientific journals, chapters of books, conference report papers and websites.

The results of this study revealed that the vast majority of workers at garages in Jimma town do not have any knowledge about the health effects of lead in the battery. It ascertained that the workers are disposing the diluted acid containing lead as well as old lead acid batteries carelessly with little concern (if at all) to their health and environment. The result also gave some concrete evidence regarding the role played by the car battery charging garages in the emission of lead into the environment. Finally, this study unearthed a painful truth that no governmental authority showed a concern to this way of free emission of lead to the environment. Therefore, to tackle this serious challenge stringent environmental regulation with law enforcement has to be exercised to use better disposal of effluent from battery charging garages. Polluters must also know the environmental cost of their battery charging garages and treated according to polluter pay or precautionary principles. Moreover, the general public has to be aware of it and all concerned organizations and governments have to work hand in hand to minimize the environmental pollution of battery charging garages.

Key words: Lead Toxicity, Battery Charging Garages, Jimma Town, Southwest and Ethiopia.

INTRODUCTION

In Ethiopia, although there are numerous small and medium industries which used lead based raw materials that may pose health risks to workers, there are no workplace regulations for lead exposure (Yalemsew Adela et al 2012).

Lead is command industrial metal that has become wide spread in air, water, soil and food. It is naturally occurring element that has been used almost since the beginning of civilization. Studies have shown that the body lead levels of modern humans are about 500times higher than those of pre-industrial time (Heimich F.Joe,2007; M.K.C. Sridhar et al 2001). Lead is uniquiluos in the environment as a result of its natural occurs and its industrial uses or anthropogenic activities for instance, in the year 2000, the cumulative industrial age anthropogenic global production of lead was 235 million(Majid Mohammad Hasein and Mohammad Saber Tahrani,2006; Bull Health Organ, 2000; Tong S et al 1996; Elizabeth Olivares,2013). It is considered one of the greatest concerns among the known toxic metal in the environment (Puckett, J. et al. 2002).

Lead is the number one environmental pollutant all over the world causing health hazards to humans and animals (Herman Sunil D'Souza et al 2003). In humans, it can be absorbed through then digestive tract. The lungs and skin where the observation depends on the age and adults absorb approximately 10% while children absorb up to 40% in ghosted lead.

After absorption lead enters the blood where 97% is taking up by the red blood cells and half-life dead of lead in the red blood cells is 2 – 3 weeks **(**Timbrell John A, 2000) due to its deposition in bones and teeth.

Lead is where as measures to abate exposure to lead have been instituted in developed nations, reports that reveal the relative contribution to elevated lead in the soil and occupational exposure are scarce in Jima town (Yalemsew Adela, et al. 2012).

One of the significant sources of environmental contamination is found to be associated with uncontrolled lead-acid –battery recycling operations and the most highly exposed adults are those who work in these places. Legislations governing lead acid battery handling, recycling and repair operations appeared un-available in Ethiopia. The informal sector involved in the charging and repair operations of lead acid battery appear to dispose used batteries together with domestic wastes or store them in and around work place environments. Matters of special concerns related to lead acid battery includes careless disposal of leaded materials (discarded plates, terminals, battery cases), or while batteries and incineration of batteries on open and freely accessible to grazing animals and the public and environmental health (Fite Tamene, 2008). Furthermore, most lead concentrations that are found in the environment are a result of human activities due to the application of lead in gasoline an unnatural lead cycle can take place.Lead compounds enter the environment through exhaustive of car (Manishi Tripathi, 2005). The research finding of the study Tijan saydi, Teklu garage, Mohammed kedir, Solomon fita, Hafiz A/Jihad, Asirat hayile, Ababba debele, Laqech zeleke, Zakir A/Fita, Hasan A/Digga, China garage, Ricardo Masino, Mohammed A/raya, Awol garage and Abdulsemad Husen garages and car battery charging were selected. To assess the awareness of lead toxicity among battery charging garages and to provide recommendations for improvement of clearly identified problems too.

