Original Article

Psychological Effects of Lead Pollution on Mental Health of School Children in Mansoura City

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Background: Several studies have been done to examine the effect of chronic accumulation of lead in the blood of children adolescence on their cognitive performance and behavior, and there some evidences since 1991 suggesting that children's intellectual ability, hyperactivity high blood lead concentration.
Aim of the study: is to estimate the prevalence of psychiatric disorder in school children of our culture and to find a relation between blood lead levels and these psychiatric disorders.
Subjects & Methods: A sample of 200 school aged children from different locations of Mansoura city were screened for psychiatric disorders using the multi-informant strength and difficulty questionnaire (SDQ) which classifies the studied sample into three main groups, normal, borderline, and abnormal. Those who showed high abnormal scores were exposed to further studies including: blood lead level assessment, socioeconomic classification using Fahmy and Sherbiny scale and minimental state examination.
Results: The results obtained indicated high percentage of blood lead levels in studied groups (n=100) than in control group (n=44), with the average blood lead level ranging from (16.15: 34.88 ug/dl) in studied group to (12.27:15.5) in control group. Blood lead level was found to be positively correlated with SDQ scores, age and gender (affected males had higher blood lead level than affected females) and inversely correlated with both social class and minimental state scores.
Conclusion: Percentage of psychiatric disorders was considerably high in our school children and blood lead level correlates positively with the abnormal cases. Psychiatric disorders and blood lead levels are higher among low social standard communities, and the high blood lead level adversely affects cognitive abilities of children.

Keywords: Lead pollution, Psychological affect, School children, Mental health.

Abbreviations:
SDQ: Strength and Difficulty Questionair
MMS: Mini- Mental State Examination Test
BLL: Blood Lead Level
AV: Average
St-d: Standard Deviation

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INTRODUCTION

Lead is a ubiquitous and poisonous heavy metal. It is widely distributed in the environment (Air, soil, sediment, surface and ground water, food, dust, paint) and in biological systems. It occurs both naturally and as a result of human activities. One of the most common sources of human exposure to lead is through exhaust from use of leaded petrol (Needleman, 2004).

However this practice is being discontinued worldwide leaving the domestic environment (Through house paint, potable water and dust) as the main continuing source of lead exposure in many communities around the world While both adults and children can suffer from chronic low-dose lead exposure, the effect is more marked in children (Chen, 2007).

Children in Egypt can be exposed to these negative consequences which could continue into later adolescence and adulthood, even with modernalization of our life. Although, increased interest in environmental sanitation with local and national efforts to decrease pollution, still lead toxicity can be a potential hazard especially in areas of high exposure and in developing countries like our own, also strong evidences that violence, hyperactivity, criminality, conduct disorders, and learning disabilities are increasing nowadays which may be related strongly to environmental pollution, especially with lead. In this study we will screen for psychological disorders among school children and try to find whether they correlate with other factors in the studied group as it's relation to blood lead levels, socioeconomic standards and minimental state examination of the children.

Our nervous system is designed to be extremely sensitive and even low lead levels can adversely affect it during its maturation and thereby produce neurobehavioral abnormalities by different mechanisms including: direct toxic effect on neurons, as well as stimulating astrocytic and glial response. Adverse effect on neuronal ion metabolism, and Inhibition of enzymes in the brain (Bellinger, 2004) .Several factors lead to

affection of children more than adults these include: Ingestion of lead in food at a greater quantity relative to body's weight compared to adults, then deposited into soft tissue before deposition in bone and its half-life in soft tissues may be longer probably because children have less bone available for lead incorporation Swallowing lead paint chips, eating contaminated food and putting hands, toys or objects contaminated with lead dust or soil in their mouths due to normal hand to mouth activity in youngsters. Increase efficiency of gastro-intestinal lead absorption, children absorb 50% of ingested lead which is three times greater than adult number (El-Defrawi, 1997) and (WHOA, 2004).

