Mothers Awareness Regarding Hazard of Lead Pollution Among Children Under 5 Years

Nabila Elsayed Sabola[1], Sahar Ahmad Shfik[2], Eman Fathy Amr Mohamed[3] Khadiga Zain Alabdeen Moustafa Mohammed[4], Mervat Mostafa Arrab[5, 6]

[1]Professor of Family and Community Health Nursing, Faculty of Nursing, Menoufia University, Egypt

[2]Professor of Community Health Nursing, College of Nursing, National University of Science and Technology, Iraq

[3]Assistant Professor of Medical Surgical Nursing, College of Nursing, National University of Science and Technology, Iraq

[4]Lecturer of Paediatric Nursing, Faculty of Nursing, Zagazig University, Egypt -Taif University, Taif city, KSA

[5]Assistant Professor of Family and Community Health Nursing, Faculty of Nursing, Menoufia University, Egypt

[6]College of Nursing, King Khalid University, Khamis Mushait, KSA.

Abstract

Background: Lead poisoning is a public health problem in many areas of the world. Children are at particularly high risk for adverse effects of lead exposure; even at low concentrations, lead can affect physical, mental, and behavioral development. Aim of the present study is to assess of mothers awareness regarding hazard of lead pollution among children under 5 years. Design: destructive research design was utilized in the current study. Setting: The study was carried out at Douyia village in Beni Suef City, Beni Suef governorate, Egypt. Sample: Cluster sample was used to select homes with the assistance of the village map obtained from the Office of Health at Douyia district. Sample size:300 mothers of children under five years were selected. Tools: Two tools were developed by the researchers for data collection. Tool 1: structured interviewing questionnaire, included four parts (a) demographic characteristics of parent and child, (b) mother's knowledge, (c) mothers' reported health habits towards cleaning house and habits that increase lead pollution, (d) mothers reported children's nutritional habits, Tool II was observational checklist for the indoor and outdoor environment of the house. Results: the main finding of the present study revealed that for, 70% of mothers had poor knowledge regarding lead pollution, as for mothers' habits, 70% of them wrong habits regarding cleaning the house, 80% of them wrong habit that increased lead pollution. Also, 65% of mothers not done practice regarding nutritional habits that effect lead pollution. Also , regarding observation checklist about indoor and outdoor the majority of them bad environment of the house , while , a statistically significant difference between total knowledge score , total habits , total practice of the studied children's mothers and all items of : parents age , level of education, occupation, , monthly income ($P < 0.001$).Conclusion : The majority of mothers had poor knowledge and wrong habit regarding lead pollution , and not done practice about nutrition practice to decreased lead pollution ,and the majority of indoor and outdoor bad environmental of the house .Recommendation: It is necessary to apply a health educational program for fathers whose jobs put them in contact with lead about how to protect themselves and their families from lead pollution; and further studies needed to be educated with different setting in rural area to improved knowledge and practice about hazard of lead pollution .

Keywords: Children under five years, lead pollution, hazards of lead pollution.

1. Introduction

Lead is a heavy metal with high toxicity and harmful effects on human health. Due to its widespread use, lead poisoning is still a public health issue of concern, particularly in developing countries (Tong et al .,2019)..

Lead is a highly toxic and pervasive metal. Chronic exposure to low levels is responsible for significant health effects, particularly in children. Prevention remains the best option for reducing childhood lead exposure, however the knowledge, attitudes and practices to lead exposure in many developing countries is not known. People are exposed to lead poisoning from a variety of sources such as industrial production (mining, metallurgy, battery manufacture, and recycling), using leaded gasoline, lead paint, electronic waster, lead-contaminated food and water, and some traditional medicines (Leggett ,2020).

Children who are more likely to be exposed to and affected by lead poisoning are more serious cases than adults due to the specific physiological and behavioral characteristics of the developing organism. Children have the habit of putting hands, toys, and strange objects into the mouth. In addition, children breathe in the air close to the ground having

doi.org/10.31838/hiv23.01.94 Received: 10.09.22, Revised: 15.10.22, Accepted: 04.12.22

more dust and lead than the above-the-ground air. Children absorb a greater amount of lead through the digestive tract than adults due to the incomplete digestive system, or digestive disorders and iron and calcium deficiency. Lead easily crosses the blood-brain barrier and damages the immature nervous system of the child. There is no safe exposure threshold for children. Severe lead poisoning is initially characterized by lethargy, abdominal pain, loss of appetite, and irritation and then causes seizures and coma (Cory-Schlecta and Schaumburg, 2019).

Low-dose lead can lead to mental and physical development disorders, neurological disorders, decreased hem synthesis and anemia, increased acoustic feedback threshold, and decreased Vitamin D levels in the blood. The neuroleptic effects of lead on children's bodies continue as the level of lead in the blood decreases Children living near mining sites are at high risk of lead exposure due to environmental pollution. In addition, the risk of lead poisoning is due to the low socioeconomic status and the professional factors of family members (Adams and Victor ,2019).

In Zamfara, Nigeria, gold mining has polluted the environment, leading to the deaths of 400 children of lead poisoning. Mean blood lead level of children living at Yatagan coal mine, Turkey, was 33.8 ± 15.6 µg/dL in females and 38.8 ± 16.0 µg/dL in males. The blood lead level was found to be >10 µg/dL in 95.7% and >20 µg/dL in 87.6% of all children. According to Kunming's Center for Lead Poisoning Prevention (China), an average of 50-60% of children under 14 in Yunnan's mining intensive regions suffer from lead poisoning (CDC, Preventing Lead Poisoning in Young Children,2015).

The study conducted by Hien et al., (2016) found that due to the contaminated soil environment with an average lead content of 689-1043 mg/kg (315-1870 mg/kg), hair lead content for the boys was 121.8 µg/g and for the girl was 60.62 µg/g. However, hair lead concentration may reflect environmental pollution but is less likely to have clinical value than blood lead concentration (Choudhari, et al.,2019).

The community health nurse plays an important role in environmental health and lead pollution prevention. This role includes improving child quality of life; determining interactions with physical, chemical, biological and social factors in the environment that increases lead pollution exposure; assessing bad habits and practices; correcting health knowledge; controlling and preventing factors that increase susceptible to these types of pollution (Clemen, 2010).

