

JOURNAL

OF THE

FACULTY OF MEDICINE

BAGHDAD

CONTENTS

Basic Research

- ☆ A circadian Variation of Cyclophosphamid Toxicity to Rabbit Bone Marrow. Basil M. Yahya, A. H. Al-Jewary, K. B. Ibrahim and R. A. Ahmad 5
- ☆ Studies on the Distribution of 14 C-B-Naphthoflavone-A ligand of the Ah-receptor in the Fetuses and Maternal Tissues of Pregnant Mice. Ezdihar A. Hassoun 11

Clinical Investigation and Case Report

- ☆ Occurrence of a Separate Nerve Fascicle in Human fetal Irochlear Nerve. Ghanim Y. Mustafa 21
- ☆ The Pathology of Orbital Tumours. (A Retrospective Study). A. S. Alhashimi, T. Al-Saleem and N. Alash and N. Hasso 31
- ☆ Bronchial Carcinoma in Iraq. Nazar B. Elahassani 37
- ☆ Rheumatic Fever in Iraqi Children. F. T. Al-Rawi and A. Al-Ani 47
- ☆ A Therapeutic Trial of Nitrofurantoin Versus Nitrofurantoin Propantheline for Urinary Tract Infection. Rakan Yehya Mohammad-Ali, T. K. Al-Hasso, B. M. Yehya and R. A. J. Ahmad 55
- ☆ Light and Electron Microscopic Study of Renal Biopsies in the Adult Nephrotic Syndrome in Northern Iraq. Khalid Abdulla, M. J. Al-Habbal and D. Krajci 63
- ☆ Ovarian Teratoma with Peritoneal Gliomatosis. Followed up to 18 Years. Nazar Al-Nasiri, M. S. Amin and K. Kuba 75
- ☆ Waardenburg's Syndrome in an Iraqi Family. Faisal H. Al-Huwaizi 81
- ☆ Lung Cancer in Iraq: Analysis of 576 Cases. F. A. Al-Alusi 87

Epidemiological Study

- ☆ Lead Absorption in Petrol Filling Station Workers in Baghdad City. Hikmet Jamil, D. J. Al-Timimi, S. I. Al-Ghabban and N. Qasim 95
- ☆ Tumours of the Minor and Major Salivary Glands. (Analysis of 225 Cases). Nawal I. Alash and T. Al-Saleem 103

J. Fac. Med. Baghdad - 1987 Vol. 29 No. 1
LEAD ABSORPTION IN PETROL FILLING STATION WORKERS IN BAGHDAD CITY

Hikmet Jamil⁽¹⁾, Dhia J. Al-Timimi⁽²⁾, Saad I. Al-Ghabban⁽¹⁾ and N. Gasim⁽³⁾

(1) Dept. of Community Med., Coll. of Med. Uni. of Baghdad.

(2) Section of Clinical Pathology, Coll. of Med., Uni. of Baghdad.

(3) Dept. of Community Med., Coll. of Med. Mustanserriah Uni.

دراسة نسبة امتصاص الرصاص في دم العاملين في محطات تعبئة البترول في مدينة بغداد
الخلاصة:

تم دراسة نسبة امتصاص الرصاص في دم العاملين في محطات تعبئة البترول في مدينة بغداد وقورنت النتائج مع نسبة امتصاص الرصاص في دم المتبرعين بالدم لدى مصرف الدم في بغداد (كمجموعة سيطرة)، احدى بنظر الاعتبار العوامل المؤثرة على ذلك. لقد وجد ارتفاع معنوي في مستوى الرصاص (القيمة المعنوية اقل من 0.01) والخصائص معنوي في فعالية الانزيم ALA-D (القيمة المعنوية اقل من 0.01). كما تبينت الدراسة ان مستوى الرصاص في دم العاملين في محطات تعبئة البترول واطىء وضمن الحدود المقبولة.

SUMMARY:

MATERIAL AND METHODS:

Lead absorption among petrol filling station workers was investigated. The results were compared with control subjects. The effects of different variables were also studied. Blood lead concentration (PbB) was significantly elevated ($P < 0.01$) with significant reduction in Delta-aminolevulinic acid dehydratase activity (ALA-D) ($P < 0.01$). The findings revealed that the level of exposure was low in such profession.