Several studies have been done to examine the effect of chronic accumulation of lead in the blood of children and adolescence on their cognitive performance and behavior. Accumulating evidence since 1991 suggests that children's intellectual ability, hyperactivity, behavioral disturbances is adversely affected at blood lead concentrations>10 ug/dL (Sattler, 2001; Chiodo, et al. 2004; Lanphear, et al. 2005; Schnaas, et al. 2006; Surkan, et al. 2007; Tellez Rojo, et al. 2006).

Jusko, et al. (2008) found Children with lifetime average blood lead concentrations between 5 and 9.9 ug/dL scored 4.9 points lower on the Full-Scale IQ vs. children with lifetime average blood lead concentrations of less than 5 ug/dL. This suggests that children's intellectual functioning at 6 years of age was impaired by blood lead concentrations.

Morales, et al. (2005) assessed demo-graphic and socioeconomic differences in blood lead levels (BLLs) among Mexican American children and adolescents in the United States. They analyzed data from the Third National Health and Nutrition Examination Survey, 1988-1994, for 3,325 Mexican-American youth aged 1 to 17 years. The main study outcome measures included a continuous measure (Microg/dL) of BLL and two dichotomous measures of BLL (> or =5 microg/dL and > or =10 microg/dL). They found that in a multivariate analyses, gender, age, generational status, home language, family income, education of head of household, and source of drinking water were statistically significant independent predictors ($p<0.05$) of having higher BLLs and of having BLL > or =5 microg/dL, whereas age, family income, and source of drinking water were significant predictors ($p<0.05$) of having BLL > or =10 microg/dL.

SUBJECTS AND METHODS

The target population included: School children aged 6-16 years old of both sexes; Children were randomly selected from schools which covered all three stages of education, in Mansoura city with different social standards. The sample consisted of 200 children.

Exclusion Criteria

Known neurological or developmental disorders: including mental retardation and epilepsy, known psychotic disorder, known severe chronic disease or learning disability. Those of age below 6, or above 16 years.

Methods

All the children included in the study sample were subjected to screening by the:

multi-informant strength and difficulty questionnaire (SDQ) which classifies the studied sample into three main groups, normal, borderline, and abnormal according to the score, in each question in the self, parent, or teacher reports. SDQ scale is 25 items on psychological attributes (Emotional, conduct, hyperactivity, peer relation and prosocial). (Goodman, 2001).

SDQ was used by Robert Goodman and colleagues in (1997, 1998, 1999, 2000, and 2001) and found high correlation between the self, parent and teacher versions compared to average cross informations obtained from previous studies using other similar scales. Children with abnormal SDQ scores were further investigated by:

1. *Mini- mental state examination test (Folstein, 1975)*. It is a five minutes screening test that is designed to evaluate basic mental function in a number of different areas tested. It involves a person's ability to recall facts, to write and to calculate numbers. The test provides a quick way to determine if more in-depth testing is needed. The test can be applied to anyone suspected of mental decline. Each area of the test is given a score. These scores show if the person is functioning with expected range of his or her age, the test includes items about orientation registration, attention, calculation, recall, and Language. A score less than 17 indicates definite cognitive decline, 17-20 probably abnormal, 21-24 equivocal, more than 25 are probably normal.

2. *Fahmy and Sherbiny, (1988)* was also implemented. It is classified into I, II, III, IV classes according to several parameters, father education, education and work of the mother, income, crowding index, sanitation, and scoring from 25-30 is high social class, 20-25 middle social class, 15-20 low social class while less than 15 is very low social class.

3. *Blood Lead Measurement* Venous blood sample was collected from school children, the samples were collected according to the results of the SDQ prediction algorithm .where 44 samples were collected from completely normal children and considered as control group. The rest of the blood samples were collected from children

having probable, any case disorder, hypera-ctivity disorder, and conduct disorder according to the predictive algorithm (Number=100), the apparatus used was the atomic absorption spectrophot-ometer connected to lead hollow cathode lamp, and is considered as an important technique in quantitative determination of heavy metals.

