

A Review of Literature on
Healthy Environments for Children
in the
Eastern Mediterranean Region

**I. STATUS OF CHILDHOOD LEAD
EXPOSURE**

(FIRST DRAFT)

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Foreword

Children are among the most vulnerable to environmental threats as they are in a dynamic state of growth with their cells multiplying fast and their organ systems developing at a rapid rate. Comparatively, children breathe more air and consume more food and water in proportion to their weight. Moreover, larger surface area/body weight ratio and Longer “shelf-life” enhances child’s vulnerability to environmental risks. On the other hand, as children’s immune, digestive, reproductive, and central nervous systems are more vulnerable than those of adults; exposure to certain environmental toxins can lead to irreversible damage as well as adulthood diseases.

Work by WHO and other international key players shows that there is real potential for improving child health and creating a better future for the coming generations through scaling up action to confront environmental dangers. **Healthy Environments for Children Alliance** brings together governments, NGOs scientists and private entities to harmonize efforts to protect children’s health and safeguard the environment. Most importantly, the Alliance will empower communities, especially poor ones, to stimulate action to improve their domestic environment and to ensure that their children have access to basic needs and services.

EMR countries share extraordinary conditions of limited resources, harsh climate, and fragile environment that possess its special risks on children’s health. Regional wars and aggressions magnify those risks and add to the suffering of children. Creating “*healthy places*” for the children to live in is a major task that will require the energy of all the parties involved to mark a step forward on the road to “*happy faces*”.

Lead is known for its toxicity and its detrimental effects are enormous to children, even at the lowest concentrations. The major of those effects is the damage that lead can do to the child’s developing brain and nervous system. Such damage could occur at blood lead levels starting with 10 µg/dl (Kessel & O’Connor, 2001). In unborn children, lead poisoning may cause premature birth, low birth weight, miscarriage, and birth abnormalities including neurological damage. In addition, maternal blood-lead levels under 10 µg/dl may increase risk of having children with behavioral problems or learning disabilities (Kessel & O’Connor, 2001). With the increased pollution caused by industries and heavy traffic emissions particularly in urban areas, along with the continuity of using traditional contaminated remedies and cosmetics and unhealthy habits, childhood lead issue grows to form a major environmental health concern that needs immediate and planned action from all EMR countries. Eliminating children’s exposure to lead will undoubtedly contribute to giving them a better future.

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Preface

This review report was prepared by the WHO Regional Centre for Environmental Health Activities (CEHA) aiming at taking stock of ongoing work and consolidating and disseminating scientific knowledge and experience as two important elements in the process of implementing the **Healthy Environment for Children initiative** effectively in the EMR. This document reflects the status of childhood lead as a significant environmental issue of particular concern to children's health and well-being, and offers a comprehensive review of the available literature and studies investigated within EMR countries focusing on childhood lead issues.

Objectives of this review could be summarized as follows:

- To scan the existing state of childhood lead exposure in EMR countries.
- To identify common causes and sources of childhood lead exposure.
- To highlight knowledge gaps and directions where further research and/or intervention is required.
- To advocate for reducing childhood lead exposure in EMR countries through phasing-out leaded gasoline, paints and toys where necessary.
- To stimulate research to determine appropriate prevention measures and to discuss lessons learned by various member states.

Methodology of review:

The reviewed studies were identified - among others – after conducting a search on CEHA database and other databases available at CEHA library (such as; Water Resources Abstracts, Pollution Abstracts, EMBASE/Pollution & Toxicology, Index Medicus for EMR, and MEDLINE 1966-2003), as well as the Internet. In addition, information on children environmental health (such as; reports, studies, surveys, ...etc) was requested from EMR countries. The identified studies were used to establish **Healthy Environment for Children bibliographic database (HEC database) for EMR countries** which currently includes 333 entries on different issues of children's environmental health (among which 37 are related to childhood lead and used in writing this review – see Annex A). The commonly measured parameters and indicators along with the investigated factors and health outcomes of lead exposure were all identified and highlighted and used to build up the **Childhood Lead database**.

Such review reports pave the way for thorough analysis, evaluation, and plans for action; by pointing out the issues and localities of concern on one hand, and the lack of information accessibility and/or information gaps on the other hand.

Glossary

Pb	lead
µg	microgram
µg/dl	microgram per decilitre
µmol/L	micromole per litre
ppm	part per million
µg/g	microgram/gram
WHO	World Health Organization
EMRO	Eastern Mediterranean Regional Office
CEHA	Centre for Environmental Health Activities
EMR	Eastern Mediterranean Region
HEC	Healthy Environment for Children
CDC	Centres for Disease Control and Prevention
USAID	United States Agency for International Development

1. Introduction & Background

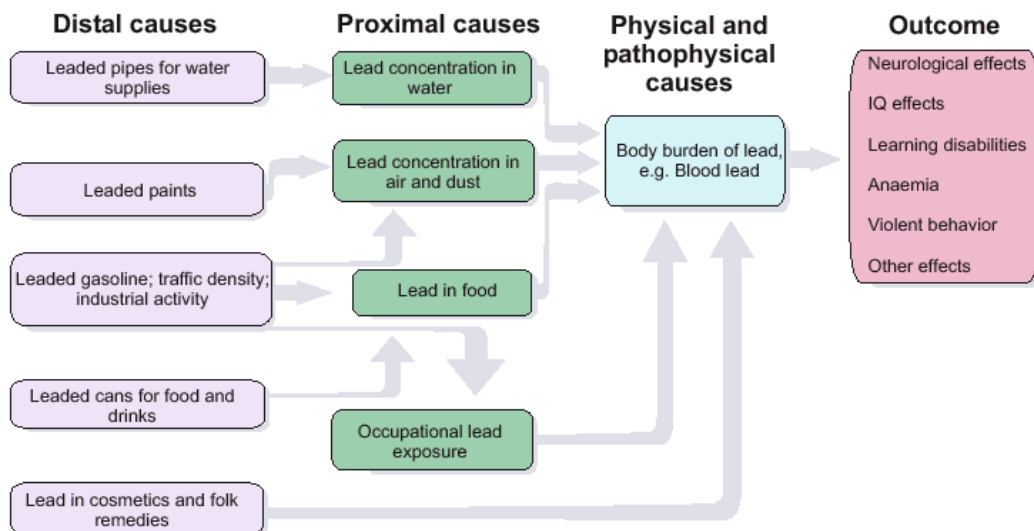
This chapter is dedicated to offer general background information on childhood lead including its sources, routes of exposure, and health outcomes.

1.1 Childhood Lead: a priority issue – why?

The toxic nature of lead has been recognized since ancient times. In a recent estimate of the global burden of disease, lead was found to account for 0.9% of the total disease burden based on its role in lead-induced mental retardation and the consequences of increased blood pressure (WHO, 2002 b). Lead poisoning affects people at all geographic areas and of all socioeconomic groups; hence, it affects the well being of the whole nation (Kessel & O'Connor, 2001).

Children are of particular vulnerability to the adverse effects of lead as they are more exposed to lead and as a child's body absorbs a larger percentage of lead compared to an adult. Due to its detrimental effect on the intellectual ability of the new generations, lead poisoning has been referred to as “the most common and societally devastating environmental disease of young children” (Kessel & O'Connor, 2001). The extent of global lead exposure problem is still unknown because data on childhood lead poisoning are very limited (INCHES, ISDE, PSR, UNICEF, UNEP & WHO, 2002). However, it is estimated that more than one third of the children in some developing regions still suffer high levels of lead exposure. In developed countries, on the other hand, only a small minority of children (mainly the urban poor) is still affected by high levels of lead (WHO, 2002 a).

Sources and pathways of lead exposure vary with local conditions and lead-health interactions can be quite complex. Diagram 1 outlines a number of exposure patterns and health outcomes associated with lead.



Source: (WHO, 2002 a)

Diagram 1: Sources, routes and health outcomes of lead exposure.

1.2 Sources of Lead

Young children are usually in closer contact with sources of lead in the environment as they spend longer time on the floor or ground exposing themselves to lead in dust and soil. They also ingest lead-contaminated dirt or dust when they touch the floor. They might also mouth toys that are dusty or dirty, or play with domestic animal/bird that was in contact with dust or dirt. Nevertheless, very young children may ingest lead as they explore their environment and try to ease teething discomfort by mouthing painted surfaces (Kessel & O'Connor, 2001). It should be emphasized that lead is persistent (non-biodegradable) and cumulative. Thus, if a child is never exposed to a single large dose of lead, still small consecutive exposures can add up resulting in a real danger.

The major sources of lead exposure are; leaded gasoline and paint, lead-glazed ceramics, emissions from smelters, battery recycling industries, leaded water pipes or as a dietary contaminant or an ingredient in traditional medicines or cosmetics (WHO, 2002 a). **Direct causes** of lead exposure could be described as proximal causes such as the lead concentration in air, dust, food and water, or as physical and pathophysical causes which assess the body burden of lead. Generally speaking, the body burden (such as blood lead, tooth lead, bone lead or hair lead) is closely related to health outcomes and can be expected to reflect lead exposure more accurately (WHO, 2002 b).

Airborne lead depends on factors such as; use of tobacco, occupation, proximity to motorways, lead smelters, and leisure activities. Lead intake from air can vary from less than 4 µg/day to more than 200 µg/day (IPCS, 1995).

While **water** from drinking water sources usually contains less than 5 µg/day of lead, tap water at homes where lead is present in plumbing can contain more than 100 µg/litre (IPCS, 1995).

On the other hand, level of **dietary lead exposure** depends on lifestyle factors such as; types of food consumed, processing technology, use of lead solder, use of lead-glazed ceramics, and lead in water (IPCS, 1995).

As far as **dust** is concerned, lead levels depend on factors like; age and condition of housing, use of lead paints, lead in petrol, and urban density (IPCS, 1995).

1.3 Health Outcomes of Lead

Health effects from lead exposure vary with the child age and the amount of exposure. The major of those impacts is the damage that lead can do to a **child's developing brain and nervous system**.

Following are some of the reported health outcomes associated with different exposure levels (Kessel & O'Connor, 2001):

- It was found that for each 10 µg/dl in child's blood, **IQ is lowered** about one to three points.
- Lead exposure can cause minor **impairments in hearing, balance, attention, and learning new material**.
- Other neurological effects might include **sleep problems, depression, hyperactivity, and aggression**.

- At lead-blood levels over 20-30 $\mu\text{g}/\text{dl}$, **nerve conduction** can be slowed, and children might fail to reach their **normal heights**.
- Above 20-30 $\mu\text{g}/\text{dl}$, **kidney damage** and **serious anemia** are possible.
- **Untreated** lead encephalopathy (over 80-150 $\mu\text{g}/\text{dl}$) accompanied with convulsions and coma usually leads to **death**.
- **Maternal blood-lead** levels under 10 $\mu\text{g}/\text{dl}$ may increase risk of having children with **behavioral problems** or **learning disabilities**.
- Lead poisoning in **unborn children** may cause **premature birth**, **low birth weight**, **miscarriage**, **stillbirths**, and **birth anomalies** including neurological damage.

1.4 Lead Risk Reduction Interventions

Although a number of actions are being taken in many countries, still there's a lot to be done to reduce childhood lead exposure. These country-level actions should aim at banning/reducing the use of leaded-gasoline, leaded-paint, and other leaded products. On the other hand, awareness should be raised on issues like the dangers of using lead-containing traditional cosmetics and medicines (such as kohl (surma), henna, farouk,...), preferable and non-preferable habits and practices (in mothers and children) related to childhood lead-exposure, and effects of residence location and conditions and occupation on childhood lead-exposure.

2. Status of Knowledge in EMR Countries

This chapter highlights the status of knowledge, information gaps, and lack of research on childhood lead issues in the countries of the Eastern Mediterranean Region. It shall focus on the issues investigated in the different countries and the past and ongoing study and research initiatives across the region.

2.1 Accessible Literature

In order to get a more focused look at the status of knowledge on childhood lead in EMR countries, a comprehensive search for literature was conducted. This search included CEHA database and other databases available at CEHA library (such as; Water Resources Abstracts, Pollution Abstracts, EMBASE/Pollution & Toxicology, Index Medicus for EMR, and MEDLINE 1966-2003), as well as the Internet. In addition, information on children environmental health (such as; reports, studies, surveys, ...etc) was requested from EMR countries. Those efforts resulted in the establishment of the *Healthy Environment for Children bibliographic database (HEC database) for EMR countries*. The HEC database includes, to date, 333 entries on the different issues of children environmental health. The database is still under development and new records are identified and added as they become available. Among the, so far, entered records; 37 were identified as related to childhood lead and were used to produce this report (see Annex A). A thorough review was carried out for the available information from full text (if available) or from the abstract. Through this review, measured parameters and their values, causes, and outcomes of childhood lead exposure were identified and used to build up the **Childhood Lead database**. Lack of information accessibility and/or information gaps was also highlighted.

2.2 Localities Investigated

Through this review, it was dramatically obvious that the identified studies were poorly distributed among EMR countries. As one could notice from Table 1, around 75% of the studies were conducted in 3 countries (Egypt, Pakistan, and Saudi Arabia); and the rest were distributed among the other 8 countries (Bahrain, Cyprus, Jordan, Kuwait, Oman, Palestine, Qatar, and UAE). No literature was found on childhood lead in the rest of the region (12 countries). This should be highlighted as an important information gap that needs immediate response and action taking into consideration the dangers of lead exposure on children especially at the early stages of their lives.

Table 1: Geographical distribution of identified literature on childhood lead among EMR countries.

Country	No. of identified Studies/Reports on Childhood Lead
Bahrain	2
Cyprus	1
Egypt	7
Jordan	1
Kuwait	1
Oman	1
Pakistan	7
Palestine	1
Qatar	1
Saudi Arabia	14
UAE	1
	Total = 37

2.3 Issues Investigated

The main childhood lead issues investigated in the identified studies are:

- Blood, tooth, or hair lead levels in children at different ages (infants, children under 5, schoolchildren & adolescents)
- Sources of lead exposure (traditional cosmetics, leaded gasoline, food, ...etc.) and lead concentration in some of those sources
- Symptoms, health and behavioural outcomes of lead poisoning
- Correlation between lead exposure with different factors (residence location & conditions, gender, age, culture & habits, socioeconomic status, ...etc)

Each issue and the corresponding number of relevant studies identified are listed in Table 2.

Table 2: Distribution of the issues investigated among the identified literature.

Issues Investigated	No. of identified Studies/Reports on Childhood Lead
Blood lead (maternal + umbilical cord)	2
Blood lead (infants + preschool children)	15
Blood lead (schoolchildren + adolescents)	18
Tooth lead	2
Hair lead	1
Sources of lead / cosmetics & traditional medicines	10
Sources of lead / food	5
Sources of lead / vehicular emissions & leaded gasoline	7
Sources of lead / paint	5
Sources of lead / industry	4
Sources of lead / water, soil, dust, air	5
Sources of lead / other (printing ink, medication,...)	2
Symptoms, health & behavioural outcomes	13

2.4 Influencing Factors Investigated

In the reviewed literature, the investigators tried to identify the factors influencing childhood lead exposure. Therefore, they studied many socioeconomic, cultural, and environmental variables and correlated them to lead levels in children. These factors include:

- Child's gender and age
- Residence and/or school location & conditions (urban/rural, proximity to traffic/pollution source; old/new, leaded paint)
- Occupational exposure
- Habits of children & mothers
- Socioeconomic status (crowding index, monthly family income/capita, number of siblings, and parents literacy)
- Hygienic conditions

Each factor and the corresponding number of relevant studies identified are listed in Table 3.

Table 3: Distribution of the factors investigated among the identified literature.

Factors Investigated	No. of identified Studies/Reports on Childhood Lead
Child's gender & age	10
Residence/School location & conditions	7
Occupational exposure	4
Habits of children & mothers	9
Socioeconomic status	9
Hygienic conditions	1

3. Exposure Patterns & Health Outcomes in EMR Countries

This chapter offers a review of the studies identified within the EMR countries on childhood lead (relevant bibliographic information is available in Annex A) with main focus on exposure patterns, indicators, and sources of childhood lead for each study. Information gaps are also identified. The studies are reviewed by country according to alphabetical order.

3.1 Blood-Lead Level

Bahrain: Blood lead level was measured in a Bahraini infant (6 weeks old) admitted to Salmaniya Medical Centre with acute lead encephalopathy (Al-Mahroos, 1993). The blood lead level was estimated to be 109 µg/dl. The infant suffered a 5-day history of vomiting, irritability, constipation, and 2 episodes of generalized tonic-clonic convulsions (each episode lasting for about 10 minutes). The child's mother admitted using kohl (surma) on umbilical cord for 15-20 days after birth and in both eyes until admission to hospital.

In the follow-up (at age of 2), the child showed "no fine or gross motor developmental delay". The child's speech was delayed and he could not form sentences at that age. He was described as an "overactive" child.

Cyprus: It was reported that 7% of Ergates' children aged (1-11) and nearly 10% of those aged (1-5) had blood lead levels exceeding "WHO & US CDC danger point". The British medical team who conducted the investigation also reported lower birth weight and higher cancer rates in Ergates. The team attributed those findings to the existence of a foundry that had poisoned the villagers of Ergates with lethal smoke toxins (Miller, 2000).

Egypt: - A study was conducted to measure teeth and blood lead levels in 60 schoolchildren aged (6-12) from an urban city (Alexandria) and from a rural area (Kafr El-Sheikh). The results indicated that 56.7% of Alexandria schoolchildren and only 6.7% of Kafr El-Sheikh children, had blood lead levels of more than 20 µg/dl (Omar *et al.*, 2001).

- Another investigation was carried out to assess the problem of lead toxicity among 408 working children and adolescents in Alexandria (Zaki *et al.*, 1998). Results showed that 20.1% of working children & adolescents aged (7-18) had blood lead levels of 25 µg/dl. In children working in battery workshops, smoking and anaemia were found to be significantly associated with high risk of lead toxicity.