INTRODUCTION:

Lead is used widely in petroleum industry which has leaped into second place after storage battery industry as a consumer of lead (1). The

possibility of lead intoxication occurring among workmen in different countries as a result of distributing commercial leaded gasoline to service stations or from dispensing gasoline at the conventional service station pumps or among the general public as a result of using leaded gasoline as a motorfuel, has been widely and intensely investigated with indication that no such intoxication occur (2).

In Iraq the use of leaded gasoline has been started for more than 25 years ago. It was highly increased during the last years due to the rapid increase in the number of Vehicles (3).

This leaded gasoline was considered to be the main cause for increasing the concentration of lead in the Iraqi cities (4). Hence, people directly exposed to such material are expected to have the highest lead concentration in their blood (5). Therefore, the present study was carried out to throw some light on the degree of lead absorption among workers in petrol filling stations and the danger of intoxication in such profession. The study also concentrated on the different variables which could have an effect on blood lead level as age, sex, smoking, alcohol drinking, and length of service.

MATERIAL AND METHODS:

One hundred fifty one workers (145 males and 6 females) employed in 28 petrol filling stations distributed in Baghdad City were investigated. Ninety - seven male blood donors were also investigated as a control group. None of the controls had previous exposure to lead or his profession deals with leaded materials.

Blood samples were obtained by venipuncture and transferred to heparinized tube for PbB, ALA-D and Haematological study.

Blood lead measurement was done by Atomic absorption Flame spectrophotometry (pye Unicamp, Atomic absorption Spectrophotometer, Series No. 2900). Extraction of lead from the whole blood was done by organic solvents (MIBK and APDC), using three different concentra-

tions of lead standard solutions (25, 50 and 100 ug/100 ml.) for calibration. All specimens were analysed in duplicates (6). ALA-D activity in whole blood was determined by the recommended colorimetric method of Burch and Siegel (7). while Hb and PCV were determined by Coulter Counter, Model S-plus, fully automatic machine (Coulter Electronics, INS Hialeah Florida, USA).

For air sampling, personal samplers (Casella London Limited) were used with a 3.7 cm. disc holder, the filters used were whatman glass fiber (GF/A). Air sample from 20 out of 28 stations were taken.

Statistical method: Student's t-test was used to test the statistical difference between two means. F-test was used to test the effect of different variables on the mean values of the different parameters.

NOTE:

- ★ Smokers: Those who smoke 5 cigarettes and above in a day.
- ★ Alcoholics: Those who drink an average of 450 cc alcohol per week.
- ★ Females: Only six females were working in 28 petrol stations and as the number is small, it was decided to exclude them from the study.

RESULTS:

The mean PbB for workers in petrol station was significantly higher than that of the control subjects ($P < 0.01$). However for both the petrol filling station workers and the control subjects the PbB was within the normal range recommended by the WHO (8). On the other hand both ALA-D activity and Hb concentration were significantly lower ($P < 0.01$) (Table 1).

No significant association could be found between PbB and ALA-D with age (Table 2). The length of service in the trade was found to exert no significant effect on the mean values of PbB, ALA-D and Hb concentration (Table 3)

Table 1 - Mean $\pm$ SD of PbB concentration, ALA-D activity and Hb concentration for petrol station workers and control subjects

Subject	No. of subjects	PbB ug/dl	ALA-D μ /ml RBC	Hb gm/dl
Petrol station workers	145	16.3 $\pm$ 4.0	184.0 $\pm$ 24.2	13.01 $\pm$ 1.05
Control subjects	97	13.7 $\pm$ 4.2	200.2 $\pm$ 41.1	14.98 $\pm$ 1.41
t-value		4.85	3.48	11.74
p		0.01	0.01	0.01

Table 2 - Mean $\pm$ SD of PbB concentration, ALA-D activity and Hb concentration / according to sex and age for workers

