Estimation of hazard quotient (HQ) by Cd (Cadmium) in female and male of Kolkata due to consumption of rohu (Labeo rohita): A short note

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Abstract
A study was conducted to assess the Hazard Quotient (HQ) by Cd (Cadmium) in female and male of Kolkata due to the consumption of Rohu (Labeo rohita). Samples were collected from three fish markets of Kolkata, cadmium concentration was estimated and hazard quotient was calculated. The maximum Hazard Quotient (HQ) of Cd was 0.556 in female and 0.448 in male respectively. However, the overall average mean values of HQ were 0.096±0.02 in females and 0.084±0.018 in males for the consumption of Cd-contaminated rohu. Though it was lower than the reference dose and was safe for consumption; it warns us about future threats.

Keywords: Cadmium, fish, rohu, hazard quotient

Introduction
The food that we consume every day is being contaminated with poisons unknowingly. Recently the pollution from heavy metals has become a burning issue. Rapid industrialization and modernization have resulted in the release of several toxic metals in the environment. These metals eventually go to the water bodies and accumulate in several aquatic organisms including fish. When these fish are consumed by the human being, it can cause serious health issues. So, we undertook a comprehensive study to assess the health risk due to cadmium-contaminated Labeo rohita collected from three commercially important fish markets, namely Garia, Sealadah and Sonarpur fish market in and around Kolkata Metropolitan city of West Bengal, India. Several other studies have already reported the threat of heavy metal in Kolkata and its surrounding areas [1–4]. The three fish markets were chosen because a large number of different types of fish was imported there from the different parts of the state as well as from the different countries and by nature, they are urban (Sealdah), Semi-urban (Garia) and rural (Sonarpur) fish markets. We designed the work for six months with the objective to estimate the hazard quotient by Cd (Cadmium) in female and male of Kolkata due to the consumption of rohu.

Materials and methods
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.

Assessment of hazard quotient (HQ)
A modified dry-weight method of Churnoff (1975) was followed to prepare the fish tissue samples for the determination of Cd [5]. The metal content of the samples was detected in Atomic Absorption Spectrophotometer (Varian AA 240) using hollow cathode lamps of Cd. Then Lifetime Average Weakly Dose (LAWD) was estimated using proper formula. Next, human health risk in terms of Hazard Quotient (HQ) was calculated by dividing the Lifetime Average Weakly Dose (LAWD) of each metal with Reference Dose (RDF) of Cd following the Health Risk Assessment Guidelines of USEPA using the following equation [6].
HQ= LAWD/ RFD

Where, LAWD=Lifetime Average Daily Dose (μg/kg/day); RFD= the reference dose of individual metal (μg/kg/day in dry weight of the sample fish).

Reference Dose (RFD) is an amount of daily exposure to toxic compound that does not show the symptoms of toxic effects from the exposed organisms. Here, the reference doses of 0.001 mg/kg/day for Cd was considered for human health risk assessment based on USEPA (2012).

Results

The maximum Hazard Quotient (HQ) of Cd through L. rohita consumption collected from Sealdah (SDH), Garia (GRA) and Sonarpur (SNP) fish markets during November 2016 to April 2017 were 0.556 in female (Fig 1) and 0.448 in male (Fig 2) respectively. However, the overall average mean values of HQ were 0.096±0.02 in females and 0.084±0.018 in males for the consumption of Cd-contaminated rohu. Overall HQ of Cd from rohu varied significantly between all the months (P<0.05).

Discussion

The hazard quotient we observed in our experiment was 0.556 in female and 0.448 in male respectively. It implies that Lifetime Average Weakly Dose (LAWD) is less than the reference dose of Cadmium. So, the rohu fish consumed by the people of Kolkata is safe. Pal and co-workers have reported a Hazard quotient of 0.26 by cadmium due to the consumption of rohu collected from urban aquaculture pond in India [7]. Comparing to this our HQ was quite higher. So, though the fish is safe, care should be taken to avoid further contamination.

Conclusion

It can be concluded that the fish we are consuming is safe. But simultaneously it also indicates about the emerging threats of heavy metals in daily food items. We should be aware of the harmful effects of these metals. Necessary steps could be taken to prevent the accumulation of metals in fish tissue. The proper way of preparation of fish can also help in reducing the metal burden [3].

References