LEAD EXPOSURE ASSESSMENT BETWEEN TWO LEAD WORKER GROUPS IN EL-BEIDA, LIBYA

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Abstract: Objective: The main goal of this current research study was to determine the blood lead levels in two lead worker groups in El-beida city, Libya.

Materials and Methods: This study was carried out on males working in radiators repairing (25 workers) and batteries repairing (25 workers), compared with the control group (30 healthy males).

Results: Blood lead levels significantly increased in the radiators and batteries repairing worker groups (p<0.01). A significant correlation was found between the duration of exposure and the blood lead levels of both groups, while there was an insignificant correlation between the age and the blood lead levels.

Conclusion: Blood lead levels of the radiators and batteries repairing worker groups were elevated. Blood lead levels correlated with the duration of lead exposure in radiators and batteries repairing workers, but not with their ages.

Keywords: Lead (Pb), lead exposure, blood lead level, radiators and batteries repairing workers, El-beida, Libya

I. INTRODUCTION

Lead is a highly toxic metal that has been used by humans for over 2000 years and is one of the most poisonous metals known due to its wide-ranging effects on multiple body systems and processes that are necessary for normal function (Pattee et al., 2003). The renal, gastrointestinal, reproductive, central nervous and peripheral nervous systems, and the biosynthesis of heme are all adversely affected by lead (Verity, 1997). The lead absorption by lungs depends on several factors in addition to concentration, these include: i) Volume of air inspired per day, whether the lead is in particle or vapor form, and, ii) Size distribution of lead-containing particles. Only a very minor fraction of particles over 0.5 μm in maximal external diameter are retained in the lung but are cleared from the respiratory tract and swallowed. The gastrointestinal absorption of lead is influenced by a large number of factors of which age and nutrition are of particular importance (Matte et al., 2000).
Written agreement consents of each worker were obtained. Subjects were categorized into three groups, as follows:

**A. Male Control Group:** This group consisted of 30 apparently healthy male volunteers, their ages ranged between 18-55 years (mean ± SD: 31±11.84), who were not exposed to lead.

**B. Radiators Repairing Worker Group:** This group included 25 individuals, their ages ranged between 22-54 years (mean ± SD: 34±10.59), who were working in radiators repairing in the industrial area, and exposed to lead by inhalation and dermal contact during repairing. The duration of exposure ranged between 2-13 years (mean ± SD: 8.0 ±2.95).

**C. Batteries Repairing Worker Group:** This group also comprised of 25 individuals, their ages ranged between 17-52 years (mean ± SD: 29±10.44), who were working in lead-acid battery repairing shops. The duration of exposure ranged between 3-14 years (mean ± SD: 8.8 ±2.76).

Blood lead levels were determined by “LeadCare II-Blood Lead Test System” (Figure 1). This test is considered to be appropriate for field studies due to its cost-effective, easy-to-apply, portable features, and reliable method (Pineau et al., 2002). Samples were collected by using disposable injectors. 50 μl of blood samples were drawn from each worker by using capillary tubes and then transferred into vacuum blood tubes containing ethylenediaminetetraacetic acid (EDTA). The samples were mixed by gently rocking the tubes. The tubes were left to stand upright for a minute. The prepared samples were deposited onto electrode strips and then inserted into the analyzer. Within three minutes, the results appeared on the screen in μg/dl. The results were analyzed statistically by using the unpaired student’s t-test to compare blood lead levels between worker groups and control group. The correlation coefficient (r) was used to determine the relationship between the blood lead levels and the ages or duration of exposure between worker groups.

**Table-1 Blood lead levels (mean±S.D., range) of the radiators and batteries repairing worker groups, and the control group.**

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<tr>
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<tr>
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<td>17.4±5.81**</td>
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<td>(5.5-13.0)</td>
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*p<0.01

Blood lead levels increased significantly in the radiators repairing (22.7±6.69, *p*<0.01) and batteries repairing (17.4±5.81, *p*<0.01) workers as compared with the control group (8.3±1.34). The mean blood lead levels of the radiators and batteries repairing worker groups were relatively higher than the mean blood lead levels of the control group. Table 1 shows the results mentioned above.

Figures 2 and 3 below show the significant correlation between the duration of exposure and the blood lead levels in radiators repairing (*p*<0.01) and batteries repairing (*p*<0.01) worker groups. While, there was a non-significant correlation between the age and the blood lead levels in the worker groups and the control group.

**III. RESULTS**

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Fig. 3. Correlation coefficient (r) between the blood lead levels (µg/dl) and the duration of exposure (year) in batteries repairing worker group.

IV. DISCUSSION

In general, the standard analysis of blood lead levels performed in laboratories around the world remains the most useful index of recent exposure (Kim et al., 2013). The US centers for disease control and prevention intervention level reported a higher blood lead levels if it is ≥10 µg/dl (WHO, 1995), and considered a cause for public health concern (Williams et al., 1998, Mathe et al., 2000, Mehdi et al., 2009 and Al Khalidy et al., 2012). All working groups show a significant correlation between the blood lead levels and the duration of exposure in radiators and batteries workers. These results are consistent with other studies (Matte et al., 2000, Mehdi et al., 2009 and Al-Khalidy et al., 2012). All working groups showed a non-significant correlation between ages and blood lead levels, as the individuals who included in this study, were adults, not children or elderly.

V. CONCLUSION

In conclusion, blood lead levels were elevated in both worker groups. Blood lead levels correlated with the duration of lead exposure in radiators and batteries workers, but not with their ages.

VI. CONFLICTS OF INTEREST

We hereby declare that there are no conflicts of interest regarding the publication of this research study.

VII. ACKNOWLEDGMENT

We would like to express our appreciation and thanks to all the participants in this research study. We would also like to thank the entire staff at Ras-Lanuf Medical Laboratory for their co-operation and helping us in the laboratory working. Finally, we appreciate everyone who supports us.

VIII. ETHICS

All participants provided written permission and consent before collecting data to conduct this research study.

IX. REFERENCES


