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Guidance And Counseling Artisanal Fisher Folks on The Dangers of Chemical Fishing at Nsidung Beach Henshaw Town, Calabar South, Cross River State, Nigeria

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Abstract

Research was conducted in March to June of 2020 to ascertain the levels of heavy metals concentration in Nsidung Beach river tributaries, Calabar after chemical poisoning with “Sniper (Dichlorvous)” and a local weed “Agerantum conyzoides” leaf paste for a period of three months. The sniper was applied each day of the months by the fisher folks. After every month’s application (March to June), river tributaries A1, A2, A3, and A4 were established, where water and caught fish samples were collected 2 and analyzed for heavy metals concentration and their values compared with the critical intake values recommended by World Health Organization (WHO). A control water and caught fish samples were collected outside the tributaries of the river where no chemical treatment was applied. Ten metals analyzed includes: Lead (Pb), Nickel (Ni), Vanadium (V), Iron (Fe), Copper (Cu), Cadmium (Cd), Mercury (Hg), Chromium (Cr), Arsenic (Ar) and Zinc (Zn). The results showed that all the metals differ in their various concentrations and at varying river tributaries sampled. All the metals had their maximum concentration in tributary A4 and in the month of April. The highest values recorded for Pb, Ni, V, Cd, and Hg were 0.30g, 0.384, 0.242, 0.138 and 0. 166mg/l for fishes respectively. These values exceeded the critical value of 0.05mg/l for each, recommended by WHO (1991). The values of Cu (0.469mg/g), Cr (0. 171mg/l) and Ar (0.676mg/l) had their critical values of 1.0mg/l; 0.5mg/l and 0.01mg/l respectively while Fe (0.479mg/l) has a critical value of

0.3mg/l, indicating their toxicity at higher levels of concentration. The concentration of some of these metals from the results are above these critical levels thus making the captured fishes dangerous for consumption by human compared with the control. The pH of the water at all sampling tributaries was moderately acidic 4.3 at station A1 and to acid in A4 sampling tributary and April. Decreasing the pH consistently increased the concentration of the metals, indicating that levels of concentration were pH dependent. Counseling perspectives was aimed at strongly discouraging the use of sniper (dichlorvous) chemical by fisher folks in the area, educate fisher folks on the consumer health and environmental hazards associated with the use of chemicals like sniper and others in fishing, develop domestication of fishes in homes using modern fishing techniques and pilot access to credit facility that can enable them acquire modern fishing tools and advice the government to formulate good policies that will benefit the fisher folks in the area.

Keywords: Water pollutants, chemical poisoning, fisher folks, counseling, Sniper.

1.Introduction

The activity of humans in the use of chemical poisoning to kill fish and other aquatic animals has increased tremendously especially in rural communities. Among 3 the commonest chemicals used are Snipper (Dichlorvous) (a chemical used to protect plants against pests and pathogens), and a native leaf called local plant. Many rural communities have no other source of drinking water except the natural rivers, streams and springs located at varying distances from their communities. When the water levels are low during the dry season, many of the communities either as a group or a few individuals adopt chemical poisoning in these drinking rivers, streams and springs in attempt to catch some fish and other aquatic animals for sale to public and for domestic consumption, leading to water poisoning. This problem has persisted and has become a yearly means of fish catching in spite of government intervention and has become very pertinent that adequate focus be placed on its control to avoid disaster which may be similar to the incidence of methyl mercury poisoning which occurred in Japan (Christian et al., 1974; Young and Blevins, 1981). The composition of some of these chemicals contain heavy metals such as nickel, lead, mercury, copper, zinc, arsenic and chromium compounds, cadmium, titanium, vanadium are among the several compounds that could be found in chemically poisoned waters. It is difficult to be sure of the possible long-term effect, but the toxins that accumulate have nowhere else to go; the river, stream and spring become its ultimate sink, (Appel and Ma, 2002).

Fish is a good indicator of aquatic contamination because its biochemical stress response is similar to those found in mammals (Mushra & Shulka, 2003).Clariasgariepinus (African cat fish) is locally called mud cat fish and is of the family Claridae- the air breading cat fishes. The adults occur mainly in quiet waters, lakes and ponds. They prefer rather shallow and swampy areas with muddy substrate and quiet waters. They also occur in flowing rivers and are tolerant to extreme environmental conditions (Sagers, 2008). They are common in natural water bodies and man-made reservoirs where they are cultured for food and for income generation. It is also accessible in our environment.

Several studies carried out in developing countries have documented poor knowledge among users and retailers, inadequate labeling of pesticides, low use of personal protective equipment and lack of systems for management of disposed pesticides and containers

(Sida,2016). According to Ufodike & Omeregie (2013) there is limited knowledge of daily exposure of sub lethal doses of pesticides, fertilizers and therapeutics. With the world population increasing yearly and with a corresponding increase in demand for food, agricultural practices have moved from subsistence to commercial agriculture. Urban and rural farmers are now engaging modern farm technologies especially in the use of pesticides for pest and weed control. However, the incidence of poor use practices is widespread while quality control in manufacture, handling, labeling and packaging is often poor (USAID, 2005). These insecticides are used in both domestic, agricultural fields and storage facilities. Fishes are aquatic organisms that serves are a major source of essential proteins for man and animals. Complex biotic societies are typically adaptable to changing conditions, but no one can guarantee that the organisms of the rivers, springs and streams, including human beings drinking from these sources will continue to survive the present rate of influx of exotic chemical poisoning, (Hudges et al., 1977; Torr et al., 1982). However, Stanley (1992) suggested standard for drinking water in form of maximal allowable concentration of various substances, including copper, lead, zinc, manganese, arsenic, chromium silver, selenium, barium, cadmium, cyanides, nitrates, fluorides, phenols, alkyl benzene sulfonates, and total organic substances.