- A study of three parts was conducted in Egypt to investigate blood lead in children. The *first part* aimed at assessing blood lead of infants and children aged (0-12) and demonstrating the relationship between demographic characteristics and some environmental factors, and the blood lead of children (El-Araby *et al.*, 1995 a). The study included 482 infants and children (exposed group) randomly selected from El-Shatby Children University Hospital irrespective of their diseases, and 18 newborns randomly selected from El-Shatby Maternity University Hospital. (control non-exposed group). Questionnaires and interviews with mothers about demographic & environmental data were conducted. The mean blood lead level in the exposed group was 15.64 µg/dl (ranging from 42 to

1.74 µg/dl). Whereas, the mean in the control group was 6.17 µg/dl (ranging from 16.92 to 0.44 µg/dl). Blood lead levels in exposed females (with a mean of 16.47 µg/dl) were significantly higher than those in exposed males (with a mean of 15.12 µg/dl). The study also indicated that for every 1-year increase in age, blood lead increased by 0.584 µg/dl (attributed to cumulative effect of prolonged exposure). Results showed that parental education had no significant effect on childhood blood lead; however, high risk occupations (solderers, plumbers, cable markers, automobile repair mechanics, ship repair workers, storage battery manufacturers, lead glaze blowers, pottery glaze markers, painters, varnish markers, welders, shot markers, traffic police officers, taxi drivers, garage workers,...) significantly affected blood lead levels in children. Another factor investigated was the socioeconomic state (crowding index, monthly family income/capita, and number of siblings). Blood lead levels were higher among those living in crowded districts (due to overcrowding, narrow streets and excessive automobile exhausts). Results showed that infants living at El-Gomrok district - which is known for its overcrowding, narrow streets and excessive automobile exhausts - had the highest blood lead level (17.71 µg/dl). Infants and children with workshops near their residence had significantly higher blood lead (17.29 µg/dl) than those living away from workshops. Also, blood lead of children residing near factories (19 µg/dl) was significantly higher than that of those living away from factories. With respect to type of internal walls cover, the highest blood lead level was detected among infants and children living in homes where the internal walls were covered by "painting oil" (21.83 µg/dl) and was significantly higher than that of those covered with cement, limewater or glue.

- The *second part* of the study investigated children and mothers' habits that may increase blood lead levels of infants and children (El-Araby *et al.*, 1995 b). The study was conducted on the same population of the *first part* (482 children chosen randomly from EL-Shatby Children University Hospital). Questionnaires and interviews with mothers about their and their children's habits like material for wrapping sandwiches, type of ingested juice, toys material, type of utensils used for cooking and serving food, using newspapers/magazines for absorption of excess fat or water, using newspapers/magazines for storing food, and using newspapers/magazines as a table cover. The study indicated that wrapping sandwiches with newspapers, ingestion of canned juice and playing with toys made of papers led to significant increase of children blood lead. In addition, using zinc utensils as well as using newspapers and/or magazines for absorption of excess fat or water, storing food, and covering tables significantly increased children blood lead.

- The *third part* of the study focused on the symptoms among infants and children in relation to blood lead and tested the association between the present symptoms and factors that contribute in increasing blood lead investigated in the first and second parts (El-Araby *et al.*, 1995 c). The study indicated that children complaining from neurobehavioural symptoms such as irritability, mood instability, lack of school interest, decreased playing activities and easy fatigability had significantly higher blood lead than symptoms-free children. In addition, blood lead level in children complaining from GIT (Gastrointestinal

Tract) related symptoms such as anorexia, abdominal colic, vomiting as well as bouts of diarrhoea alternating with constipation was significantly higher than that of symptoms-free children. The associations between 9 symptoms and 9 characteristics (3 environmental factors, 3 children habits and 3 mothers' habits) were studied. The environmental factors are from the *first part* of the study and they include walls cover, proximity to workshops, and nearby factories. Children habits and mothers' habits are from the *second part* and relate to toys, canned juice, wrapping sandwiches with newspapers, type of utensils used, and using papers for excess water & fat and/or for storing food and/or as table cover. Decreased playing activities and vomiting were significantly associated with all 9 characteristics. However, irritability and anorexia were significantly associated with 8 of these. Easy fatigability and colic were associated with 7 and 6 of them respectively.

- An investigation of environmental lead concentrations in Cairo was conducted for the Egyptian Environmental Affairs Agency, Technical Cooperation Office for the Environment (EEAA/TCOE) and was funded by the U.S. Agency for International Development, Cairo Mission (USAID/Cairo) as a part of a programme for developing a Lead Exposure Abatement Plan (LEAP). The goal was to estimate the magnitude and extent of children's exposure to lead through various environmental media in the greater Cairo Metropolitan area. Investigators collected samples of soil, dust, drinking water, paint, various foods, cosmetics, traditional medicines, newspaper, and ceramics from locations throughout Cairo and analyzed the samples to determine their lead content. The initial round of sampling was conducted in November/December 1996. Additional sampling to confirm and extend results was conducted in June 1997. Then, investigators used data from this study and previously reported research in a lead exposure model to estimate the distribution of blood lead levels in young children in Cairo and the relative contribution of various exposure pathways to the expected mean blood lead level. The analysis indicated that the blood lead levels of children in Cairo range from 14.4 µg/dl for children less than 1 years old to 10.8 µg/dl for those aged 5-6 years old. Results of modeling indicated that approximately 64% of the children in Cairo have blood lead levels above 10 µg/dl and approximately 14% have blood levels above 20 µg/dl. The study stated that levels as low as 10 µg/dl were associated with learning disabilities and lowered IQ (Chappell *et al.*, 1997).

Jordan: A team of investigators from the Ministry of Health, Ministry of Education and department of Statistics, Jordan, conducted this study which was sponsored by WHO/CEHA in 1999. The study aimed to assess the risk of lead exposure of children aged (6-14) at high-risk areas in Amman. The study involved sampling of blood to determine lead concentration in school children living at downtown City of Amman and at Al-Shmaisani. Results of blood sampling were supported by results of ambient air monitoring program implemented by Air Monitoring Division / Environmental Health Directorate. The study indicated that air pollution by emissions from vehicles operated with leaded gasoline is contributing to elevating lead concentration in the blood of children living at Downtown City of Amman in comparison to those living at Al-Shmaisani. Males were more affected than females. Average blood lead concentration in schoolboys

was 5.664 µg/dl at Downtown of Amman, and 2.124 µg/dl at Al-Shmaisani. Whereas, for schoolgirls, those values were 4.02 and 2.049 µg/dl, respectively.

Kuwait: A study was conducted on 400 children (222 males & 178 females), between the ages of 1 month and 13 years with a history of convulsions, admitted during a 2-year period (1982-1983) to Paediatric Department of AL-Jahra Hospital in Kuwait (Manandhar *et al.*, 1989). Males were more than females, with more children admitted in the winter season than in the summer. The largest group suffered febrile convulsions (77%), followed by afebrile convulsions and epilepsy (11.2%), hypocalcaemia with or without rickets (5.7 %), central nervous system infections (4.4%) and lead intoxication (0.8%). In nearly 40 % of the children, the laboratory investigations were normal, while polymorphonuclear leucocytosis (37.5%) was the most common laboratory finding. Central nervous system infections were found in all age groups, and hypocalcaemia and lead intoxication were found to be significant causative factors for convulsions in children less than 2 years of age.

Oman: Childhood lead poisoning was studied by the measurement of 529 blood samples randomly selected from children less than 12 years old, without clinical suspicion of lead poisoning. The samples were collected from four areas within the Sultanate of Oman: the Royal Hospital, a tertiary referral centre in the capital Muscat; and the district hospitals Nizwa, Sur, and Sohar. In all areas, between 22 and 45% of children had higher than desirable blood lead levels according to CDC criteria. The highest blood lead levels were found in the Royal Hospital, Muscat and occurred among children attending the paediatric oncology or thalassaemic clinics who were undergoing extensive investigations (Timms & Bold, date??).

Pakistan: - An investigation was conducted to study blood lead concentrations in Karachi were as high as reported in 1989 and to identify which types of exposure to lead contribute most to elevated blood lead concentrations in children in Karachi (Rahbar *et al.*, 2002). A total of 430 children aged (36-60) months were selected through a geographically stratified design from the city centre, two suburbs, a rural community and an island situated within the harbour at Karachi. Blood samples were collected from children and a pre-tested questionnaire was filled out to assess the effect of various routes of exposure. Cooked food, drinking water and house dust samples were collected from households. About 80% of children had blood lead concentrations of 10 µg/dl or more, with an overall mean of 15.6 µg/dl. The highest mean (among the five localities investigated) was that of the harbour (21.6 µg/dl). As suggested by the study, this could be partially attributed to the high consumption of fish and seafood having high lead content. At the 5 % level of significance, houses nearer to the main intersection in the city centre, application of surma to children's eyes, father's exposure to lead at workplace, parents' illiteracy and child's habit of hand- to-mouth activity were among variables associated with elevated lead concentrations in blood. The investigators considered these findings as a public health concern, as most children in Karachi are likely to suffer some degree of intellectual impairment as a result of environmental lead exposure. The investigators also believed that there is enough evidence of the continuing problem of lead in petrol to force the petroleum industry to take quick action. The evidence also shows the need for

appropriate interventions to reduce the burden due to other factors associated with this toxic element.

- Copper, manganese and lead levels were studied in blood samples of 165 normal school children aged (5-14) years, belonging to the Bari Imam area, Islamabad (Ahmed *et al.*, 1992). The mean lead levels for boys ranged from 14.14 to 35.4 µg/dl, while the mean levels for girls ranged from 15.00 µg/dl to 34.22 µg/dl.

- Blood lead levels were estimated in 170 schoolchildren, aged (13-19) years, residing in Chakshahzad area of Islamabad (Sadaruddin, 1995). The overall mean blood lead level was 2.38 µg/dl, ranging from 0.2 to 8.6 µg/dl (3.22 µg/dl in boys and 1.49 µg/dl in girls). The highest mean levels for lead were found at the age of 13 years. Blood lead levels in adolescents reported in this study were relatively low. They reflect very little or no risk to the health of children in Chakshahzad and it also indicated that area of Chakshahzad is relatively clean from any lead pollution.

- Blood lead levels were determined in preschool children residing in Urban areas of Rawalpindi city (Hafeez & Malik, 1996). The study included 92 children (50 males and 42 females) aged (1-5) years. Blood lead levels were measured to fall in the range of 7 µg/dl to 34 µg/dl (mean 18.8 µg/dl). The mean lead levels were slightly higher in males (20.3 µg/dl) than in females (17.2 µg/dl) and over 90% children had lead levels above the acceptable limit of 10 µg/dl. Use of leaded petrol, contaminated surma, leaded paints and pica in children; are common and form potential causes of increases in lead levels.

- Five hundred school children comprising males and females in the ratio of 3:1 with mean age of 14 and 13.2 years respectively were selected from various schools of Peshawar city and investigated for blood lead levels (Zahoorullah *et al.*, 1994). Mean blood lead levels of male and female students have been found to be 21.2 ± 8.15 and 16.8 ± 4.81 µg/dl, respectively. 13% of male students showed blood lead level in the range of 31-50 µg/dl with no female students in this range. Those students are at risk of neurophysiologic impairment and the investigators call for immediate measures to reduce environmental pollution caused by leaded petrol. On the other hand, mean blood lead level of students who live near main roads was significantly higher than those living at a distance of more than 1/2 km from main road. It was found that 32.6% of the students had blood lead levels above 20 µg/dl. The finding that 13 % of male children having high blood level in the range of 31-50 µg/dl and who are at risk of neurophysiologic impairment should be a cause for concern and immediate measures need to be taken to reduce environmental pollution caused by leaded petrol.

- Another study was conducted in the United State on the effect of imported eye cosmetics on Pakistani and Indian children using them. Children were evaluated for lead exposure in California through a state-mandated lead-screening program that had begun in November 1991 (Sprinkle, 1995). A chart review of children at a county hospital clinic was undertaken for the period beginning October 1991 and ending February 1994. Lead exposure questionnaires were filled out at clinic visits, and telephone interviews were conducted with parents or guardians of children from ethnic groups who use eye cosmetics. Lead level results were available for 175 children. The average lead level was 4.3 µg/dl (0.21 µmol/L) for

Pakistani/Indian children not using eye cosmetics and 12.9 µg/dl (0.62 µmol/L) (P=0.03) for those using the products. Chemical evaluation of some of the eye cosmetics used by these children revealed high lead content. The study showed that the use of eye cosmetics imported from Pakistan was strongly correlated with elevated blood lead levels. The study also stated that legislation has not been effective in protecting children from this source of lead exposure, and that education on lead toxicity and avoidance of substances containing lead is greatly needed, particularly for target groups.

Palestine: The re-emergence of lead poisoning from contaminated flour was reported in West Bank Palestinian village (El-Sharif *et al.*, 2000). The authors described an outbreak of lead poisoning in a West Bank Palestinian family and drew attention to an unusual important source of lead exposure. All 13 members of the family (2 children & 11 adults) were found to have lead poisoning following hospitalization for 'gastroenteritis', headache, joint pain, weight loss, and vision difficulties. Seven females had low hemoglobin levels. Blood lead concentrations ranged from 42 to 48 [µg/dl]. Household flour samples obtained from a stone mill, previously closed because of lead contamination, were found to contain 2000 ppm lead.

Qatar: Two hundred blood samples were collected from children (less than 15 years) referred by pediatric clinics to determine their blood lead levels for diagnostic purposes. Only 3 patients showed values exceeding the level of 25 µg/dl used in Qatar as the maximum limit for normal blood lead. The highest level reached approximately 38 µg/dl and was a single case. Compared to results collected in the eighties and early nineties the obtained results suggested that there have been significant reductions in lead levels in water, food, and the blood of children. That was due to the measures implemented in the State of Qatar over the last ten years to control the spread of lead contamination. These measures were mainly successful due to the availability of good analytical methods for lead measurement. The study recommended that a wider national survey be conducted to allow better assessment of the average lead intake and blood levels in children, pregnant women and nursing mothers. A new protocol to deal with high blood lead levels in children was proposed to replace the present practice in the State of Qatar. The proposed protocol introduced the new action levels of 10 µg/dl for children and pregnant women and 30 µg/dl for adults replacing the previous unified level of 25 µg/dl (CEHA Special Studies; SS-9, 1999).

Saudi Arabia: - Blood lead levels were measured in 538 girls aged 6-12 years who attended primary public schools in Riyadh, Saudi Arabia (Al-Saleh *et al.*, 1999 a). Of the 538 screened children, 24.4 % had blood lead levels greater than or equal to 10 µg/dl, the Centers for Disease Control's level of concern. Variations in the blood lead levels were investigated with respect to a number of risk factors the main of which was the regional location of the school. Students who attended schools located in the Central region of Riyadh had significantly higher blood lead concentrations than those who attended schools in the peripheral areas (Central: 10.6 µg/dl, Eastern: 8.09 µg/dl, Western: 7.76 µg/dl, Northern: 5.64 µg/dl, and Southern: 7 µg/dl). This is most likely to be due to the heavy vehicular emissions in the Central region. Other variables such as low family income, grade and application of kohl to the child's eyes and/or umbilicus at birth were also

contributors to the blood lead levels. These observations emphasized the importance of health education programs to promote the reduction of lead exposure in the general population.

- Relationships between blood lead concentrations in 1 047 children attending outpatient clinics at the King Faisal Specialist Hospital and Research Centre aged 2 months to 16 years and age, sex, and province (i.e., residence) were examined (Al-Saleh *et al.*, 1994 a). The study reported that mean blood lead concentrations increased during the first 5 years of life, and then began to decrease reaching a minimum at approximately 16 years of age. Boys who were more than 6 years of age had higher blood concentrations than similarly aged girls. Blood lead levels of children living in the Eastern Province were higher (38.01 µg/dl, ranging from 64.82 to 26.13 µg/dl) than those found in children from other provinces. Most of the children with elevated blood lead concentrations resided in small towns, like Ehssa, Abqiq, Hofouf, rather than in cities such as Dammam and Dahrn. Investigators attributed high blood lead to factors such as socioeconomic status and cultural habits (e.g., diet, use of traditional remedies and cosmetics). It was also reported by the same authors (Al-Saleh & others, 1994 ") that the percentage of children with blood lead levels exceeding 12.59 µg/dl was 20% and that of children with levels exceeding 25 µg/dl was 3.5%.

- A Saudi infant (3 months) was admitted to Arar Central hospital with a history of fever, weight loss, constipation, anorexia, pallor, and microcytic anaemia. His conditions deteriorated thereafter with convulsions and intracranial hypertension until he received treatment from lead toxicity for about 2 months at Maternity and Children's Hospital in Riyadh. The investigation carried out to find the source of lead failed and so, a two-stage survey was designed and implemented at Arar (Al-Saleh *et al.*, 1996). In the first stage, 108 children (50 males & 58 females) aged (1 month-12 years) attending pediatric outpatient clinic of Arar Central Hospital were examined and their parents were asked to fill a questionnaire. 14% of those had blood lead levels exceeding 20 µg/dl. The mean blood lead concentration was 13.54 µg/dl (ranging from 67.8 to 3.7 µg/dl). Taking the lead as a ratio of hemoglobin, 23% of the children had Pb/Hb exceeding 1.5 µg Pb/g Hb. Most of the increased concentrations (92%) occurred in children less than 5 years of age. 85.7% of families admitted using kohl or other remedies. Thus, high lead concentrations were attributed to the use of traditional cosmetics and remedies; and to socioeconomic and cultural factors (including children's habits to play in streets & eat with fingers). In the second stage, a follow-up for those children with high blood lead levels (21 children) was performed focusing on lead sources (water, dust, soil) and the conditions of the household (lead in paint, sex, relatives' blood lead...and others). However, no statistical association was found between blood lead levels and lead in soil, dust and water.

- A study was conducted at Riyadh to investigate the effect of lead on haematological parameters in 538 schoolgirls in the first & second grade (aged 6-12 years) at 35 classes of 33 public schools (Al-Saleh *et al.*, 1999 b). The blood lead levels in students ranged from 2.3 to 27.362 µg/dl. Results indicated that haematological parameters could occur at blood lead levels less than "CDC limit". In addition, the study reported that out of the 108 children with lead levels greater

than 10 µg/dl, 24 suffered from microcytic anaemia. A number of socioeconomic factors were also investigated in relation to lead levels and the results showed that blood lead concentrations were negatively correlated with student's weight, height, and number of half-siblings.

