

FLUORIDE ABSORPTION AMONG WORKERS OF LAMPS FACTORY

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Key Words : Fluoride, Workers Lamps factory, Iraq.

امتصاص الفلورايد بين العاملين في مصنع المصابيح الكهربائية

الخلاصة :

تم دراسة ٤١ شخص كمجموعة معرضة الى الفلورايد و ٢٨ شخص كمجموعة سيطرة. لم يكن هناك فرق معنوي في نسب الفلورايد عند المعرضين من الجنسين ولا بين نماذج العراقيين والاجانب في حين لوحظ فرق معنوي في نسب الفلورايد في الادرار بين نماذج ما قبل العمل وما بعد العمل ، وايضا بين العاملين المعرضين ومجموعة السيطرة. كما دلت الدراسة بان هناك علاقة طردية بين مستوى الفلورايد في الادرار من جهة وبين كل من فترة التعرض للفلورايد ومستوى تركيز الفلورايد في الهواء من جهة اخرى. لقد بينت الدراسة ان قياس نسب الفلورايد في الادرار مؤشر جيد لامتناس الفلورايد.

SUMMARY :

41 workers exposed to fluoride, and 28 non-exposed workers were studied. No significant difference in mean urinary fluoride level (MUFL) was observed between male and female workers, and between Iraqi and Chinese workers. There was significance difference between the pre- and post-shift MUFL. A strong correlation was observed between MUFL and duration of exposure, and also between MUFL and air fluoride level. It is suggested that MUFL might be considered as a good index of fluoride absorption.

INTRODUCTION :

Fluoride is found in nearly all rocks and soils, and in tissues of all plants and animals. Thus, it is present in food and water, and is a constant ingredient of diet in man.⁽¹⁾

A continuous daily intake of milligrams per day of fluoride has been found to be beneficial in the prevention of dental caries⁽²⁾. Long-term exposure to higher quantities have deleterious effects on enamel and bone^(3,4), while single doses cause acute toxic effects or may even be lethal⁽⁵⁾. The chronic effects of fluoride have been described by several authors^(6,8). There is little or no evaluation of the health status of fluoride workers in Iraq. Therefore aim of this work is to focus some light on the degree of fluoride absorption in fluoride exposed workers (EW) at the Electrical Lamps Factory in Al-Taji area, Baghdad and its relation to the degree of environmental pollution and on the health of workers.

MATERIALS AND METHODS :

1. The Electrical lamps Factory in Al-Taji has a total labour force of 520 workers 41 EW (mean age 30.6 ± 8.9) who work in fluorescent line department were chosen as a target population to study the industrial absorption of fluoride. A control group (CW) of 28 workers (mean age 32.3 ± 11.8) was chosen from clothing factory. There was no significant difference in age between the two groups (EW and CW).
2. Each Iraqi worker filled a questionnaire, while Chinese workers were assisted by Chinese translator in filling the questionnaire form. The questionnaire included general information and symptoms especially respiratory, nervous, or cutaneous manifestation that are relevant to fluoride intoxication.
3. Two urinary samples for each worker were taken, one pre-shift and the other post-shift.
4. A total of 13 samples of air were collected from five sites of the department.
5. Urine and air samples were kept in the refrigerator until next morning before being analysed in the chemical laboratory of the National Centre of Health and Safety, using a chemical procedure (Fluoride sensitive specification electrode Model 94-09 Orion Research Corporation Cambridge - Massachusetts).

RESULTS :

Table 1 shows the MUFL for different groups in pre-and post-shift work, while table 2 shows the prevalence of different symptoms among the Iraqi EW (18 workers) compared to their CW. All the Chinese EW (23 workers) answered negative for all the symptoms. Fig. 1 illustrates the correlation line between duration of exposure to fluoride MUFL. Table 3 shows the distribution of the post-shift MUFL and air Fluoride concentration according to different sites of workplace (department).

