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FRESH FISH POISONING: A CASE STUDY OF FISHES HARVESTED FROM RIVER JEGA

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ABSTRACT
Four different fresh fish species (Oroechromis niloticus, Synodontis annectens, Bagrus bajad and Mormyrus rume) from River Jega, Kebbi State were analysed to determine the levels of poisoning caused by toxic metals such as Cd, Cr, Pb, Ni, Mn, Fe and Cu from the organs of those fresh fishes using Atomic Absorption Spectroscopy. The mean concentration of Cr 0.354 ppm, 0.343 ppm and Mn 0.263 ppm, 0.230 ppm in both flesh and gills of the fresh fish respectively were higher than the WHO permissible limit of 0.01 ppm Cr and 0.05ppm Mn, while the others were within the tolerable limits. However, the mean concentration of Cr and Mn were high against that of Cd 0.006 ppm, 0.007 ppm and Pb 0.019 ppm, 0.029 ppm in flesh and gills of the fresh fish respectively. It is here recommendation that people should be enlightened on the health implication of these toxic metals. An effective waste management plan should also be developed and implemented in the area to reduce/eliminate the impact of these toxic metals on the environment.

Key words: Fresh fish, Flesh, gills, toxic, metals, Jega River.

1.0 INTRODUCTION

The pollution of fresh waters by various contaminants such as poisonous metals is increasing daily and has become of great concern to the entire world because of the health threat it poses to the aquatic organisms such as fresh fishes [1, 2, & 3]. Heavy metals released to the environment by man's activities such as domestic, industrial and agricultural are the principal route of the contamination of aquatic systems. These poisonous metals gets into the aquatic organisms through the food chains resulting into bio-concentration and bio-accumulation and which eventually threatens the health of humans who depends on the fishes as a source of protein [4]. Fishes are used to evaluate the health hazard effects of aquatic organisms, because among the aquatic system fishes are the most predisposes to the effects of the pollutants [5 & 6]. Among the different metals analyzed, lead (Pb), cadmium (Cd) and chromium (Cr) are classified as chemical hazards and maximum residual levels have been prescribed for humans [7, 8 & 9].

Essential metals, such as copper (Cu) and Iron (Fe), have normal physiological regulatory functions [10], but may also bio-accumulate reaching a toxic levels [11]. The toxic effects of heavy metals include the bioaccumulation as reviewed by Scholars [12, 13, 14 & 15]. According to [16 & 17] heavy metal may alter the physiological and biochemical activities of various fishes in both tissues and blood.

Numerous studies have been carried out on metal pollution in different species of edible fishes, this is not surprising because, fishes served as the major part of human diet. Prompt interest on determination of toxic elements in fish has commenced through studies on fish toxicological and environmental pollution [18 & 19]. The aim of this study is to determine the concentration of toxic metals such as Cr (Chromium), Pb (Lead), Cd (Cadmium), Mn (Manganese), Ni (Nickel), Cu (Copper) and Fe (Iron) in different organs of different species of fish. It is expected that the results of this research will assist in acquiring information about the level of toxic metals in fresh fish harvested from River Jega.

2.0 MATERIALS AND METHODS

Four fish species such as *Oroechromis niloticus, Bagrus bajad, Synodontis annectens and Mormyrus rume* were collected at the landing site of the river. These fish species are abundant and widely consumed by the inhabitants of this area. The organs of these fishes such as flesh and gills were carefully removed by opening the fishes using a plastic knife. The organs were oven dried at 105±20 ^{0}C for 8 hours after which 3g each of both flesh and gills of the different fishes were weighed and pulverized into a uniform particle size prior to analysis [20 & 21]. The resulting powder was digested in a fume cupboard by adding a mixture of 10cm^3 Conc. H_2SO_4 and 5cm^3 Conc. HNO_3 and heated until the solution volume was reduced to 2cm^3. The digestion continued until the solution turned colourless. This ensured the total removal of HNO_3.

The sample was allowed to cool and 15 cm^3 distilled water was added with gentle swirling. 1M NaOH was added drop wise until a brown or colourless solution was obtained. The solution was then filtered using a whatman filter paper No. 42 followed by dilution to the mark in a 25cm^3 volumetric flask. All samples were analyzed using AAS.