Significance of the study

Lead pollution in Egypt is the main source of air pollution as it represents more than 75% of total pollution in Egypt. Diesel fuel burning is responsible for 18% of the total lead pollution in Egypt. The cement factories and foundries copper is responsible for the other ratio of lead pollution (Bakir and Amitai, 2019).

The exposure to low levels of lead can result in serious and irreversible health and behavioral problems, especially in children. While the high lead levels can cause serious long-term health problems and harm almost every part of the body, especially the brain and reproductive organs. Lead can damage the developing brain and nervous systems of unborn children much more easily than those of adults. The effects of lead are most severe in children, and the high concentrations cause lead poisoning can lead to death

(Olympio,Gonçalves, Günther, &Bechara,2020).

Aims of the Study

This study aimed to assess of mother's awareness regarding hazard of lead pollution among children under 5 years through the following objectives:

1- Assessing mothers' knowledge about hazards of lead pollution.

2- Evaluate the mother's health habits contributing to lead pollution.

3- Assess the mothers' reported practices for children's under five years regarding nutritional habits'

Research questions

1. Are the mothers having knowledge about hazard of lead pollution?
2. What the mother's health habits regarding control of lead pollution and its poisoning?
3. What the mothers reported practices for children's under five years regarding nutritional habits?
4. Is there a relationship between mothers' knowledge, health habits and their demographic characteristics?
5. Is there a relationship between mothers' knowledge, practice and health' habits?

2. Materials and Methods

Design: descriptive research design was utilized to conduct this study.

Setting: The current study was alied at Douyia village at Beni Suef City, Beni Suef Governorate, Egypt. Beni Suef city consists of 7 rural local units comprising 34 villages and 118 farms. Douyia village is one of them, it is located at east of the Nile River. The total population of Douyia village is 6,783 people, including 3,433 men and 3350 women. it was the largest rural area in the population number and high arithmetic exposure to lead.

Sample: Cluster sample was used to select homes with the assistance of the village map obtained from the Office of Health Douyia. Mothers were met during scheduled home visit; each mother was visited 4 times/ week.

Subject: All children from one month to 5 years at Douyia district in Beni Suef City were 3000 child in year 2021. Accordingly, the estimated sample size was 300 children and their mothers / caregivers were included in the study.

The samples were selected according to the following criteria

Mothers of children living in Douyia village.
Children both sexes (male and female).
If the mothers have more than one child less than five years, it is considered one case.
Study Tools: The data collection instruments were developed by the researchers after reviewing the literature related to lead pollution. It included 2 constructed interviewing questionnaires that were divided into:
First tool: -An interviewing questionnaire that contained four parts:
Part I: Demographic characteristics data of the study mothers such as: mothers and fathers age, level of education , parents occupation , monthly income children age, sex, and numbers of siblings ,sources of mothers knowledge regarding lead pollution nature of exposure to lead during work of the father and child activates lead to pollutant .
Part II: Assess mother's knowledge related to meaning of pollution, lead pollution and lead poisoning. This part contains 8 questions, the questions coded as following:
Correct = 1: The mothers choose true answers.
Incorrect = zero: The mothers choose wrong answers &total score = 8 points
Scoring system as the following:
Poor knowledge: from <50% (< 6).
Average knowledge: from <75 % (< 6)
Good knowledge: > 75 % (> 6)
Part III: Assess mothers reported health habits predispose to lead pollution to **assess:**
Mothers' habits towards cleaning the house, such as: covering the floor, cleaning the floor cover daily
Mothers' reported habits that increase lead pollution, like use of newspaper with food, don't run water before use.
Scoring system and the results were categorized as the following:
No = 0: if the mother reported no action or wrong habit.
Yes = 1: if the mother reported doing right action.
Part VI: Assess mothers reported practices for children's under five years regarding nutritional habits that affect lead pollution, such as: the child didn't eat breakfast, didn't eat three meals and snacks.
This part contain 18 questions, were coded as following:
Always = 1 (all the week)
Sometimes = 2 (5times/ week)
Rarely = 3 (once every week)
Never = 4
While the questions from (3, 4, 5, 6, 7, 8, 11, 12, 13 and 18) coded as following:
Never = 1
Rarely = 2(once every week)
Sometimes = 3(5times/ week)
Always = 4(all the week)
Total score = 18 points.
Total scores

Done practice = > 50%
Not done practice =< 50
II- The second tool: - Observational checklist, it was developed by the researchers to assess the environment, it was divided into two sections: Indoor lead pollution such as home paint, water pipes, water supply and expose the children to smoke. And outdoor environment observe greenery or trees outside the homes, burning wastes beside the house, home structure

Scoring system was coded as follows

No = 0: if the observed item was not found.
Yes = 1: if the observed item was found & total score = 16 points for indoor and
7 points for outdoor.
Good environmental >50 % Bad environmental <50%

Field work

An official permission was obtained oral permissions from mothers to participate in the study.
The process of data collection was carried out in the period from January 2021 to October 2021, (9 months), 4 days / week, each visit took from 30: 45 mints. Each family was visited 4 times.
The researchers visited 6 houses/ day, 4 days per week (24 houses/ week).
The initial visit: The questionnaire was filled during the initial visit.
The researchers introduced herself for the mother/caregivers, explains the purpose of research and filled the questionnaire related to socio demographic data and lead pollution knowledge it took about10 minutes and the questionnaire related method of cleaning the house took about 20 minutes,
The researchers observed the home environment (indoor and outdoor of the house), it took about 15 minutes, observe the child and his/her mother habits related to lead pollution
The researchers did a computer search about the study topic. Then reviewing past and current literature covering the various aspects of the problem was done using books, articles periodicals, magazines and studies related to the research study.
The researchers took official letter from the Dean of Faculty of Nursing, Beni Suef University, contains the purpose of the research. Then, the researchers visited the environmental monitoring of the Egyptian Ministry of health and population and obtained an official document about the arithmetic mean at year (2009) from points of air monitoring about lead measurement in Cairo. The highest point was at Beni Suef distract. Also, observe an arithmetic mean increase each year than the previous year.
Before collecting the data another official letter to the Health Office of Beni Suef district to obtain the district map. This map helped the researchers in selecting the houses and collecting the data.

