

Day in, day out in leaded air

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LEAD is recognised as a neurotoxin all over the world. Even a low-level ingestion of lead causes neurological impairment. Children are more vulnerable to lead intoxication than adults are. Lead poisoning in children leads to developmental delay, learning disabilities and impairment of intellectual faculties. In adults, ingestion of lead causes fatigue, anaemia and hypertension. Childhood lead encephalopathy is a growing concern all over the world. Awareness of lead poisoning among every one is a must to combat the debilitating effect it can inflict upon our children. As a first step, we must know where the lead comes from, how we ingest it, and what remedies are there for victims of lead poisoning.

Lead is present in dust, airborne particulate, lead-based paint, lead-containing pipe in water supply systems, food can solder, glazed pottery, discarded battery, crystal glass, some bathtubs, even in some window blinds. In Bangladesh and many third world countries,

(CDC), Atlanta, blood lead level above 10 ug/dl (microgram per deciliter) is considered to be a case of lead poisoning and remedial means are recommended by physicians to bring the level below this value. It has been reported that although 10 ug/dl is the lowest limit for concern, no threshold value has been identified under which any adverse effect of lead in children or adults cannot be detected.

The Intronic Technology Centre, Dhaka, in collaboration with the Dhaka Shishu (Children's) Hospital carried out the current study by in summer 1999. The *Shishu Bikash Kendro* (Child Development Centre) of the Dhaka Children Hospital sees about 1500 children a year, many with neurological problems, developmental disabilities and delay. Of these, about 20 per cent are diagnosed as "non-specific delay" due to malnutrition, deficiencies in micro-nutrient and Vitamins A, C, D, deficiencies, etc. Only recently the hospital recognised lead poi-

All children at an early age of 1-2 years, must be screened for lead in blood. In an effort to minimise exposure of urban population to lead, an immediate ban on leaded gasoline in Bangladesh will be a significant first step followed by a strict national policy and enforcement of emission guidelines for all automobiles. Of course, we must be vigilant about other sources of lead and take necessary steps to prevent it from getting into the food chain of our children. After what we have seen in the "arsenic crisis", can we remain complacent and let a lead crisis shape up in front of our very eyes?

some observations are worth noting. There is a marked increase in blood lead level in urban population (almost double) as compared to the rural population. Also the mean blood lead level of urban slum population is even higher than the urban population with better living condition. In the rural adults, the blood lead levels ranged from 6.0 to 16.4 ug/dl while in children it ranged from 4.5 to 11.6 ug/dl. The range for urban adults was 4.6 to 26.1 ug/dl while the range for urban children was 5.8 to 21.6

The most striking observation one makes from Table 1 is that our urban population especially the children have lead levels in excess of WHO and CDC permissible level of 10 ug/dl. These levels are high enough to be a health hazard under CDC's 1991 guidelines for preventing lead poisoning. In fact, according to the CDC, most of the cases in the urban children group in our study can be labelled as lead-poisoning cases. No wonder a recent report (N.Z. Khan, *The Daily Star*, December 29, 1998) indicated that we have significant dropout rate from our schools in urban areas. The high lead concentration in urban air finds its way into the brain of our children thus causing neurological damage, lowered IQ, behavioural disorders.

The entire situation is alarming and maybe only the tip of the iceberg. It is highly possible that lead in air may have caused neurological damage to many children living in the cities. Pregnant woman accumulates lead in her blood and passes it to the unborn child in the womb. In the present study we observed blood lead level of 34.1 ug/dl in a one-and-a-half-year-old child from Agargaon slum area. The mother of the child showed lead level of 38.9 ug/dl. In a separate study involving 30 workers in a battery recycling plant outside Dhaka, mean blood lead level ranged from 11.8 ug/dl to 47.0 ug/dl with a mean value of 23.5 ± 7.8 ug/dl. Obviously, the elevated lead level results from occupational exposure to lead.

Physicians in developed countries prescribe chelation therapy as a treatment of lead poisoning. However, the therapy is complicated, and must be given to patients under close supervision. Also the therapy may lead to side effects. In addition, the patient must be provided lead-free environment, otherwise the blood lead level will revert to the same high level. The prescription is therefore one of prevention. All children at an early age of 1-2 years, must be screened for lead in blood. In an effort to minimise exposure of urban population to lead, an immediate ban on leaded gasoline in Bangladesh will be a significant first step followed by a strict national policy and enforcement of emission guidelines for all automobiles. Of course, we must be vigilant about other sources of lead and take necessary steps to prevent it from getting into the food chain of our children. After what we have seen in the "arsenic crisis", can we remain complacent and let a lead crisis shape up in front of our very eyes? As a nation we must have the will power and commitment to provide a lead-free environment to all citizens.

Table 1: Mean blood lead levels in urban, urban, slum and rural population by age groups. All data are expressed in ug/dl units.