3.0 RESULTS AND DISCUSSION

The concentration of metals in the flesh of different fish species is shown in Table 3.1. The Cr (Chromium) and Mn concentration were higher in *Synodontis annectens* flesh 0.466 ppm, 0.384ppm respectively compared to other fish species examined and lower in *Mormyrus rume* flesh 0.243 ppm Cr and 0.184 ppm for Mn. The result of the Chromium concentration found in the gills of the fishes is depicted on Table 3.2. The values ranged from 0.514 ppm to 0.216 ppm with the highest Chromium concentration value of 0.514 ppm in *Synodontis annectens* gills, this is because the gill is an important site for the entry of heavy metals that provokes lesions and gill damage [22], and the lowest concentration of Chromium was found in the gills of *Mormyrus rume* (0.216 ppm). The mean concentration of Chromium and Manganese was higher in flesh with a value 0.354 ppm and 0.263 ppm respectively than in gills (0.343 ppm) and (0.230 ppm) respectively of the entire fish species. The concentration value of both Chromium and Manganese in this study was found to be higher than the WHO (World Health Organization) tolerable limits 0.01 mg/kg [23]. However, the concentration of both Chromium and Manganese in fishes in River Jega should be monitored to avoid their toxic effect through prolong exposure. The mean concentration of Lead in the flesh and gills of fishes of this study are 0.019 ppm, 0.029 ppm table 3.1 and 3.2 respectively is lower than the present legislative permissible limits 0.12 ppm [24] and 0.20 ppm [25 & 26]. Cadmium mean concentration in flesh 0.006 ppm and gills 0.007 ppm of fresh fishes respectively obtained in this study is below the tolerable limits by the present legislation 0.18 ppm, 0.05 ppm [24 & 25]. In general, human contamination by Cadmium intake is not a concern because several studies [27, 28 & 29] have reported a low level contamination of Cadmium in different areas of the world.

The mean levels of Lead in the flesh, and the gills of the four fish species examined ranged 0.019 ppm- 0.029 ppm respectively. These are lower than the permissible limit of 2.0 ppm proposed by [7]. A report given by [27] stated that mean concentration level of Lead was 0.09ppm in Herring and Sprat samples. According to [30] mean concentration of Lead is 6.73ppm. Lead concentration from Ogba River in Nigeria ranges between 2.67 - 4.0 mg/kg in Tilapia (*Oroechromis niloticus*) and 2.0-2.67 mg/kg in *Heamichromis faseiatus* [31]. The levels obtained in this study are lower than the levels recorded by these researchers and also lower than the tolerable permissible limits. Although, the levels of other trace metals were found to be within the permissible limits, bioaccumulation and magnification is capable of leading to toxic level of these metals in fish, even when the exposure is low. According to [32] fish species can accumulate heavy metals above the abiotic environment to incur bioaccumulation. There is need for constant monitoring of the trace metals concentration in Jega River since the river serves as a source of drinking water, irrigation and fishing for the local inhabitants.

Table 3.1: Concentration of Heavy metals in the flesh of various fresh fishes

Fish flesh	Heavy metals concentration (ppm)						
	Cr	Pb	Cd	Fe	Ni	Cu	Mn
Oroechromis niloticus	0.381	0.045	0.006	0.222	0.136	0.124	0.236
Synodontis annectens	0.466	0.010	0.004	0.431	0.364	0.246	0.384
Bagrus bajad	0.324	0.012	0.009	0.351	0.412	0.136	0.248
Mormyrus rume	0.243	0.009	ND	0.192	0.186	0.096	0.184
Mean	0.354	0.019	0.006	0.299	0.275	0.151	0.263

Key: ND Not detected

Table 3.2: Concentration of Heavy metals in gills of various fresh fish species

Fresh fish Gills	Heavy metals concentration (ppm)						
	Cr	Pb	Cd	Fe	Ni	Cu	Mn
Oroechromis niloticus	0.246	0.062	0.007	0.118	0.102	0.118	0.145
Synodontis annectens	0.514	0.022	0.005	0.410	0.386	0.204	0.362
Bagrus bajad	0.396	0.024	0.008	0.390	0.364	0.147	0.264
Mormyrus rume	0.216	0.006	ND	0.201	0.199	0.114	0.146
Mean	0.343	0.029	0.007	0.280	0.263	0.146	0.230

Key: ND-Not detected

4.0 CONCLUSION

The levels of heavy metals found in the muscles and gills of the fish species from River Jega such as Cr

and Mn most especially on *Synodontis annectens* do pose health risk to human consumers since it was higher than WHO (World Health Organization) permissible limits this is because *Synodontis annectens* is a benthic feeder, as such acquire those metals from the sediments. However, very close and continuous monitoring is required to provide information on the accumulation patterns of these metals in the fishes. The information obtained in this study can serve as the baseline records for the future metal pollution monitoring programmes in Jega area, since Jega is not industrialized.

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