MATERIAL AND METHODS

Study area description

The study was conducted in Oromia National Regional State in Jimma town. The Town is situated 347 km far from Addis Ababa to the south-western direction. The total population of Jimma town is 240, 000. Jimma town has two woredas Viz. woreda one and woreda two. Jimma is the largest city in southwestern Ethiopia. It's a special zone of the Oromia Region and is surrounded by Jimma Zone. It has a latitude and longitude of 7°40′N 36°50′E. The town was the capital of Kaffa Province until the province was dissolved. Herbert S. Lewis states that in the early 1960s it was "the greatest market in all of southwestern Ethiopia. On a good day in the dry season it attracts up to thirty thousand people. Currently, the people of Jimma are depending on trade (various products) and producing/selling coffee and wood products.

Sample size

The objective of the paper is to investigate awareness of toxicity of lead among garages workers in Jimma town. To conduct such kind of research, one obviously needed to collect primary data through field study from each and every responsible person at garage. Sampling techniques was introduced to select target garage workers.

In Jimma town, there are 23 legal licensed battery charging garage. Out of this 23 garage, 15 of them are selected randomly for this paper.

Data collection instruments

Both qualitative and quantitave study, design method have been used in the study. The qualitative study method refers to any kind that produces findings that has no statistical procedure or other means of quantification.

Qualitative is not exclusive in this study as the study also use, to limit extent, the quantative in combination with triangulation approach. Beyond the quantitative, this research also adopted the case oriented approach by selected fifteen garages in Jimma town on assessment of lead toxicity awareness among battery charging garage workers in the study site.

Research design

The study adopts data triangulation approach as different source of data were used. Methodology of the data collections was conducted using survey method and questionnaires to triangulate the information

Survey data

Methods employed in this study are survey method. These methods were chosen for its low cost and sustainability to observe several cases.

Documentary evidence

In addition to the primary, secondary sources of data such as publication, books, study, research, study documents and reports in the area of assessment of lead toxicity awareness among garage projects have been referred and consulted.

Procedure and data collection

Major topics are formulated on the objectives of the study while questions and checklist also developed. This was important to ensure that the study participants freely expressed their views and feeling about the garages roles in creating awareness of lead toxicity.

Response rate

The researcher was able to conduct all survey method and collected questionnaires with the study participants according to the schedule. There was flexibility in asking questions and study participants were freely to response accordingly, clarification and follow up on answer were immediately.

The researcher also cross-checked the information collected using other methods such as secondary data collection. The researcher took note of the need to get the views, opinions and above all the voice of lead toxicity on the assessment among garage .

Lastly, the researcher did documentary analysis of published and unpublished literature in order to obtain more information about garages role on assessment of lead toxicity awareness among battery charging garage workers in Jimma town. The literature obtained, examined the criteria of the garages, as well as the process and implementation of the awareness arrangements. This provided the researcher with more comprehensive overview of the role of garages on assessment of lead toxicity awareness among garage.

Data sources

The research method employed in this research is the survey method. This method was chosen for its lower cost and its sustainability to observe several cases. The data used in this paper includes both primary and secondary data. Primary data was collected form responsible person at garage were interviewed using structural questionnaires.

Secondary data was gathered from secondary sources including; books, journals, publications, study documents, research, annual reports and other relevant quantity. In addition to this personal observation by the researcher was used in enriching the data use in the study.

Data collection method

As indicated above multiple data gathering instruments was employed to collect data for the study. Structured questionnaires, unstructured interviews, personal observations, document analysis were used in this study. The base for preparation of final questionnaires was the pilot survey undertaken including 15 person at garages from Jimma town which are responsible person at each garages.

The questionnaire include only closed end question. The question was prepared only for responsible person at the garages. The researcher supervised and managed interviewed of selected garages in Jimma town, using unstructured questionnaires. After gathering the data, relevant statically methods of analysis were used in order to come up with the appropriate result. The statically tools like ratios, percentages, arithmetic means, cross-section tabulation and descriptive statically methods, time series analysis were employed in condensing the data for further purpose of analysis and interpretation.

