



HEALTH ASSESSMENT IN OCCUPATIONALLY EXPOSED POPULATION TO INORGANIC LEAD

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ABSTRACT. The regular medical control established by law in professional lead exposure provides a number of investigations required for workers. Our study has included 97 subjects, occupationally exposed to inorganic lead. Clinical examination, blood tests and urine tests were made to all 97 subjects. The study shows that most subjects have increased values of lead in blood, beyond the limit tolerable organic. Urinary concentration of delta-aminolevulinic acid - an indicator of biological effects, has increased, which correlates with a high absorption of lead. Also, creatinine is not particularly important in lead intoxication, being normal or near normal in most cases. Analysing haemoglobin we have found that only a low rate of subjects had normal levels of haemoglobin, which entitles haemoglobin determination as a marker useful in assessing long-term exposure to inorganic lead. Regarding the clinical symptoms we have found that many subjects have at least one symptom related to intoxication / high absorption of inorganic lead but most of them having no symptoms, although elevated sanguine lead was recorded.

Keywords: lead, intoxication, occupational, exposure

INTRODUCTION

Regular medical examination in occupational exposure to inorganic lead is based on legislation that requires performing clinical and laboratory investigations (Szasz, 2008).

Studying a group of subjects occupationally exposed to inorganic lead, some of them proved to be usefulness in early detection and accurate assessment of inorganic lead intoxication cases. Also, the relationship between values indicated by these tests, clinical and paraclinical status are very important in lead intoxication (Szasz, 2008) but there are no guidelines in order to show what indicator is better in early identification of inorganic lead intoxication.

MATERIALS AND METHODS

In our research we have included 97 subjects in a non/ferrous factory which were clinical examined. Also, blood tests and other tests like delta-aminolevulinic acid were made.

Clinical examination was performed by occupational medicine specialists, with particular emphasis on occupational history.

Biological sampling were carried out under hygienic and ethical rules by a unit authorized and approved for this purpose and the tests were performed with modern medical equipment, in terms of internal and external quality control - atomic absorption spectrophotometer, automated hematology, biochemistry and urine analyzers.

These clinical examinations and tests have been accompanied by recognition of technological process by the occupational doctor to accurately assess risks and harms for workers (Szasz, 2008).

Statistical processing of data was performed using EpiInfo and MicrosoftExcel2007 software.

RESULTS AND DISCUSSIONS

Regarding gender, men accounted for the entire group, due to the very hard working conditions in the factory.

Regarding to experience at work the study shows that 21.65% of subjects have very little experience - less than one year, 12.38% between 2-10 years and a major proportion, almost 65.98% have a considerable length, of over 10 years

Regarding the number of intoxications per employee it can be seen that a significant number of subjects, 39.18% , suffered of inorganic lead intoxication over the years.

It is noted that most subjects have had between 1-5 intoxication (figure 1).

According to WHO classification on the relationship between exposure and biological effect of the 97 subjects, 34% had mild exposure, 34% having a moderate exposure and 26.8% having excessive exposure, with values of sanguine lead over 100 μ g / 100 ml. Thus, most cases are between 40-100 μ g lead/100 ml (figure 2).

The study also shows that only three subjects have a value of sanguine lead under <40 μ g/100 ml, considered below the intoxication.

Urinary concentration of delta-aminolevulinic acid (Δ -urinary ALA) - an indicator of biological effect, has slightly / moderately increased to 55.91% of cases - which is correlated with a slightly higher lead absorption / moderate at 11 83% of cases found large increases in delta-aminolevulinic acid, which correlates with a much higher uptake of lead, and 32% are not exceeded normal values of delta-aminolevulinic acid (table 1).

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Table 1

The analysis of urinary Δ -ALA		
Δ -ALA in urine	Subjects	%
< 8 mg/l	30	32.26
8-20 mg/l	52	55.91
> 20 mg/l	11	11.83
TOTAL	93	100.00

Table 2

Analysis of symptoms / syndromes		
	Subjects	%
With symptoms	43	44.33
Without symptoms	54	55.67
TOTAL	97	100

According to data obtained in this study, creatinine is not particularly important in these intoxications, so it can be used more as a 'wake-up call' on the administration of chelating substances in intoxication with inorganic lead.

Thus, 63.16% of cases have normal creatinine under 1.1 mg/100 ml, 34.74% slightly higher. However, large amounts over 2 mg/100 ml were just in only two cases of the studied lot (figure 3).