Statistical Analysis

The data from self, teachers, and parents reports were entered into the SDQ computerized package database. The output of the package was presented in the form of Excel Data Sheet. The sheet shows frequency distribution for sub-item score, normal, borderline, and abnormal classification. Also shown in the Excel work sheet the diagnostic prediction results which were presented as unlikely, possible, and probable. Furthermore, the resulted Excel work sheet was entered into the Statistical Package for Social Science (SPSS) to study the reliability of the data obtained and to perform Chi-Square test for statistical significance studies.

According to the results of the diagnostic prediction obtained from the above study, the researcher was able to choose the sample for the in-depth study. Those were exposed to mini-mental state examination test, and Fahmy and Sherbiny socio-economic standard scale test. Only 100 school children and 44 of the control group showed agreement for collecting blood samples. The results of blood lead level analysis, mini-mental state examination, and Fahmy and Sherbiny scale tests were all entered into the SDQ Excel work sheet and SPSS database to perform further statistical studies, e.g., mean, standard deviation, correlations etc.

RESULTS

Table (1) show the results from prediction algorithm for school children grouped as male and female. Statistical significant difference between male and female exists in both any case and emotional disorders. Conduct and hyperactivity disorders are independent of child sex 14.54% have any psychiatric disorder, 9.81% have emotional disorder, 5.18% have conduct disorder and 3.9% have hyperactivity disorder.

Table (2, 3) shows the SDQ classification as normal, borderline, and abnormal for school children according to self report score. In this table the school children are grouped by age into two groups. The table shows also the results of Chi-Square test. It can be seen that prosocial, hyperactivity, emotion, and conduct scores are significantly dependent on the child age. for other scores there is no statistical significance.

Table 1: SDQ Prediction for school children grouped as male-female:

Disorder	School Total	Male %	Female %	X^2	P
Any case					
• Unlikely	65.84%	69.41%	62.36%		
• Possible	9.62%	21.23%	18.04%	18.804	0.000
• Probable	14.54%	9.36%	19.60%		
Emotional					
• Unlikely	80.95%	87.21%	74.83%		
• Possible	9.24%	7.99%	10.47%	27.847	0.000
• Probable	9.81%	4.79%	14.7%		
Conduct					
• Unlikely	80.72%	80.82%	80.62%		
• Possible	14.10%	14.38%	13.81%	0.309	0.857
• Probable	5.18%	4.80%	5.57%		
Hyperactivity					
• Unlikely	78.85%	79.18%	78.62%		
• Possible	17.25%	17.22%	17.18%	0.062	0.804
• Probable	3.9%	3.6%	4.2%		

Table 2: Shows the SDQ classification as normal, borderline, and abnormal for school children according to self report score:

	13<Age>10	I6<Age>13	X^2	P
IMPACT				
%Normal	70.93	68.35		
%Borderline	2.85	2.22	1.32	0.858
%Abnormal	26.22	29.43		
PROSOCIAL				
%Normal	93.3	90.82		
%Borderline	4.47	4.43	9.686	0.046
%Abnormal	2.24	4.75		
PEER				
%Normal	66.46	68.35		
%Borderline	26.22	12.34	9.228	0.056
%Abnormal	7.32	19.3		
HYPERACTIVITY				
%Normal	70.12	63.92		
%Borderline	14.84	15.19	11.226	0.024
%Abnormal	15.04	20.89		
EMOTION				
%Normal	56.5	77.53		
%Borderline	17.48	9.81	41.28	0.0
%Abnormal	26.02	12.66		
CONDUCT				
%Normal	72.56	59.49		
%Borderline	15.04	17.09	20.283	0.0
%Abnormal	12.4	23.42		

Table 3: shows the SDQ parent report classification for school children grouped by age., significant statistical difference existed in hyperactivity, emotion, and total score:

