

LEAD: THE SILENT KILLER IN OUR FAVOURITE STREET FOODKrishnajyoti Goswami¹, Ipsita Mazumdar²¹Director, National Referral Centre for Lead Projects in India, West Bengal (NRCLPI, WB).²Associate Professor, Department of Biochemistry, KPC Medical College & Hospital, Jadavpur, Kolkata, India.**ABSTRACT****INTRODUCTION**

Street vended foods are a very common consumable commodity across age and income groups. It covers a wide range of a variety of food items to suit every need, and are hugely popular all over the country. They can, however, contain toxic heavy metals, like lead, which can pose serious health hazards, including neuropathy, cardiovascular, renal as well as bone diseases. Source of lead can be various artificial food colorants used to increase the palatability of such food, and also automobile emission exhaust smoke that pollutes the street atmosphere, the very place where such food is prepared or kept ready to consume. Contamination with heavy metals is a serious threat because of their toxicity, bioaccumulation and bio magnifications in the food chain. This source of lead toxicity, however, is one aspect of the health hazards that has not been widely explored. The aim of this study is to increase awareness among general population, both consumers and vendors, regarding a very common but often overlooked source of heavy metal contamination.

METHODOLOGY

Lead was measured by flame atomic absorption spectrophotometry after digestion of food with 98% Nitric acid.

RESULTS

This present study measures the level of lead in various commonly consumed street vended food items across the streets of Kolkata, India, and shows that the range of its level is much higher than the WHO recommended level of lead in food materials. The level also has close association with the food colorant used.

In conclusion, the gross lack of awareness among the general population, both at the vendor and the consumer level, regarding this particular health hazard related to the food they consume on a regular basis, needs to be addressed as a serious issue, and personal safety measures should be undertaken.

KEYWORDS

Street food, Lead, Food colorant.

MESH TERMS

Lead poisoning, Lead Chromate, Lead Neuropathy, Tetra-ethyl Lead, Tetra-methyl Lead.

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INTRODUCTION: Street vended foods are defined as ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers in the streets and other public places for immediate consumption or later without further processing or preparation.¹ In Kolkata, India, many varieties of street vended foods are available, known for their unique flavour, appearance, variety and availability at a low cost. Also, street foods are very popular to a large number of people as a source of inexpensive, convenient and more-or-less nutritious food; a source of attraction and novelty to tourists and economically advantaged individuals; and it also provides business opportunities at very low capital. Street food vending plays an important role in assuring food

security for low income urban populations. This lip-smacking fare often looks as good as it tastes, if not better, because of its vividly coloured appearance. This is due to the presence of artificial colours in them, which are a source of a variety of health hazards.² The environment for consumption of such foods are also a matter of concern, as nowadays, hundreds of pollutants are discharged into the atmosphere, among which, heavy metals are regarded as a serious threat.³ However, the possibility of presence of toxic heavy metals in street food at an unacceptable level is one aspect of the health hazards that has not been widely explored. In recent times, the risk associated with the exposure of food product to heavy metals has aroused widespread concern about human health. Contamination with heavy metals is a serious threat because of their toxicity, bioaccumulation and biomagnifications in the food chain.⁴ Presence of high content of lead (Pb) in food is associated with neuropathy, cardiovascular, renal as well as bone diseases.⁵ Consumption of heavy metal contaminated food over a long period of time leads to accumulation and a propensity towards these health problems. There is

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however, no regulation governing the use of food artificial colours used in street foods in the country.

This study intends to assess the amount of lead, present in street vended foods, and its effects on the health of regular consumers of such food over a long period of time.

MATERIALS AND METHODS: Food samples were collected from roadside vendors; both mobile carts and shanty eateries, in various locations through Kolkata, for example, Jawaharlal Nehru Road, Park Street, S N Banerjee Road, Lyons Range and Shyambazar, between August and November 2015.

The respondents of the study, who were the street vendors, were interviewed using a questionnaire to elicit information on the method of preparation of the food and some of the ingredients used during lunch time in these areas.

Triplicate samples were collected at each location and blended together to get a weekly average. The samples were dried at 70-80°C for 24 hrs, then powdered and stored at -20°C for further analysis.