DATA PRESENTATION, ANALYSIS AND DISCUSSION

This chapter deals with data presentation, analysis and discussion collected from primary source according to the arrangement of the research questions that guide this study. As indicated in the methodology part, data collected through questionnaire and interview will be systematically presented, analyzed and discussed in the following sections.

Characteristics of Respondents

As revealed in Table 1, of the total sample for the garage, 13(86.67%) of the respondents are male and 2(13.33%) of them are female.

Description		Number of respondents	Percentage of respondents
sex	male	13	86.67
	female	2	13.33
	total	15	100
age	18-35 years	6	40
	36-45 years	8	53.33
	Over 46 years	1	6.67
	total	15	100

Source: Survey data, 2014

Table 1. Respondents by Sex and Age.

As indicated in Table 1, out of the total respondents, 6(40%) of them are in the age range of 18-35 years, 8(53.33%) of respondents are in the age range of 36-45 years and only 1(6.67%) of respondent is in the age range of over 46 years. From this, the researcher understood that the majority (93.33%) of the respondents categorized under the productive age group (18-45) and only 6.67% of the respondents have an age of over 46 years.

Description	Number of respondents	Percentage of respondents
Illiterate	-	-
Primary (1-8)	2	13.33
Secondary (9-10)	10	66.67
Preparatory	1	6.67
Diploma	2	13.33
BA degree and above	-	
Total	15	100

Source: Survey data, 2014

Table 2. Sample Respondents by Level of Education.

As indicated in Table 2, from the total respondents, 10(66.67%) are high school (9-10), 2 (13.33%) respondents are primary (1-8), 2(13.33%) respondents are Diploma holders and 1(6.67%) respondents are preparatory. This shows that the majority of the responds have low level of education. Only 13.33 % of the respondents have diploma.

Concerning lead acid battery services

Description		Number of respondents	Percentage of respondents
Do you know the components of car battery?	Yes	4	26.67
	No	11	73.33
	Total	15	100

Source: Survey data, 2014

Table 3. Know-how on car battery components.

As can be seen in Table 3, of the total sampled respondents 4(26.67%) reported that they know the components of car battery and 20(13.3%) respondents said that they do not know the components of car battery. This implies that majority of the workers of garage in Jimma town accomplish their work only depending on their past experience.

Description		Number of respondents	Percentage respondents
Does the garage provides refilling and recharging service?	Yes	15	100
	No	0	0
	Total	15	100
Do you recycle the car battery?	Yes	0	0
	No	15	15
	Total	100	100

Source: Survey data, 2014

Table 4. Service delivered by the garage.

As can be shown in Table 4, 15(100%), all respondents reported that they provides refilling and recharging service. This implies that the entire garage under consideration gives the service of refilling and recharging services.

Generally, the life span of battery depends on the type of battery and capacity of the car's electric regulatory system. If good conditions are maintained, battery can serve at an average for about three years.

Awareness of impact of lead on human health & the environment

Lead occurs naturally in the earth's crust, usually as lead sulphide PbS (galena). However, as a result of human activity, in the atmosphere nowadays lead is found mainly as $PbSO_4$ and $PbCO_3$. Lead is malleable and relatively low melting point, and therefore it has been used since ancient times to transport water, and found with copper Cu in metal alloys e.g. in small quantities within brass (with zinc Zn) and bronze (with tin Sn).

Indeed lead poisoning is probably the oldest recorded industrial (occupational) disease. Lead has been used, as an organic alkyl compound - tetraethyl lead - to prevent 'knocking' in petrol (gasoline) engines by increasing the 'octane value' of the fuel. Lead is generally resistant to corrosion - but it will dissolve weakly in acid (low pH) water, or even in water of a very high pH.

Table 5. Awareness of toxicity of lead acid battery.