- Blood lead was determined in 202 Saudi male volunteers (16-57 years old). The influence of smoking on lead exposure was investigated by including smokers, previous smokers, and non-smokers (Al-Saleh, 1995). Blood lead was significantly higher in current smokers than in non-smokers and previous smokers. The mean blood lead concentration in male smokers (16-19) was 12.37 µg/dl, in previous smokers 11.4 µg/dl, and in non-smokers 8.92 µg/dl. The distribution of blood lead data in the screened population suggested the existence of two mixed populations and a cut-off of 12 µg/dl was found where the two populations separate. Of the exposed population with blood lead concentrations above 12 µg/dl, 80 % were smokers.

- Twenty-two young children and infants aged (6 months to 13 years) were admitted to the King Fahad National Guard Hospital during the period from 1984-1988 (Yaish *et al.*, 1993). Ten of those children aged (8-48) months showed the clinical and laboratory findings of lead encephalopathy. Each child/infant suffered from one or more of the following signs and symptoms: seizures, coma, ataxia, bizarre behaviour, apathy, vomiting, loss of coordination, and change in the state of consciousness or loss of recently acquired skills. The measured the mean blood lead level in this group of children to be 6.2 ± 3.8 µmol/L and they all suffered from anaemia. Two children of the ten died (blood lead levels of 13.2 and 6.9 µmol/L), one was left with gross neurological disorder, and the rest survived without evidence of mental damage. The study attributed the high lead concentration to the use of traditional remedies and medicines namely; farouk and bakhoor. Farouk, which is an orange granular powder with lead content of 2310 ppm (µg/g), was used by parents of 9 children to rub children's gum to enhance tooth eruption. Whereas, one infant was exposed intentionally to fumes of bakhoor as a traditional practice. The other twelve cases with sub clinical lead poisoning were discovered while investigating the causes of hypochromic microcytic anaemia in 400 children.

- Another study included 514 schoolchildren (383 as exposed group and 131 as control group) aged (6-14) years (Jarallah *et al.*, 1993). The children were selected from four primary schools at Riyadh; three of which represented urban, inner-city areas of high traffic density and the fourth represented semi-rural areas of low traffic density. Primary care physicians interviewed all of the investigated children, and a brief physical examination with special emphasis on central nervous system was conducted. Results indicated that 89.7% of the exposed group and 42.5% of the control group had blood lead levels greater than 10 µg/dl. The mean blood lead levels in schoolchildren at different schools were: school 1 (15.7 µg/dl), school 2 (13.8 µg/dl), school 3 (14.2 µg/dl), and school 4 (9.93 µg/dl). The mean atmospheric lead concentration in the vicinity of different schools was measured to be: school 1 (11.5 µg/m), school 2 (10.3 µg/m), school 3 (8.5 µg/m), and school 4 (1.2 µg/m). The investigators stated that the ambient air

borne lead levels in the heavy traffic areas in Riyadh exceeded international air quality standards.

- High lead concentration in breast milk is one of the first sources of lead exposure in neonates. A study was conducted on breast milk samples collected from 58 nursing mothers at King Khalid University Hospital (Younes *et al.*, 1995). Results showed that 47 mothers (81%) had detectable lead concentrations. The lead in breast milk samples from those 81% of nursing mothers varied from a low concentration of 0.318 $\mu\text{g}/\text{dl}$ to a high of 2.5 $\mu\text{g}/\text{dl}$ with an average of 0.768 ± 0.42 $\mu\text{g}/\text{dl}$. Lead concentration was found to be low in young mothers and higher in mothers aged 36 years or more with an average of 0.515 ± 0.14 and 1.344 ± 0.65 $\mu\text{g}/\text{dl}$, respectively. The study showed that breast milk samples obtained from mothers residing near industrial areas or highways, using copper casserole coated with white (rich in lead) inner coat and eating food material preserved for long periods in metal containers showed higher lead concentration than those from mothers living in remote areas with reduced exposure.

- A survey was carried out among 124 pregnant women (and their respective 126 newborns) living in Riyadh City to investigate the passage of lead from the pregnant mother to the unborn child (Al-Saleh *et al.*, 1995). The mean maternal blood lead level was measured to be 5.49 ± 2.6 $\mu\text{g}/\text{dl}$ and for the umbilical cord 4.14 ± 1.81 $\mu\text{g}/\text{dl}$. Lead levels were higher in maternal than in the umbilical cord blood. The study confirms the transfer of lead from the mother to the fetus as an excellent correlation between the maternal and cord blood lead levels was observed. A weak but significant relationship was found between maternal blood lead concentrations and birth weight of newborns. The investigators concluded that low levels of lead exposure to pregnant women might be considered hazardous. In addition, findings on low birth weight suggested further research on early lead exposure effects and the significance of other factors.

- Another investigation was conducted on 226 blood samples from 113 mothers of 23 different nationalities (Al-Khayat *et al.*, 1997 a). Samples were collected from mothers before delivery, and from cord blood from their respective neonates. Mean maternal blood lead level was 0.72 $\mu\text{mol}/\text{L}$ (14.9 $\mu\text{g}/\text{dl}$), range 0.32-1.34 $\mu\text{mol}/\text{L}$ (6.6- 27.8 $\mu\text{g}/\text{dl}$) and mean cord blood level was 0.64 $\mu\text{mol}/\text{L}$ (range 0.29-1.46 $\mu\text{g}/\text{dl}$). It was found that 16% of the mothers and nearly 10 cord blood samples had blood lead level greater than 0.97 $\mu\text{mol}/\text{L}$ (20 $\mu\text{g}/\text{dl}$). Very high levels, in excess of 1.21 $\mu\text{mol}/\text{L}$ (25 $\mu\text{g}/\text{dl}$), were detected in 3.5% of mothers as compared to 2.6% of cord blood samples (verify numbers and units). Out of 113 infants, 65 (58%) were males with a mean cord blood lead level of 0.63 $\mu\text{mol}/\text{L}$ and 48 (42%) were females with a mean level of 0.66 $\mu\text{mol}/\text{L}$. The lowest maternal blood lead levels 0.68 $\mu\text{mol}/\text{L}$ were observed in ages 20 to 25 years old, and lowest cord blood levels 0.58 $\mu\text{mol}/\text{L}$ were seen in maternal age of less than 20 years old. On the other hand, the highest maternal and cord blood lead levels (0.82 and 0.75 $\mu\text{mol}/\text{L}$) were observed in maternal ages of greater than 35 years old. The results indicated a direct correlation between blood lead level in mothers and in umbilical cord as observed from the linear regression distribution curve.

UAE: Al-Khayat *et al.*, (1997 b) studied 19 infants with a mean age of 3.8 months who showed features of acute lead encephalopathy following the use of traditional

medicines. All presented with convulsions; CT scans of the brain on admission showed "brain oedema in 4, atrophy in 4 and normal findings in 11". Cerebrospinal fluid analysis in 9 patients showed "pleocytosis in 6 and a high protein content in 8". The median lead level in these 19 infants with encephalopathy was 3.6 $\mu\text{mol/L}$ (74.5 $\mu\text{g/dl}$). Seven had a mean lead level of only 2.7 $\mu\text{mol/L}$ (56.9 $\mu\text{g/dl}$) which is much below the level set as the threshold for encephalopathy (70 $\mu\text{g/dl}$). During follow-up, thirteen infants developed brain damage and the investigation indicated that in very young infants acute lead encephalopathy might occur at lead levels lower than previously reported.

3.2 Tooth-Lead Concentration

Bahrain: A study was conducted to determine lead exposure among children in Bahrain (Al-Mahroos & Al-Saleh, 1997). A total of 280 shed deciduous whole teeth were collected from 269 children aged (5–15). The study period extended from July 1993 to April 1994. The study showed that the overall mean tooth-lead level was 4.3 $\mu\text{g/g}$ dry weight with a range of 0.1–60.8 $\mu\text{g/g}$ dry weight. The cumulative frequency distribution revealed that 35 % of the teeth had a lead concentration of more than 4 $\mu\text{g/g}$ dry weight. The tooth-lead concentrations differed according to the tooth type and age. The child's sex, nationality, area of residence and socio-economic status had no impact on tooth-lead level.

Pakistan: An investigation was carried out to evaluate chronic lead exposure in children by measuring lead levels in shed primary teeth collected from primary school children in Karachi (Rahman & Yousuf, 2002). A total of 309 teeth were collected from nine different schools, and analysed for lead content by atomic absorption spectrophotometry with electrothermal atomization. The mean (SD) age of the subjects was 7.6 (1.2) years and the mean lead level was 5.78 $\mu\text{g/g}$ of whole tooth (dry weight), ranging from 0.42 to 39.75 $\mu\text{g/g}$. Incisor teeth had a significantly higher mean (SD) lead level, 6.42 (4.19) $\mu\text{g/g}$, than canines and molars which contained 4.91 (5.12) μg and 4.50 (2.67) μg lead whole tooth (dry weight), respectively. Significant differences were observed between different schools. No difference was observed between boys and girls and the accumulation of lead in teeth was not correlated with chronological age.

3.3 Hair-Lead Concentration

Saudi Arabia: The concentrations of lead in the scalp hair of 800 school children (aged 6–8 years) from four cities: Makkah, Jeddah, Riyadh and Tabuk in Saudi Arabia, were measured (Ahmad *et al.*, 1988). Mean lead concentrations for these four locations were found to be 17.6 $\mu\text{g Pb/g}$ hair for Makkah, 23.3 $\mu\text{g Pb/g}$ hair for Jeddah, 5.1 $\mu\text{g Pb/g}$ hair for Riyadh and 10.9 $\mu\text{g Pb/g}$ hair for Tabuk. The mean values of Pb concentrations in hair for Jeddah, Makkah and Tabuk cities are on the high side of the acceptable "normal range", indicating an increasing trend in environmental lead pollution.

3.4 Bone-Lead Concentration

No available literature on this issue.

4. Commonly Measured Indicators & Parameters in EMR Countries

A summary of indicators and parameters commonly measured and investigated in the reviewed literature is presented in Table 4.

Table 4: Commonly measured indicators and parameters of lead exposure.

	Commonly measured indicators & parameters
Blood-Lead	<ul style="list-style-type: none"> - Mean, average, maximum, or minimum blood lead level or blood lead concentration ($\mu\text{g}/\text{dl}$ or $\mu\text{mol}/\text{L}$); in children, infants, mothers, or umbilical cord. - Lead as a ratio of hemoglobin ($\mu\text{g Pb}/\text{g Hb}$); and % of children with Pb/Hb values exceeding $1.5 \mu\text{g Pb}/\text{g Hb}$. - % of children/infants within certain age group at specific locality having blood lead concentrations above a certain value (CDC or WHO criteria/threshold/danger point, $10 \mu\text{g}/\text{dl}$, $20 \mu\text{g}/\text{dl}$, $25 \mu\text{g}/\text{dl}$). - % of mothers having blood lead concentrations above a certain value (CDC or WHO criteria/threshold/danger point, $10 \mu\text{g}/\text{dl}$, $20 \mu\text{g}/\text{dl}$, $25 \mu\text{g}/\text{dl}$)
Tooth-Lead	<ul style="list-style-type: none"> - Mean, average, maximum, or minimum tooth lead level ($\mu\text{g}/\text{g}$ dry weight). - % of teeth with lead concentration exceeding $4 \mu\text{g}/\text{g}$ dry weight.
Hair-Lead	<ul style="list-style-type: none"> - Lead concentration in the scalp hair of children within certain age group at specific locality ($\mu\text{g Pb}/\text{g}$ hair).

5. Commonly Investigated Sources & Causes of Lead Exposure in EMR Countries

The most common sources and causes of elevated lead levels in EMR countries are summarized in Table 5. These sources could be categorized into **self-inflicting exposure** (use of cosmetics and remedies like kohl, henna and farouk), **general exposure** (leaded gasoline, paints, food industrial emissions and dietary intake), and **occupational exposure**.

Table 5: Commonly investigated sources and causes of lead exposure.

Source/Cause of Lead Exposure	Lead Concentration in Source	Country (Reference Study No.)*
Kohl (surma) on umbilical cord used by mother for 15-20 days after birth and in both eyes until admission to hospital.		Bahrain (267)
Foundry emissions		Cyprus (316)
Occupational exposure (children & adolescents in battery workshops), urban industrialized cities.		Egypt (312)
Majority of total daily uptake of lead comes from diet uptake, then soil & dust . Air, water and paint don't contribute.	<i>Initial food samples:</i> 0.1 – 1755.4 mg/kg <i>Exter. Dust:</i> 268 mg/kg <i>Soil:</i> 127.7 mg/kg <i>Drink. Water:</i> 1.69 mg/kg <i>Exter. Paint:</i> 347.3 mg/kg <i>Inter. Paint:</i> 2151 mg/kg	Egypt (320)
Parent's high-risk occupations (solderers, plumbers, cable markers, automobile repair mechanics, ship repair workers, storage battery manufacturers, lead glaze blowers, pottery glaze markers, painters, varnish markers, welders, shot markers, traffic police officers, taxi drivers, garage workers). Environmental factors: Internal walls cover (painting oil more than cement, limewater or glue). Proximity to workshops & factories. Socioeconomic state (overcrowded areas with narrow streets & excessive automobile exhausts).		Egypt (212, 214)
Children habits: ingestion of canned		Egypt

juice, playing with paper toys and wrapping sandwiches by newspapers or magazines. Mothers' habits: using papers for absorption of fat & water, using papers for storing food and/or covering tables, and using zinc utensils.		(213, 310, 214)
Ambient air contained more lead due to leaded-gasoline operated vehicles.	<i>Amman/Downtown:</i> 0.161 µg/m ³ ** <i>Amman/Al-Shmaisani:</i> 0.066 µg/m ³ **	Jordan (329)
Kohl as cosmetics applied by mothers to themselves and their children		Kuwait (202)
Alternative medicines		Oman (311)
Surma, occupational exposure, wind direction, child's hand-to-mouth habit, living near city center, food & drinking water, house dust, and leaded petrol.	<i>Food:</i> 1.33 – 5.86 µg/g <i>Water:</i> 1.85 - 8.19 µg/l <i>Dust:</i> 2.84 – 96 µg/g	Pakistan (305)
Eye cosmetics		Pakistan (125)
Leaded petrol, surma, leaded paints & pica		Pakistan (227, 228)
Flour from traditional stone mills (reinforced with lead joints)	2000 ppm	Palestine (331)
Water & food.	<i>Water:</i> 0.0001 – 0.132 mg/l <i>Milk (powder):</i> 0.3174 mg/kg <i>Milk (pasteurized liquid):</i> 0.049 mg/l <i>Yoghurt:</i> 0.048 mg/kg <i>Rice:</i> 3.4722 mg/kg	Qatar (314)
Heavy vehicular emissions, kohl, low family income.		Saudi Arabia (321)
Socioeconomic status & cultural habits (diet, use of traditional remedies & cosmetics, and children's habits to play in streets & eat with fingers). Environmental & hygienic conditions: (indoor & outdoor).	<i>Water</i> (from houses): 0.2 - 26.04 µg/l <i>Dust</i> (from houses): 13.49 – 175.41 µg/g <i>Soil</i> (from houses): 4.81 – 155.89 µg/g <i>Air:</i> *** 0.4 – 3.681 µg/m ³	Saudi Arabia (322, 324, 325)

	<i>Soil</i> :*** 12.46 – 23.05 µg/g	
Rapid modernization, environmental lead pollution, & increased use of leaded gasoline.		Saudi Arabia (34, 322, 31)
Farouk : an orange granular powder used by parents of 9 children to rub children's gum to enhance tooth eruption. Bakhoor fumes.	<i>Farouk</i> : 2310 ppm	Saudi Arabia (160)
Breast milk. Living conditions (cooking, utensils) and eating habits were investigated and it was found out that mothers with high lead concentrations are living in industrial or highways for not less than 4 yrs. Some used copper utensils coated with white (rich in lead) inner coat and ate acidic foods preserved for long periods of time in metal containers.	0.318 – 2.5 µg/dl	Saudi Arabia (333)

* Corresponds to MFN in Annex A

**Average for 6 years (1994-1999).

***Maximum & minimum from 4 zones of Arar.

6. Commonly Investigated Health Outcomes in EMR Countries

This chapter is dedicated to highlight symptoms and adverse health impacts commonly investigated and measured due to childhood lead exposure in EMR countries. Table 6 summarizes those symptoms and impacts.

Table 6: Commonly investigated symptoms & health outcomes of lead exposure.

Commonly investigated Symptoms & Health Outcomes	Associated Lead Level	Country (Reference Study No.)*
The infant suffered a 5-day history of vomiting, irritability, constipation , and 2 episodes of generalized tonic-clonic convulsions (each episode lasting for about 10 minutes). At age of 2, the child showed “no fine or gross motor developmental delay”. The child’s speech was delayed and he could not form sentences at that age. He was described as an “ overactive ” child.	109 µg/dl	Bahrain (267)
Lower birth weight and higher cancer rates.	> WHO & US CDC danger point	Cyprus (316)
In children working in battery workshops, smoking and anaemia were found to be significantly associated with high risk of lead toxicity.	25 µg/dl	Egypt (312)
Neurobehavioural symptoms such as irritability, mood instability, lack of school interest, decreased playing activities and easy fatigability.	16.99 – 20.65 µg/dl	Egypt (214)
GIT (Gastrointestinal Tract) related symptoms such as anorexia, abdominal colic, vomiting as well as bouts of diarrhoea alternating with constipation	18.94 – 19.67 µg/dl	Egypt (214)
History of convulsions : Central nervous system infections were found in all age groups, and hypocalcaemia and lead intoxication were found to be significant causatives factors for convulsions in children less than 2 years of age.	> 2 mmol/l	Kuwait (202)
' Gastroenteritis ', headache, joint pain, weight loss, and vision difficulties. Low hemoglobin levels.	42 - 48 [µg/dl]	Palestine (331)
An infant (3 months) with a history of		Saudi Arabia

fever, weight loss, constipation, anorexia, pallor, and microcytic anaemia. His conditions deteriorated thereafter with convulsions and intracranial hypertension.		(325)
Student's height and weight negatively correlated with blood lead levels.		Saudi Arabia (327, 321)
Microcytic anaemia. Haematological abnormalities.	10 µg/dl & less	Saudi Arabia (327)
Seizures, coma, ataxia, bizarre behaviour, apathy, vomiting, loss of coordination, and change in the state of consciousness or loss of recently acquired skills. Anaemia.	6.2 µmol/L	Saudi Arabia (160)
Two children of ten died. One was left with gross neurological disorder.	13.2 & 6.9 µmol/L	Saudi Arabia (160)
Low birth weight.	<i>Maternal:</i> 5.49 µg/dl <i>Umbilical cord:</i> 4.14 µg/dl	Saudi Arabia (328)
Neuropsychological and behavioural problems	9.02 - 27.36 µg/dl	Saudi Arabia (31)
Acute lead encephalopathy in 19 infants (could occur at lead levels below reported). 13 of them developed brain damage.	74.5 µg/dl	UAE (85)

*Corresponds to MFN in Annex A

7. Actions in EMR Countries

This chapter provides a review of actions implemented (or planned to be) in EMR countries towards reducing childhood lead exposure.