Reliability of the tools

Reliability was applied by the researchers for testing the internal consistency of the tool, by administration of the same tools to the same subjects under similar conditions two times 15 days a part. Answers from the repeated testing were compared (Test- re- test reliability was 0.82) and Cronbach's Alpha reliability was 0.890.

Validity of the tools

The validity was tested for content validity by jury of five experts in the field of community health nursing and pediatric specialty to ascertain relevance and completeness; it was done before the pilot study. The content and face validity of the study tools were measured to evaluate the individual items as well as the entire tools used for the study as being relevant and appropriate to test what they wanted to measure. The experts were asked to evaluate individual items on the study tools in relation to its relevance and appropriateness. If the items adequately measure all dimensions of the construct, they give a percent to each. Score of 0.80 or better is generally considered to have good content validity. Face validity of the tools= 93%.

Pilot study

It was conducted in Douyia village slum area in Beni Suef City, Beni Suef Governorate, on 10% (30 mothers), to test the clarity of data collection tools. Also, to detect any obstacle or problem that might arise in data collection, and estimate the time needed to fill the tools. The subjects of this pilot study were included from the study sample. The time needed for filling the questionnaire and the observation tool was around 35: 40 minutes for each mother.

Ethical considerations

The agreements for participation were taken after the purpose of the study was explained. Before data collection, the mothers were informed about the aim of the study. They were given an opportunity to refuse to participate and they were notified that they could withdraw at any stage of research. Also, they were assured that, the information would remain confidential and used for the research purpose only.

Statistical Design

Data were analyzed using the statistical package for social sciences (SPSS) version 24. Qualitative data was presented as number and percent. Comparison between groups was done by Chi-square test. $P < 0.05$ was considered to be statistically significant of results.

Limitation of the study: All the families refused giving blood sample from their children to make lead blood test and measure lead poisoning in the children's blood and very little references were found related to the topic.

Table (1): Frequency Distribution of studied children and their mothers regarding demographic characteristics, n=300

Demographic data	The studied sample (N=300)	
	No.	%
Mothers age: < 20 20 <30 >30	90 140 70	30.0 46.7 23.3
Mean ± SD 25.88 ± 0.71		
Fathers age: < 30 30 < 40 >40	80 200 20	26.7 66.7 6.6
Mean ± SD 33.44± 0.81		
Father's level of education:		
Illiterate	85	28.4
Read & write	50	16.7
Secondary education	148	49.3
University or more	17	5.6
Mother's level of education:		
Illiterate	55	18.4
Read & write	40	13.3
Secondary education	190	63.3
University or more	15	5.0
Father occupation:		
Employed	90	30.0
(Worker+ Hand work)	*(210)*	*(70.0%)*
Worker	50	23.8
Hand work	160	76.2
Mother occupation:		
Housewife	224	74.6
Worker	76	25.4
Children age (months): Range	1-60 months	
Mean ± SD	10.96 ± 0.91	
Sex of the children:		
Males	149	49.7
Females	151	50.3
Number of siblings:		
1 – 2	167	55.7
3 – 4	55	18.3
> 5	40	13.4
No siblings	38	12.6
Monthly Income:		
Adequate	80	26.7
Inadequate	220	73.3

Table (1) displayed the reported demographic characteristics of the study sample, regarding to mothers age 46.7% of them the age between 20 <30 years, the mean age 25.88 ± 0.71 . 66.7% of fathers the age between 30 < 40 years, the mean age 33.44± 0.81. Regarding level of their education,

49.3% of fathers and 63.3% of mothers had elementary education 74.6% of mothers were housewives. 70% of fathers were Worker+ Hand work. Also, children. 55.7% of children were having 1 – 2 siblings. More than half of them 50.3% were females. The most 73.3% of the mothers reported not having adequate income

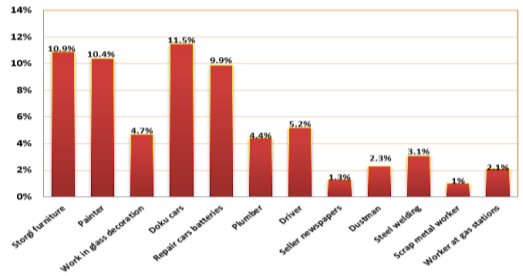

Figure (1): Nature of exposure to lead pollution during work of the fathers

Figure (1) Presented 66.8% of fathers who expose to lead pollution during their work. This figure revealed that 11.5% of the fathers worked in doku cars, 10.9% storgi, 10.4% painter, and 9.9% repair batteries.

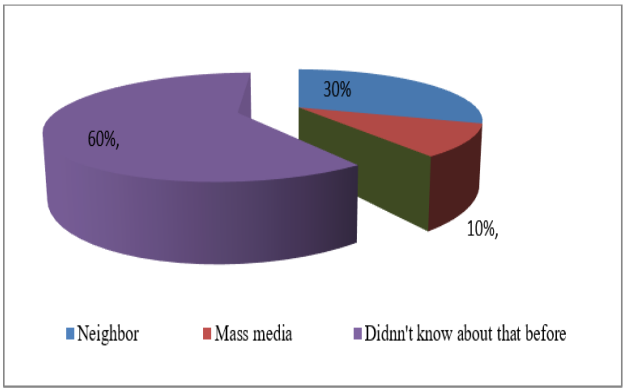

Figure (2): Sources of mothers' knowledge regarding lead pollution, (n=300).

Figure (2): Showed that 60% of mothers' didn't know about lead pollution before ,30% the source of knowledge by mass media and 10% of them the source of knowledge by neighbor.

