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## Estimation of lifetime average daily dose (Ladd) by cd (cadmium) in people of Kolkata due to consumption of rohu (*Labeo rohita*): A short note

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### Abstract

An experiment was conducted to assess the Lifetime Average Daily Dose (LADD) by Cd (Cadmium) in people of Kolkata due to the consumption of rohu (*Labeo rohita*). Samples were collected from three fish markets of Kolkata, cadmium concentration was determined and LADD was estimated. The maximum LADD of Cd was 0.556 $\mu\text{g}/\text{kg}/\text{wk}$  in female and 0.488 $\mu\text{g}/\text{kg}/\text{wk}$  in male respectively. It was lower than the reference dose and thus the fish can be declared safe for consumption.

**Keywords:** Cadmium, fish, rohu, LADD

### 1. Introduction

Health hazard due to heavy metal pollution has become a burning issue nowadays. Heavy metals are released from the industries and other anthropogenic sources. They eventually pollute the environment and intaken by different organisms. Fishes are one of the major sites for the accumulation of heavy metals. When these fish are consumed by a human being, it can cause severe health problem in them. So, we conducted a study to estimate the health risk of the people of Kolkata in terms of Lifetime Average Daily Dose (LADD) by Cd (Cadmium) due to the consumption of rohu (*Labeo rohita*) fish. Already several researchers have confirmed about the metal contamination in fishes of Kolkata<sup>[1-3]</sup>. The major portion of the population here is fish-eating and can be susceptible to the heavy metal contaminations. We collected fish samples from three fish markets namely Sealdah, Garia and Sonarpur from November 2016 to April 2017. Metal concentration was determined and LADD was calculated with the objective to assess the health hazard in both male and female population.

### 2. Materials and methods

#### 2.1 Selection of fish species and market

Rohu (*Labeo rohita*) was selected for the experiment. The fish was collected from three popular and important fish markets namely Sealdah (22°34'03"N 88°22'15"E), Garia (22.4662° N 88.4049°E) and Sonarpur (22.43°N 88.42°E) fish markets abbreviated as SDH, GRA and SNP respectively, situated in and around Kolkata of West Bengal. The duration of the collection was from November 2016 to April 2017.

#### 2.2 Assessment of Lifetime Average Daily Dose (LADD)

A modified dry-weight method of Churnoff (1975) was followed to prepare the fish tissue samples for the determination of Cd<sup>[4]</sup>. The metal content of the samples was detected in Atomic Absorption Spectrophotometer (Varian AA 240) using hollow cathode lamps of Cd. Health Risk Assessment Guidelines of USEPA (1989) was followed for the assessment of 'Lifetime Average Daily Dose (LADD) using the following equation<sup>[5]</sup>.

$$\text{LADD } (\mu\text{g}/\text{kg}\text{-day}) = (\text{Cs} \times \text{IR} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

Where,

Cs = the metal concentration in fish ( $\mu\text{g}/\text{kg}$  of dry weight)

IR = the fish ingestion rate (0.032 kg/meal in West Bengal)

EF = Exposure Frequency (260 meals/year)

ED = the life time Exposure Duration (the 70 years of an average life span of a person of West Bengal was considered)

BW = Average body weight of an adult male (57 kg) or female (50 kg) of West Bengal

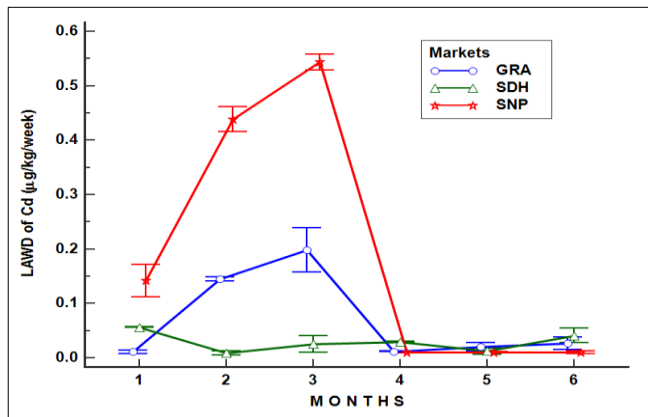
AT = the averaging time (period over which exposure is averaged- days; AT = EF x ED)

### Correspondence

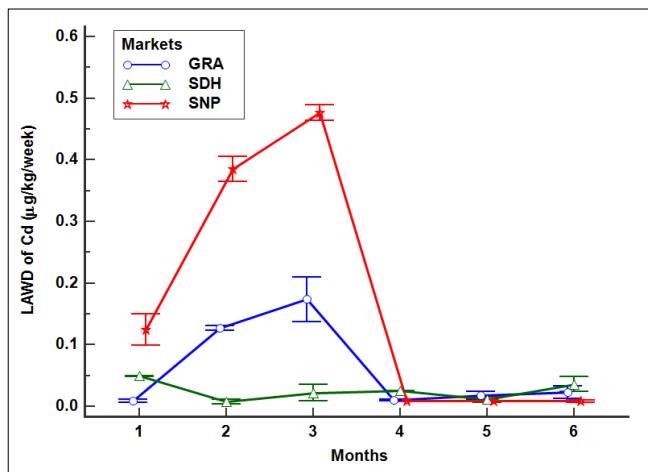
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### 3. Results

The maximum Lifetime Average Daily Dose (LADD) of Cd through rohu was 0.556 $\mu\text{g}/\text{kg}/\text{wk}$  in female (Fig 1) and 0.488 $\mu\text{g}/\text{kg}/\text{wk}$  in male (Fig 2) respectively. The comparison of mean difference of LADD in between the GRA, SDH and SNP fish markets for Cd consumed by females and males of West Bengal through the meat of rohu were varied significantly ( $P < 0.05$ ).



**Fig 1:** The Lifetime Average Daily Dose (LADD) of Cd by a female of West Bengal through the consumption of *L. rohita* meat marketed from Sealdah, Garia and Sonarpur fish markets in Kolkata during Nov-2016 to April-2017



**Fig 2:** The Lifetime Average Daily Dose (LADD) of Cd by a male of West Bengal through the consumption of *L. rohita* meat marketed from Sealdah, Garia and Sonarpur fish markets in Kolkata during Nov-2016 to April-2017

### 4. Discussion

The reference doses of Cd considered for human health risk assessment based on USEPA is 1  $\mu\text{g}/\text{kg}\text{-day}$ . According to our experiment the LADD of both male and female of West Bengal was lower than the reference dose. So, the fish that is consumed can be declared safe. But the concentration of other heavy metals should also be assessed.

### 5. Conclusion

It was clear from our experiment that the fish sold in markets contain a good amount of heavy metals in them. Though the concentration of Cadmium didn't cross the threshold level, but it gives an indication of possible threats from heavy metals in the near future. So, we should try to decrease the exposure of heavy metals and other pollutants in the environment for the benefit of our future generation.

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