	Age>6:<10	Age>10:<13	Age>13:<16	P
IMPACT				
%Normal	79.62	71.28	62.50	
%Borderline	0.0	1.06	0.0	0.574
%Abnormal	20.37	27.66	37.50	
PROSOCIAL				
%Normal	98.15	95.74	87.50	
%Borderline	1.85	3.19	12.50	0.303
%Abnormal	0.0	1.06	0.0	
PEER				
%Normal	75.93	74.47	75.00	
%Borderline	9.26	23.40	25.00	0.267
%Abnormal	14.81	2.13	0.0	
HYPERACTIVITY				
%Normal	88.88	63.83	62.50	
%Borderline	7.41	17.02	31.25	0.004
%Abnormal	3.71	19.15	6.25	
EMOTION				
%Normal	68.52	72.34	43.75	
%Borderline	18.52	8.51	12.50	0.041
%Abnormal	12.96	19.15	43.75	
CONDUCT				
%Normal	74.07	56.38	56.25	
%Borderline	7.41	8.51	5.25	0.245
%Abnormal	18.52	35.11	37.50	
TOTAL				
%Normal	85.18	57.45	56.25	
%Borderline	7.41	11.70	18.75	0.007
%Abnormal	7.41	30.85	25.00	

Table (4, 5) show the SDQ classifications of school children according to gender for both self and parent reports respectively. Results of chi-square test are shown also in both tables. Significant statistical difference existed in prosocial, emotion and total scores from the point of view of self report, whereas statistical significant difference existed in peer score only according to parent report. Other scores do not depend on whether the child is male or female.

Table (6) Average and standard deviation of BLL in control group and studied group, the highest level was in males and those of the older age group. BLL of control group ranged between 12.27 ug/dL and 15.5 ug/dL, the blood lead level of studied group was significantly higher and ranged from 16.15 ug/dl and 34.88 ug/dL, the levels showed high statistically significant difference in relation to those of control.

Table 4: SDQ self report classification of school children according to gender:

	Male	Female	X^2	P
IMPACT				
%Normal	73.13	66.75		
%Borderline	2.49	2.69	4.034	0.133
% Abnormal	24.38	30.56		
PROSOCIAL				
%Normal	88.06	96.33		
%Borderline	6.72	2.44	19.73	0.0
%Abnormal	5.22	1.22		
PEER				
%Normal	66.9	67.4		
%Borderline	23.8	23.7	0.04	0.97
%Abnormal	9.2	8.8		
HYPERACTIVITY				
%Normal	69.65	65.53		
%Borderline	13.68	16.63	1.834	0.4
%Abnormal	16.67	17.85		
EMOTION				
%Normal	78.36	51.10		
% Borderline	12.69	16.14	79.8	0.0
%Abnormal	8.96	32.76		
CONDUCT				
%Normal	68.41	66.5		
%Borderline	15.17	16.38	0.355	0.837
%Abnormal	16.42	17.12		
TOTAL				
%Normal	64.68	47.43		
%Borderline	18.66	28.12	24.47	0.0
%Abnormal	16.67	24.45		

Table 5: SDQ Parent report classification of school children according to gender:

	Male	Female	X^2	P
IMPACT				
%Normal	78.21	68.97		
%Borderline	0.0	1.15	2.408	0.3
% Abnormal	2.79	29.89		
PROSOCIAL				
%Normal	94.87	96.55		
%Borderline	5.13	2.3	1.814	0.404
%Abnormal	0.0	1.15		
PEER				
%Normal	52.56	73.56		
%Borderline	25.64	4.6	15.37	0.0
%Abnormal	21.79	21.84		
HYPERACTIVITY				
%Normal	70.51	73.56		
%Borderline	17.95	12.64	0.981	0.612
%Abnormal	11.54	13.79		
EMOTION				
%Normal	61.54	54.02		
% Borderline	11.54	16.09	1.142	0.565
%Abnormal	26.92	29.89		
CONDUCT				
%Normal	64.10	60.92		
%Borderline	8.97	6.97	0.675	0.713
%Abnormal	26.92	32.18		
TOTAL				
%Normal	65.38	67.82		
%Borderline	8.97	12.64	1.227	0.542
%Abnormal	25.64	19.54		