DISCUSSION :

There were no significant difference ($p > 0.1$) between fluoride EW and CW regarding sex of MUFL in both the pre-and post-shift urinary samples which are in line with the findings of other researchers^(10,11). There was a significant difference ($p < 0.01$) between the pre- and post-shift MUFL of EW which resulted from exposure to environmental fluoride during the working shift, which is similar to the finding observed by Chan-Young et al.⁽¹²⁾. This environmental effect is also proved by the finding that there was no significant difference ($p > 0.1$) between MUFL in the pre-shift urinary samples and that of CW or between Iraqi and Chinese workers in both pre-and post-shift, which indicate the lack of race difference in fluoride absorption and MUFL. There was a significant increase in symptoms due to irritation of upper

Table 2. The prevalence of different symptoms among EV/ & CW- (Iraqi worker).

Symptoms of chimeric symptoms among EW & CW - (Iraqi worker).							
Symptoms*	exposed	workers	control		chi square value	significance	
	No. of cases	percent	No. of cases	percent			
Lachrymation	8	44.44	3	10.71	6.85	p<0.01	
Sore throat	7	38.89	3	10.71	5.11	p<0.025	
Nasal congestion and sneezing	7	38.89	2	7.14	7.01	p<0.01	
Skin burn and itching	7	38.89	2	7.41	7.01	p<0.01	
Nausea, vomiting and abd ominal pain	5	27.78	5	17.85	0.63	p>0.1	
Tingling and numbness	7	38.89	16	57.14	1.46	p>0.1	
Stiffness of joints	9	50.00	14	50.00	0	p>0.1	
Backaches and joint pain	11	61.11	17	60.71	0.007	p>0.1	

* one worker may have more than one symptom.

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Table 3. The distribution of the post-shift MUFL and mean air Concentration taken at different site of the work place.

Site of Sampling	MUFL (mg/gm creatinine)*	mean air concentration (ug/m ³)*
1	1.04	0.037
2	1.05	0.029
3	0.45	0.024
4	0.93	0.026
5	0.57	0.024

* Each figures represent the mean of two workers in that site tested.