7.1 Leaded Gasoline Phase-Out: an urgent priority – why?

Human exposure to lead represents a serious environmental health hazard. Due to its dispersing nature, leaded gasoline is identified as the major among the other lead sources, accounting for more than 90% of all atmospheric lead emissions in many urban areas (World Bank, 1998 A). As leaded gasoline is burned, lead compounds are released into the air in the form of fine particles that remain suspended for weeks. Those particles can easily travel long distances where they eventually rest into soil and dust, or more easily absorbed through the lungs. Young children who are the most vulnerable to lead hazards ingest lead in dust and soil as a result of their normal hand-to-mouth habit. All the previous combine to prove that phasing-out leaded gasoline is a pressing international priority to give the coming generations a cleaner and improved environment (Alliance to End Childhood Lead Poisoning <http://www.aeclp.org/>).

7.2 Phasing-Out Leaded Gasoline: the experience

Whereas leaded gasoline was completely phased-out in the majority of high-income countries and in some middle-income countries, most of the low-income countries still use alarmingly high lead content in gasoline and have not yet introduced unleaded gasoline (World Bank, 1998 “A & B”). In countries where leaded gasoline have already been eliminated, significant benefits have been sensed in both health and economical sectors, including improved air quality, reduced health care costs, and huge reduction in vehicle maintenance costs. Children, on the other hand, became more “ready to learn” and individuals became more productive in the society. Although experience in phasing-out leaded gasoline proved its economical feasibility in both developed and developing countries, several measures should be undertaken to implement a successful transition to unleaded gasoline (Alliance to End Childhood Lead Poisoning <http://www.aeclp.org/>).

Based on the fact that technical issues are easy to handle, two elements play the decisive role in starting a phase-out programme; namely, the recognition of the lead problem, and the political commitment to tackle this problem. This directs the main focus of proper government policies towards public awareness building and education; consensus building; fuel specifications; price, tax, import and environmental policies; regulations for implementation; and promotion and training (World Bank, 1998 A).

As far as the Eastern Mediterranean Region is concerned, many countries emphasized the potential risks associated with lead exposure. As mentioned earlier in this review report, some countries have already started some research to investigate the childhood lead exposure (extent, causes, and health outcomes). Other countries were probably busy with securing the very basic needs of their own people and dedicated no attention for such issue. However, all EMR countries use leaded gasoline and only limited information is identified on the

establishment of proper measures or actions for phasing-out lead in gasoline. Following is a brief on the efforts of EMR countries that have already taken action or planning to join the global trend aiming at phasing-out lead additives in gasoline (based on identified information and literature):

- **Bahrain:** phased-out lead in gasoline as from July 2002 (UNEP, 2002).
- **Egypt:** introduced unleaded gasoline as recently as in 1996. The USAID assisted Egypt in its plan to phase-out lead by 1999 (ESCWA, 2001).
- **Jordan:** planned to phase-out lead in gasoline as from 2003 (UNEP, 2002).
- **Kuwait:** introduced unleaded gasoline as late as October 1998. The Kuwaiti government has been reported as planning to phase-out leaded gasoline by October 1999. To facilitate its replacement by unleaded gasoline, plans have been made to double its cost to the consumer (ESCWA, 2001).
- **Morocco:** planned to phase-out lead in gasoline as from September 2005 (UNEP, 2002).
- **Oman:** phased-out lead in gasoline as from August 2001 (UNEP, 2002).
- **Pakistan:** planned to phase-out lead in gasoline as from October 2001, completed that in July 2002 (UNEP, 2002).
- **Saudi Arabia:** reported as planning to convert to unleaded gasoline by 2002-2003 (ESCWA, 2001).
- **UAE:** January 1st 2003 marks a fresh beginning with the phase-out of leaded gasoline and the introduction of two new grades of unleaded gasoline in the UAE. This major transition is part of the Federal Government's strategy to provide the people of the UAE with a pollution-free environment. It is also in line with the directives of the Gulf Cooperation Council on the phase out of leaded gasoline. In support of the government's initiative, public and private sector joined hands to launch a comprehensive public awareness campaign. All petrol stations joined in distributing pamphlets offering general guidelines for assisting motorists on the switchover, and answering their inquiries. A website was established and dedicated along with the toll-free green telephone line to provide information on technical issues and clarify any queries. The oil companies, on the other hand, have adopted a series of new methods at refineries and service stations to facilitate a smooth transition. The staff at service stations has also been trained to advise people on the changeover. All those efforts combined to form the "UAE Goes Green campaign" which also focuses on the many positive changes that unleaded gasoline will bring on UAE environment (UAE Goes Green).

8. Conclusions

At the end of this review, the following points could be concluded to reflect the status of childhood lead in EMR countries:

- Human exposure to lead in EMR countries is recognized as a part of a global serious environmental health hazard that should be tackled urgently. Its detrimental effects - even at very low exposure dose - call for immediate action to phase-out lead and reduce the risk of exposure.
- Children are of particular vulnerability to the adverse effects of lead as they are more exposed to lead through their normal behaviour and as a child's body absorbs a larger percentage of lead compared to an adult.
- There is a big gap in knowledge and lack of information on childhood lead issues in the region. Much is still needed to coordinate efforts in data collection, indicator development, and intervention and monitoring among the EMR countries to better assess the extent of the problem and find effective solutions.
- The identified studies on childhood lead were poorly distributed among EMR countries. Around 75% of the studies were conducted in 3 countries (Egypt, Pakistan, and Saudi Arabia); and the rest were distributed among the other 8 countries (Bahrain, Cyprus, Jordan, Kuwait, Oman, Palestine, Qatar, and UAE). No literature was found on childhood lead in the rest of the region (12 countries).
- Body burden of lead (measured by blood lead, tooth lead, bone lead orr hair lead) is closely related to health outcomes and so reflects lead exposure more accurately than lead concentrations in air, dust, food, or water. In EMR countries, the main childhood lead indicator commonly measured is the blood lead level (except for a study that measured hair lead content and 2 studies that measured tooth lead levels).
- The main childhood lead issues investigated in EMR countries include sources of lead exposure (traditional cosmetics & remedies, leaded gasoline, food...); symptoms and health outcomes of lead exposure; and effect of factors like residence location & conditions, gender, age, and cultural & socioeconomic status.
- Sources of lead exposure could be categorized into self-inflicting exposure (use of cosmetics and remedies like kohl, henna and farouk), general exposure (leaded gasoline, paints, industrial emissions and dietary intake), and occupational exposure. However, leaded gasoline is identified to account for more than 90% of all atmospheric lead emissions in many urban areas.
- The main investigated health impacts associated with lead exposure in EMR countries include neurobehavioural disorders and lead encephalopathy, reduced weight and height, haematological abnormalities, GIT related symptoms, and reduced learning abilities.
- Preventive measures such as phasing-out leaded gasoline have already been initiated in some countries of the EMR to reduce lead exposure; however, a number of countries have not yet taken any steps towards that target. Other actions, on the other hand, still need to be addressed more seriously such as raising awareness on issues like the dangers of using lead-containing traditional cosmetics and medicines (such as kohl (surma), henna, farouk,...),

preferable and non-preferable habits and practices (in mothers and children) related to childhood lead-exposure, and effects of residence location and conditions and occupation on childhood lead-exposure.

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Annex A

HEC Database

Childhood Lead

Last updated: Apr.01 2003

MFN 0078

Subject LEAD

Country(ies)BAHRAIN

Title LEAD LEVELS IN DECIDUOUS TEETH OF CHILDREN IN BAHRAIN

Source , ANN-TROP-PAEDIATR. ANNALS-OF-TROPICAL-PAEDIATRICS. 17/2
(147-154)1997

Author(s)AL, MAHROOS, F; AL, SALEH, FS

Publication Year 1997

Key Words DECIDUOUS TOOTH; LEAD POISONING; ENVIRONMENTAL
EXPOSURE; LEAD ENDOGENOUS COMPOUND

Abstract TO DETERMINE LEAD EXPOSURE AMONG CHILDREN IN BAHRAIN, A
TOTAL OF 280 SHED DECIDUOUS WHOLE TEETH WERE COLLECTED FROM
269 CHILDREN. TEETH WERE ANALYZED FOR LEAD CONCENTRATIONS
USING ATOMIC ABSORPTION SPECTROPHOTOMETRY WITH
ELECTROTHERMAL ATOMIZATION.CHILDREN WERE BETWEEN 5 AND 15
YEARS OLD. THE STUDY PERIOD EXTENDED FROM JULY 1993 TO APRIL
1994. THE STUDY SHOWED THAT THE OVERALL MEAN TOOTH-LEAD LEVEL
WAS 4.3 MU G/G DRY WEIGHT WITH A RANGE OF 0.1-60.8 MU G/G DRY
WEIGHT. THE CUMULATIVE FREQUENCY DISTRIBUTION REVEALED THAT
35% OF THE TEETH HAD A LEAD CONCENTRATION OF MORE THAN 4 MU
G/G DRY WEIGHT. THE TOOTH-LEAD CONCENTRATIONS DIFFERED
ACCORDING TO THE TOOTH TYPE AND AGE. THE CHILD'S SEX,
NATIONALITY, AREA OF RESIDENCE AND SOCIO-ECONOMIC STATUS
HADNO IMPACT ON TOOTH-LEAD LEVEL. IN CONCLUSION, LEAD IS
PRESENT IN TOXIC CONCENTRATIONS IN 35% OF THE TEETH OF THE
CHILDREN STUDIED. URGENT MEASURES ARE NEEDED TO ELIMINATE
LEAD FROM GASOLINE, PAINT AND OTHER SOURCES IN THE
ENVIRONMENT.

MFN 0267

Subject LEAD POISONING

Country(ies)BAHRAIN

Title LEAD ENCEPHALOPATHY IN A BAHRAINI INFANT (CASE
PRESENTATION)

Source BAHRAIN MED. BULL., VOL.15, NO. 3

Author(s)AL MAHROOS, FADHEELA

Publication Year 1993

Key Words ENVIRONMENTAL POLLUTION; LEAD

Abstract TO INCREASE AWARENESS ABOUT LEAD POISONING GENERALLY
AND LEAD ENCEPHALOPATHY SPECIFICALLY, WE REPORT A CASE OF
INFANTILE LEAD ENCEPHALOPATHY RESULTING FROM THE USE OF KOHL

(SURMA)ON THE UMBILICAL CORD. THERE IS A NEED FOR PUBLIC EDUCATION ABOUT THE DANGER OF THIS PRACTICE. STRICT REGULATIONS ABOUT IMPORTATION AND DISTRIBUTION OF SUCH PRODUCTS ARE NEEDED.

Notes 19. FULL TEXT BECAME AVAILABLE

MFN 0316

Subject LEAD; HEAVY METALS

Country(ies)CYPRUS

Title NEWS: COMMITTEE TO REVIEW 'CLOSE THE FOUNDRY' ADVICE

Source CYPRUS MAIL, NOV. 16, 2000

Author(s)MILLER, ANTHONY

Publication Year 2000

Key Words LEAD POISONING; ENVIRONMENTAL HEALTH

Notes NEW: NEWS ABOUT A REPORT ON BLOOD-LEAD LEVELS IN CHILDREN (ALSO SEE 0317)

MFN 0310

Subject LEAD

Country(ies)EGYPT

Title TEETH AND BLOOD LEAD LEVELS IN EGYPTIAN SCHOOLCHILDREN: RELATIONSHIP TO HEALTH EFFECTS

Source J APPL TOXICOL , VOL. 21, NO. 4. PP. 349-52, JULY-AUG. 2001

Author(s)OMAR, M. ; IBRAHIM, M.; ASSEM, H.; MOUSTAFA, Y.; BATTAH, F.

Publication Year 2001

Key Words LEAD; SCHOOLCHILDREN

Abstract THE OBJECTIVE OF THIS WORK WAS TO STUDY TEETH AND BLOOD LEAD LEVELS IN EGYPTIAN SCHOOLCHILDREN AND TO RELATE LEAD LEVELS TO SOCIODEMOGRAPHIC AND ENVIRONMENTAL FACTORS, THE DEGREE OF URBANIZATION AND SUSPECTED MANIFESTATIONS OF POSSIBLE LEAD EXPOSURE. THE STUDY WAS CONDUCTED ON 60 CHILDREN AGED 6-12 YEARS: 30 CHILDREN LIVING IN AN URBAN AREA AT ALEXANDRIA CITY AND 30 CHILDREN LIVING IN A RURAL AREA AT KAFR EL-SHEIKH PROVINCE. BOTH GROUPS ARE MATCHED FOR AGE AND GENDER. EVERY CHILD WAS SUBJECTED TO HISTORY TAKING, CLINICAL EXAMINATION AND IQ MEASUREMENTS. LABORATORY INVESTIGATIONS INCLUDED MEASURING TEETH AND BLOOD LEAD LEVELS, HAEMOGLOBIN, SERUM IRON AND TOTAL IRON BINDING CAPACITY. THE RESULTS SHOWED THAT THE MEAN BLOOD LEAD LEVEL OF CHILDREN IN ALEXANDRIA WAS SIGNIFICANTLY HIGHER THAN THAT OF THE CHILDREN IN KAFR EL-SHEIKH; ALSO 56.7 AND 6.7 OF CHILDREN FROM ALEXANDRIA AND KAFR EL-SHEIKH HAD A BLOOD LEAD LEVEL OF 20 MICROG DL(-1), WITH THE MOST FREQUENT SYMPTOMS OF HEADACHE, ARTHRALGIA AND LACK OF SCHOOL INTEREST. THE CHILDREN IN ALEXANDRIA HAD SIGNIFICANTLY LOWER MEAN TEETH LEAD AND HAEMOGLOBIN LEVELS THAN THOSE OF THE KAFR EL-SHEIKH GROUP. A HISTORY OF WRAPPING SANDWICHES IN NEWSPAPERS, AGE AND DISTANCE BETWEEN THE HOME AND SCHOOL WERE SIGNIFICANT PREDICTORS OF LEAD EXPOSURE. THESE FINDINGS

SUPPORT THE CONCEPT THAT TEETH LEAD CONCENTRATION MAY BE A VALID ADDITION TO THE INDICATORS USED FOR ASSESSMENT OF THE BODY BURDEN OF ENVIRONMENTAL LEAD. IN ADDITION, CHILDREN LIVING IN URBAN AREAS SUCH AS ALEXANDRIA NEED SPECIAL CONSIDERATION REGARDING PROTECTION FROM LEAD EXPOSURE, AS WELL AS TEETH AND BLOOD LEAD EVALUATION.

Notes NEW: ABSTRACT ONLY

MFN 0312

Subject LEAD

Country(ies)EGYPT

Title LEAD TOXICITY AMONG WORKING CHILDREN AND ADOLESCENTS IN ALEXANDRIA, EGYPT

Source EASTERN MEDITERRANEAN HEALTH JOURNAL, VOLUME 4, ISSUE 3, PP. 520-529, 1998

Author(s)ZAKI, A.; EL-SHAZLY, M. ; ABDEL-FATTAH, M.; EL-SAID, K.; CURTALE, F.

Publication Year 1998

Key Words LEAD TOXICITY; WORKING CHILDREN; URBAN CITIES

Abstract A SUBSTANTIAL NUMBER OF CHILDREN AND ADOLESCENTS WORK AND ARE EXPOSED TO DIFFERENT OCCUPATIONAL AND ENVIRONMENTAL HAZARDS. IN ORDER TO IDENTIFY THE PREVALENCE OF LEAD TOXICITY AND RELATED RISK FACTORS, A STUDY WAS CONDUCTED OF 408 WORKING CHILDREN AND ADOLESCENTS IN ALEXANDRIA. IN 20.1 OF THOSE SAMPLED, THE BLOOD LEAD LEVEL WAS 25 MG/DL. FOR CHILDREN WORKING IN BATTERY WORKSHOPS IN EL-GOMROUK AND MINA EL-BASSAL DISTRICTS, ANAEMIA AND SMOKING WERE FOUND TO BE SIGNIFICANTLY ASSOCIATED WITH A HIGHER RISK OF LEAD TOXICITY. THUS, MORE ATTENTION SHOULD BE PAID TO THE PROBLEM OF LEAD TOXICITY IN WORKING CHILDREN, PARTICULARLY IN INDUSTRIALIZED URBAN CITIES WITH HEAVY TRAFFIC AND AN UNPROTECTED WORK ENVIRONMENT.

Notes NEW: FULL TEXT AVAILABLE (WHO)VERIFY

MFN 0320

Subject LEAD

Country(ies)EGYPT

Title LEAD EXPOSURE ABATEMENT PLAN FOR EGYPT: RESULTS OF ENVIRONMENTAL SAMPLING FOR LEAD (EHP-REPORT)

Source

Author(s)CHAPPELL, R.; BILLIG, P.; BRANTLY, E.; AULT, S.; EZZELDIN, H.
Corporate Author (s)

USAID MISSION TO EGYPT UNDER EHP ACTIVITY NO. 256-CC

Publication Year 1997

Key Words LEAD SAMPLING; LEAD ANALYSIS; FOOD; PAINT; COSMETICS; NEWSPAPER; ENVIRONMENTAL MEDIA

Abstract THE TEST IS TO SEE THE

Notes NEW: ENVIRONMENTAL HEALTH PROJECT ACTIVITY REPORT NO. 32

MFN 0318

Subject LEAD

Country(ies)EGYPT

Title LEAD EXPOSURE ABATEMENT PLAN FOR EGYPT: EHP-REPORT

Source

Author(s)O'TOOLE, L.; BRANTLY, E.; BILLIG, P.; PHOENIX, J.