Table 6: Average and standard deviation of BLL in control group and studied group, the highest level was in males and those of the older age group:

age	Percentage	Average BLL for control group		Average blood 1 lead for school children		P
			St-d		St-d	
>6:<10	25.00%	12.27 ug/dL	3.44	16.15 ug/dL	3.56	0.00
>10:<13	31.82%	15.0 ug/dL	3.40	32.88 ug/dL	6.27	0.02
>13:<16	43.18%	15.5 ug/dL	3.33	33.28 ug/dL	10.2	0.01
Male Female	54.50%	14.790 ug/dL	4.032	34.88 ug/dL	9.44	0.03
	45.45%	13.750 ug/dL	3.580	19.47 ug/dL	6.15	0.04

Table (7) Show the correlation of BLL and SDQ scores in studied group for both self and parent reports. In case of self report, high correlation exists for peer, hyperactivity, conduct and total scores whereas high correlation exists for prosocial, hyperactivity, emotion, conduct, and total scores in case of parent reports. Moreover, all correlation values are positive which states that as the BLL increases, the SDQ score increases. This indicates that lead pollution in the environment adds to the occurrence of psychiatric disorders.

Table 7: Show the correlation of BLL and SDQ scores in studied group for both self and parent reports. In case of self report:

SDQ Report	Prosocial	Peer	Hyperact	Emotion	Conduct	Total Score
Self	-0.387	0.48	0.613	0.394	0.756	0.795
Parent	-0.614	0.40	0.86	0.654	0.714	0.787

Table (8) Shows mean and standard deviation of BLL in school children classified according to socioeconomic standard score. The table shows also the correlation between BLL and socioeconomic standard score. It can be seen that significant negative correlation exists between BLL and socioeconomic standard score. This means that an inverse relation exists between BLL and socioeconomic standard. It is noticed also that class III and IV have high BLL in comparison to other groups.

Table 8: Shows mean and standard deviation of BLL in school children classified according to socioeconomic standard score:

Class	Percentage	Av. Social Score	St. Dev.	Av. BLL	Correlation
>25:30	25.83%	27.63	2.03	16.59ug/dL	-0.264
>20:25	37.50%	22.91	1.12	21.28ug/dL	-0.602
> 15:20	31.67%	17.833	0.878	36.53ug/dL	-0.007
<15	5.00%	13.5	0.55	42.5ug/dL	-0.700
Total Correlation with Socioeconomic St.					-0.847

Table (9) shows mean and standard deviation of BLL in school children classified according to minimental state examination score, significant negative correlation exists between BLL and minimental state examination score. This means that an inverse relation exists between BLL and minimental scores.

Table 9: Relation between BLL and minimental state grouping For school children group:

Class	Percentage'	Av. MMS	St. Dev.	Av. BLL	Correlation
>17	2.50%	16	0.5	37.0ug/dL	-0.87
>17:<21	25.0%	19.7	1.08	33.77ug/dL	-0.22
>21:<25	24.17%	23.4	1.46	28.28ug/dL	-068
>25	48.33%	28.43	1.71	16.5ug/dL	-0.442
Total correlation with MMs					-0.853

DISCUSSION

The SDQ predictive algorithm combines data obtained from multi- informant reports to define the child as having a disorder, unlikely, possible or probable to occur, regarding probable as positive cases, while unlikely and possible regarded as negative cases.

The algorithm detected that 14.54% of total sample of school children have a certain psychiatric disorder, 9.81% of the sample have emotional disorders, and 5.18% have conduct disorders while 3.9% had hyperactivity disorder. To detect gender difference by the, predictive algorithm it was found that females had higher percentage of probable cases than males being 19.6% in girls and 9.36% in boys. Regarding emotional disorders 14.7% of girls in contrast to only 4.49% in boys. 5.57% had conduct disorders in girls while only 4.8% in boys, 4.2% was detected to have hyperactivity disorder in girls in contrast to 3.6% in boys.

