FREQUENCY OF AMNORMAL BLOOD PARAMETERS (LEAD,CALCIUM,HAEMOGLOBIN LEVEL) IN PEOPLE EXPOSED TO VEHICLE SMOKE

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ABSTRACT

Objective: To determine the frequency of abnormal blood parameters (Lead,Calcium,Haemoglobin level) in people exposed to vehicle smoke.

Methods: Case control retrospective descriptive study was conducted in Department of Biochemistry Nowshera Medical College Nowshera from November 2016 -December 2017. Only male patients from 6-64 years were included in this study. Two hundred and fifty eight males were randomly selected: employees of Private Transport Service (PTS) (150), Traffic Police(36), Shopkeepers alongside roads (36). All these subjects were exposed to vehicle smoke for 8-10 hours daily during duty. Thirty six persons of same age group living away from the roads were included as control in this study. People taking steroid medicines, drinking water from lead pipes, using surma or living near industries which influence lead levels were excluded from this study.

Results: Mean blood lead level was 24.06 ug/dl in control persons and 52.20 ug/dl in subjects exposed to vehicle smoke. In controls the average Hb and Ca level were 14.73 g/dl and 9.38 mg/dl and 13.48 g/dl and 8.8 mg/dl in exposures respectively. whereas mean Hb-Foetal level in controls was 0.9% and 1.4% in exposed group.

Conclusions: Blood lead levels had no significant association with Hb,Hb-Foetal and Calcium In exposures, employees of Traffic Police were found to have comparatively higher blood lead level. It was observed that blood lead level was slightly higher in younger groups

Keywords: Calcium, Haemoglobin, Hb-Foetal, Lead, Cyanmethaemoglobin

INTRODUCTION

Lead is ubiquitous in the environment, as a result of its natural occurrence, industrial use and vehicles running on leaded petrol. During the Roman empire, its production was about 80,000 tons per year and has risen, rapidly this century to about three million tons annually. Because of this increase, Americans are said to have 500 times more lead in their skeletons than Peruvians of 1800 years ago.[1] Half a million ton end up in the atmosphere, 70% of which originates from the combustion of petrol which contains tetraethyl lead as an anti knocking agent.[1] In our country, generally there are three types of petrol being used: regular, super, high octane. When the oil is processed for these three types, the amount of lead being added is 0.4 g/liter for regular,0.63 g/liter for super and 0.84 g/liter for high octane grades of petrol. A decrease of 36.7% in atmospheric lead was noted in USA due to the introduction of lead free petrol.[2]

Lead enters the body either by ingestion through gastrointestinal tract or by inhalation through lungs. About 10-30% of inhaled lead and 10-15% of ingested lead is distributed via the red cells throughout the soft tissues and accumulated in the skeleton.[3] The remaining lead is excreted through the liver and kidneys. Hence the balance of absorption and excretion maintains blood lead concentration within safety limits in normal conditions. During abnormal exposure its level rises rapidly, the major symptoms of which include weakness, headache, vomiting, body pain, depression, memory loss, reduced sexual potency and oedema of brain. In addition, increased level of lead in pregnant women cause premature delivery and gives rise to neurological damage and growth retardation in infants. It has been estimated that if mean level of lead in USA were lowered from 17 to 10 ug/dl, 50000 myocardial infarctions and 7000 strokes per year would be prevented.[4] In 1987, it was reported that mental development of infants over the first two years of life, whose cord blood lead level had been 25 ug/dl, was slower than those of lower levels.

Besides casing these abnormalities, the elevated lead level displaces calcium from the hydroxyapatite crystal and inhibits several of the enzymes involved

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in heme synthesis. Moreover, different countries have established values for their population but no data are available in our country for people exposed excessively to vehicle smoke. The present study was therefore,, conducted to determine calcium, hemoglobin and lead levels in employees of Private Transport Service (PTS), Traffic Police (TP) and Shopkeepers alongside busy roads.