Description		Number of respondents	Percentage respondents
Do you know that the diluted acid solution has human and environmental effects?	Yes	3	20
	Some what	10	66.67
	No	2	13.33
	Total	15	100
Is there any person who has faced health problems related with contacts of lead acid battery?	Yes	9	60
	No	6	40
	Total	15	100

Source: Survey data, 2014

As indicated in Table 5, out of total sampled respondents, 3 (20%) of them know the human and environmental effect of diluted acid solution, 10(66.67%) responded that the know some it and they said that also it is not poising. The remaining respondents 2(13.33) responded as if they do not have any awareness of the effect of diluted acid solution on human and environment. The vast majority of workers at garages in Jimma town do not have any knowledge about the health effects of lead in battery they are handling every day and every hour for years. It is also ascertained that the workers are disposing the diluted acid containing lead as well as old lead batteries carelessly with little concern to their health and environment. The effects of lead poisoning are well documented. Lead exposure can impact almost every one of the body's organs or systems. The most common systems affected are the nervous and reproductive systems, with the brain and kidneys being the most impacted organs. While the effects of lead on adults are serious, the impact it has on children is much more severe. Exposed children often experience effects on mental and physical growth and can develop blood anemia, harsh stomach aches, muscle weakness and brain damage (Rebocho J.,2006).Infants and unborn children are at greatest risk when exposed to lead, with symptoms like miscarriage, premature birth, decreased mental ability in the infant, learning difficulties and reduced growth in young children. Exposure in large quantities can ultimately cause death in children of all ages (National Research Council, 1993). In adults, occupational exposure is the main cause of lead poisoning. People can be exposed when working in a variety of fields that produce or use lead-containing products including smelters and battery recycling operations. Parents who are exposed to lead in the workplace can bring lead dust home on clothes or skin and expose their children (Carol A.R., 1996). Environmental lead contamination also causes serious effects in the ecosystems that encompass those environments. When released into the air, lead can travel for long distances before settling. Since lead does not naturally break down, lead accumulations on surface soil can remain for up to 2,000 years, sometimes wiping out entire populations of micro-organisms. Plants are impacted by lead through absorption and the settling of lead on leaf surfaces, and animals also experience severe side effects from lead exposure – most often in the central nervous system, like in humans. Animals exposed regularly, like grazing animals, experience the most serious effects often leading to death.

Blood lead levels worldwide have been declining sharply since the 1980s, when leaded gasoline began to be phased out. In those countries that have banned lead for food and drink cans and have banned leaded gasoline additives, blood lead levels have fallen sharply since the mid-1980s. Yet in developing countries, numerous examples of mass poisoning exist because of the release of lead into the environment from industrial operations including smelters and battery recyclers.

CONCLUSION

The role of lead-acid battery charging and repairing facilities cannot be underestimated in reducing uncontrolled emissions of lead to the environment.

Ironically, the sector serves as a source of lead in the environment. Many of these operations occur in residential areas placing public health at risk.

In addition, many discarded batteries remain in and around homes, readily accessible to young children. In view of the general lack of awareness of the hazards of lead from discarded batteries, many battery repair and recycling personnel demonstrate poor occupational health practices, including non-use of protective devices (gloves, masks or respirators, safety glasses) and constant exposure to battery wastes and acids, just to mention a few. Effluents from these sites often enter the general drainage system, especially during heavy rainfall, situations which maximize the impact of the sector on the surrounding environment and the health of inhabitants.

This study revealed that the vast majority of workers at garages and workshops in Jimma town do not have any knowledge about the health effects of lead in the battery they are handling every day and every hour for years. It also ascertained that the workers are disposing the diluted acid containing lead as well as old lead acid batteries carelessly with little concern (if at all) to their health and environment. The result also gave some concrete evidence regarding the role played by the car battery charging garages and workshops in the emission of lead into the environment. This study also unearthed a painful truth that no governmental authority showed a concern to this way of free emission of lead to the environment. One may put under question the awareness level of the experts at the government offices such as the Jimma town Council, the Health Bureau as well as the Environmental Protection Agency on the environmental effects of lead. Even the licensing authority, the Trade and Industry Bureau should have put knowledge about the health effect of lead and disposal facility for acidic solution containing lead and old lead acid batteries as one of the criteria to issue the license. In any case, this is a wake-up call to all concerned authorities, governmental and non-governmental alike, environmental activists and able individuals.

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