Corporate Author (s)

USAID MISSION TO EGYPT UNDER EHP ACTIVITY NO. 355-CC

Publication Year 1997

Key Words LEAD SOURCES; EDUCATION; AWARENESS

Notes NEW: ENVIRONMENTAL HEALTH PROJECT ACTIVITY REPORT NO. 37

MFN 0212

Subject LEAD; ENVIRONMENTAL POLLUTION

Country(ies)EGYPT

Title ENVIRONMENTAL LEAD POLLUTION AND CHILDREN AT ALEXANDRIA
PART I: DEMOGRAPHIC CHARACTERISTICS AND ENVIRONMENTAL
CONDITIONS

Source ALEX. J. PEDIATR., 9

Author(s)EL ARABY, IBRAHIM I.; HAFEZ, BAHIGA; MOSTAFA, YEHIA; EL-
DELGAWI, WAHID; BADR EL-DIN, OMNEYA; LOKA, MANAL

Publication Year 1995

Key Words ENVIRONMENTAL POLLUTION; ADVERSE EFFECTS; LEAD

Abstract THIS PART OF THE STUDY WAS CONDUCTED TO ASSESS BLOOD
LEAD (PBB)OF INFANTS AND CHILDREN AT ALEXANDRIA AND TO REVEAL
THE RELATION BETWEEN DEMOGRAPHIC CHARACTERISTICS AND SOME
ENVIRONMENTAL FACTORS, AND PBB OF CHILDREN. STUDY POPULATION
WAS COMPOSED OF 482 INFANTS AND CHILDREN AS AN EXPOSED GROUP
AND 18 NEWBORNS AS A CONTROL GROUP. QUESTIONNAIRE ABOUT
DEMOGRAPHIC CHARACTERISTICS AND ENVIRONMENTAL CONDITIONS
WAS COMPLETED BY INTERVIEWING MOTHERS OF CHILDREN AND PBB
WAS DETERMINED FOR ALL INFANTS AND CHILDREN. EXPOSED GROUP
HAD SIGNIFICANTLY HIGHER PBB (15.64 ± 6.58 MICROGRAM/DL)THAN
CONTROL GROUP (6.17 ± 4.21 MICROGRAM/DL). FEMALES HAD
SIGNIFICANTLY HIGHER PBB THAN MALES. EMPLOYMENT OF PARENTS IN
HIGH RISK OCCUPATIONSREGARDING LEAD EXPOSURE LED TO
SIGNIFICANT INCREASE OF PBB OF THEIR CHILDREN. AGE AND CROWDING
INDEX WERE DIRECTLY CORRELATED WITH PBB. CHILDREN LIVING IN EL-
GOMROK SHOWED SIGNIFICANTLY HIGHER PBB THAN THOSE IN OTHER
DISTRICTS. PAINTING OIL AS WELL AS NEARBY WORKSHOPS AND
FACTORIES SIGNIFICANTLY INCREASED PBB OF INFANTS AND CHILDREN.

Notes 20 (SEE: 213, 214)FULL TEXT BECAME AVAILABLE

MFN 0213

Subject LEAD; ENVIRONMENTAL POLLUTION

Country(ies)EGYPT

Title ENVIRONMENTAL LEAD POLLUTION AND CHILDREN AT
ALEZXANDRIA PART II: CHILDREN AND MOTHER'S HABITS

Source ALEX. J. PEDIATR., 9

Author(s)EL ARABY, IBRAHIM I.; HAFEZ, BAHIGA; MOSTAFA, YEHIA; EL-
DELGAWI, WAHID; BADR EL-DIN, OMNEYA; LOKA, MANAL

Publication Year 1995

Key Words ENVIRONMENTAL POLLUTION; ADVERSE EFFECTS; MATERNAL BEHAVIOUR; ETHNOLOGY; CHILD BEHAVIOUR

Abstract THIS PART OF THE STUDY WAS CARRIED OUT TO REVEAL CHILDREN AND MOTHER'S HABITS THAT MAY INCREASE BLOOD LEAD OF INFANTS AND CHILDREN AT ALEXANDRIA. STUDY POPULATION WAS CHOSEN RANDOMLY FROM EL-SHATBY CHILDREN UNIVESITY HOSPITAL (482 CHILDREN). QUESTIONNAIRE ABOUT CHILDREN MOTHERS HABITS WAS COMPLETED BY INTERVIEWING MOTHERS OF CHILDREN AND BLOOD LEAD (PBB) WAS DETERMINED FOR ALL CHILDREN. WRAPPING OF SANDWICHES BY NEWSPAPERS, INGESTION OF CANNED JUICE AND PLAYING WITH TOYS MADE OF PAPER LED TO SIGNIFICANT INCREASE OF CHILDREN PBB. REGARDING MOTHERS HABITS, USING ZINC UTENSILS AS WELL AS USING NEWSPAPERS AND/OR MAGAZINES FOR ABSORPTIONS OF EXCESS FAT OR WATER, STORING FOOD, AND COVERING TABLES SIGNIFICANTLY INCREASED PBB OF CHILDREN.

Notes 11 (SEE: 212, 214) FULL TEXT BECAME AVAILABLE

MFN 0214

Subject LEAD; ENVIRONMENTAL POLLUTION

Country(ies) EGYPT

Title ENVIRONMENTAL LEAD POLLUTION AND CHILDREN AT ALEXANDRIA PART III: SYMPTOMATOLOGY

Source ALEX. J. PEDIATR., 9

Author(s) EL ARABY, IBRAHIM I.; HAFEZ, BAHIGA; MOSTAFA, YEHA; EL-DELGAWI, WAHID; BADR EL-DIN, OMNEYA; LOKA, MANAL

Publication Year 1995

Key Words ENVIRONMENTAL POLLUTION; ADVERSE EFFECTS; LEAD

Abstract THIS PART OF THE STUDY WAS PERFORMED TO REVEAL SYMPTOMS AMONG INFANTS AND CHILDREN IN RELATION TO BLOOD LEAD (PBB) AND TO TEST THE ASSOCIATION BETWEEN THE PRESENT SYMPTOMS AND FACTORS THAT CONTRIBUTE IN INCREASING PBB. STUDY POPULATION WAS CHOSEN RANDOMLY FROM EL-SHATBY CHILDREN UNIVERSITY HOSPITAL (482 CHILDREN). QUESTIONNAIRE ABOUT ENVIRONMENTAL CONDITIONS, CHILDREN'S AND MOTHER'S HABITS WAS COMPLETED BY INTERVIEWING MOTHERS OF CHILDREN AND PBB WAS DETERMINED FOR ALL CHILDREN. CHILDREN COMPLAINING OF NEUROBEHAVIOURAL SYMPTOMS SUCH AS IRRITABILITY, MOOD INSTABILITY, LACK OF SCHOOL INTEREST, DECREASED PLAYING ACTIVITIES AND EASY FATIGABILITY HAD SIGNIFICANTLY HIGHER PBB THAN SYMPTOMS-FREE CHILDREN. SIMILARILY, PBB OF CHILDREN COMPLAINING OF GIT RELATED SYMPTOMS SUCH AS ANOREXIA, ABDOMINAL COLIC, VOMITING AS WELL AS BOUTS OF DIARRHOEA ALTERNATING WITH CONSTIPATION WAS SIGNIFICANTLY HIGHER THAN THAT OF SYMPTOMS-FREE CHILDREN. DECREASED PLAYING ACTIVITIES AND VOMITING WERE SIGNIFICANTLY ASSOCIATED WITH ALL 9 STUDIED ENVIRONMENTAL FACTORS AND HABITS. HOWEVER, IRRITABILITY AND ANOREXIA WERE SIGNIFICANTLY ASSOCIATED WITH 8 OF THESE FACTORS AND HABITS; EASY FATIGABILITY AND COLIC WERE ASSOCIATED WITH 7 AND 6 OF THEM, RESPECTIVELY.

Notes 17 (SEE 212, 213) FULL TEXT BECAME AVAILABLE

MFN 0329

Subject LEAD

Country(ies)JORDAN

Title STUDY ON LEAD EXPOSURE OF THE POPULATION OF HIGH RISK AREAS
IN AMMAN WITH FOCUS ON CHILDHOOD EXPOSURE

Source

Corporate Author (s)

MINISTRY OF HEALTH/ENVIRONMENTAL HEALTH

DIRECTORATE ;WHO/CEHA

Publication Year 2000

Key Words LEAD EXPOSURE; LEADED GASOLINE; SCHOOL CHILDREN

Abstract THIS STUDY WAS CONDUCTED BY A TEAM OF INVESTIGATORS FROM THE MINISTRY OF HEALTH, MINISTRY OF EDUCATION AND DEPARTMENT OF STATISTICS, JORDAN. THE STUDY WAS SPONSORED BY THE WORLD HEALTH ORGANIZATION / REGIONAL CENTRE FOR ENVIRONMENTAL HEALTH ACTIVITIES (CEHA). THE STUDY AIMED TO ASSESS THE RISK OF LEAD EXPOSURE OF CHILDREN AT HIGH RISK AREAS IN AMMAN. THE STUDY COVERS SAMPLING OF BLOOD FOR LEAD CONCENTRATION DETERMINATION IN SCHOOL CHILDREN LIVING AT DOWNTOWN CITY OF AMMAN AND AT AL-SHMASANI. RESULTS OF BLOOD SAMPLING WERE SUPPORTED BY RESULTS OF AMBIENT AIR MONITORING PROGRAM IMPLEMENTED BY AIR MONITORING DIVISION / ENVIRONMENTAL HEALTH DIRECTORATE. THE STUDY INDICATED THAT AIR POLLUTION BY LEAD EMITTED BY VEHICLES OPERATED WITH LEADED GASOLINE IS CONTRIBUTING IN ELEVATING LEAD CONCENTRATION IN THE BLOOD OF CHILDREN LIVING AT DOWNTOWN CITY OF AMMAN IN COMPARISON TO THOSE LIVING AT AL-SHMAISANI. MALES WERE MORE AFFECTED THAN FEMALES.

Notes NEW: FULL TEXT AVAILABLE

MFN 0202

Subject LEAD

Country(ies)KUWAIT

Title A STUDY OF CONVULSIONS IN CHILDHOOD

Source MED. PRINC. PRACT., 1

Author(s)MANANDHAR, D.S.; HUNT, M.C.; MOHAMED, M.I.

Publication Year 1989

Key Words CHILD HOSPITALIZATION; LEAD; POISONING; EPILEPSY;
ETIOLOGY

Abstract THIS PROSPECTIVE STUDY WAS PERFORMED ON 400 CHILDREN, BETWEEN THE AGES OF 1 MONTH AND 13 YEARS WITH A HISTORY OF CONVULSIONS, ADMITTED DURING A 2-YEAR PERIOD. THERE WERE MORE MALES THAN FEMALES, WITH MORE CHILDREN ADMITTED IN THE WINTER SEASON THAN IN THE SUMMER. THE LARGEST GROUP SUFFERED FEBRILE CONVULSIONS (77 PERCENT), FOLLOWED BY AFEBRILE CONVULSIONS AND EPILEPSY (11.2 PERCENT), HYPOCALAEMIA WITH OR WITHOUT RICKETS (5.7 PERCENT), CENTRAL NERVOUS SYSTEM INFECTIONS (4.4 PERCENT) AND LEAD INTOXICATION (0.8 PERCENT). IN NEARLY 40 PERCENT OF THE CHILDREN, THE LABORATORY INVESTIGATIONS WERE NORMAL, WHILE

POLYMORPHONUCLEAR LEUCOCYTOSIS (37.5 PERCENT) WAS THE MOST COMMON LABORATORY FINDING. CENTRAL NERVOUS SYSTEM INFECTIONS WERE FOUND IN ALL AGE GROUPS, AND HYPOCALCAEMIA AND LEAD INTOXICATION WERE FOUND TO BE SIGNIFICANT CAUSATIVES FACTORS FOR CONVULSIONS IN CHILDREN UNDER 2 YEARS OF AGE.
Notes 11. FULL TEXT BECAME AVAILABLE

MFN 0311

Subject LEAD

Country(ies) OMAN

Title BRIEF REPORT. ALTERNATIVE MEDICINES ELEVATE BLOOD LEADS IN OMANI CHILDREN REFERRED FOR EXTENSIVE INVESTIGATION

Source JOURNAL OF TROPICAL PEDIATRICS, VOLUME 46, ISSUE 4, PP. 241-242

Author(s) TIMMS, PM.; BOLD, AM.

Key Words LEAD; MEDICINES

Abstract THE FREQUENCY OF ELEVATED BLOOD LEAD LEVELS IN OMANI CHILDREN REFERRED FOR ROUTINE INVESTIGATION WAS DETERMINED BY MEASUREMENT OF 529 BLOOD SAMPLES RANDOMLY SELECTED FROM CHILDREN LESS THAN 12 YEARS OLD, WITHOUT CLINICAL SUSPICION OF LEAD POISONING. THE BLOOD WAS COLLECTED FROM FOUR DISTINCT AREAS WITHIN THE SULTANATE OF OMAN: THE ROYAL HOSPITAL, A TERTIARY REFERRAL CENTRE IN THE CAPITAL MUSCAT; AND THE DISTRICT HOSPITALS NIZWA, SUR, AND SOHAR. IN ALL AREAS, BETWEEN 22 AND 45 PER CENT OF CHILDREN HAD HIGHER THAN DESIRABLE BLOOD LEAD LEVELS ACCORDING TO CDC CRITERIA. THE HIGHEST BLOOD LEAD LEVELS WERE FOUND IN THE ROYAL HOSPITAL, MUSCAT AND OCCURRED IN CHILDREN ATTENDING THE PAEDIATRIC ONCOLOGY OR THALASSAEMIC CLINICS WHO WERE UNDERGOING EXTENSIVE INVESTIGATIONS.

Notes NEW: ABSTRACT ONLY

MFN 0305

Subject LEAD

Country(ies) PAKISTAN

Title FACTORS ASSOCIATED WITH ELEVATED BLOOD LEAD CONCENTRATIONS IN CHILDREN IN KARACHI, PAKISTAN

Source BULLETIN OF THE WORLD HEALTH ORGANIZATION, VOL. 80, NO. 10, PP. 769-75, 2002

Author(s) RAHBAR, MH.; WHITE, F.; AGBOATWALLA, M.; HOZHABRI, S.; LUBY, S.

Publication Year 2002

Key Words LEAD/BLOOD; CHILD; PRESCHOOL; RISK FACTORS; ENVIRONMENTAL EXPOSURE; VEHICLE EMISSIONS; COSMETICS/CHEMISTRY; DUST/ANALYSIS; OCCUPATIONAL EXPOSURE; SOCIOECONOMIC FACTORS; CROSS SECTIONAL STUDIES

Abstract OBJECTIVES: TO CONFIRM WHETHER BLOOD LEAD CONCENTRATIONS IN KARACHI WERE AS HIGH AS REPORTED IN 1989 AND TO IDENTIFY WHICH TYPES OF EXPOSURE TO LEAD CONTRIBUTE MOST TO

ELEVATED BLOOD LEAD CONCENTRATIONS IN CHILDREN IN KARACHI. METHODS: A TOTAL OF 430 CHILDREN AGED 36-60 MONTHS WERE SELECTED THROUGH A GEOGRAPHICALLY STRATIFIED DESIGN FROM THE CITY CENTRE, TWO SUBURBS, A RURAL COMMUNITY AND AN ISLAND SITUATED WITHIN THE HARBOUR AT KARACHI. BLOOD SAMPLES WERE COLLECTED FROM CHILDREN AND A PRETESTED QUESTIONNAIRE WAS ADMINISTERED TO ASSESS THE EFFECT OF VARIOUS TYPES OF EXPOSURE. COOKED FOOD, DRINKING-WATER AND HOUSE DUST SAMPLES WERE COLLECTED FROM HOUSEHOLDS. FINDINGS: ABOUT 80 . OF CHILDREN HAD BLOOD LEAD CONCENTRATIONS 10 G/DL, WITH AN OVERALL MEAN OF 15.6 G/DL. AT THE 5 LEVEL OF SIGNIFICANCE, HOUSES NEARER TO THE MAIN INTERSECTION IN THE CITY CENTRE, APPLICATION OF SURMA TO CHILDREN'S EYES, FATHER'S EXPOSURE TO LEAD AT WORKPLACE, PARENTS' ILLITERACY AND CHILD'S HABIT OF HAND- TO-MOUTH ACTIVITY WERE AMONG VARIABLES ASSOCIATED WITH ELEVATED LEAD CONCENTRATIONS IN BLOOD. CONCLUSION: THESE FINDINGS ARE OF PUBLIC HEALTH CONCERN, AS MOST CHILDREN IN KARACHI ARE LIKELY TO SUFFER SOME DEGREE OF INTELLECTUAL IMPAIRMENT AS A RESULT OF ENVIRONMENTAL LEAD EXPOSURE. WE BELIEVE THAT THERE IS ENOUGH EVIDENCE OF THE CONTINUING PROBLEM OF LEAD IN PETROL TO PROMPT THE PETROLEUM INDUSTRY TO TAKE ACTION. THE EVIDENCE ALSO SHOWS THE NEED FOR APPROPRIATE INTERVENTIONS IN REDUCING THE BURDEN DUE TO OTHER FACTORS ASSOCIATED WITH THIS TOXIC ELEMENT.

Notes NEW: FULL TEXT AVAILABLE SEE 313

MFN 0307

Subject LEAD

Country(ies) PAKISTAN

Title LEAD LEVELS IN PRIMARY TEETH OF CHILDREN IN KARACHI

Source ANN TROP PAEDIATR , VOL. 22, NO. 1, PP. 79-83, MAR.2002

Author(s) RAHMAN, A.; YOUSUF, FA.