Regarding to hemoglobin values, it has usually changes after a longer exposure and soak in the body. Given the great age of the workplace and that workers were not rotated to other departments with less exposure to inorganic lead we found that 80% of them have hemoglobin levels below 10%, 15.79% between 10 -12% and only 4.21% had normal levels of hemoglobin, which entitles the determination of hemoglobin as a marker useful in assessing long-term exposure to inorganic lead (figure 4).

Regarding the clinical symptoms we have found that 44.33% of subjects have had at least one symptom related to intoxication / high absorption of inorganic lead and 55.67% showing no symptoms, although elevated BLL (blood lead level) record, what is less suggestive of the risk assessment of inorganic lead intoxication or severity, only on a general clinical examination (table 2).

The syndromes detected due to lead are: asteno-vegetative syndrome - 14.43% of the cases, anemia syndrome - only 3.09% of cases, pseudo-rheumatismal syndrome - 10.31% of cases, digestive syndrome - only 4.12% of cases, peripheral nerve syndrome - only 1.03% (figure 5).

In contrast, hypertension and liver disorders may suggest an interrelation with exposure to lead, but that cause-effect relation cannot be fully established because of this multifactorial determinism.

Regarding lead concentration in blood, most cases are between 40-100 μ g/100 ml, so beyond tolerable organic. However, over 26% of workers had values over 100 μ g/100 ml, with no major signs of intoxication, although these are described in medical literature (Szasz, 2008, Cocărlă, 2008).

Urinary concentration of delta-aminolevulinic acid (Δ -urinary ALA) is slightly / moderately increased in 55.91% and in 11.83% of cases there are large increases in delta-aminolevulinic acid, without any symptom, unlike the data presented in medical literature (Szasz, 2008, Cocărlă, 2008).

Creatinine has no particular relevance in these intoxications, although this test is provided as required by applicable law on the occupational exposure to inorganic lead (Szasz, 2008, Cocărlă, 2008).

Low hemoglobin values recorded in the vast majority of subjects entitles hemoglobin determination as a marker useful in the assessment of long-term exposure to inorganic lead.