Age (years)	No.	PbB ug/dl	ALA-D μ /ml RBC	Hb gm/dl
- 20	2	17.0 $\pm$ 1.4	187.5 $\pm$ 35	11.7 $\pm$ 1.84
20 - 29	8	17.3 $\pm$ 5.8	177.0 $\pm$ 30	13.5 $\pm$ 0.49
30 - 39	48	16.7 $\pm$ 4.1	182.2 $\pm$ 24	13.7 $\pm$ 1.11
40 - 49	52	16.0 $\pm$ 3.7	186.4 $\pm$ 26	13.2 $\pm$ 0.91
50 +	35	15.9 $\pm$ 3.7	184.2 $\pm$ 22	13.0 $\pm$ 1.11
Mean Range				
(19-61 yr)	42.7	16.3 $\pm$ 4.0	184.4 $\pm$ 24	13.0 $\pm$ 1.05
F		0.46	0.35	2.44
P		0.05	0.05	0.05

Table 3 - Mean $\pm$ SD of PbB concentration, ALA-D activity and Hb concentration / according to length of service for workers

Length of service (yrs)	No. of workers	PbB ug/dl	ALA-D μ /ml RBC	Hb gm/dl
-3	6	16.9 $\pm$ 1.5	191.8 $\pm$ 24	12.99 $\pm$ 1.2
3-5	20	16.6 $\pm$ 5.1	178.8 $\pm$ 28	13.25 $\pm$ 0.82
6+	119	16.2 $\pm$ 3.8	184.5 $\pm$ 24	12.99 $\pm$ 1.07
F-value		0.87	0.86	0.62
P		0.05	0.05	0.05

As many authors (9,10) found a good correlation between smoking and raised PbB, the smoker workers were found to have a significantly higher PbB concentration than non smokers ($P < 0.01$). While the differences in ALA-D and Hb were non-significant (Table 4).

No significant effect of alcohol consumption was found on the different parameters (Table 4).

Table 4 - Mean $\pm$ SD of PbB concentration, ALA-D activity and Hb concentration / according to smoking habit, alcohol consumption

	No. of workers	PbB ug/dl	ALA-D μ /ml RBC	Hb gm/dl
Smokers	64	17.4 $\pm$ 3.9	181.7 $\pm$ 22	13.16 $\pm$ 0.88
Non-	81	15.5 $\pm$ 3.7	185.8 $\pm$ 26	12.85 $\pm$ 1.21
F		9.29	0.99	3.24
P		0.05	0.05	0.05
Drinkers	29	16.3 $\pm$ 3.8	185.2 $\pm$ 23	13.68 $\pm$ 1.03
Non-	116	16.3 $\pm$ 4.0	183.8 $\pm$ 25	13.11 $\pm$ 1.01
Fvalue		0.001	0.08	0.62
P		0.05	0.05	0.05

The mean lead in air concentration (PbA) in twenty filling stations was $14.2 \pm 5.4 \text{ ug/m}^3$. (range = 8 - 20 ug/m^3).

The correlation between PbB and PbA in the petrol station was significant ($P < 0.05$). But no significant correlation was found between PbA and ALA-D ($P > 0.05$).

DISCUSSION:

In spite of the significant difference in the mean PbB concentration between the petrol filling station workers and the control subjects; the results revealed that the level of lead was still within the acceptable limit for exposed workers. The upper acceptable limit of PbB is a matter of controversy. Gibson et al (11) stated that it is 60 $\text{ug}/100 \text{ ml}$ while Landri-gan and Baker (12) stated that it should not exceed 40 $\text{ug}/100 \text{ ml}$.

However, the results obtained from the present study were in agree-

ment with those reported by de Silva and Donnan (13) who found that petrol service station workers have a very low degree of exposure.

The inhibition of ALA-D activity by lead in this group of workers was relatively less than that previously reported among the printing workers and Battery workers (14), as the mean ALA-D activity for printing workers and battery workers were 141.4 ± 38 and 77.0 ± 30 respectively (mean $\pm$ SD) while the result obtained from this study was 184.0 ± 24.7 . This in turn was due to the lower exposure level as indicated by the lower PbB (Table 1).