Dried samples were ground into a fine powder of approximately 80-micron diameter. 1 G of the dried sample was weighed on the digestion tray, and 10 ml of 98% nitric acid was added. This was then placed in a boiling water bath and allowed to remain for 72 hrs. The resulting pale yellow solution was made upto 25 ml with de-ionized water for each sample and stored. The solutions were analyzed for Pb using a flame atomic absorption spectrophotometer (AAS, Perkin Elmar, model 2130).

The analytical quality control included analysis of standards and triplicate analysis of samples and blanks. The accuracy of the analytical technique was evaluated by analyzing a certified standard reference material SRM1634B, trace element in water (NIST, USA).

Ethics: Since the study contains no experimentations involving human or animals, ethical committee clearance was not obtained at any stage during the study.

RESULTS: The food items tested were categorized by their primary colour into 3 groups- yellow colour containing food (group 1), red colour containing food (group 2) and chocolate colour containing food (group 3).

The results of the study are summarized in table 1.

Category of food tested	Range of lead content in sample ($\mu\text{g/gm}$)	Mean \pm SD
Group 1 - Biryani, Tandoori Chicken, Laddoo , Cut fruits (Pineapple), Paan-Supari	3.6-4.1	3.8 \pm 0.42
Group 2 - Red Syrup, Gulab Jamoon, Kalo-jaam, Cut fruits (Watermelon)	2.7-3.9	3.3 \pm 0.59
Group 3 - Chocolates, Candies, Chocolate ice cream	2.5-3.6	2.9 \pm 0.97

Table 1: Lead concentration ($\mu\text{g/gm}$) of commonly consumed street-vended foods around Kolkata, India

It is observed that the yellow colour containing foods are highest in their lead content; with the red colour containing foods coming to a close second and the lead content of chocolate coloured foods are the lowest. Lead content of all categories of food exceed the WHO standardized maximum lead limit (0.3 $\mu\text{g/gm}$) by a huge margin.

DISCUSSION: In the developing countries, drinks, meals and snacks sold by street food vendors are widely consumed by millions of people. These foods provide an affordable source of nutrients to most of the lower and middle income sector of the population, among whom it is extremely popular due to its taste, appearance, easy and affordable availability.

The lead concentrations of the commonest street foods consumed, according to our questionnaire, were depicted in Table 1. It shows that the lead content of all varieties of food, under all categories, exceeded the WHO limit for lead in food, which is 0.3 $\mu\text{g/gm}$.⁶ Such a result is probably due to the presence of non-permitted colour in food, which contains high amount of lead. Again, it might be due to the fact that the atmosphere in which such substances are sold, that is the roadside, contains high amount of lead in it due to automobile emissions exhaust smoke, in form of tetra ethyl and tetra methyl lead. In addition to the automobile exhaust smoke, industrial effluents also aggregate as particles, and lead concentration in the atmosphere builds up and settles on exposed food products that are ready to consume. Fried food showed slightly lesser concentration of lead in high vehicle-dense areas, probably because oil absorbs lead particles more strongly. This result suggests that consumers of street foods in highly dense traffic areas are exposed to higher risk of high lead levels in blood. Earlier studies conducted by Nriagu and Abdulmajid et al corroborates this fact.^{7,8} It is seen in the present study that the food containing the colour yellow are higher in lead content than the other coloured food groups. This might be because of the fact that Carmine Yellow (lead chromate), the commonest yellow colour used in food, has a very high lead content. The red colour containing food and lastly the chocolate coloured food comes next to it in their amount of lead content.

CONCLUSION: It is apparent from this study that street foods exposed to air pollution and containing artificial food colorant contain high level of lead, which is a very toxic substance for a variety of human systems, including hematopoietic, neural and hepatic systems. Also there is a gross lack of awareness among the general population regarding this particular health hazard related to the food they consume on a regular basis. The aim of the study, therefore, is to increase awareness both at the consumer and the vendor level, who can undertake personal safety measures like covering the food and using non-toxic colorants to decrease the chances of heavy metal poisoning.

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