STUDY OF THE EFFECT OF AIR POLLUTION BY LEAD ON PREGNANT FEMALES AND FETAL OUTCOME

Thesis

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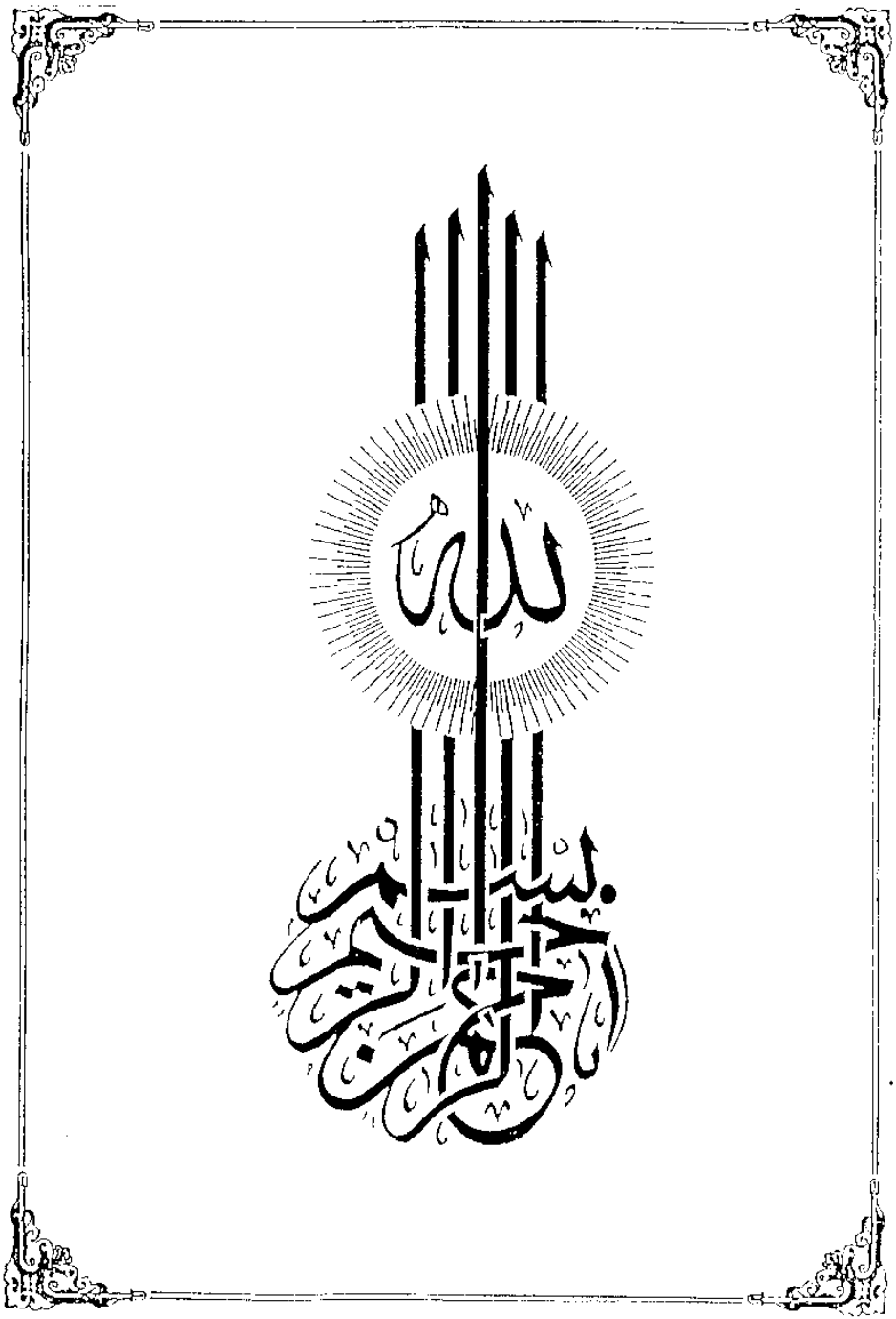

To My

Parents

ACKNOWLEDGMENT

*My greatest thanks to" **ALLAH**" without whom I would not have been able to complete this work.*

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Introduction

INTRODUCTION

With increased control over infectious disease, more concern has been given to environmental pollution. *(O'Halloran & Spickett, 1992)* An important type of this is air pollution which implies the introduction of undesirable substances. One of these is lead which is a heavy metal commonly used in industry and has been added to gasoline. Interest on lead metabolism and toxicity has grown over the recent years. *(Goyer, 1993)*

The principal source of air pollution with lead is automobile combustion of tetra-ethyl lead-containing gasoline. *(Granadillo et al, 1987)* Its concentration in air correlates with vehicular traffic density, being higher in urban than rural areas *(U. S. Department of Health, Education and Welfare, 1965)* and high blood lead is typically found in city dwellers who are not occupationally exposed. *(Romero et al, 1990)*

In developed countries, un-leaded gasoline has been used for over 10 years as a control measure. *(Hwang & Wang, 1990)* Industrial uses of lead, especially metallurgic and chemical ones, also contribute to atmospheric lead. However, control measures has been introduced to reduce this.*(First, 1968)* Lead inhibits enzymes activity, alter calcium metabolism *(Lockitch, 1993)* and affects haemopoiesis, brain and kidneys. *(Aub et al, 1926)*