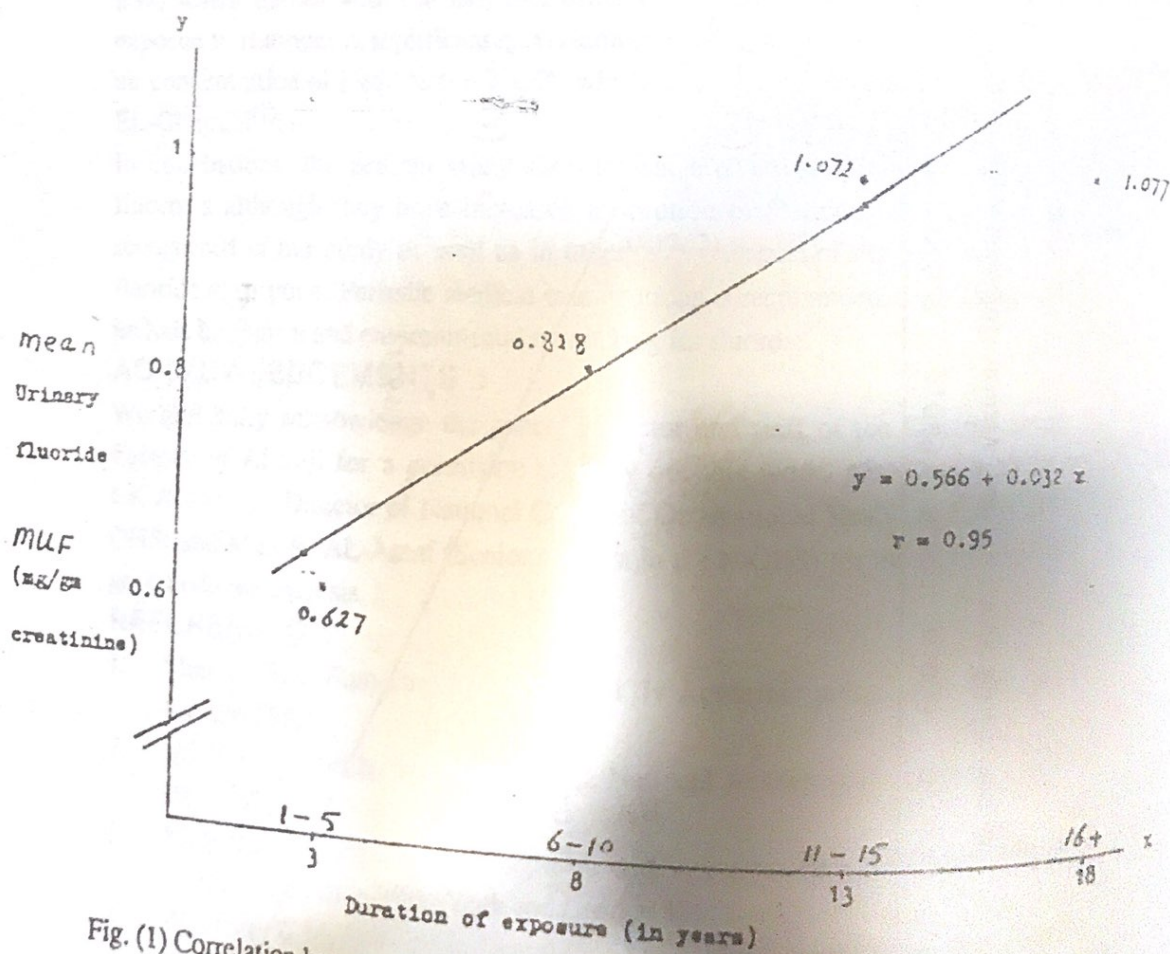


Fig. (1) Correlation between nurinary fluoride excretions and duration of exposure.