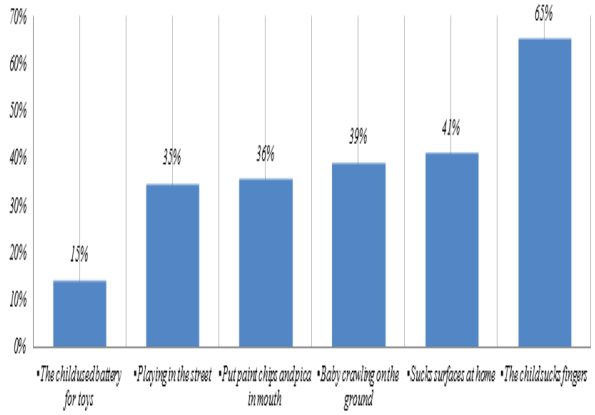

Figure (3): Observed distribution of the child's lead pollutant activities (n=300)

Figure (3): Showed that 65% of children lead pollutant activities was the child suck fingers. And only 15% of them lead pollutant by battery for toys

Regarding research Q1: Are the mothers having knowledge about hazard of lead pollution?

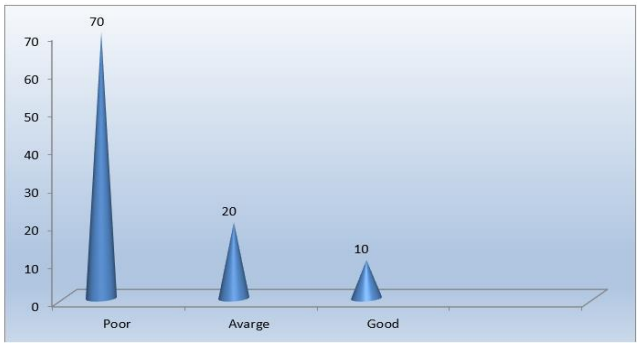

Figure (4): Mothers total score of knowledge regarding lead pollution, (n=300).

Figure (4): Showed that 70% of mothers' had poor knowledge regarding lead pollution ,20% of them average knowledge, and only 10% had good knowledge.

Regarding research Q2: Evaluate the mother's health habits contributing to lead pollution?

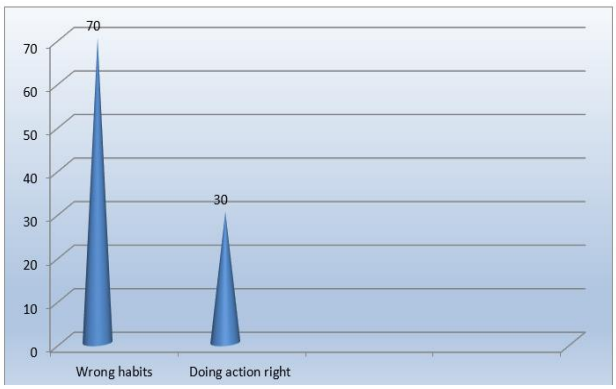

Figure (5): Mothers' reported habits regarding cleaning the house (n=300).

Figure (5): Showed that 70% of mothers had wrong habits regarding cleaning the house and only 30% of them doing action right regarding cleaning the house.

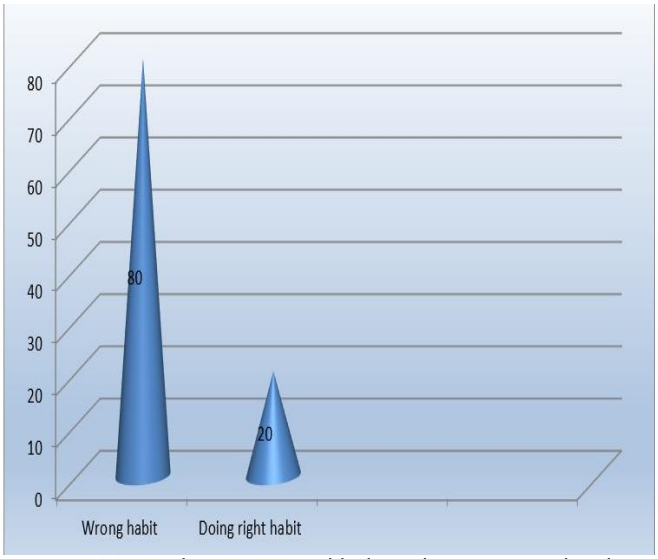

Figure (6): mothers reported habits that increase lead pollution (n=300).

Figure (6): Showed that 80% of mothers had wrong habits regarding control of led pollution and only 30% of them doing action right regarding control of

led pollution.

Regarding research Q3: Assess the mothers reported practices for children's under five years regarding nutritional habits'?

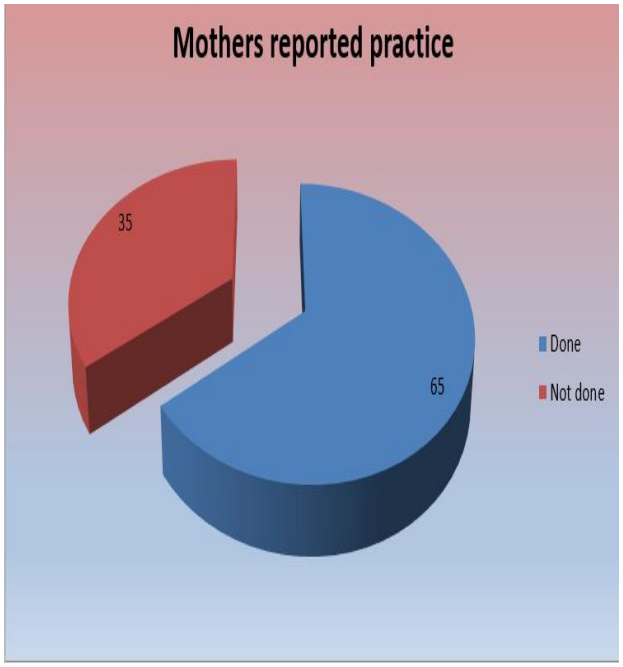

Figure (7): mothers reported practice for children regarding nutritional habits that effect led pollution (n=300).

Figure (7): Showed that 65% of mothers' had not done practice regarding nutritional habits that affect lead pollution and only 35% of them done practices regarding nutritional habits that affect lead pollution.