Publication Year 2002

Key Words LEAD; PRIMARY SCHOOL

Abstract THE MAJORITY OF CHILDREN IN KARACHI HAVE BLOOD LEAD LEVELS ABOVE 10 MICROGRAMS/DL, THE UPPER SAFETY LIMIT SET BY THE UNITED STATES CENTERS FOR DISEASE CONTROL AND PREVENTION. A STUDY WAS UNDERTAKEN TO EVALUATE CHRONIC LEAD EXPOSURE IN CHILDREN BY MEASURING LEAD LEVELS IN SHED PRIMARY TEETH COLLECTED FROM PRIMARY SCHOOL CHILDREN IN KARACHI. A TOTAL OF 309 TEETH WERE COLLECTED FROM NINE DIFFERENT SCHOOLS, AND ANALYSED FOR LEAD CONTENT BY ATOMIC ABSORPTION SPECTROPHOTOMETRY WITH ELECTROTHERMAL ATOMIZATION. THE MEAN (SD) AGE OF THE SUBJECTS WAS 7.6 (1.2) YEARS AND THE MEAN LEAD LEVEL WAS 5.78 MICROGRAMS/G OF WHOLE TOOTH (DRY WEIGHT), RANGING FROM 0.42 TO 39.75 MICROGRAMS/G. INCISOR TEETH HAD A SIGNIFICANTLY HIGHER MEAN (SD) LEAD LEVEL, 6.42 (4.19) MICROGRAMS/G, THAN CANINES AND MOLARS WHICH CONTAINED 4.91 (5.12) MICROGRAMS AND 4.50 (2.67) MICROGRAMS LEAD WHOLE TOOTH (DRY WEIGHT), RESPECTIVELY. SIGNIFICANT DIFFERENCES WERE OBSERVED BETWEEN

DIFFERENT SCHOOLS. NO DIFFERENCE WAS OBSERVED BETWEEN BOYS AND GIRLS AND THE ACCUMULATION OF LEAD IN TEETH WAS NOT CORRELATED WITH CHRONOLOGICAL AGE.

Notes NEW: ABSTRACT ONLY

MFN 0032

Subject LEAD; HEAVY METALS

Country(ies)PAKISTAN

Title THE COPPER, MANGANESE AND LEAD LEVELS IN CHILDREN OF A SCHOOL IN ISLAMABAD.

Source PAK. J. ZOOL., VOL. 24, NO. 3, PP. 227-229; 1992

Author(s)AHMED, S.; LUBNA, S.; SULTANA, K.

Publication Year 1992

Key Words COPPER; MANGANESE; LEAD; CHILDREN; HEAVY METALS

Abstract COPPER, MANGANESE AND LEAD LEVELS WERE STUDIED IN BLOOD SAMPLES OF 165 NORMAL SCHOOL CHILDREN AGED 5 TO 14 YEARS, BELONGING TO THE BARI IMAM AREA, ISLAMABAD. MEAN COPPER LEVELS RANGED FROM 40.91 MU G/DL TO 98.56 MU G/DL AMONG THE BOYS. THE VALUES RANGED FROM 56.88 MU G/DL TO 111.2 MU G/DL AMONG THE GIRLS. MEAN MANGANESE LEVELS RANGED FROM 0.605 TO 2.34 MU G/DL FOR BOYS AND THE VALUES DETERMINED FOR THE GIRLS RANGED FROM 0.365 TO 2.24 MU G/DL. THE MEAN LEAD LEVELS FOR BOYS RANGED FROM 14.14 TO 35.4 MU G/DL, WHILE THE MEAN LEVELS FOR GIRLS RANGED FROM 15.00 MU G/DL TO 34.22 MU G/DL.

MFN 0125

Subject LEAD

Country(ies)PAKISTAN

Title LEADED EYE COSMETICS: A CULTURAL CAUSE OF ELEVATED LEAD LEVELS IN CHILDREN

Source , J-FAM-PRACT. JOURNAL-OF-FAMILY-PRACTICE. 40/4 (358-362)1995

Author(s)SPRINKLE, RV

Publication Year 1995

Key Words LEAD POISONING DIAGNOSIS; LEAD POISONING ETIOLOGY; EYE; COSMETIC DRUG TOXICITY; LEAD DRUG TOXICITY

Abstract BACKGROUND. PREVENTING LEAD EXPOSURE IS OF PARAMOUNT IMPORTANCE BECAUSE LEAD IS SIGNIFICANTLY TOXIC AT SUBCLINICAL LEVELS, AND TREATING PATIENTS WITH ELEVATED BLOOD LEAD LEVELS IS DIFFICULT. CHILDREN WERE EVALUATED FOR LEAD EXPOSURE IN CALIFORNIA THROUGH A STATE-MANDATED LEAD SCREENING PROGRAM THAT WAS BEGUN IN NOVEMBER 1991. IMPORTED EYE COSMETICS WERE IDENTIFIED AS A SUSPECTED SOURCE OF LEAD EXPOSURE FOR PAKISTANI AND INDIAN CHILDREN WHO USED THESE PRODUCTS. METHODS. A RETROSPECTIVE CHART REVIEW OF CHILDREN AT A COUNTY HOSPITAL CLINIC WAS UNDERTAKEN FOR THE PERIOD BEGINNING OCTOBER 1991 AND ENDING FEBRUARY, 1994. LEAD EXPOSURE QUESTIONNAIRES WERE FILLED OUT AT CLINIC VISITS, AND TELEPHONE INTERVIEWS WERE CONDUCTED WITH PARENTS OR GUARDIANS OF CHILDREN FROM ETHNIC GROUPS WHO USE EYE COSMETICS. RESULTS. LEAD LEVEL RESULTS WERE

AVAILABLE FOR 175 CHILDREN. THE AVERAGE LEAD LEVEL WAS 4.3 MU G/DL (0.21 MU MOL/L)FOR PAKISTANI/INDIAN CHILDREN NOT USING EYE COSMETICS AND 12.9 MU G/DL (0.62 MU MOL/L)(P=.03)FOR THOSE USING THE PRODUCTS. CHEMICAL EVALUATION OF SOME OF THE EYE COSMETICS USED BY THESE CHILDREN REVEALED HIGH LEAD CONTENT. CONCLUSIONS. USE OF EYE COSMETICS IMPORTED FROM PAKISTAN WAS FOUND TO BE STRONGLY CORRELATED WITH ELEVATED BLOOD LEAD LEVELS. ALTHOUGH IMPORTATION OF LOADED EYE COSMETICS IS PROHIBITED BY LAW, LEGISLATION HAS NOT BEEN EFFECTIVE IN PROTECTING CHILDREN FROM THIS SOURCE OF LEAD EXPOSURE. EDUCATION REGARDING LOW LEVEL LEAD TOXICITY AND AVOIDANCE OF SUBSTANCES CONTAINING LEAD IS NEEDED, PARTICULARLY FOR TARGETED SUBPOPULATIONS.

MFN 0223

Subject LEAD; TOXICITY

Country(ies)PAKISTAN

Title BLOOD LEAD LEVELS IN YOUNG CHILDREN IN CHAKSHAHZAD, ISLAMABAD

Source JPMA - PAK. MED. ASSOC., 45

Author(s)SADARUDDIN, AGHA; AGHA, F.; KHATOON, N.; SULTANA, KH.

Publication Year 1995

Key Words LEAD; BLOOD; ENVIRONMENTAL POLLUTION

Abstract BLOOD LEAD LEVELS WERE ESTIMATED IN ONE HUNDRED AND SEVENTY SCHOOL CHILDREN, AGED 13 TO 19 YEARS, RESIDING IN CHAKSHAHZAD AREA OF ISLAMABAD. THE OVERALL MEAN BLOOD LEAD LEVEL WAS 2.38 MICROGRAM /DL (RANGE 0.2 TO 8.6 MICROGRAM /DL), 3.22 MICROGRAM /DL IN BOYS AND 1.49 MICROGRAM /DL IN GIRLS. A SIGNIFICANT DIFFERENCE (P<0.01)WAS FOUND IN MEAN BLOOD LEAD CONCENTRATIONS BETWEEN THE TWO SEXES. THE HIGHEST MEAN LEVELS FOR LEAD WERE FOUND AT THE AGE OF 13 YEARS. BLOOD LEAD LEVELS IN ADOLESCENTS REPORTED HERE WERE RELATIVELY LOW. THEY REFLECT VERY LITTLE OR NO RISK TO THE HEALTH OF CHILDREN IN CHAKSHAHZAD AND IT ALSO INDICATED THAT AREA OF CHAKSHAHZAD IS RELATIVELY FREE FROM ANY LEAD POLLUTION (JPMA 45:215, 1995).

Notes 27. FULL TEXT BECAME AVAILABLE

MFN 0227

Subject LEAD

Country(ies)PAKISTAN

Title BLOOD LEAD LEVELS IN PRESCHOOL CHILDREN IN RAWALPINDI

Source JPMA - PAK. MED. ASSOC., 46

Author(s)HAFEEZ, ASSAD; MALIK, QUADRAT U.

Publication Year 1996

Key Words LEADBEHAVIOR; OCCUPATIONAL HEALTH; ENVIRONMENTAL EXPOSURE

Abstract BLOOD LEAD LEVELS WERE DETERMINED IN PRESCHOOL CHILDREN RESIDING IN URBAN AREAS OF RAWALPINDI CITY. OF 92 (50 MALES AND 42 FEMALES)CHILDREN AGED ONE TO 5 YEARS WERE

INCLUDED IN THE STUDY. BLOOD LEAD LEVELS RANGED FROM 7 MICROGRAM /DL TO 34 MICROGRAM /DL (MEAN 18.8 MICROGRAM /DL). THE MEAN LEAD LEVELS WERE SLIGHTLY HIGHER IN MALES (20.3 MICROGRAM /DL) THAN IN FEMALES (17.2 MICROGRAM /DL) AND OVER 90 PERCENT CHILDREN HAD LEAD LEVELS ABOVE THE ACCEPTABLE LIMIT OF 10 MICROGRAM /DL. USE OF LEADED PETROL, CONTAMINATED SURMA, LEADED PAINTS AND PICA IN CHILDREN ARE COMMON IN OUR COUNTRY AND MAY LEAD TO INCREASES LEAD LEVELS AND APPROPRIATE MEASURES SHOULD BE TAKEN TO CONTROL THIS TREND (JPMA 46:272, 1996).

Notes 15. FULL TEXT BECAME AVAILABLE

MFN 0228

Subject LEAD

Country(ies) PAKISTAN

Title BLOOD LEAD LEVELS IN SCHOOL CHILDREN OF PESHAWAR CITY

Source PAK. J. MED. RES., 33

Author(s) ZAHORULLAH; HAQ, T.; AKHTAR, T.; & AKHTAR, M. Publication Year 1994

Key Words ENVIRONMENTAL EXPOSURE; HEMATOLOGIC TESTS; METHODS; LEAD; BLOOD

Abstract FIVE HUNDRED SCHOOL CHILDREN COMPRISING MALES AND FEMALES IN THE RATIO OF 3:1 WITH MEAN AGE OF 14 AND 13.2 YEARS RESPECTIVELY WERE SELECTED FROM VARIOUS SCHOOLS OF PESHAWAR CITY AND INVESTIGATED FOR THEIR BLOOD LEAD LEVELS. MEAN BLOOD LEAD LEVELS OF MALE AND FEMALE STUDENTS HAVE BEEN FOUND TO BE 21.2 ± 8.15 AND 16.8 ± 4.81 MICROGRAM /DL RESPECTIVELY. 13 PERCENT OF MALE STUDENTS SHOWED BLOOD LEAD LEVEL IN THE RANGE OF 31-50 MICROGRAM /DL WITH NO FEMALE STUDENTS IN THIS RANGE. MEAN BLOOD LEAD LEVEL OF STUDENTS WHO LIVE NEAR MAIN ROADS WAS SIGNIFICANTLY HIGHER THAN THOSE LIVING AT A DISTANCE OF MORE THAN 1/2 KM FROM MAIN ROAD. IN CONTRAST TO KARACHI WHERE OVER 98 PERCENT OF CHILDREN HAD BLOOD LEAD LEVELS OVER 20 MICROGRAM /DL, IN PESHAWAR, 32.6 PERCENT HAD A LEVEL ABOVE THIS LIMIT. THE FINDING THAT 13 PERCENT OF MALE CHILDREN HAVING HIGH BLOOD LEVEL IN THE RANGE OF 31-50 MICROGRAM /DL AND WHO ARE AT RISK OF NEUROPHYSIOLOGIC IMPAIRMENT SHOULD BE A CAUSE FOR CONCERN AND IMMEDIATE MEASURES NEED TO BE TAKEN TO REDUCE ENVIRONMENTAL POLLUTION CAUSED BY LEADED PETROL.

Notes 12. FULL TEXT BECAME AVAILABLE

MFN 0331

Subject LEAD POISONING

Country(ies) PALESTINE

Title RE-EMERGENCE OF LEAD POISONING FROM CONTAMINATED FLOUR IN WEST BANK PALESTINIAN VILLAGE

Source INT-J-OCCUP-ENVIRON-HEALTH (INTERNATION-JOURNAL-OF-OCCUPATIONAL-AND-ENVIRONMENTAL-HEALTH), 6/3, PP. 183-186, 2000

Author(s)EL-SHARIF, N; FISCHBEIN, A; KONIJN, A; GORODETSKY, R; EL-SHARIF, H; KAUL, B; HERSHKO, C; GRAUER, F; FONER, H; AL-BABA, A; DWEIK, Z; LIHSOUNAT, M; RICHTER, ED

Publication Year 2000

Key Words LEAD POISONING; STONE MILLS; FLOUR; WEST BANK

Abstract ALTHOUGH CONTAMINATED FLOUR WAS FIRST DESCRIBED AS AN IMPORTANT SOURCE OF ENDEMIC LEAD POISONING IN THE MIDDLE EAST ALMOST 20 YEARS AGO, THE USE OF LEAD IN COMMUNITY FLOUR MILLS HAS NOT BEEN ELIMINATED AND CONTINUES TO REPRESENT A SIGNIFICANT ENVIRONMENTAL RISK. THE AUTHORS DESCRIBE AN OUTBREAK OF LEAD POISONING IN A WEST BANK PALESTINIAN FAMILY AND DRAW ATTENTION TO THIS UNUSUAL BUT IMPORTANT SOURCE OF LEAD EXPOSURE. ALL 13 MEMBERS OF THE FAMILY (2 CHILDREN 11 ADULTS), WERE FOUND TO HAVE LEAD POISONING FOLLOWING HOSPITALIZATION FOR 'GASTROENTERITIS', HEADACHE, JOINT PAIN, WEIGHT LOSS, AND VISION DIFFICULTIES. SEVEN FEMALES HAD LOW HEMOGLOBIN LEVELS. BLOOD LEAD CONCENTRATIONS RANGED FROM 42 TO 48 *GMG/DL. HOUSEHOLD FLOUR SAMPLES OBTAINED FROM A STONE MILL, PREVIOUSLY CLOSED BECAUSE OF LEAD CONTAMINATION, CONTAINED 2000 PPM LEAD. FLOUR FROM TRADITIONAL STONE MILLS REINFORCED WITH LEAD JOINTS REMAINS A POTENTIAL SOURCE FOR LEAD POISONING.

Notes NEW: ABSTRACT ONLY (FROM POLLUTION TOXICOLOGY)

MFN 0314

Subject LEAD POISONING

Country(ies)QATAR

Title LEAD POISONING: THE FORGOTTEN EPIDEMIC; PRELIMINARY STUDY IN QATAR

Source

Corporate Author (s)

WHO.EMRO.CEHA

Publication Year 1999

Key Words LEAD; LEAD SOURCES; WATER; CHILDREN'S FOOD; INFANT FOOD

Abstract A TOTAL OF 450 SAMPLES OF DRINKING WATER WERE ANALYZED FOR MEASUREMENT OF LEAD LEVELS. FROM 336 SAMPLES COLLECTED FROM VARIOUS LOCATIONS IN THE CITY OF DOHA AND ITS SUBURBS, 39 SAMPLES HAD A LEAD LEVEL EXCEEDING THE WHO GUIDELINE OF 0.01 MG/L. THE HIGHEST LEVEL REACHED IN THESE VIOLATIVE SAMPLES WAS 0.132 MG/L. SEVENTY-THREE SAMPLES OF BOTTLED WATER WERE COLLECTED REPRESENTING 21 BRANDS. ONLY 2 SAMPLES REACHED A LEVEL OF 0.012 MG/L, SLIGHTLY EXCEEDING THE WHO GUIDELINE VALUE. FROM A TOTAL OF 41 SAMPLES OF UNDERGROUND WATER REPRESENTING 12 DIFFERENT GEOGRAPHICAL LOCATIONS IN QATAR, ONLY 6 SAMPLES SLIGHTLY EXCEEDED THE WHO GUIDELINE VALUE AND THE HIGHEST LEVEL REACHED WAS 0.027MG/L. MORE THAN 200 SAMPLES OF PROCESSED FOODSTUFFS WERE ANALYZED, REPRESENTING SEVERAL FOOD GROUPS. GENERALLY, NO SERIOUS VIOLATIONS IN LEAD LEVELS WERE FOUND IN ANY SAMPLES ANALYZED. THESE INCLUDED INFANT FORMULAE (17 SAMPLES)AND COMMODITIES WIDELY USED BY CHILDREN (26 SAMPLES

OF MILK AND DAIRY PRODUCTS, 34 SAMPLES OF FRUIT DRINK PRODUCTS AND SOFT DRINKS, AND 11 SAMPLES OF POTATO AND CORN BASED SNACK PRODUCTS). WITH THE EXCEPTION OF 3 SAMPLES OF MILK AND DAIRY PRODUCTS AND ONE SAMPLE OF RICE GRAINS, LEAD LEVELS WERE WELL BELOW THE MAXIMUM LIMITS RECOMMENDED BY THE FAO/WHO CODEX ALIMENTARIUS COMMISSION. TWO HUNDRED BLOOD SAMPLES WERE COLLECTED FROM CHILDREN (15 YEARS) REFERRED BY PEDIATRIC CLINICS TO DETERMINE THEIR BLOOD LEAD LEVELS FOR DIAGNOSTIC PURPOSES. ONLY 3 PATIENTS SHOWED VALUES EXCEEDING THE LEVEL OF 25 µG/DL USED IN QATAR AS THE MAXIMUM LIMIT FOR NORMAL BLOOD LEAD. THE HIGHEST LEVEL REACHED APPROXIMATELY 38 µG/DL AND WAS A SINGLE CASE. COMPARED TO RESULTS COLLECTED IN THE EIGHTIES AND EARLY NINETIES THE PRESENT RESULTS SUGGEST THAT THERE HAVE BEEN SIGNIFICANT REDUCTIONS IN LEAD LEVELS IN WATER, FOOD, AND THE BLOOD OF CHILDREN. THIS IS DUE TO THE MEASURES IMPLEMENTED IN THE STATE OF QATAR OVER THE LAST TEN YEARS TO CONTROL THE SPREAD OF LEAD CONTAMINATION. THESE MEASURES WERE MAINLY SUCCESSFUL DUE TO THE AVAILABILITY OF GOOD ANALYTICAL METHODS FOR LEAD MEASUREMENT. IT IS RECOMMENDED THAT A WIDER NATIONAL SURVEY BE CONDUCTED TO ALLOW BETTER ASSESSMENT OF THE AVERAGE LEAD INTAKE AND BLOOD LEVELS IN CHILDREN, PREGNANT WOMEN AND NURSING MOTHERS. A NEW PROTOCOL TO DEAL WITH HIGH BLOOD LEAD LEVELS IN CHILDREN IS PROPOSED TO REPLACE THE PRESENT PRACTICE IN THE STATE OF QATAR. THE PROPOSED PROTOCOL INTRODUCES THE NEW ACTION LEVELS OF 10 µG/DL FOR CHILDREN AND PREGNANT WOMEN AND 30 µG/DL FOR ADULTS REPLACING THE PRESENT UNIFIED LEVEL OF 25 µG/DL.