Regarding the percentage of psychiatric disorders in our study, the findings are nearly similar to that of (Babu, 2001) who found in an epidemiological study, that about (14-20)% of children in the community have one or more psychiatric disorder and that conduct disorder ranged from 6% to 16% for boys in the studied sample while only 9% in girls.

Mullick and Goodman, (2001), when applying the SDQ on Bangladeshi children found that psychiatric disorders were considered probable in 17.9% of the total studied sample, 10.5% had emotional disorders, 5.6% had conduct disorders and 3.1% had hyperactivity disorders. These results are nearly similar to findings in our study.

The results of self-reports from school children showed prosocial, hyperactivity, emotional and conduct scores were significantly dependent on age. Moreover parent reports of these children also revealed significant statistical difference existed between different age groups in hyperactivity, emotional, and total scores.

When the self and parent reports were studied for gender difference between school children it was found from self-report that females had higher abnormal impact, hyperactivity, emotion, conduct and total scores whereas, male children showed higher abnormalities in prosocial and peer scores. Statistical significant difference existed only in prosocial, emotion, and total scores. While in parent reports females had higher abnormal scores on most of the symptom scores except the total score. Statistical significant difference existed only in peer problem score.

Vasconcelos, et al. (2003) in a screening study of 403 children in Portogal with male/female ratio of (1.9:1) found that 108 (26.8%) children screened as positive cases, 17.9% of the sample had ADHD, and there was nearly no sex difference in the study.

WHO (2001) for percentage of children having psychiatric disorders in the community stated that 17.7% in Ethiopia, 20.7% in Germany, 12.8% in India, 15% in Japan, 21.7% in Spain, 22.5% in Switzerland and 21% in USA. The results indicating that each country has its own profile, i.e., there is no constant percentage that should be detected and different countries could have figures higher or lower than each other. Also Koskelainen, et al. (2000) found no significant differences in the rates of the disorders when they were classified by age group or gender.

Turner and Gil, (2002), also found that the gender difference observed was two fold increase rate of affective and anxiety disorders among females as compared to males, while this association disappeared when ADHD or conduct disorder was taken into account.

Because the clinical diagnoses of lead toxicity is exceedingly difficult in children prior to the occurrence of sever injury to the nervous system, early diagnosis depends on laboratory detection of lead in blood (Refaat, 2001)

To assess this problem in our study, 100 school children were chosen according to the results of the prediction from those who have probable psychiatric disorder were screened for their BLL (These were the only children showed parent or caregiver agreement to collect blood samples) 44 children were chosen from completely normal children and assigned to control group and were also screened for their BLL. Moreover, the 100 school children were subject to mental assessment by MMSE, besides, socioeconomic standard classifications.

When the control group classified according to age, it was found that the average BLL is higher in older children (15.5 ng/dL) than in younger children (12.27 ug/dL). When the control group was classified according to gender, it was found that average BLL is higher in boys (14.79ug/dL) than in girls (13.75ug/dL).

The average BLL for school children who have probable psychiatric disorders classified by age was found as 16.15 ug/dL for age >6:<10 years, 32.88 ug/dL for age >10:< 13 years, and 33.28 ug/dL for age >13: <16 years. Again average BLL is higher in older children than in younger children. Also, male children have higher average BLL (34.88 ug/dL) than female children (19.47 ug/dL). The average BLL in school group is significantly higher than the control group. Several studies are in harmony with these findings. The results coincide with results obtained by (Refaat, 2001), who

found that children of older age had BLL higher than the younger age. This can be attributed to the following causes:

- Elder children become involved in outdoor activities more than younger children.
- The accumulating nature of lead toxicity.

Refaat (2001) found that no statistical significance between males and females although males had higher BLLs. Omar, et al. (2001), also found similar results. On the other hand (WHO, 2001) reported higher BLL in males than females, and this was attributed to the higher haemotocrit values of boys, higher lead consumption and outdoor activities than girls.

