

Lead absorption among people living in Baghdad city

The results of nine studies conducted on lead absorption among people living in Baghdad city show that the mean PbB among those groups studied were various (range between 56.6 ± 24.7 and 9.5 ± 4.1 ug/100 ml), but they were all below the normal limit recommended by the WHO. One group has a high level of PbB, but still within the acceptable limit. Although the results of PbA concentrations varied according to the characteristics of the studied areas, the mean PbA concentration in Baghdad city was within the acceptable limit (2.8 ± 2.0 ug/m³). However, there was a significant correlation between PbB and PbA ($r=0.81$). It could be concluded that the level of PbB among people living in Baghdad city is still within the accepted limit.

Introduction

Lead is an ubiquitous pollutant in air, soil and water. It is bluish-grey, soft, malleable and a heavy metal that can be easily casted, moulded or extruded. It has a specific gravity of 11.3, a melting point of 327°C and a boiling point of 1,525°C. There is evidence that this element has been in use for about 6,000 years¹. Lead concentration in the biosphere is increasing rapidly since the beginning of this century due to the increase in industrialisation and introduction of leaded gasoline.

Huge amounts of lead are currently produced annually. The world production of lead during 1971 was 5.5 million tons, the main producers being Australia,

USA, Mexico and Canada². Forty per cent of lead is used as a metal, 25 per cent in alloys and 35 per cent in chemical compounds³.

Lead was the most common cause of poisoning in industry⁴ and the oldest recorded occupational disease⁵. However, it is still one of the most prevalent environmental hazards⁶, because it appears as dust or fumes in the atmospheric air of the workplace and the community environment.

Lead dust or fumes enter into the body primarily by inhalation and ingestion if the particles are less than 0.75 μ in diameter. Penetration through the skin occurs, only, with organic compounds. The rate of its absorption is influenced by the type, severity and duration of exposure, as well as age, sex, personal habits... etc.

The main important source of lead in the environment is the combustion of petrol containing lead. Oil refineries, battery manufacturing, paints and painting industries are, also, other important sources.

The increase of environmental lead pollution has focused serious attention on its possible harmful effects which result from the dissemination of the metal into

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TABLE 1

MEAN + SD OF PbB AND PbA FOR STUDY GROUPS				
Study Groups	No of Workers	PbB ug/100 ml	No of Samples	PbA ug/m ³
		56.3 ± 24.7	28	266.3 ± 107.9
GR1	108	23.6 ± 6.7	24	16.0 ± 6.3
GR2	97	16.3 ± 4.0	20	14.2 ± 5.4
GR3	145	16.9 ± 9.2	5	4.6 ± 1.1
GN1	100	15.1 ± 2.5	10	2.9 ± 2.1
GN2	146	13.7 ± 4.2	—	—
GN3	97	13.2 ± 4.2	22	2.8 ± 2.0
GN4	629	10.2 ± 4.2	2	2.0 ± 1.3
GN5	49	9.5 ± 4.1	—	—
GN6	40	—	—	—

(-) data not available

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the general environment through human activity. Several studies on lead pollution and its effect on the health status were carried out in many countries^{7,8}. In Iraq, the problem of environmental lead pollution has been recently studied⁹, but no study has been carried out yet on lead absorption among Iraqi people. Such a study is very important as it could determine the magnitude of the problem in populations at risk from environmental lead pollution. This initiated a plan to carry out several studies in this direction on different groups and the findings are summarised and discussed in this paper.

Material and methods

This study is based on the results obtained from nine studies (seven published) carried out in different work areas. Three of these studies were carried out on workers at direct risk from lead, which included battery workers (GR₁), painting workers (GR₂) and petrol station workers (GR₃). The other six studies were done on workers and children (age six-12 years) who were not directly at risk from lead - community groups. These are dairy product workers (GN₁), outdoor traffic policemen (GN₂), blood donor

workers (GN₃), children aged six-12 years (GN₄), indoor traffic policemen (GN₅) and office clerical people (GN₆). The population of these studies and the air samples collected represent different geographical locations of Baghdad city.

Lead levels in blood (PbB) and in air (PbA) were determined by spectrophotometer equipped with burner and air-acetylene flame.

Student-t test was used to test the difference between two means. Analysis of variance and F-test were used on the original raw data to test the effect of different variables on the mean values of different parameters. The level of significance (P) is less than 0.05.

Note: Although the erythrocyte a-amino-lavulinic acid dehydratase activity was measured in all of these studies and the haemoglobin level was estimated in some of them, the results of only PbB and PbA will be presented and discussed here.

Results and discussion

Table 1, shows the mean PbB and PbA of the groups. The mean PbB of the risk groups (GR₁, GR₂, GR₃) and community groups (GN₁-GN₆) are below the normal level suggested by the WHO in 1968¹⁰ except for GR₁ which although slightly high, is

still within the acceptable normal limit. A significant difference in the mean PbB has been found between the risk groups and the community groups. Among the community groups living in the centre of Baghdad, the mean PbB level (15.8 ± 4.5 ug/100 ml) was significantly higher than the level in people living in the suburb areas of Baghdad (12.7 ± 3.0 ug/100 ml), industrial areas (12.4 ± 2.7 ug/100 ml) and rural areas (8.8 ± 2.0 ug/100 ml). There was no significant difference between the mean PbB of the male and female risk groups, but the PbB level was significantly higher in boys (13.7 ± 4.5 ug/100 ml) than in girls (12.6 ± 3.7 ug/100 ml) in the community groups. No significant effect of age or years of service were found in the mean PbB of both groups. However, there were significant differences in the mean PbB level of both groups when tested for cigarette smoking or alcohol drinking.

Regarding lead in the air (PbA), the upper acceptable limit of atmospheric lead concentration varies according to the characteristic of the studied areas. The mean PbA concentration in Baghdad city was 2.8 ± 2.0 ug/m³ which is within the acceptable limit. This, however, is less than the levels reported in many large cities. Meanwhile, the PbA concentration in the centre of Baghdad city was 5.8 ± 0.8 ug/m³ which is still below the upper limit proposed by the European Economic Community. This level is significantly higher than the level recorded in the suburbs (2.9 ± 0.4 ug/m³), industrial (2.2 ± 0.2 ug/m³) and rural areas (0.4 ± 0.1 ug/m³). However, it should be mentioned that the static sampler used for PbA estimation was operating continuously for three days and therefore, our results do not represent a

monthly median level. Nevertheless, there was a significant correlation between PbB and PbA in general ($r = 0.81$).

Conclusion

From all these studies, we can conclude that the levels of PbB among people living in Baghdad city (except in the centre) are still within the safe permissible limit, while those among people living in the centre of the city indicate an increased lead absorption. High PbA concentrations have been recorded in the centre of Baghdad city and the level in the residential areas tends to exceed the permissible limits. The effect of the leaded industry on the atmospheric lead concentration is negligible compared to exhaust emitted from the vehicles using leaded gasoline.

Legislation to prohibit or, at least, to reduce the amount of lead additive in petrol has to be considered seriously. Since lead is emitted from various sources, preventive measures should be directed towards these sources. Health education of the community about the injurious effects of lead is important.

Acknowledgement

I would like to thank those who helped me in conducting these studies.

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