METERIAL AND METHODS

Case control retrospective descriptive study was conducted in Department of Biochemistry Nowshera Medical College Nowshera from November 2016 -December 2017. Two hundred and fifty eight males were randomly selected: employees of Private Transport Service (PTS) (150), Traffic Police(36), Shopkeepers alongside roads (36). All these subjects were exposed to vehicle smoke for 8-10 hours daily during duty. Thirty six persons of same age group living away from the roads were included as control in this study. Age range in all cases was 6-64 years. Information regarding age, height, weight, economic condition, historyof infection and medication, history of past illness, marital status and duration in the respective profession were recorded on a Performa. People taking steroid medicines, drinking water from lead pipes,using surma or living near industries which influence lead levels were excluded.

Blood samples (5 cc) were collected in disposable syringes taking precautions against environmental contamination. All the glassware were soaked overnight in diluted nitric acid and rinsed three times in deionized water. Blood smear of each sample was prepared and stained with Geimsa Stain to note basophilic stippling and red cell morphology. Estimation of lead in samples and metallic standards were estimated on Atomic absorption spectrophotometer (Hitachi). The level of calcium was measured by the Cromatest, Hb-Foetal by alkali denaturation method and for determination of haemogolobin level Cyanmethaemoglobin method was used.

RESULTS

Blood parameters were measured in 258 subjects. Mean blood lead level was 24.06 ug/dl in control persons and 52.20 ug/dl in subjects exposed to vehicle smoke. In controls the average Hb and Ca level were 14.73 g/dl and 9.38 mg/dl in controls, and 13.48 g/dl and 8.8 mg/dl in exposures respectively (Figure-1): whereas mean Hb-Foetal level in control men was 0.9% and 1.4% in exposed group. Blood lead levels had no significant association with Hb,Hb-Foetal and Calcium (Table 1).

In exposures, employees of Traffic Police were found to have comparatively higher blood lead level. It was observed that blood lead level was slightly higher in younger groups (table 2)

50% of the exposed subjects had hypochromasia and microcytosis, while 11% had reticulocytosis. Basophilic stippling was found in 18% cases. The important associated complication in the exposures were Hypertension, depression, Headache, body pain, memory loss and raised hearing threshold. 39% of exposed subjects had no abnormalities at all.

DISCUSSION

Lead is relatively more abundant than other heavy metals in the atmosphere. Traffic exhaust fumes

Table 1: Blood Parameters Mean Values In Study Populations

Parameters	Tarffic Police	Shopkeeper	P.T.S	Control
Lead (ug/dl)	53.43±5.01	52.10±1.91	51.06±1.73	24.06±1.7
Calcuim(mg/dl)	8.37±1.55	8.98±1.05	9.05±1.16	9.38±0.6
Haemoglobin(g/dl)	12.59±1.36	13.85±0.38	14.02±1.34	14.73±0.78
Hb-Foetol	1.6±0.4	1.4±0.3	1.2±0.3	0.9±0.2

Table 2: Average Blood Parameters In Exposures(Agewise)

Age Group	Nos	Hb(g/dl)	Calcium(mg/dl)	Pb(ug/dl)
<10	2	13.08±1.72	8.56±0.68	53.0±1.04
10-19	8	13.45±1.99	8.57±0.83	52.71±0.82
20-29	58	13.67±1.33	8.88±1.16	52.33±4.02
30-39	96	12.90±1.16	8.91±1.24	51.50±1.71
40-49	32	13.13±1.51	9.13±1.43	51.0±1.51
50-59	22	12.38±1.69	9.28±0.98	50.68±1.56
60+	4	13.2±1.06	8.3±0.73	49.18±0.81