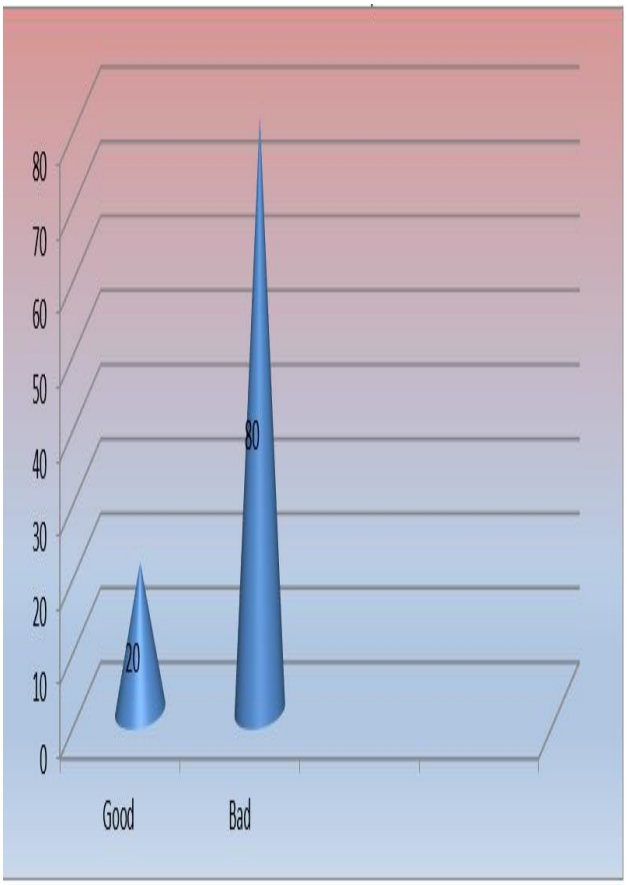

Figure (8): Observation checklist of indoor and outdoor exposure of the studied Children under 5 years to lead

The figure showed that 80% of indoor and outdoor bad environment, and 20% of them good environment.

Table (2): Observation checklist of indoor and outdoor exposure of the studied Children under 5 years to lead (n=300)

Household settings	The studied children sample (N =300)	
	No.	%
1-Indoor environment:		
●Peeled paintings from walls:		
Yes	157	52.4
No	71	23.6
Not applicable	72	24.0
●Source of drinking water:		
▪From tap at home	289	96.3
▪From water tank	11	3.7
●Pipes inside house made from steel or lead		
Yes	300	100
●Covering the floor:		
Yes	240	80.0
-If yes, method of covering the floor:(n=247)		
Carpets	124	51.6
Iyas	116	48.4
●Any one from the family smoke at home:		
Yes	220	73.4
2- Outdoor environment:		
●Green area outside:	37	12.4
●Burning rubbish beside the house:	80	26.6
●The house near from cars on the public street:	55	18.4
●The house is of old structure:	68	22.6
●Water pipes outside the house is old & made from steel or lead:	60	20.0

Table (2) displayed that regarding indoor environment exposure of the studied children under 5 years to lead, 52. 4% were Peeled paintings from walls, 96.3% had tab at home as a source of drinking water, 100% of pipes inside house made from steel or lead, 51.6% had carpets as a method of covering

the floor and 73.4 had family member smoke at home. In relation to outdoor environment exposure of the studied children under 5 years to lead 26.6% had burning rubbish beside the house

Table (3): Relation between of the studied children's mothers' total habits score and their demograp hic characteristics (n=300)

Socio demographic data	Habits score levels of the studied children's mothers				χ2	P- value
	Wrong habits N=210		Doing action right N=90			
	no	%	no	%		
Mothers age:						
< 20	60	28.6	30	33.3	16.47	<0.001**
20 < 30	110	52.4	30	33.3		
>30	40	19.0	30	33.4		
Fathers age:						
< 30	60	28.6	20	22.3	14.75	<0.001**
30 < 40	140	66.6	60	66.6		
>40	10	4.8	10	11.1		
Sex of the children:						
Male	130	61`.9	19	21.1	19.47	<0.001**
Females	80	38.1	71	78.9		
Number of siblings						
No sibling	20	9.5	18	20.0	15.97	<0.001**
1 - 2	140	66.7	27	30.0		
3-4	30	14.3	25	27.8		
≥5	20	9.5	20	22.2		
Income:						
Adequate	20	9.5	60	66.7	17.42	<0.001**
Not adequate	190	90.5	30	33.3		
Level of father education:						
Illiterate,	40	19.1	45	50.0	19.21	<0.001**
read and write	20	9.5	30	33.3		
Secondary education	140	66.7	8	8.9		
University or more	10	4.7	7	7.8		
Father occupation:						
Employment	50	23.8	40	44.4	17.02	<0.001**
Professionalism	40	19.0	10	11.2		
Worker	120	57.2	40	44.4		
Level of mother education:						
-Illiterate,	40	19.0	15	16.6	18.08	<0.001**
read and write	30	14.3	10	11.2		
Secondary education	130	61.9	60	66.6		
University or more	10	4.8	5	5.6		
Mothers occupation:						
Working	190	90.5	34	37.8	19.47	<0.001**
Housewife	20	9.5	56	62.2		
*Significant (p<0.05)						

Table (3): Presented a statistically significant difference between total habits score of the studied children's mothers and all items of; age of mothers and fathers, sex of the children, Number of siblings, Income, Level of fathers' & mothers' education, and Mothers occupation. P =<0.001.

3. Discussion

Lead is a metal that is cheap, useful, found in many products and in many places in the environment. Lead is a heavy metal that causes toxicities when entered through breathing, eating or absorbed to human body. Lead is a highly toxic substance, exposure to which can produce a wide range of adverse health effects. It is particularly harmful to young children especially under 5 years. Lead is a well-known non-biodegradable toxic metal in the environment. More than million children in developing countries are suffering permanent neurological damage due to lead pollution complication (Tabaku,Bizgha, & Rahlenbeck, 2019).

Regarding total scores knowledge of mothers, related to lead pollution, the finding of this study indicated that the majority of mothers had poor knowledge regarding lead pollution. On the same line of the present finding, the study carried out by Phommathansy, Wichiencharoen, & Nookong, (2019) who emphasized that 85% of mothers had poor knowledge regarding lead pollution. The investigator point of view , this finding means that the important implementation of the educational intervention has a positive effect on increasing mother`s knowledge score levels related to lead

pollution to improved child health.