Notes NEW: CEHA SPECIAL STUDIES; SS-9

MFN 0308

Subject LEAD

Country(ies) SAUDI ARABIA

Title RELATIONSHIPS BETWEEN BLOOD LEAD CONCENTRATIONS, INTELLIGENCE, AND ACADEMIC ACHIEVEMENT OF SAUDI ARABIAN SCHOOLGIRLS.

Source INT J HYG ENVIRON HEALTH , VOL. 204, NO. 2-3, PP. 165-74, NOV. 2001

Author(s) AL-SALEH, I.; NESTER, M.; DEVOL, E.; SHINWARI, N.; MUNCHARI, L.; AL-SHAHRIA, S.

Publication Year 2001

Key Words LEAD; PRIMARY SCHOOLGIRLS; NEUROPSYCHOLOGICAL IMPAIRMENT; BEHAVIOURAL IMPAIRMENT

Abstract THIS CROSS-SECTIONAL STUDY EXAMINED THE ASSOCIATION BETWEEN BLOOD LEAD LEVELS AND NEUROPSYCHOLOGICAL AND BEHAVIOURAL PROBLEMS OF 533 SCHOOLGIRLS (6-12 YEARS OF AGE) WHO ATTENDED PUBLIC SCHOOLS IN RIYADH, CAPITAL OF SAUDI ARABIA. REGRESSION MODELS WERE USED TO DETERMINE THE BEST PREDICTORS OF BEERY VMI SAUDI-BASED STANDARD SCORES, TONI SAUDI-BASED SCORES AND RANK PERCENTILE. THE MEAN BLOOD LEAD LEVEL WAS 8.11 +/- 3.50 MICROGRAMS/DL IN THE RANGE OF 2.3 TO 27.36 MICROGRAMS/DL. SIGNIFICANT NEGATIVE ASSOCIATIONS WERE NOTED BETWEEN BLOOD LEAD LEVELS AND BEERY VMI SAUDI-BASED STANDARD SCORES AS WELL

AS RANK PERCENTILE. LEAD HAD NO EFFECT ON TONI SAUDI-BASED STANDARD SCORES. BEERY VMI SAUDI-BASED STANDARD SCORES, TONI SAUDI-BASED STANDARD SCORES AND RANK PERCENTILES WERE INVERSELY RELATED TO PUPILS WITH BLOOD LEAD LEVELS 9 MICROGRAMS/DL. THESE FINDINGS ATTEST AN ASSOCIATION BETWEEN NEUROPSYCHOLOGICAL AND BEHAVIOURAL IMPAIRMENT AND LEAD EXPOSURE AT BLOOD LEAD LEVELS IN THE RANGE OF 9.02 TO 27.36 MICROGRAMS/DL. THE RESULTS OF THIS STUDY SHOULD BE SERIOUSLY CONSIDERED BY PUBLIC HEALTH AUTHORITIES TO GIVE MORE ATTENTION TO THIS PEDIATRIC HEALTH PROBLEM.

Notes NEW: ABSTRACT ONLY

MFN 0321

Subject LEAD

Country(ies)SAUDI ARABIA

Title DETERMINANTS OF BLOOD LEAD LEVELS IN SAUDI ARABIAN SCHOOLGIRLS

Source INT J OCCUP ENVIRON HEALTH, VOL. 5, NO. 2, PP. 107-114, 1999

Author(s)AL-SALEH, IMAN; NESTER, MISHAEL; DEVOL, EDWARD; SHINWARI, NEPTUNE; AL-SHAHRIA, SULIMAN

Publication Year 1999

Key Words BLOOD/LEAD; SCHOOLCHILDREN; KOHL

Abstract BLOOD LEAD LEVELS WERE MEASURED IN 538 GIRLS AGED 6-12 YEARS WHO ATTENDED PRIMARY PUBLIC SCHOOLS IN RIYADH, SAUDI ARABIA. OF THE 538 SCREENED CHILDREN, 24.4 PERCENT HAD BLOOD LEAD LEVELS OR = 10 MICROGRAM/DL, THE CENTERS FOR DISEASE CONTROL'S LEVEL OF CONCERN. VARIATIONS IN THE BLOOD LEAD LEVELS WAS INVESTIGATED WITH RESPECT TO A NUMBER OF RISK FACTORS. THE MAIN DETERMINANT OF BLOOD LEAD LEVELS WAS THE REGIONAL LOCATION OF THE SCHOOL. PUPILS WHO ATTENDED SCHOOLS LOCATED IN THE CENTRAL REGION OF RIYADH HAD SIGNIFICANTLY HIGHER BLOOD LEAD CONCENTRATIONS THAN DID PUPILS WHO ATTENDED SCHOOLS IN THE PERIPHERAL AREAS. THIS IS MOST LIKELY TO BE DUE TO THE HEAVY VEHICULAR EMISSIONS IN THE CENTRAL REGION. OTHER VARIABLES SUCH AS LOW FAMILY INCOME, GRADE AND APPLICATION OF KOHL TO THE CILD'S EYES AND/OR UMBILICUS AT BIRTH WERE ALSO CONTRIBUTORS TO THE BLOOD LEAD LEVELS. THESE OBSERVATIONS EMPHASIZE THE IMPORTANCE OF HEALTH EDUCATION RPOGRAMS TO PROMOTE THE REDUCTION OF LEAD EXPOSURE IN THE GENERAL POPULATION.

Notes NEW: FULL TEXT AVAILABLE

MFN 0322

Subject LEAD

Country(ies)SAUDI ARABIA

Title DISTRIBUTION OF BLOOD LEAD LEVELS IN 1 047 SAUDI ARABIAN CHILDREN WITH RESPECT TO PROVINCE, SEX, AND AGE

Source ARCHIVES OF ENVIRONMENTAL HEALTH, VOL. 49, NO. 6, PP. 471-476, 1994

Author(s)AL-SALEH, IMAN; DEVOL, EDWARD; TAYLOR, ANDREW

Publication Year 1994

Key Words BLOOD/LEAD; CHILDREN; COSMETICS; GEOGRAPHICAL DISTRIBUTION

Abstract RELATIONSHIPS BETWEEN BLOOD LEAD CONCENTRATIONS IN 1 047 CHILDREN AGED 2 MO TO 16 Y AND AGE, SEX, AND PROVINCE (I.E., RESIDENCE)WERE EXAMINED. THE RELATIONSHIPS WERE CONSISTENT WITH OTHER STUDIES, IN WHICH MEAN BLOOD LEAD CONCENTRATIONS REPORTEDLY INCREASED DURING THE FIRST 5 Y OF LIFE, AFTER WHICH BEGAN TO DECREASE, REACHING A MINIMUM AT APPROXIMATELY 16 Y OF AGE. HOWEVER, BOYS WHO WERE MORE THAN 6 Y OF AGE HAD HIGHER BLOOD CONCENTRATIONS THAN SIMILARLY AGED GIRLS. BLOOD LEAD LEVELS OF CHILDREN LIVING IN THE EASTERN PROVINCE WERE HIGHER THAN LEVELS FOUND IN CHILDREN FROM OTHER PROVINCES. MOST OF THE CHILDREN IN THIS STUDY WHO HAD ELEVATED BLOOD LEAD CONCENTRATIONS RESIDED IN SMALL TOWNS, E.G., EHSSA, ABQIQ, HOFUUF, RATHER THAN IN CITIES SUCH AS DAMMAM AND DAHRAN. FACTORS, SUCH AS SOCIOECONOMIC STATUS AND CULTURAL HABITS (E.G., DIET, USE OF TRADITIONAL REMEDIES AND COSMETICS), MAY HAVE CONTRIBUTED TO THIS RESULT.

Notes NEW: FULL TEXT AVAILABLE

MFN 0323

Subject IRON DEFICIENCY

Country(ies)SAUDI ARABIA

Title THE USEFULNESS OF ZINC PROTOPORPHYRIN AS IRON DEFICIENCY SCREENING TOOL FOR SAUDI CHILDREN

Source INTERNATIONAL JOURNAL OF ENVIRONMENTAL HEALTH RESEARCH, 7, PP. 55-61, 1997

Author(s)AL-SALEH, IMAN; SHINWARI, NEPTUNE

Publication Year 1997

Key Words ZINC PROTOPORPHYRIN; IRON DEFICIENCY; LEAD EXPOSURE; CHILDREN

Abstract BLOOD SAMPLES FROM 240 SAUDI CHILDREN AGED 1 DAY-72 MONTHS OLD WERE ANALYSED FOR ZINC PROTOPORPHYRIN (ZPP), LEAD (PB)AND HEMATOLOGICAL PARAMETERS. ELEVATED BLOOD ZINC PROROPORPHYRIN CONCENTRATIONS (3.3 MICROGRAM/G HB)WERE FOUND IN 50.8 PERCENT. THESE CHILDREN HAD A MEAN BLOOD ZPP CONCENTRATION OF 6.857 ± 4.925 MICROGRAM/G (3.35-43.7 MICROGRAM/G). BLOOD LEAD LEVEL 10 MICROGRAM/DL WERE FOUND IN 8 CHILDREN IN THE RANGE OF 10.45-61.08 MICROGRAM/DL. ON THE OTHER HAND, HB LESS THAN 11 G/DL WERE FOUND IN 51.6 PERCENT. THE CORRELATION COEFFICIENT BETWEEN THE CONCENTRATION OF ZPP AND THE HEMATOLOGICAL PARAMETERS AND AGE WERE TESTED. SIGNIFICANT NEGATIVE CORRELATION WAS FOUND BETWEEN ZPP CONCENTRATIONS AND HB, HCT, RBC AND AGE. WE CONCLUDE THAT THE USE OF HEMATOFUROMETER TO MEASURE ZPP PROVED TO BE AN EFFECTIVE AND INEXPENSIVE SCREENING TOOL FOR IRON DEFICIENCY IN CHILDREN ESPECIALLY IN COMMUNITIES WHERE THE PREVALENCE OF IRON DEFICIENCY IS HIGH.

Notes NEW: FULL TEXT AVAILABLE

MFN 0324

Subject LEAD

Country(ies)SAUDI ARABIA

Title A CHARACTERIZATION OF THE BLOOD LEAD CONCENTRATION IN SAUDI ARABIAN CHILDREN

Source ANNALS OF CLINICAL BIOCHEMISTRY, VOL. 31, PP. 469-472, 1994

Author(s)AL-SALEH, IMAN; DE VOL, EDWARD; TAYLOR, ANDREW

Publication Year 1994

Key Words BLOOD/LEAD; CHILDREN; NIN-LINEAR MATHEMATICAL MODEL; CUMULATIVE DISTRIBUTION

Abstract THE RESULTS PRESENTED IN THIS PAPER ARE THOSE DERIVED FROM AN EXTENSIVE ANALYSIS OF LEAD IN 1047 CHILDREN AGED 2 MONTHS TO 16 YEARS ATTENDING AS OUTPATIENTS AT A REFERENCE HOSPITAL, TAKING CASES FROM ALL PARTS OF THE KINGDOM OF SAUDI ARABIA. SINCE THE DISTRIBUTION OF BLOOD LEAD DATA IN THE SAMPLE SUGGESTED THE EXISTENCE OF TWO MIXED SUB GROUPS AMONG THE STUDIED CHILDREN, A NON-LINEAR MATHEMATICAL MODEL WAS USED FIT TO THE DATA. MORE THAN 20 PERCENT OF THE CHILDREN HAD BLOOD LEAD CONCENTRATIONS ABOVE 0.608 MICROMOLE/L (12.59 MICROGRAM/DL).

Notes NEW: FULL TEXT AVAILABLE

MFN 0325

Subject LEAD

Country(ies)SAUDI ARABIA

Title LEAD EXPOSURE IN THE CITY OF ARAR, SAUDI ARABIA

Source ARCHIVES OF ENVIRONMENTAL HEALTH, VOL. 51, NO. 1, PP. 73-, 1996

Author(s)AL-SALEH, IMAN; MUSTAFA, ALI; DUFOUR, LAILA; TAYLOR, ANDREW; HITON, RICHARD

Publication Year 1996

Key Words LEAD POISONING; COSMETICS; SOCIOECONOMIC FACTORS

Abstract IN FOLLOW-UP TO A CASE OF LEAD ENCEPHALOPATHY, HIGH PREVALENCES OF LEAD EXPOSURE (23 PERCENT)AND IRON DEFICIENCY (60 PERCENT)WERE FOUND IN CHILDREN WHO LIVED IN ARAR, SAUDI ARABIA. ENVIRONMENTAL FACTORS HAD MINOR EFFECTS ON THE BLOOD LEAD CONCENTRATIONS OF THESE CHILDREN. WE CONCLUDED THAT TRADITIONAL COSMETICS AND REMEDIES WERE THE MAJOR SOURCES OF LEAD EXPOSURE IN THIS ARAR POPULATION.

Notes NEW: FULL TEXT AVAILABLE

MFN 0326

Subject LEAD

Country(ies)SAUDI ARABIA

Title USEFULNESS OF ERYTHROCYTE PROTOPORPHYRIN AS A PRIMARY SCREENING TEST FOR LEAD EXPOSURE IN CHILDREN

Source INTERNATIONAL JOURNAL OF EVIRONMENTAL HEALTH RESEARCH, 2, PP. 184-191, 1992

Author(s)AL-SALEH, IMAN; TAYLOR, ANDREW; HINTON, RICHARD

Publication Year 1992

Key Words ERYTHROCYTE PROTOPORPHYRIN; LEAD EXPOSURE; CHILDREN

Abstract ERYTHROCYTE PROTOPORPHYRIN AND BLOOD LEAD

CONCENTRATIONS WERE MEASURED IN SAMPLES FROM 583 SAUDI CHILDREN ATTENDING THE OUTPATIENT CLINICS. ERYTHROCYTE PROTOPORPHYRIN CONCENTRATIONS SHOWED POOR CORRELATION WITH BLOOD LEAD CONCENTRATIONS OF 25 UG PER DL AND BELOW.

MEASUREMENT OF ERYTHROCYTE PROTOPORPHYRIN AS A PRIMARY TEST FOR LEAD EXPOSURE IS NOT RECOMMENDED.

Notes NEW: FULL TEXT AVAILABLE

MFN 0327

Subject LEAD

Country(ies)SAUDI ARABIA

Title BLOOD LEAD LEVEL AND HAEMATOLOGICAL PARAMETERS IN SAUDI ARABIAN FEMALE SCHOOL CHILDREN

Source JOURNAL OF ENVIRONMENTAL MEDICINE, 1: PP. 141-146, 1999

Author(s)AL-SALEH, IMAN; NESTER, M; DEVOL, E; SHINWARI, N; AL-SHAHRIA, S

Publication Year 1999

Key Words LEAD; SCHOOL CHILDREN; HAEM-SYNTHESIS;

HAEMATOLOGICAL PARAMETERS

Abstract THE PRESENT STUDY AFFORDED THE OPPORTUNITY TO STUDY THE EFFECT OF LEAD ON HAEMATOLOGICAL PARAMETERS OF 538 SAUDI FEMALE PUPILS AGED 6 TO 12 YEARS LIVING IN RIYADH CITY. BLOOD LEAD LEVELS RANGED FROM 2.3 TO 27.362 MICROGRAM PER DL. BASED ON MENTZER'S FORMULA, 42 PUPILS WERE EXCLUDED DUE TO THALASSAEMIA. MULTIPLE REGRESSION ANALYSES WERE CONDUCTED TO STUDY THE EFFECT OF LEAD ON HAEMATOLOGICAL PARAMETERS SUCH AS HGB, HCT, MCV AND MCH AFTER ADJUSTING FOR SERUM FE AND A NUMBER OF OTHER VARIABLES. THE RESULTS SHOWED THAT MCV WAS SIGNIFICANTLY ASSOCIATED WITH BLOOD LEAD LEVELS. MICROCYTIC ANAEMIA IN 108 PUPILS WITH BLOOD LEAD LEVELS 10 MICROGRAM PER DL WAS ALSO INVESTIGATED. OF THE 108 PUPILS, 24 HAD MICROCYTIC ANAEMIA AS DEFINED BY MCV 80FL AND HCT 0.36. THE RESULTS OF THIS STUDY INDICATE THAT HAEMATOLOGICAL ABNORMALITIES CAN BE SEEN AT BLOOD LEAD LEVELS LESS THAN THE CURRENT CDC ACCEPTABLE LIMIT FOR LEAD.