Age group	Rural	Urban	Urban Slum
Adults	9.2 +/- 3.9 (7)	15.2 +/- 6.4 (21)	16.1 +/- 8.2 (11)
Children	7.7 +/- 2.7 (10)	13.0 +/- 6.3 (12)	22.7 +/- 7.2 (9)
Grand Mean	8.3 +/- 3.2 (17)	14.4 +/- 6.3 (33)	18.9 +/- 8.3 (20)
Median	7.2	12.7	16.2

vehicular traffic, due to use of leaded gasoline, remains the single largest source of environmental lead pollution often accounting for over 90 per cent of all lead emissions in the atmosphere. Beginning mid-seventies many countries including USA phased out leaded gasoline from petrol. In developed countries like the USA, the major source of lead is lead-based paints especially in older houses built before 1978. Paint chips and dusts in older houses are major source of lead poisoning in children. Lead-based paints have been banned effectively in USA and in many other countries. In Bangladesh, the major source of lead is still roadside dust and air in the big cities. Use of leaded gasoline for many years and lack of strict emission control policies have compounded the severity of air pollution in the capital city and other major cities and towns.

We all know air pollution in Dhaka is getting worse every year. But how badly is our air polluted? Intronic Technology Centre has carried out a number of scientific studies in Dhaka. In summer 1998, our study on volatile organic compounds (VOC) in auto-exhaust and ambient air in a relatively less traffic area identified and quantified a number of hydrocarbons, aliphatic and aromatics (*The Independent*, August 28, 1998). The study reported here was aimed at determining blood lead levels in representative populations within Dhaka and in rural populations. Whether it is ingested through food or breathing air, lead shows up in the blood system, so the blood lead level is a marker of lead poisoning. In countries like the USA, children are screened at an early age for lead levels in their blood. According to the World Health Organisation and the Centre for Disease Control

soning as a probable cause. In a number of neurologically-impaired children, the radiograph of long bones showed bands of increased densities typically known as "lead lines" and blood lead measurements revealed excessive levels of lead.

We determined blood lead levels in 70 individuals of different ages, occupation and social status. We applied CDC (Centre for Disease Control, USA) approved methodologies based on stripping voltammetry technique for all blood lead measurements. Briefly, the technique involves collecting the sample (50 ul) (50 micro-litre) in heparinised capillary tubes and storing the specimens in acidified reagents. After thorough mixing, 50ul aliquot is placed on a gold electrode and an initial deposition potential is applied against a reference electrode. This step ensures separation of total lead from organic base material, followed by reduction and subsequent deposition on gold surface. A voltage scan in less negative direction relative to a standard reference electrode then causes oxidation of lead and stripping out from the gold surface. Lead is oxidised at a characteristic voltage and the anodic current generated is proportional to the concentration of lead in the sample. Control reference samples were checked periodically for quality assurance, precision and accuracy of the data. All the samples collected are finger stick samples. Lead free gloves, sterilised cotton, alcohol swabs (Becton Dickinson Company, USA) were used throughout the blood lead measurements. All CDC protocols regarding blood collection and preservation were carefully followed to avoid contamination and positive bias results.

Although the number of cases are not overwhelming yet

ug/dl. Finally, the urban slum adults blood lead level ranged from 9.6 to 38.9 ug/dl and those for the urban slum children ranged from 12.3 to 34.1 ug/dl.

It is worth noting that in rural and urban population, adults have higher lead level than children because of more accumulation over the years. But in the urban slum population this trend is reversed. Children with poor nutrition or absence of nutrition absorb and accumulate more lead than their counterparts who have access to better nutrition. It is also no surprise that the blood lead level in urban population is significantly higher than the rural population, since our urban population are exposed to air pollution with very high lead content.

The major source of lead in urban air is automobile exhaust. An earlier study by the Atomic Energy Centre (M. Khaliqzaman, *et al*, 1997) reported that Dhaka air has the highest lead concentration (463 ng/m³) (nanogram per cubic metre) in the world surpassing the previous record held by Mexico City (437 ng/m³). This is the air the children breathe while walking to school, playing outside, or eating food and snacks that vendors sell outside the schoolyard.

The lead level in Dhaka air is very much in line with the lead content in leaded gasoline. According to a World Bank Technical Report (1996), in Bangladesh, maximum lead content in leaded gasoline is 0.8 g/l. This is relatively a very high lead content when we compare the numbers from other Asian countries: India 0.42 g/l; Pakistan 0.42 g/l; Malaysia 0.15 g/l; Sri Lanka 0.20 g/l; Thailand 0.15 g/l; Indonesia 0.45 g/l; Singapore 0.15 g/l (World Bank Technical Paper no. 397).



Auto-exhaust continues to be the major source of lead pollution.