Table (4): Relation between mothers' total knowledge score and their demographic characteristics.(n=300).

Socio demographic data	Knowledge score levels of the studied children's mothers						χ^2	P- value
	Poor n=210		Average n=60		Good n=30			
	No	%	no	%	no	%		
Mothers age :								
< 20	40	19.1	40	66.7	10	33.3	19.47	<0.001**
20 < 30	110	52.4	15	25.0	15	50.0		
>30	60	28.5	5	8.3	5	16.7		
Fathers age :								
< 30	40	19.1	30	50.0	10	33.3	12.34	<0.001**
30 < 40	160	76.2	25	41.7	15	50.0		
>40	10	4.7	5	8.3	5	16.7		
Fathers level of education:								
Illiterate,	40	18.2	35	58.3	10	33.3	19.21	<0.001**
read and write	30	13.6	20	33.3	10	33.3		
Secondary education	140	63.7	0	0.0	8	26.7		
University or more	10	4.5	5	8.4	2	6.7		
Sex of the children:								
Male	110	50.0	29	48.3	10	33.3	11. 45	<0.001**
Females	110	50.0	31	51.7	20	66.7		
Number of siblings						1.003		
No sibling	20	9.1	5	8.3	13	43.3	13.28	<0.001**
1 - 2	140	63.6	20	33.3	7	23.3		
3-4	40	18.2	10	16.7	5	16.7		
≥5	20	9.1	25	41.7	5	16.7		
Income:								
Adequate	40	18.2	30	50.0	10	33.3	10.48	<0.001**
Not adequate	180	81.8	30	50.0	20	66.7		
Father Level of education:			0.84					
Illiterate,	40	18.2	35	58.3	10	33.3	17.65	<0.001**
read and write	30	13.6	20	33.3	10	33.3		
Secondary education	140	63.7	0	0.0	8	26.7		
University or more	10	4.5	5	8.4	2	6.7		
Father occupation:								
Employment	50	22.7	30	50.0	10	33.3	17.02	<0.001**
Professionalism	20	9.1	20	33.3	20	66.7		
Worker	150	68.2	10	16.7	0	0.0		
Level of mother education:								
Illiterate,	25	11.4	20	33.3	10	33.3	18.92	<0.001**
read and write	20	9.1	10	16.7	10	33.3		
Secondary education	170	77.2	25	41.7	5	16.7		
University or more	5	2.3	5	8.3	5	16.7		
Mothers occupation:								
Working	180	81.8	30	50.0	14	46.7	16.67	<0.001**
Housewife	40	18.2	30	50.0	16	53.3		

Table (4): Presented a statistically significant difference between total Knowledge score of the studied children's mothers and all items of; sex of the children, Number of siblings, Income, Level of fathers' & mothers' education, and Mothers occupation. P =<0.001.

Table (5): Correlation between total Knowledge, total reported Practice and Demographic characteristics for mothers regarding lead pollution. (n=300)

Variable	Total knowledge score	
	R	P
Total knowledge	-0.345	<0.05*
Total reported health habits	-0.393	<0.01**
Total mothers practice regarding nutritional habits	0.503	<0.01**
*Correlation is significant at the 0.01 level (2-tailed)		

It was clear from **table (5)** that there was a highly statistically significant correlation between total knowledge ,total reported health habits and total reported practices regarding nutritional habits p= < 0.01*

When the researchers asked the mothers about any health centers related to the Egyptian Ministry of Health and Population who took any blood or urine samples from their children to test lead level, all of them reported that they didn't take any blood or urine from their children to investigate lead before. This could mean that the problem of lead pollution and its health risks is not viewed seriously by the government. On the other hand, the Agency for Toxic Substances and Disease Registry (Agency for Toxic Substances & Disease Registry "ATSDR", 2018) reported that the Nigerian government do blood lead test and follow up annually to control lead pollution complications.

Regarding mothers' habits towards cleaning the house, regarding to type of disinfectants used in cleaning, the majority of mothers were using chlorine in cleaning the house. This finding is agree by Yamamoto & Yasuhara, (2019) illustrated that, the 58% of studied mothers using chlorine in cleaning the house, the investigator point of view, the lead element combined with chlorine and produce new chemical product that is dangerous on human health. The study sample decrease the use of chlorine could be because they felt the extent of danger of using chlorine directly on the dust for

cleaning the house.

Regarding mother's habits toward cleaning children's toys, the majority of mothers continuously cleaning child toys. This finding was supported by Gould, (2019) who mentioned that the all mothers should be interested in cleaning the children's toys. The investigator point of view, the mothers continuously cleaning child toys because especially fur toys, the lead dust accumulate in it and they should avoid buying painted plastic toys.

Concerning leaving the shoes outside the house, the finding of this study showed that only one quarter of them leave the shoes outside the house'. This finding was supported by Alexander & Farrell, (2019) mentioned that , 65% of the study sample the leave the shoes outside the house'. The investigator point of view, the pair of shoes carried dust from outdoor road to inside the house; this dust may contain lead so recommended leaving shoes outside the house.

Concerning mothers habits toward using newspaper in food packaging, the present study showed that less than two thirds of them reported using newspaper in food packaging. Meanwhile, the majority of them use newspaper to absorb oil after frying food, This finding was supported by Suk, (2020) the study mentioned that, 60% of the study sample using newspaper in food packaging. The investigator point of view, who emphasized lead inter in printing processes of newspaper. This means that the food absorbs lead from the newspaper and transmits it to the food. , so it is very important to participate the mothers in educational program was successful to inform mothers to avoid using newspaper in food packaging and sucking up oil after frying food.

Regarding mothers habits towards make up, less than two thirds of them reported the use of kohl. The continuation of using kohl is a culturally accepted and common behavior for Egyptian women. However. This finding was supported by Awasthi, Pande, Srivastav, &Frumkin, (2019), in India, reported that 60% of mothers reported the use of kohl. The investigator point of view, the kohl contains lead to prove the color, which threaten human health because it is absorbed through human skin directly.