Yang, et al. (2002), who found that, average BLL in males is 29.3 ug/dL and 23.4 ug/dL in females with average BLL for the studied sample of 29.3 ug/dL.

The high BLL reported in our study in comparison to other results may be attributed first to the great industry and large number of automobiles in a small city like Mansoura. Second, efforts done to minimize environmental pollution by lead products are still of minimal amount.

Kandil (1993) screened BLL in 222 children of different age groups in Cairo city, and found that 9.46% had BLL of 10:14 ug/dL and 25.33% had BLL more than 24 ug/dL.

Omar, et al. (2001), found 96.6% of his studied children had BLL more than 10 ug/dL and 85% had BLL more than 20 ug/dL.

Refaat (2001) found in his study that the average BLL was 30 ug/dL and that all the studied students had BLL above 10 ug/dL. 83% had BLL above 20 ug/dL, 49% had BLL more than 30 ug/dL, 14% were more than 40 ug/dL and only 5% had more than 50 ug/dL.

Kalra, et al. (2003), conducted a cross sectional study in Delhi-India, to estimate average BLL and prevalence of lead toxicity in school children. They found that average BLL was 7.8 ug/dL and about 18.4% of the sample had BLL above 10 ug/dL.

In the present study high BLL were found among children of low socioeconomic standards, whose fathers are usually manual workers and who live in places which are exposed to higher levels of lead pollution due to presence of factories which emit lead dust in the environment, besides having their houses nearby pollution areas. Moreover, lifestyle habits, which may include newspaper to wrap foodstuff or other objects that are used by children. Furthermore, low socioeconomic standard families are ignorant about environmental and health hazards of lead more than families of high socioeconomic standards, i.e., they may show some neglect to their children more than families of high socioeconomic standards.

These findings are consistent with the findings of Yang, et al. (2002), who conducted a study on 1,888 children in Taiwan city and found that geographic factor; social standard, age, and gender significantly influence the BLL.

Pinedo, et al. (1999), screened about 80,000 preschool and school children in Colombia to analyse the effect of sex, age, and socioeconomic standard on the development of psychiatric disorders in general and ADHD in specific. They found that children of low socioeconomic standards were more susceptible to the development of disorders, which a finding is also found in this study.

One of the main serious results of lead exposure in children has been shown to be the neurobehavioral effects. In the present study an inverse relationship was found between blood lead levels and mini-mental state examination of the studied sample, this goes with the results obtained by (Jusko, et al. 2008) who after adjustment for maternal IQ, Home scale scores, and other potential confounding factors, lifetime average blood lead concentration (Mean=7.2 ug/dL; median=6.2 ug/dL) was inversely associated with Full-Scale IQ (p=0.006) and Performance IQ scores (p=0.002). Compared with children who had lifetime average blood lead concentrations <5 ug/dL, children with lifetime average concentrations between 5 and 9.9 ug/dL scored 4.9 points lower on Full-Scale IQ (91.3 vs 86.4).

In the present study, a good correlation was noticed between the BLL and the SDQ scores especially with conduct symptom score and hyperactivity symptom score, the negative sign for the correlation with prosocial score indicates inverse relationship. This is due to the fact that high score indicates normal and low score indicates abnormal.

Moreover, all correlation values are positive which states that as the BLL increases, the SDQ score increases, which indicates that lead pollution in the environment adds to the occurrence of psychiatric disorders.

SUMMARY AND CONCLUSIONS

The development and implem-entation of routine screening methods using screening questionnaires to be applied in places where large collections of children are present e.g. schools, is an essential need. Aiming to identify children whom are suffering, or are at risk of developing psychological disorders, with referring those in need to specialized physicians, thus early detection of cases and thus early application of treatment intervention.

Prevalence of child psychiatric disorders differs from a place to another depending upon the diagnostic system used to identify cases in the screening process, the type of questionnaire used ,it's validity , reliability and items that it measures. The characteristics of the sample upon which the survey was done.