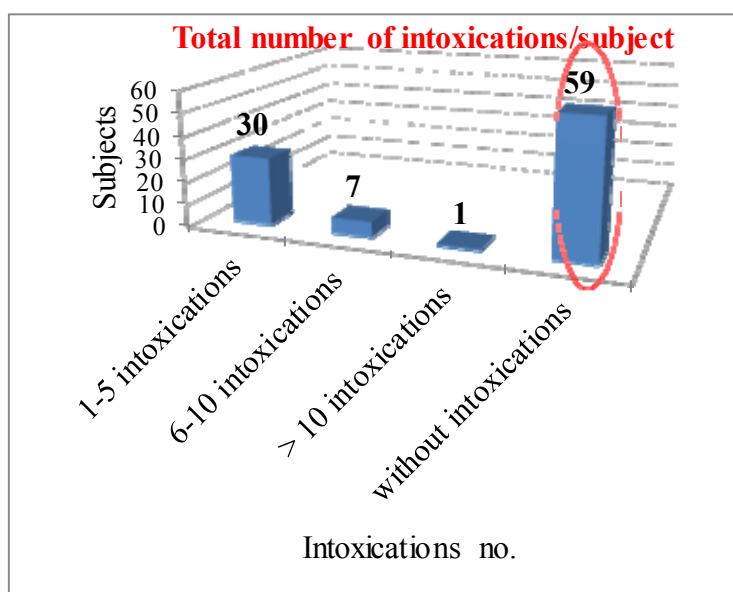


Fig. 1 Lead intoxication distribution

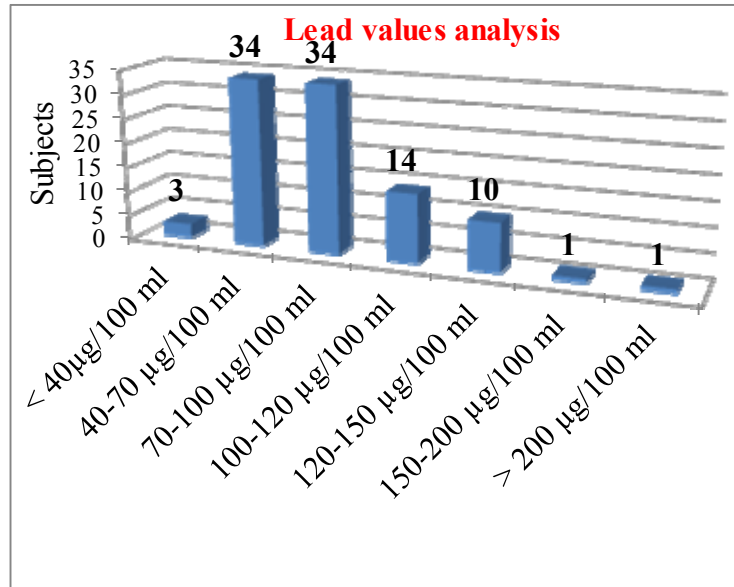


Fig. 2 Analysis of lead concentration in blood

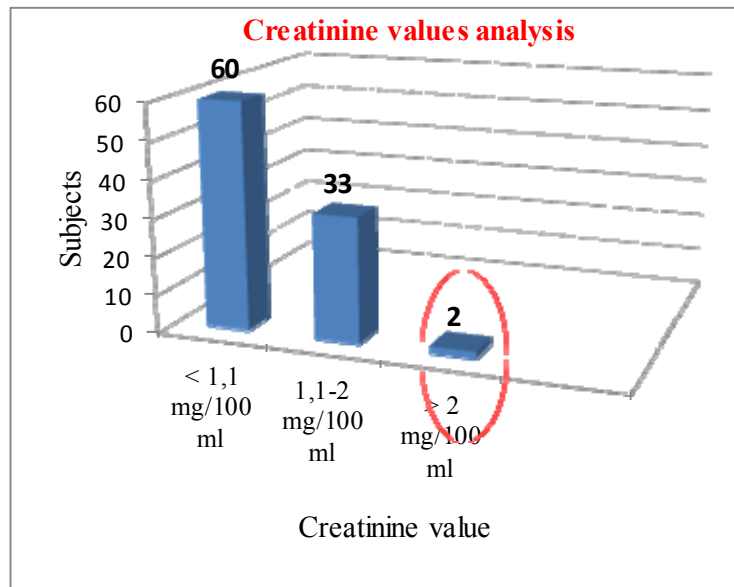


Fig. 3 Creatinine values analysis

Most lead exposed workers showed no symptoms during regular medical examination even though they had laboratory values indicating an increased absorption of lead or lead intoxication

The characteristic syndromes of classical descriptions of inorganic lead intoxication are present in small and very small proportions.

CONCLUSIONS

Occupational exposure to inorganic lead of the study group had resulted in 39.18% of cases the occurrence of inorganic lead intoxication.

Most of the subjects have had more than one intoxication.

Regarding lead concentration in blood, most cases are between 40-100µg/100 ml, so beyond tolerable organic.

Urinary concentration of delta-aminolevulinic acid (Δ -urinary ALA) shows slightly / moderately increased in 55.91% of cases and in 11.83% of cases there are large increases in delta-aminolevulinic acid, so it can be used as a good indicator in early diagnosis of inorganic lead intoxication.

Creatinine has no particular relevance in studied lead intoxications.

Only 4.21% had normal levels of hemoglobin, the others having varying degrees of anemia, which entitles the determination of hemoglobin as a marker helpful in assessing the long exposure to inorganic lead.