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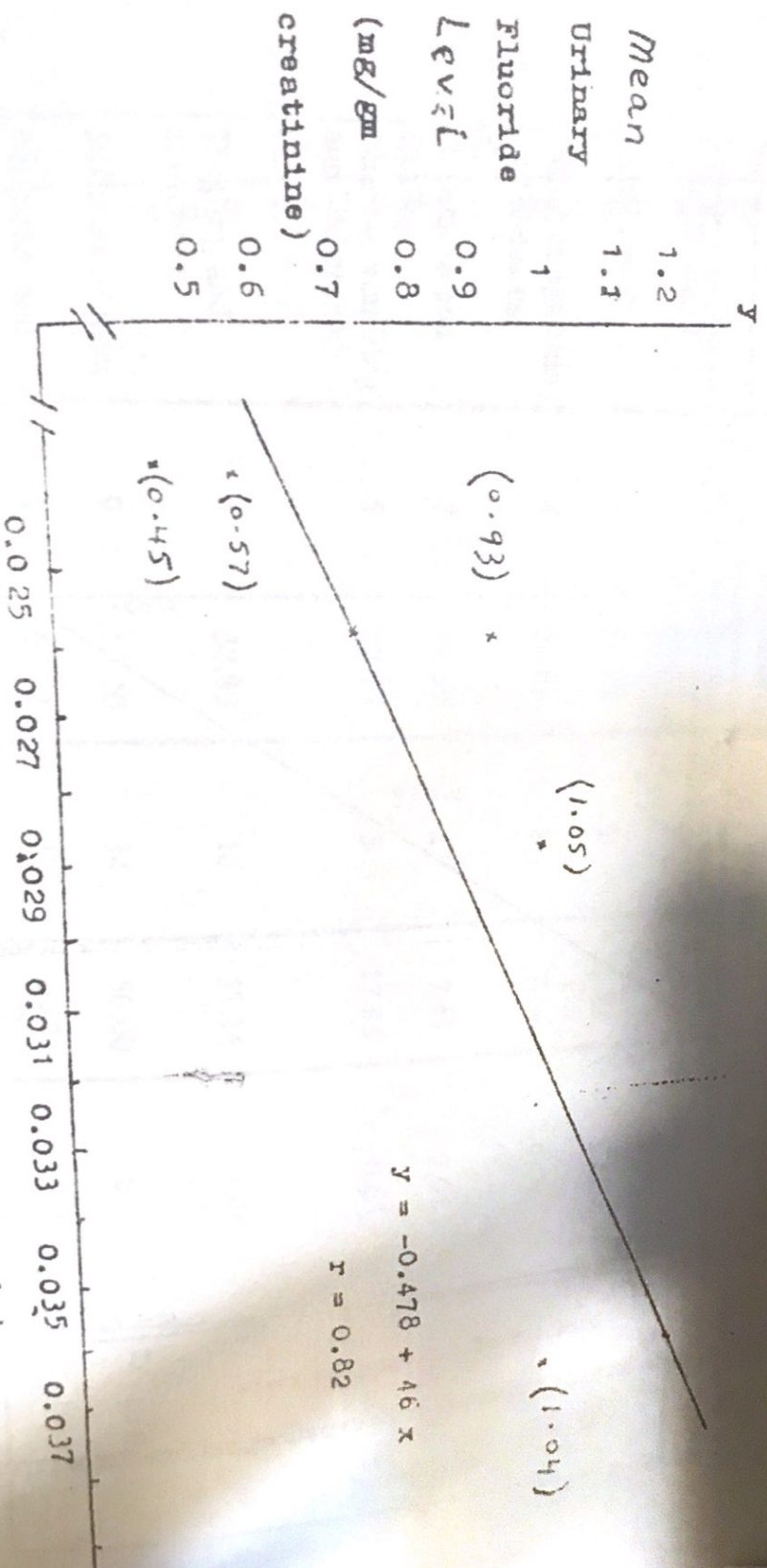


Fig. (2) Correlation between post-shift urinary fluoride levels MUFL and air concentrations of fluoride.

respiratory tract and conjunctival mucosa together with skin burns and itching in the EW compared to CW which could be attributed to the environmental fluoride level that is also reflected in MUFL. These results are in parallel with the results observed by EL-Ghawabi.⁽⁷⁾ Who studied the prevalence of these symptoms in EW of superphosphate industry. The insignificant symptoms of gastro-intestinal irritation could be attributed to the nature of exposure which was mainly through the respiratory tract and not by ingestion. Other symptoms (Backaches, joint pain and stiffness-etc) showed high prevalence among CW due to ergonomic reasons and posture of work. The mean air concentration for fluoride was 0.028 mg/m³ which is below the currently accepted TLV of 2.5 mg/m³. A significant correlation ($r = 0.95, p < 0.01$) was found between the duration of exposure to fluoride and MUFL of EW, which agrees with the fact that urinary excretion is affected by previous exposure to fluoride. A significant correlation ($r = 0.82, p < 0.01$) was found between air concentration of fluoride and MUFL which is similar to the results obtained by EL-Ghawabi⁽⁷⁾.

In conclusions, the present study showed that EW are not at risk of chronic fluorosis although they have increased absorption of fluoride MUFL which is recognized in our study as well as in other^(5,12,13) is one of the best indices of fluoride absorption. Periodic medical examinations is recommended which should include biological and environmental monitoring for fluoride.

ACKNOWLEDGEMENTS :

We gratefully acknowledge the general director and staff of the Electric lamps Factory in Al-Taji for a permission to carry out this work. Also thanks to Dr. J.K.AL-Ajzan (Director of National Centre of Occupational Health and Safety (N-OHS) and Miss R. AL-Assaf (Senior chemist in the N-OHS) for the facilities they gave to do the analysis.

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