Notes NEW: FULL TEXT AVAILABLE

MFN 0328

Subject LEAD

Country(ies)SAUDI ARABIA

Title LEAD, ERYTHROCYTE PROTOPORPHYRIN, AND HEMATOLOGICAL PARAMETERS IN NORMAL MATERNAL AND UMBILICAL CORD BLOOD FROM SUBJECTS OF THE RIYADH REGION, SAUDI ARABIA

Source ARCHIVES OF ENVIRONMENTAL HEALTH, VOL. 50, NO. 1, PP. 66-73, 1995

Author(s)AL-SALEH, IMAN; KHALIL, MOHAMMED ABDULKARIM; TAYLOR, ANDREW

Publication Year 1995

Key Words LEAD EXPOSURE; HAEMATOLOGICAL PARAMETERS; PREGNANT WOMEN; NEWBORNS

Abstract A SURVEY WAS UNDERTAKEN AMONG 124 PREGNANT WOMEN LIVING IN RIYADH CITY TO INVESTIGATE THE PASSAGE OF LEAD FROM THE PREGNANT MOTHER TO THE UNBORN CHILD. THE MEAN MATERNAL BLOOD LEAD LEVEL WAS 5.49 ± 2.6 MICROGRAM PER DL AND FOR THE UMBILICAL CORD WAS 4.14 ± 1.81 MICROGRAM PER DL. LEAD LEVELS WERE HIGHER IN MATERNAL THAN IN THE UMBILICAL CORD BLOOD. THE RESULTS ARE IN AGREEMENT WITH OTHER STUDIES. IN THIS STUDY, AN EXCELLENT CORRELATION BETWEEN THE MATERNAL AND CORD BLOOD LEAD LEVELS ($R=.83$, $P.0001$) CONFIRMS THE TRANSFER OF LEAD FROM THE MOTHER TO THE FETUS. A WEAK BUT SIGNIFICANT RELATIONSHIP WAS FOUND BETWEEN MATERNAL BLOOD LEAD CONCENTRATIONS AND BIRTH WEIGHT OF NEWBORNS (R

Notes NEW: FULL TEXT AVAILABLE

MFN 0330

Subject LEAD

Country(ies)SAUDI ARABIA

Title LEAD EXPOSURE IN SAUDI ARABIA AND ITS RELATIONSHIP TO SMOKING

Source BIOMETALS, VOL. 8, PP. 243-245, 1995

Author(s)AL-SALEH, IMAN

Publication Year 1995

Key Words LEAD; SMOKING

Abstract LEAD WAS DETERMINED IN WHOLE BLOOD SAMPLES OBTAINED FROM 202 SAUDI MALE VOLUNTEERS. THE INFLUENCE OF SMOKING ON LEAD EXPOSURE WAS INVESTIGATED. BLOOD LEAD WAS SIGNIFICANTLY HIGHER IN CURRENT SMOKERS THAN IN NON-SMOKERS AND PREVIOUS SMOKERS ($P0.05$). THE DISTRIBUTION OF BLOOD LEAD DATA IN THE SCREENED SUBJECTS SUGGESTED THE EXISTENCE OF TWO MIXED POPULATIONS AND A CUT-OFF OF 12 MICROGRAM /DL WAS FOUND WHERE THE TWO POPULATIONS SEPARATE. OF THE EXPOSED POPULATION, 80 PERCENT WITH BLOOD LEAD CONCENTRATIONS ABOVE 12 MICROGRAM /DL WERE SMOKERS.

Notes NEW: FULL TEXT AVAILABLE

MFN 0034

Subject LEAD

Country(ies)SAUDI ARABIA

Title MEASUREMENTS OF HAIR LEAD CONCENTRATIONS IN CHILDREN OF FOUR CITIES IN SAUDI ARABIA.

Source ENVIRON. INT., VOL. 14, NO. 3, PP. 237-242; 1988

Author(s)AHMAD, P.; KUTBI, I.I.; ABULFARAJ, W.H.; AHMED, M.

Publication Year 1988

Key Words LEAD; HAIR; CHILDREN

Abstract THE CONCENTRATIONS OF LEAD IN THE SCALP HAIR OF 800 SCHOOL CHILDREN, AGED 6-8 YEARS, FROM FOUR CITIES: MAKAKH, JEDDAH, RIYADH AND TABUK IN SAUDI ARABIA, WERE MEASURED BY ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRY. MEAN LEAD CONCENTRATIONS FOR THESE FOUR LOCATIONS WERE FOUND TO BE 17.6 MU G PB/G HAIR FOR MAKKAH, 23.3 MU G PB/G HAIR FOR JEDDAH, 5.1 MU G PB/G HAIR FOR RIYADH AND 10.9 MU G PB/G HAIR FOR TABUK. THE MEAN VALUES OF PB CONCENTRATIONS IN HAIR FOR JEDDAH, MAKKAH AND TABUK CITIES ARE ON THE HIGH SIDE OF THE ACCEPTABLE "NORMAL RANGE", INDICATING AN INCREASING TREND IN ENVIRONMENTAL LEAD POLLUTION. RIYADH APPEARS TO BE RELATIVELY "CLEAN" IN THIS RESPECT. RAPID MODERNIZATION WITH INCREASED USE OF LEADED GASOLINE FOR TRANSPORTATION MAY ALREADY BE CAUSING A STRESS ON THE ENVIRONMENT OF SAUDI ARABIA.

MFN 0065

Subject LEAD

Country(ies)SAUDI ARABIA

Title CORRELATION BETWEEN MATERNAL AND CORD BLOOD LEAD LEVELS

Source , INT-J-ENVIRON-HEALTH-RES. INTERNATIONAL-JOURNAL-OF-ENVIRONMENTAL-HEALTH-RESEARCH. 1997; 7/4 (323-328)

Author(s)AL, KHAYAT, A; HABIBULLAH, J; KOUTOUBY, A; RIDHA, A; ALMEHDI, AM

Publication Year 1997

Key Words LEAD BLOOD LEVEL

Abstract WHOLE BLOOD LEAD LEVELS WERE ESTIMATED BY ATOMIC ABSORPTION ANALYSIS IN 226 BLOOD SAMPLES FROM 113 MOTHERS OF 23 DIFFERENT NATIONALITIES. SAMPLES WERE COLLECTED BEFORE DELIVERY, AND FROM CORD BLOOD FROM THEIR RESPECTIVE NEONATES. THE CONCENTRATIONS OF BLOOD LEAD WERE WITHIN THE EXPECTED RANGE OF OCCUPATIONALLY UNEXPOSED POPULATIONS. MEAN MATERNAL BLOOD LEAD LEVELS WERE 0.72 | 0.10 MU MOL/L (14.9 | 2.14 MU G/DL), RANGE 0.32-1.34 MU MOL/L (6.6- 27.8 MU G/DL)AND MEAN CORD BLOOD LEVELS WERE 0.64 |0.12 MU MOL/L (RANGE 0.29-1.46 MU MOL/L). SIXTEEN PERCENT OF THE MOTHERS AND NEARLY 10 CORD BLOOD SAMPLES WERE FOUND TO HAVE BLOOD LEAD LEVEL GREATER THAN 0.97 MU MOL/L (20 MU G/DL). VERY HIGH LEVELS, IN EXCESS OF 1.21 MU MOL/L (25 MU G/DL), WERE DETECTED IN 3.5 OF MOTHERS AS COMPARED TO 2.6 OF CORD BLOOD SAMPLES. OUT OF 113 INFANTS, 65 (58)WERE MALES WITH A MEAN CORD BLOOD LEAD LEVEL OF 0.63 MU MOL/L AND 48 (42)WERE FEMALES WITH A MEAN LEVEL OF 0.66 MU OL/L. THE LOWEST MATERNAL BLOOD LEAD LEVELS 0.68 MU MOL/L WERE OBSERVED IN AGES 20 TO 25 YEARS OLD, AND LOWEST CORD BLOOD LEVELS 0.58 MU MOL/L WERE SEEN IN MATERNAL AGE OF LESS THAN 20 YEARS OLD. ON THE OTHER HAND, THE HIGHEST MATERNAL AND CORD BLOOD LEAD LEVELS (0.82 AND 0.75 MU MOL/LRESPECTIVELY)WERE OBSERVED IN MATERNAL AGES OF GREATER THAN 35 YEARS OLD. THE RESULTS SHOW A DIRECT CORRELATION OF BLOOD LEAD LEVEL BETWEEN MOTHERS AND

UMBILICAL CORD AS SEEN IN THE LINEAR REGRESSION DISTRIBUTION CURVE.

MFN 0160

Subject LEAD

Country(ies)SAUDI ARABIA

Title LEAD POISONING AMONG SAUDI CHILDREN

Source , ANN-SAUDI-MED. 13/5 (395-401)1993

Author(s)YAISH, HM; NIAZI, GA; AL, SOBY, A

Publication Year 1993

Key Words LEAD POISONING DIAGNOSIS; LEAD POISONING ETIOLOGY; LEAD POISONING DRUG THERAPY; LEAD POISONING EPIDEMIOLOGY; ANEMIA DIAGNOSIS; ANEMIA ETIOLOGY; ENVIRONMENTAL EXPOSURE; EDETTIC ACID DRUG THERAPY; DIAZEPAM DRUG THERAPY

Abstract TEN SAUDI CHILDREN WITH CLINICAL AND LABORATORY FINDINGS RELATED TO LEAD INTOXICATION WERE SEEN AT THE KING FAHAD NATIONAL GUARD HOSPITAL FROM 1984 TO 1988. A PRESUMPTIVE DIAGNOSIS OF CHRONIC LEAD POISONING WAS MADE RETROSPECTIVELY ON 12 OTHER CHILDREN WITH HYPOCHROMIC AND MICROCYTIC ANEMIA WHOSE OTHER LABORATORY DATA WERE CONSISTENT WITH LEAD POISONING. THE AGES OF THE CHILDREN RANGED FROM SIX MONTHS TO 13 YEARS. AFTER THE FIRST CHILD WITH LEAD ENCEPHALOPATHY WAS DIAGNOSED, A HIGH INDEX OF SUSPICION WAS MAINTAINED, THUS ENABLING US TO ESTABLISH AN EARLY DIAGNOSIS OF LEAD ENCEPHALOPATHY. THE FINDINGS OF THIS STUDY SUGGEST THAT EXCESSIVE LEAD EXPOSURE MAY STILL POSE A SERIOUS PUBLIC HEALTH HAZARD IN SAUDI ARABIA TODAY WHICH NEEDS TO BE ADDRESSED.

MFN 0207

Subject LEAD POISONING

Country(ies)SAUDI ARABIA

Title LEAD POISONING AMONG SAUDI CHILDREN

Source ANN. SAUDI MED., 13

Author(s)YAISH, HASSAN.M.; NAIZI, GULZAR.A.; AL SOBY.ABDULLAH.

Publication Year 1993

Key Words LEAD; BLOOD

Abstract TEN SAUDI CHILDREN WITH CLINICAL AND LABORATORY FINDINGS RELATED TO LEAD INTOXICATION WERE SEEN AT THE KING FAHAD NATIONAL GUARD HOSPITAL FROM 1984 TO 1988. A PRESUMPTIVE DIAGNOSIS OF CHRONIC LEAD POISONING WAS MADE RETROSPECTIVELY ON 12 OTHER CHILDREN WITH HYPOCHROMIC AND MICROCYTIC ANEMIA WHOSE OTHER LABORATORY DATA WERE CONSISTENT WITH LEAD POISONING. THE AGES OF THE CHILDREN RANGED FROM SIX MONTHS TO 13 YEARS. AFTER THE FIRST CHILD WITH LEAD ENCEPHALOPATHY WAS DIAGNOSED, A HIGH INDEX OF SUSPICION WAS MAINTAINED, THUS ENABLING US TO ESTABLISH AN EARLY DIAGNOSIS OF LEAD ENCEPHALOPATHY. THE FINDINGS OF THIS STUDY SUGGEST THAT EXCESSIVE LEAD EXPOSURE MAY STILL POSE A SERIOUS PUBLIC HEALTH HAZARD IN SAUDI ARABIA TODAY WHICH NEEDS TO BE ADDRESSED.

Notes 27. FULL TEXT BECAME AVAILABLE.DUPLICATE/160

MFN 0031

Subject LEAD

Country(ies)SAUDI ARABIA

Title LEAD EXPOSURE AMONG SCHOOL CHILDREN IN RIYADH, SAUDI ARABIA: A CASE- CONTROL STUDY.

Source BULL. ENVIRON. CONTAM. TOXICOL., VOL. 50, NO. 5, PP. 0007-4861; 1993

Author(s)JARALLAH, J.S.; NOWEIR, K.M.; AL-SHAMMARI, S.A.; AL-SALEH, I.A.; AL-ZAHRANI, M.A.; AL-AYED, M.H.

Publication Year 1993

Key Words LEAD; CHILDREN; ENVIRONMENTAL HEALTH; BLOOD ANALYSIS; EXHAUST EMISSIONS; TRANSPORTATION; HAZARDS

Abstract IN THE KINGDOM OF SAUDI ARABIA THE CITY ROADS AND HIGHWAYS HAVE WITNESSED A PHENOMENAL RISE IN VEHICULAR TRAFFIC IN THE LAST 20 YEARS. THE ATMOSPHERIC LEAD CONCENTRATION IN JEDDAH CITY WAS FOUND TO BE 3.38 MU G/M OF AIR IN CERTAIN HEAVY TRAFFIC AREAS, AND THIS IS HIGHER THAN THE AIR QUALITY GUIDELINE 0.5-1.0 MU G/M FOR EUROPE. THE PRESENT STUDY WAS UNDERTAKEN TO EVALUATE THE HEALTH HAZARDS RELATED TO LEAD IN SCHOOL CHILDREN IN DIFFERENT AREAS IN RIYADH CITY. THE STUDY IS ESSENTIALLY AN ENVIRONMENTAL AS WELL AS A BIOLOGICAL ONE.

Notes FULL TEXT BECAME AVAILABLE

MFN 0333

Subject LEAD POISONING

Country(ies)SAUDI ARABIA

Title LEAD CONCENTRATION IN BREAST MILK OF NURSING MOTHERS LIVING IN RIYADH

Source ANNALS OF SAUDI MEDICINE (ANN SAUDI MED), MAY 1995

Author(s)YOUNES, BASSAM; AL-MESHARI, ABDUL AZIZ; AL-HAKEEM, AMAL; AL-SALEH, SAAD

Publication Year 1995

Key Words LEAD POISONING; BREAST MILK; MILK SAMPLES

Abstract LEAD POISONING HAS PROVEN TO BE OF THE MOST DIFFICULT ENVIRONMENTAL HEALTH PROBLEMS. PART OF THIS DIFFICULTY IS BASED ON THE LACK OF DISTINCTIVE MANIFESTATIONS AT AN EARLY PHASE IN THE PROCESS. BREAST MILK FEEDING WITH HIGH LEAD CONCENTRATION IS ONE OF THE FIRST SOURCES OF LEAD EXPOSURE IN NEONATES. THIS STUDY REPORTED THAT THE LEAD IN BREAST MILK SAMPLES FROM 81 PERCENT OF NURSING MOTHERS VARIED FROM A LOW CONCENTRATION OF 0.318 MICROGRAM/DL TO A HIGH OF 2.5 MICROGRAM/DL WITH AN AVERAGE OF 0.768 ± 0.42 MICROGRAM/DL. LEAD CONCENTRATION WAS FOUND TO BE LOW IN YOUNG MOTHERS AND HIGHER IN MOTHERS AGE 36 YEARS OR MORE WITH AN AVERAGE OF 0.515

± 0.14 AND 1.344 ± 0.65 MICROGRAM/DL, RESPECTIVELY. THERE WERE NO SIGNIFICANT DIFFERENCES BETWEEN LEAD CONCENTRATION IN SAMPLES OBTAINED FROM RIGHT OR LEFT BREASTS AND SIMILARLY, NO SIGNIFICANT DIFFERENCES IN LEAD CONCENTRATIONS IN MILK SAMPLES IN RELATION TO THE LENGTH OF PERIOD OF LACTATION. BREAST MILK SAMPLES OBTAINED FROM MOTHERS RESIDING NEAR INDUSTRIAL AREAS OR HIGHWAYS, USING COPPER CASSEROLE COATED WITH WHITE (RICH IN LEAD) INNER COAT AND EATING FOOD MATERIAL PRESERVED FOR LONG PERIODS IN METAL CONTAINERS SHOWED HIGHER LEAD CONCENTRATION THAN FROM THOSE LIVING IN REMOTE AREAS WITH REDUCED EXPOSURE. THE DIAGNOSIS OF LEAD POISONING REQUIRED A CONSTANT AWARENESS OF ITS PREVALENCE.

Notes NEW: FULL TEXT AVAILABLE

MFN 0085

Subject LEAD

Country(ies) UNITED ARAB EMIRATES

Title ACUTE LEAD ENCEPHALOPATHY IN EARLY INFANCY - CLINICAL PRESENTATION AND OUTCOME

Source , ANN-TROP-PAEDIATR. ANNALS-OF-TROPICAL-PAEDIATRICS. 17/1 (39-44)1997

Author(s) AL, KHAYAT, A; MENON, NS; ALIDINA, MR

Publication Year 1997

Key Words BRAIN DISEASE ETIOLOGY; LEAD POISONING DIAGNOSIS; LEAD POISONING ETIOLOGY; TRADITIONAL MEDICINE; NEUROTOXICITY ETIOLOGY

Abstract WE STUDIED 19 INFANTS WITH A MEAN AGE OF 3.8 MONTHS WHO PRESENTED WITH FEATURES CONSISTENT WITH ACUTE LEAD ENCEPHALOPATHY FOLLOWING THE USE OF TRADITIONAL MEDICINES. ALL PRESENTED WITH CONVULSIONS; CT SCANS OF THE BRAIN ON ADMISSION SHOWED BRAIN OEDEMA IN FOUR, ATROPHY IN FOUR AND NORMAL FINDINGS IN 11. CEREBROSPINAL FLUID ANALYSIS IN NINE PATIENTS SHOWED PLEOCYTOSIS IN SIX AND A HIGH PROTEIN CONTENT IN EIGHT. THE MEDIAN LEAD LEVEL IN THESE 19 INFANTS WITH ENCEPHALOPATHY WAS 3.6 MU MOL/L (74.5 MU G/DL). SEVEN HAD A MEAN LEAD LEVEL OF ONLY 2.7 MU MOL/L (56.9 MU G/DL) WHICH IS MUCH BELOW 70 MU G/DL, THE LEVEL USUALLY PROPOSED AS THE THRESHOLD FOR ENCEPHALOPATHY. THIRTEEN INFANTS DEVELOPED BRAIN DAMAGE DURING FOLLOW-UP; STATISTICAL ANALYSIS CORRELATED THE LEAD LEVEL AT 2 MONTHS POST CHELATION WITH AN ABNORMAL NEUROLOGICAL OUTCOME. OUR FINDINGS INDICATE THAT IN VERY YOUNG INFANTS ACUTE LEAD ENCEPHALOPATHY MAY OCCUR AT LEAD LEVELS LOWER THAN PREVIOUSLY REPORTED.