are not only polluting our atmosphere but also raising lead levels of blood. In the present study we found that lead level in control subjects was within safety limits. The safety limits set by Bio-Science laboratories and Centre of Disease Control are 40ug/dl for adults and 30ug/dl for children. Similar results were reported in an earlier study in children of Islamabad.[5] Other research workers observed different lead levels (Mean 38.2 ug/dl) in children at Karachi who travel a long distance to school.[6] In our study we observed that blood lead levels were higher in exposure than controls and none had level below safe values among exposures. Employees of traffic police had slightly raised lead level than other two groups. Similar to our findings, Traffic police in Cantt area Karachi also more lead level (46.6 ug/dl) than school children and soldiers (29.9 ug/dl) at MalirCantt. Blood lead level, as high as 97 ug/dl, was reported in traffic constables in Alexandria, Egypt[7], Sarah et al determined low blood level in indoor firing range users exposed to lead fumes as compared to lead furnace shops workers.[8] The increased lead level (71 ug/dl) in one police man with 20 days service may be due to unadjusted/un-adapted hemeostatic mechanism of his body including lead deposition in and mobilization from the bones, and excretion by the kidneys, the same case is an agreement with the fact that blood lead levels arte a measure of recent exposure to lead only, as its half is 18 days. Because of the same reason duration period did not show any association with the lead level. Similar findings were reported by the others.[9] We also noted that lead level was slightly higher in younger groups. The reason may not be only that developing brain is especially vulnerable to toxins but absorption in young people per second is also greater as compared to old age groups.

Lead poisoning inhibits several enzymes involved in haem synthesis. An important phase of haem synthesis is the conversion of delta aminolevulinic acid to porphobilinogen which pb++ inhibites. This is why our study exposures had relatively lower Hb than controls. Betts et al estimated that due to this inhibition anemia may be caused in children at lead levels of 37 ug/dl and in adults at 60 ug/dl.[10] Increased amount of haem precursor in such cases also affecting red cells chemistry. In the present study we also found different abnormal morphology of red cells and raised Hb-Foetal levels in exposures. Pagliuca et al reported classic basophilic stippling in the blood film of British demolition workers.[11] Ong and Lee observed that lead had considerable affinity for foetal haemoglobin.[12] Besides Calcium is also among the variables having non-significant lead correlation. Due to similar chemical analogy both $Ca^{++}$and pb^{++}compete during metabolic process. Hence decrease intake of calcium aggravate the toxic effects of lead by increasing its absorption and decreasing it,s excretion as found in our study. This might be the reason that milk had been given free to lead industry workers to prevent toxic effect of lead.[13] Same principle was most probably applied in treatment of lead poisoning with calcium chelats.Pb^{++}displaces $Ca^{++}$from the chelate and the resulting Pb^{++} chelate is rapidly excreted in the Urine. Our control group and 39% exposures showed noabnormality. While previous research workers reported that blood lead levels as low as 4 ug/dl raise hearing thresholds, 7 ug/dl can cause irreversible neurotoxic effects, 8 ug/dl increases blood pressure, 10 ug/dl can cause shortened red cells life and 25 ug/dl irreversible chronic nephropathy and loss of intelligence quotient in children.[14] This means that individual also very greatly in their response to lead. William investigated that blood lead level of 100 ug/dl may kill one person and have no effect on another[14]. The level of lead in exposures of this comparatively clean area may be due to poor working conditions, lack of basic education and absence of prevention measures for personal protection. Hence the present investigation will create awareness amount people in general and specifically in those who are in direct contact with vehicle smoke. Estimation of lead in samples and metallic standards were estimated on Atomic absorption spectrophotometer (Hitachi).[15] The level of calcium was measured by the Cromatest,[16] Hb-Foetal by alkali denaturation method[17] and for determination of haemogolobin level Cyanmethaemoglobin method was used.[18]

CONCLUSIONS

Blood calcium, haemoglobin, Hb-Foetal and Lead levels were measured in 258 male subjects exposed to vehicle smoke. The concentration of lead was significantly higher in people exposed to lead than that of control group ($P<0.001$).A significant difference was also observed in the levels of calcium ($P< 0.05$),haemoglobin ($p < 0.05$) and Hb-Fetal ($P<0.001$) in the two groups.

In younger group the level of lead was slightly raised. Exposure period showed no significant relationship with the lead levels. However, a policeman had increased level with less exposure duration.The symptoms due to lead exposure were headache, body pain, hypertension and depression. The present study suggested the need of strategy to reduce the impact of heavy air pollution due to vehicles.

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