Concerning mothers habits towards use of pottery ornate, the finding of this study indicated that less than half of them use pottery ornate .This finding was emphasized by Walsh, (2020) the study mentioned that, 50% of study sample use pottery ornate .The investigator point of view, the pottery ornate threatens the human health because it is made from soil that may be contaminated with lead, and painted by cheap colors containing lead.

Additionally, the present findings illustrated that, less than quarter of them reported using canned foods and drinks. This finding was supported by Bellinger, (2019) the study showed that, 55% of mothers in the study sample using canned foods and drinks. The investigator point of view, the lead solder used in tin cans combine with stored canned food and release dangerous substances affecting the users' health

The investigator point of view concluds the important the mothers participate any educational program are successful and raised their awareness toward prevention or at least controlling lead effects, because mothers were lacking information about the danger of such practices on their children's health.

Concerning total scores mothers habits related to lead pollution, the finding of this study indicated that the majority of mothers wrong habits regarding lead pollution. On the same line with the present findings, the study carried by Nathan, (2019) the majority of mother's wrong habits regarding lead pollution

The investigator point of view that emphasized the important to participate the mother's any workshop or educational program to improve the mother's habits regarding control of lead pollution.

Concerning observation checklist to assess indoor environmental, less than two thirds of the present study sample lives in houses that have peeled paintings from walls. This result is in congruence with Aribigbola, (2018) the study showed that, 60% of the study sample lives in houses that have peeled paintings from walls.

The investigator point of view concludes that,the lead enters in the manufacture of paint because lead increases the durability of paint and resists mold. Also the lead paint becomes hazardous only if it is cracked, peeled or chipped from walls. The current study found that more than one third of the children put peeled painting in their mouth, which means that children are at risk to ingest lead or steel.

Concerning indoor water pipes, in the present study sample, the majority of study subjects have water pipes made from steel or lead. This result is in congruence with Skarupa, (2019) mentioned that the majority of study subjects have water pipes made from steel or lead. The investigator point of view, the lead element can be found dissolved in drinking water or can be present as particles. Usually small pieces of lead solder or lead rust detach from pipes. Because release of particles is sporadic, it is harder to capture this source in a water test. All of these are sources of lead contamination in drinking water. From the researcher point of view, the studied samples are at risk of lead pollution because they drink water from old pipes made from lead or steel.

Concerning indoor environment observation, (cigarettes smoke), around three fourth of the study sample are passive smokers who inhale cigarette smoke at their homes. This finding was emphasized by Amitai, (2019) mentioned that, 40% of the study sample are passive smokers who inhale cigarette smoke at their homes. The investigator point of view, the lead is present in tobacco and gets into the air during burning the cigarette. A cigarette contains between 0.017 and 0.98 micrograms of lead. That means that the children live at these houses inhale lead from cigarettes smoking and shisha.

Regarding green area beside the houses, the present study showed that only a small percentage of the study sample had green area outside their houses.

This finding was emphasized by Springs, Banks, &Schwab, (2019) reported that, 5% of the study sample small percentage of the study sample had green area outside their houses. The investigator point of view, the vegetation intercepts airborne particulate matter of lead, reducing lead concentrations in air. This means that the presence of green area improves air quality and reduces the amount of lead exposure to humans and, in turn, reduces the incidence of lead pollution.

As for burning rubbish, more than two thirds of the present study sample lived beside open burning rubbish area which is very dangerous. This finding was emphasized by Guilarte, (2018) reported that, 60% of the study sample lived beside open burning rubbish area which is very dangerous.

The investigator point of view, open burning of wastes is one of the main sources that introduce lead into the environment in many regions. Lead is present in many household products and in many other components of wastes that end up in urban waste or in uncontrolled waste deposits. Smoke from the open burning of waste pollute the air and transport lead for long distances, thus reaching communities settled kilometers away from the sources.

Concerning the location of house near public street, less than half of the present study lives near public street. This finding was emphasized by Lamba, & Minga, (2019) reported that, 45% of the study sample lives near public Street. The investigator point of view, the lead particles can remain airborne for some time following the initial introduction into the atmosphere. Therefore, residents nearest from road vehicles where leaded gasoline is still being used as fuel may have an increased risk of lead exposure. Also, the researcher observed that the majority of these cars are old and fuse black smoke into the air, which pollute the air in this area, and affect children and adults health.

Concerning observation checklist of indoor and outdoor exposure of the studied children under five years to lead pollution, the finding of this study indicated that the majority of study sample their homes were not good and bad environment. On the same line with the present findings, the study carried by Nathan et al., (2019) who emphasized that the majority of them bad house.

The current study describes that there were highly statistically significant relation between parent's age, level of education, occupation, monthly income and total knowledge ($P < 0.001$). The same line with Bottle, and Aylin, (2019). The study found that, highly statistically significance positive correlation between age, gender, level of education, occupation, monthly income and total knowledge ($P < 0.001$).

The current study describes that there were highly statistically significant relation between parents age, level of education, occupation, , monthly income and total mothers habits ($P < 0.001$). The same line with Little et al, (2019). The study found that, highly statistically significance positive correlation between age, gender, level of education, occupation, monthly income and total mothers habits ($P < 0.001$). This could explain the effect of education in health literacy. Also, the effect of income was significant since family with better income will have better health care.

Regarding to correlation between total knowledge, total mothers habits and total mothers practice regarding nutritional habits. The current study represented that there was highly significance correlation between total knowledge score and total reported habits and total mothers practice regarding nutritional, this result were in agreement with Kornfeind, (2019) who indicated that, the current study represented that there was highly significance correlation between total knowledge score and total reported habits and total mothers practice regarding nutritional

4. Conclusion

The study denoted that the majority of mothers' had poor knowledge regarding lead pollution, and the minority of them had good knowledge. Also , Showed that the majority of mothers' had wrong habits regarding cleaning the house and the majority of them had wrong habits regarding control of led pollution , and the majority of mothers not done practice regarding nutritional habits that effect lead pollution, Also , regarding observation chick list about indoor and outdoor the majority of them bad environment , while , a statistically significant difference between total Knowledge score , total habits total reported practice of the studied children's mothers and all items of; parents age , level of education, occupation, , monthly income

5. Recommendation

The study recommended that, Organizing health education campaigns to visit rural areas, to prevent lead pollution through posters and mother classes; designing a health educational program for fathers whose jobs put them in contact with lead elements about how to protect themselves and their families from lead pollution; and further studies needed to be performed with different variables, subjects and different settings.