The effect of lead on Hb occurred at blood lead level above 50 ug/100 ml (15). None of the petrol filling station workers had blood lead level above 50 ug/100 ml. Therefore, the lower Hb concentration in this group of workers cannot be explained on this base, but might be due to the direct effect of gasoline on Hb synthesis.

The absence of any significant effect of age, sex, length of service and alcohol consumption on the parameters of lead absorption could be again explained by the lower level of exposure at the plants and the workers might be in equilibrium with the state of exposure (10,16).

It is, however, interesting to note that cigarette smoker workers had relatively higher mean PbB concentration than non-smokers, this could be attributed to the direct contamination of the fingers and cigarette.

The PbA level in the petrol filling stations pointed out that the level of exposure was low. Also there was no significant difference in PbA between different petrol filling stations. This suggests that there is no need for monitoring PbA in petrol filling stations.

In conclusion it can be said that workers in petrol filling stations are exposed to low levels of lead and that there is no danger of lead poisoning in such profession.

ACKNOWLEDGEMENTS:

The authors gratefully acknowledge the help of Dr. Mayade Al-Niai-

mi. Many thanks are due to Dr. Ghassan Al-Shamma as well as to the staff of the clinical chemistry Laboratory of Medical City. The authors also thank the members of the Department of Physiological Chemistry, College of Medicine for their valuable laboratory facilities.

REFERENCES:

- 1- Ziegfeld, R.L. Importance and uses of lead. *Arch. Environ. Hlth.*, (1964) 5: 202-212.
- 2- Rankin, S. Lead, inorganic and organic. In: Felming, A.J., Dalonzo, C.A., and Zapp, J.A. (Ed.). *Modern Occupational Medicine*. 2nd. edition: (1960) 432-442. Lead and Febiger. Philadelphia.
- 3- Annual Abstract of Statistics. Published by the Central Statistical Organization, Ministry of Planning, Iraq. (1981).
- 4- Hana, A.A.K., and AL-Bassam, K.S. A survey of lead pollution in Baghdad. *Water, air and soil pollution*, (1983) 19: 3-14.
- 5- World Health Organization Health Hazards of the Human Environment. WHO: Geneva. (1973).
- 6- Westerlund - Helmersson, U. Determination of lead and cadmium in blood by a modification of Hessel Method. *Atomic Absorption Newsletter*, (1970) 9: 133-134.
- 7- Burch, H.B., and Siegel, A. An improved method for the determination of Erythrocyte - aminolevulinic acid dehydratase. *Clin. Chem.*, (1971) 17: 1038-1041.
- 8- World Health Organization Environmental Health Criteria. 3. Lead. WHO: Geneva. (1977).
- 9- Shaper, A.G., et. al. Effect of alcohol and smoking on PbB in middle aged British men. *Brit. Med. J.*, (1982) 284: 299-302.
- 10- Brockhaus, A., Freier, I. and Ewers, U. Levels of cadmium and lead in blood in relation to smoking, sex, occupation and other factors in an adult population of the FRG. *Int. Arch. Occup. Environ. Hlth.*, (1983) 52: 167-175. Abstract.

- 11- Gibson, S.L.M., Mackenzie, J.C., and Goldberg, A. The diagnosis of industrial lead poisoning. *Brit. J. Industr. Med.*, (1968) 25: 40-51.
- 12- Landrigan, P. J., and Baker, E. L. J. Epidemiological aspects of occupational lead poisoning. *J. Uoeh.*, 5 (supp): (1983) 145-155. Abstract.
- 13- de Silva, P. E., and Donnan. Petrol Vendors, Capillary blood lead levels and contamination. *Med. J. Aust.*, (1977) 1: 344-347.
- 14- AL-Ghabban, S. I. M. Sc. Thesis. Dept. of Community Medicine- College of Med. University of Baghdad- Iraq. (1986).
- 15- Zielhuis, R. L. L. Interrelationship of biochemical responses to the absorption of inorganic lead. *Arch. Environ. Hlth.*, (1971) 23: 299-310.
- 16- Alessia, L., Castoldi, M. R., and Burrati, M. Behaviour of some indicators of biological effect in female lead workers. *Int. Arch. Occup. Environ. Hlth.*, (1977) 40: 283-292. Abstract.