During pregnancy, maternal blood lead level is affected by changes in plasma volume, transfer to the fetus and mobilization from bone. *(Lockitch, 1993)* Any how, lead affects obstetric performance. In the past, it was used as an abortifacient. *(Hall & Cantab, 1905)* It may, also, cause premature membrane rupture, pre-eclampsia, pregnancy hypertension and premature delivery. *(Winder, 1993)*

Maternal lead crosses the placenta to affect the fetus in utero. *(Barltrop, 1969)* and correlation between maternal and cord blood lead levels has been reported. *(Koren et al, 1990)* Maternal blood lead has been, thus, used to assess Fetal exposure. *(Rothenberg et al, 1989)* Great concern about exposure of pregnant women to lead is due to the increased sensitivity of fetal nervous tissues to its toxic effects. *(O'Halloran & Spickett, 1992)* Behavioural and neurological deficits were reported with maternal blood levels as low as 10-15 μg/dl. *(Flanigan et al, 1992)* In addition, Lead can have other effects. High placental and bone lead have been found in still births and neonatal deaths. *(Sullivan and Barlow, 1979)* Also, it may affect the birth weight *(Nordstrom et al, 1978)* and cause minor malformations *(Needleman et al, 1984)* Furthermore, high lead level increases the risk of neurobehavioural dysfunction following neonatal jaundice. *(Grandjean, 1993)* Even after delivery, maternal lead is also available to suckling infants through breast milk. *(O'Halloran & Spickett, 1992)*

Aim Of Work

AIM OF WORK

The aim of this study is to find out correlation between maternal and neonatal blood lead levels in areas with different air lead concentrations with elucidation of its impact on obstetric performance and fetal outcome so as to identify its hazards and try to protect pregnant women from them.

Review Of Literature

REVIEW OF LITERATURE

1. The lead Metal

1.1 History of lead:

Lead was one of the first metals known to man and its poisoning is the oldest recorded occupational disease. Hippocrates (310 BC) was the first to recognize it as a cause of colic. By the second century BC, Nikador wrote his "Alexipharmaca" describing both colic and paralysis as the result of ingesting litharge (Lead oxide). Pliny (AD 23-79) stated that lead poisoning was common in ship building because the ancients painted their ships with native ceruse. Ramazzini (1713) noticed tremors of hands followed by paralysis in potters who worked with lead. A full description of lead poisoning was given by Tanquerel des Planches in 1839. ***(Hunter, 1973)***

1.2 Physical character:

Lead, plumbum, Pb, has an atomic number of 82, an atomic weight of 207.2, a specific gravity of 11.3, a melting point of 327°C and a boiling point of 1470°C. It is a flexible, heavy, bluish-gray and soft metal that have found wide use in industry due to its malleability, ductility and being not readily corroded. It is highly insoluble in aqueous phases of natural systems. This accounts for its poor absorption and slow excretion and, therefore, high degree of accumulation with prolonged exposure. ***(Schilling, 1981)***

1.3 Occurrence:

It has 4 radioactive isotopes (lead-210,-211, -212 and -214). Lead 210 is a natural ß-and α-emitter with a half life of about 22 years and has been useful as an atmospheric tracer. ***(Ault et al, 1970)***

1.4 Lead alloys:

Some metals, as arsenic, might be added to lead to improve some physical or chemical properties. Similarly, lead could be added to other metals, as steel, to obtain certain desirable characteristics.

1.5 Lead use in industry:

Lead has been used in a wide variety of industries including sheets, pipes, containers, greases, ceramics, explosives, electric cable insulation, floor coverage, as a stabilizer in plastics, glass and metallizing (eg. production of leaded steel). However, the main uses of lead have included the manufacture of paint pigments, storage batteries and antiknock gasoline. The use of lead in the production of corrosion-resistant paint pigments has been decreasing while its use in the manufacture of batteries and antiknock gasoline has increased. ***(U.S. Bureau of Mines, 1969)*** In addition, lead is used in the manufacture of laboratory and medical shields for its protective quality against gamma and X-rays. ***(Goldschmidt, 1937)*** Furthermore, lead salts are used externally as astringent and antiseptic lotions (eg. acetate and nitrate).

2- Lead Metabolism in the body

2.1 Input :

Lead may enter the body through the gastrointestinal tact, the respiratory tract or the skin. The amount of lead in food depends on its natural content of lead, exposure to automobile exhaust and lead containing pesticides, storage as well as preparation. Plants of heavily polluted areas contain high lead levels. ***(Royal Commission on Environmental Pollution, 1983)*** It decreases with distance from high ways and over half of it is removable by washing. ***(Motto et al, 1970)(Noweir, 1990)*** Lead containing pesticides are especially important as they increase lead level in fruits and vegetables directly and if used for long period, they increase it in the soil as well. Lead poisoning in cattle has been associated with substantial lead levels in milk. ***(Oskarsson et al, 1992)*** The contribution of water, as a source of lead, is low and most lead is removed by sedimentation ***(WHO, 1987)*** , however, it could be high with the use of lead pipes ***(Kehoe, 1961)*** as well as lead-lined water tanks, especially after stagnation over night. ***(El-Wood, 1984)***

Absorption of lead from the gastrointestinal tract is very poor and only 5 to 10% of the ingested lead enters the blood. ***(Kehoe, 1964) (Six & Goyer, 1970)*** Decreased dietary intake of calcium appears to increase lead absorption. ***(Shields & Mitchell, 1941) (WHO, 1977)***

Inhalation of lead is a smaller potential source of input than the ingestion of food and water. Yet it is the most important in