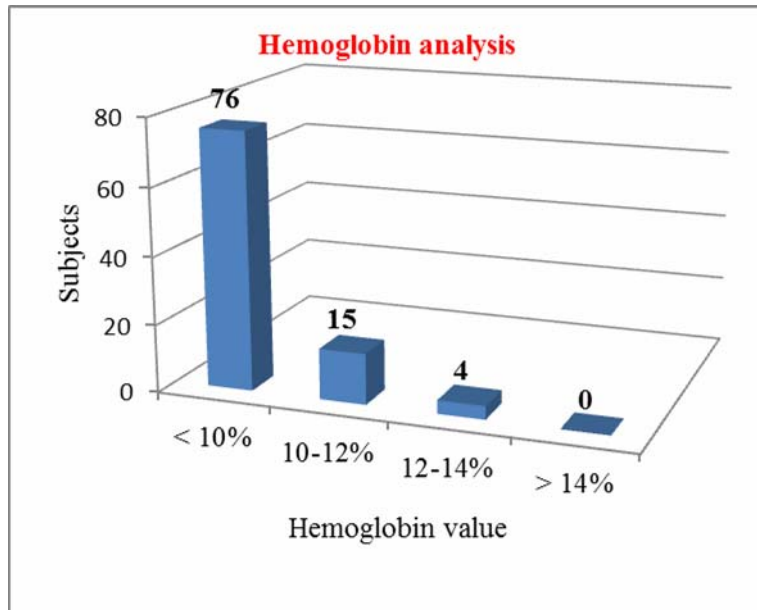


Fig. 4 Hemoglobin analysis

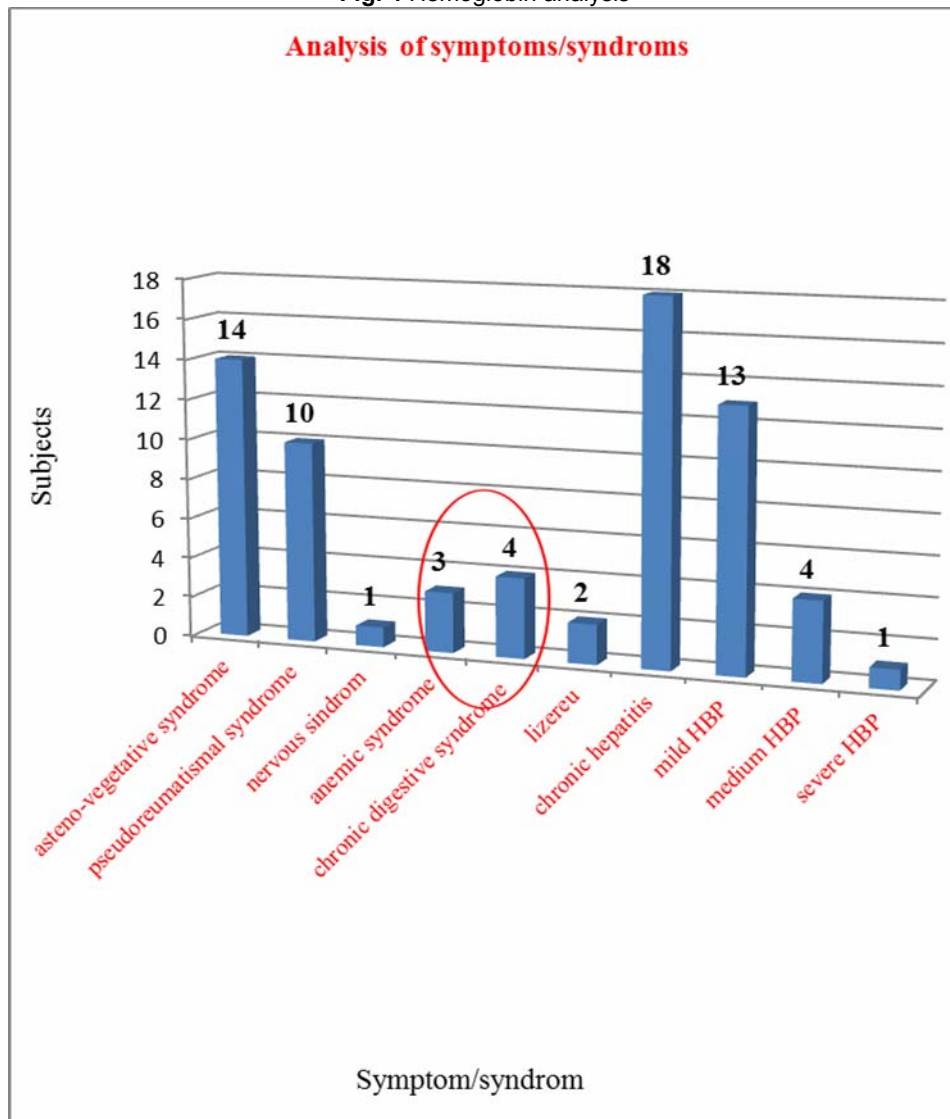


Fig. 5 Analysis of symptoms / syndromes

Most lead exposed workers showed no symptoms during regular medical examination even though they had laboratory indicating an increased absorption / inorganic lead intoxication, being a less specific indicator in early diagnosis of inorganic lead intoxication.

Asteno-vegetative syndrome, anemia, pseudoreumatismal syndrome, digestive syndrome and peripheral nervous syndrome described in the classic are present in small and very small proportions in the studied group, also being a less specific indicator in early diagnosis of inorganic lead intoxication.

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