References

Tong, Y. E. von Schirnding, M and Prapamontol, T. "Environmental lead exposure: a public health problem of global dimensions," Bulletin of the World Health Organization, vol. 78, no. 9, pp. 1068–1077, 2019.View at: Google Scholar

WHO, "Childhood lead poisoning," pp. 11-19, 2010.View at: Google Scholar

Leggett, R. W "An age-specific kinetic model of lead metabolism in humans," Environmental Health Perspectives, vol. 101, no. 7, pp. 598–616,2020.View at: Publisher Site | Google Scholar

Cory-Schlecta D. A. and. Schaumburg, H. H "Lead, ignorganic," in Experimental and Clinical Neurotoxicology, P. S. Spender, H. H. Schaumburg,

and A. C. Ludolph, Eds., Oxford University Press, New York, NY, USA, 2nd edition 2019.View at: Google Scholar

CDC, Preventing Lead Poisoning in Young Children: A Statement by the Centers for Disease Control, Centers for Disease Control and Prevention, Atlanta, Georgia, Ga, USA,2015.

WHO, Environmental Health Criteria 165—Inorganic Lead, International rogramme on Chemical Safety, World Health Organization, Geneva, Switzerland, 1995.

Adams R. D and. Victor M, Principles of neurology, McGraw-Hill, New York, NY, USA, 5th edition, 2019.

Needleman, H. L Schell A., D. Bellinger, A. Leviton, and E. Allred, N. "The long-term effects of exposure to low doses of lead in childhood: An 11-year follow-up report," The New England Journal of Medicine, vol. 322, no. 2, pp. 83–88, 1990.View at: Publisher Site | Google Scholar

Choudhari, N. G. Sathwara, V. K. Shivgotra et al., "Study of lead exposure to children residing near a lead-zinc mine," Indian Journal of Occupational and Environmental Medicine, vol. 14, no. 2, pp. 58–62, 2019.View at: Publisher Site | Google Scholar

Medicins Sans frontieres (MSF), Lead poisoning crisis in Zafara State northenrn Nigeria, 2012.

Yapici, G. Can, A. R. Kiziler, B. Aydemir, İ. H. Timur, and A. Kaypmaz, "Lead and cadmium exposure in children living around a coal-mining area in Yatağan, Turkey," Toxicology & Industrial Health, vol. 22, no. 8, pp. 357–362, 2006.View at: Publisher Site | Google Scholar

Occupational Know lege International, Summary of Mass Lead Poisoning Incidents, 2012.

Hien, M. Yoneda, S. Fujii, and H. T. Hai, "Effects of age, sex, and environmental factors using samples of hair from residents living in the vicinity of the Cho Dien lead/zinc mine (Vietnam) WIT Transactions on Ecology and The Environment," 2012.View at: Google Scholar

Esteban, C. H. Rubin, R. L. Jones, and G. Noonan, "Hair and Blood as Substrates for Screening Children for Lead Poisoning," Archives of Environmental & Occupational Health, vol. 54, no. 6, pp. 436–440, 1999.View at: Publisher Site | Google Scholar

Wedeen, M. J. Kosnett, and K. L. Hipkins, "Recommendations for medical management of adult lead exposure," Environmental Health Perspectives, vol. 115, no. 3, 2007.View at: Google Scholar

Council of State and Teritorial Epidemiologists, "Public Health Reporting and National Notification for Elevated Blood Lead Levels (15_EH-01)," 2016, http://c.ymcdn.com/sites/www.cste.org/resource/resmgr/2015PS/2015PSFinal/15-EH-01.pdf.View at: Google Scholar

Environmental Protection Agency, Office of Pollution Prevention and Toxic Residential Lead Hazard Standards – TSCA Section 403.

Brewer, D. M. Sullivan, and S. D. Angima, Evaluating and Reducing Lead Hazard in Gardens and Landscapes, Oregon State University Extension Service, 2016.

Vietnam Ministry of Health Decision, "Guidelines for the lead poisoning diagnosis and treatment," 2012, http://www.nghean.vn:10040/wps/wcm/connect/so+y+te/vbpq/vbpq/vbbyt/74d66b004571c651b420f4cf5bb6201f?View at: Google Scholar

Von Schirnding, A. Mathee, M. Kibel, P. Robertson, N. Strauss, and R. Blignaut, "A study of pediatric blood lead levels in a lead mining area in South Africa," Environmental Research, vol. 93, no. 3, pp. 259–263, 2003.View at: Publisher Site | Google Scholar

Sanders, S. K. Miller, V. Nguyen, J. B. Kotch, and R. C. Fry, "Toxic metal levels in children residing in a smelting craft village in Vietnam: a pilot biomonitoring study," BMC Public Health, vol. 14, no. 1, article 114, 2014.View at: Publisher Site | Google Scholar

Daniell, L. V. Tung, R. M. Wallace et al., "Childhood Lead exposure from battery recycling in vietnam," BioMed Research International, vol. 2015, Article ID 193715, 10 pages, 2015.View at: Publisher Site | Google Scholar

. Deborah, Childhood Blood Lead Levels and Associated Risk Factors in Vietnam [M.S. Thesis], University of Washington, Seattle, Washington, Wash, USA, 2012.

Wang and J. Zhang, "Blood lead level in children, China," Environmental Research, vol. 101, pp. 412–418, 2006.View at: Publisher Site | Google Scholar

Kafourou, C. Touloumi, V. Makropoulos, A. Loutradi, A. Papanagiotou, and A. Hatzakis, "Effects of Lead on the Somatic Growth of Children," Archives of Environmental Health: An International Journal, vol. 52, no. 5, pp. 377–383, 1997.View at: Publisher Site | Google Scholar

Little, S. Spalding, B. Walsh et al., "Blood lead levels and growth status among African-American and Hispanic children in Dallas, Texas—1980 and 2002: Dallas Lead Project II," Annals of Human Biology, vol. 36, no. 3, pp. 331–341, 2009.