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A mobile medium for environmental education

By Sarder Md. Asaduzzaman

DEVELOPMENT and urbanisation are two sides of the same coin. In most cities of the developing countries, the process of urbanisation is taking place without any systematic manner, which is wreaking havoc on the citizens with regard to proper housing, employment and transportation. In respect of non-motorised transportation, the rickshaw is playing a tremendous role in employment generation, keeping the environment free from pollution, and costing comparatively low.

In Bangladesh especially in Dhaka, the rickshaws are, as it were, a mobile canvas. There are about 5 lac legal and illegal rickshaws in this city of more than 1 crore. The rear of these rickshaws are painted with numerous colourful designs. It displays various types of paintings highlighting burning issues ranging from rural scenarios, the independence movement, different structural drawings, alluring cinema snaps etc.

The German Embassy in Bangladesh organised a rickshaw-painting competition last year. In total 45 rickshaw artists and art-students from the Institute of Fine Arts, Dhaka University took part in the competition. The theme of the painting competition was 'Germany'. On the other hand the Alliance Francaise, Dhaka organised an exceptional exhibition on 'The Rickshaw-Baby Taxi Paintings in Bangladesh' on 1st October 1999 for the first time. About 500 painting-plates were placed in the exhibition. The remarkable thing was that these two initiatives were taken by two different foreign missions rather than any local initiators. In fact, these paintings have tremendous potential, which was evident from the arrangements.

Majority of these artists are illiterate or semi-literate but very much skilled. They have been engaged years after years in this profession. During this long span of time they have been exhibiting this kind of fantastically (!) exaggerated art.

According to a survey, conducted by a non-govt. voluntary organisation, published recently in a daily newspaper, it is found that 97.86% rickshaws, in Dhaka City, carry dif-

ferent types of artistic impressions. Administering a survey on 4238 rickshaws in Farnaghat, Moghbazar, Malibagh, Motijheel, Rampura, Sayedabad and the Gabtall traffic point in Dhaka, they revealed that 2.17% rickshaws do not carry any sort of art. Out of the painted rickshaws 69.55% exhibit different film actors/actresses and the rest 30.45% different types of architectural instances. Among the cinema stars there are local and Indian also. On the other hand, of the architectural depictions, the Parliament Bhaban, Ahsan Manjil, Tajmahal, Bangabandhu Bridge, Kamapur Railway station, Zia International Airport are remarkable.

Recently, this manual art is being supplanted with the arrival of printed boards. Actually, this sort of artistry creates an appeal to the emotional Bangladeshis. As a developing country, like us, this type of art may play a vital role to create awareness among the people towards environment development. As such if we to some extent, actively and consciously imagine, then it would be possible to utilise this media as one of the effective awareness building tools as environmental education.

In respect to our socio-economic context, from poor to the rich, child to the aged, everybody more or less uses this media (the rickshaw) as an important and quick transport. Moreover, a large amount of active but unemployed youth

groups consider it as one of the common income source for them. So, any kind of message would be very easy to disseminate to the masses through this kind of media (rickshaw).

Nowadays the environment is being considered as a rapidly degrading thing, not only in Bangladesh but worldwide. Recently the environmental degradation and pollution rate has become so alarming that NGO sectors as well as government sectors have taken diversified actions plans and are also implementing those. So with respect to such a diminishing environment it would be possible to utilise, this simple but common transport media (rickshaw) as an environment awareness-raising tool. Then it might enhance us, undoubtedly, to achieve our respective environmental goals. If we use the information, qualitative art and messages on the backs of rickshaws removing the various unproductive, and to some extent, obscene art, then it would play a vital role to uplift the mass awareness levels. Some recommendations in this regard, are mentioned below:

- 1) It might be imposed as a pre-condition while issuing license to the rickshaw owners that environmental awareness-raising artistry must be used in place of the existing pictures of Bangla films.
- 2) Rickshaw pullers should be motivated so that they might be aware about it.
- 3) If they are motivated and

aware then they can act as a pressure group to the owners as pre-condition in lending rickshaws

4) The backs of rickshaws might be used as campaigning material (like poster, banner, sticker, leaflet etc.).

5) A motivational program might be introduced for the painter or, they can appeal to the owners in this respect.

6) DoE and concerned government high authorities can play a vital, important and progressive role in this respect. They can use it as campaigning material and also in commemorating different special days (like World Environment Day, Ozone Day, Earth Day, Water Day, etc.). They can take a scheme to distribute free printed boards of the special respective posters to the rickshaw owners. As a result, the owners group would feel encouraged definitely.

7) The role of City Corporation and concerned administration should be emphasized.

8) In general, if it is possible to raise awareness among the passengers, then they might play a role, to some extent, in rickshaw selection which should be conveyed to the owners by the pullers.

The small amount of rickshaws bearing the architectural impressions would be first targets because they would be easier to motivate.

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