From the results of this study the following conclusion remarks are observed:

- Percentage of abnormal children was considerably high in our school children's.
- Blood lead level correlates positively with the abnormal cases being higher in those suffering from hyperactive and conduct symptoms than normal. *Psychiatric disorders are higher among low socioeconomic standard communities.
- High blood lead level adversely affects cognitive abilities of children.

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الملخص العربى

تأثير التلوث البيئى بالرصاص على الصحة النفسية لأطفال المدارس بمدينة المنصورة

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مقدمة: نظرًا لكون الاضطرابات النفسية فى الأطفال من الظواهر الهامة فى المجتمع والتى قد يجهل الآباء والمعلمين بها. ونظرًا لعدم تواجد التوعية الكافية بين الجهات المختصة بالتعامل مع الأطفال الذين يعانون من تلك الإضرابات، ولا سيما أن هذه المشاكل النفسية قد تؤدى الى مضاعفات خطيرة على صحة الطفل النفسية وتؤثر فى تحصيله الدراسى كما تؤثر بالسلب على بناء شخصيته، لذا كان من الضروري وجود طريقة سهلة وسريعة ودقيقة ذات مصداقية لعمل مسح ميداني فى الأماكن ذات التجمعات الكبيرة من الأطفال مثل المدارس، حيث أن الأطفال يقضون وقت طويل بها مع احتمال وجود أطفال مصابون بالفعل أو معرضون للإصابة باضطرابات نفسية عديدة.

كما أن التلوث البيئى بالرصاص أصبح من المواضيع ذات الأهمية العالمية وذلك للمضاعفات العديدة خاصة مع تزايد التقدم الصناعى والتمدن. وتكمن خطورة الرصاص فى كون التعرض له بنسبة قليلة على المدى الطويل يؤثر بالسلب على نمو وتطور الجهاز العصبى المركزي مما ينتج عنه اضرابات نفسية وسلوكية جسيمة.

الهدف من الدراسة: وتهدف الدراسة الى البحث عن الإضرابات النفسية لدى أطفال المدارس وإيجاد علاقة بين الإضرابات ونسب الرصاص فى دم الأطفال وكذلك علاقة المستوى الاجتماعى والمستوى العقلى بنسبة الرصاص.

عينة الدراسة وأدواتها: وقد تم عمل مسح للإضطرابات النفسية باستخدام اختبار التحديات والصعوبات (SDQ) للأطفال البالغ عمرهم من (6-16) عام.كما تم قياس القدرة المعرفية لدى هؤلاء الأطفال باستخدام مقياس الحالة العقلية المصغر وتم تصنيفهم الى مستويات اجتماعية مختلفة تبعاً لمقياس فهمي وشربيني.

نتائج الدراسة:

- أظهرت نتائج الدراسة أن 14.54% من أطفال المدارس يعانون من اضطرابات نفسية وقد ارتفعت هذه النسبة فى الأطفال ذات المستوى الإجتماعى الأقل. ووجد أن نسبة الرصاص فى الدم أعلى فى السن الأكبر وفى الذكور عنها فى الإناث.
- وأظهرت النتائج أيضاً وجود علاقة طردية بين ارتفاع مستوى الرصاص فى الدم واحتمالية الإصابة بالإضرابات النفسية وخاصة زيادة النشاط الحركى والاضطرابات المزاجية ـ كما وجدت علاقة عكسية بين كل من القدرات العقلية والمستوى الإجتماعى للأطفال ومستوى الرصاص فى الدم.

الاستنتاجات: ومن هنا فقد أوصت الدراسة الى أن الاكتشاف المبكر للإضطرابات النفسية فى أطفال المدارس ذو أهمية كبرى لتوفر العلاج والرعاية اللازمة واتخاذ القرارات البيئة المطلوبة للحد من نسبة التعرض للتلوث البيئى بالرصاص والذى يؤثر على الذكاء ويتسبب فى تدهور الحالة العقلية لدى نسبة ليست بالقليلة من هؤلاء الأطفال.