In developing countries like Nigeria, only few chemicals have been ecologically tested for safety in spite of their environmental impacts (Bucher et al., 2013). Every ocean and every continent, from the tropics to the once-pristine polar regions is contaminated (Worldwide Fund, 2014). The effects of these activities are often outrageous with corresponding immediate or later consequences to both direct and indirect dependents of these water bodies (Byne, et al., 1994). Strict government legislation and heavy penalties have not in any way changed these negative trends of indiscriminate disposal of chemicals into our water bodies. Detergent is one of the most toxic pollutants we have in the world today inflicting so many damages to the environment and the organisms thereon especially those in the aquatic environment (Ndome and Ivon, et al. 2016).

The pollution of water supplies is probably responsible for more human illness than any other environmental influence. The diseases so transmitted are chiefly due to microorganisms and parasites, such as cholera (an illness caused by ingestion of the bacterium vibrio cholerae) is an illness characterized by intense diarrhea which results rapidly in massive fluid depletion and death of a very large percentage of untreated patients.

Koli and Whitemore (1983) have through their various works on the contamination of fishes, found that pollutants, especially heavy metals can cause serious damage to human lives. Others have indicated certain process that could be affected by heavy metal levels in fish to include physiological balance and respiratory processes Hemmandez and Diaz (1986), cardiac respiration rhythms, Skidmoll (1970), oxygen, consumption of gill tissue and enzymatic activities, Hughes and Aversy (1977), Tort et al. (1982) and these effects on fish according to Jacki (1974) have a high tendency of manifesting in human. This study was undertaken to appropriate counseling measures as safeguards to reduce the impact of chemical poisoning of fishes and water to reduce hazards on consumers health.

Nsidung beach River tributaries lies within latitude 8o 14'N and 8o20'E, longitude 6o 14'N and 6o 18'E, with a rainfall of over 2,000mm in the rainforest vegetation”, It has been a routine for fishermen in this area to chemically poison the river with Sniper (Dichlorvous) and native leaves called local plant with high lead content in an attempt to catch fish and other aquatic animals for sale to the public and for domestic consumption. In this study, litres of Sniper (Dichlorvous) together with 1000kg of the local plant leaves were mixed thoroughly with sand and released into the tributaries by the fisher folks to enable fish capture.

2.Materials and Methods

2.1 Study Area

Fisher *men Catching Fish by the Process of use of chemical at the beach*

Fisher men at the side of Fishing

2.2 Treatments

1. Sniper (Dichlorvous) (application per month, for four months, march to june and was done.
2. Local plant leaves 1000 kg (The fresh leaves of local plant were pounded in a mortar to form a paste and then mixed with Sniper (Dichlorvous) and sand.
3. Control sample where no treatment was given (Both Sniper (Dichlorvous) and local plant contents and other chemical pollutants were not used in this control study.

3.Statistical Analysis

Data was analyzed using analysis of variance (ANOVA) and means compared using coefficient of variability (cv%) (Little and Hills, 1978).

2.3 Instrumentation, heavy metal determination and analysis

A total of ten heavy metals (Pb, Ni, V, Fe, Cu, Zn, Cd, Ti, Ch and Ar) were analyzed using the procedures of Milner and Whitefield (1981) and atomic absorption spectrophotometer (AAS) Unicam 919 model. The sampled fishes were aspirated into the air acetylene flame of the AAS. A calibration curve of the metal was prepared before analysis of the samples. And this was done by using standard stock solution of the metal analyzed. From the curve, the concentration of the metal in sample was determined (Whiteside, 1979). All analysis was done in triplicates to ensure that accurate results are obtained. The pH of the water was measured with a pH meter ECE model M3 in a water suspension, using a glass electrode.

4.Results and Discussion

The pollution of water is the addition of undesirable foreign matter which deteriorates the quality of water. Thus, water quality may be defined as its fitness for the beneficial uses by man and animals. One of the consequences of the unique physical and chemical properties of water is that it invites or accepts pollution readily, at time through unexpected mechanisms (Ashraf et al., 1992). The use of chemical fishing in Nsidung beach river tributaries poses great danger to the consumers health and thus creates the needs for counselors to swing into action to safeguard lives and properties.

Table 1: *Heavy metals concentration in water samples in Nsidung beach in June after application of treatments.*

Metal (mg/l)	WaterBefore	WaterAfter	FishBefore	FishAfter
Lead	0.051±0.002	0. 121±0.002	0.071±0.001	0.216±0.002
Nickel	0.036±0.002	0. 116±0.002	0.058±0.002	0. 184±0.003
Vanadium	0.049±0.001	0.023±0.002	0.036±0.001	0.091±0.001
Iron	0.039±0.002	0.028±0.001	0.046±0.003	0.231±0.001
Copper	0.068±0.001	0.056±0.001	0.037±0.002	0. 186±0.002
Cadmium	0.019±0.001	0.024±0.002	0.017±0.002	0.071±0.001
Mercury	0.016±0.002	0.012±0.002	0.016±0.001	0.032±0.002
Chromium	0.022±0.002	0.020±0.001	0.024±0.002	0.021±0.002
Arsenic	0.026±0.001	0.018±0.002	0.025±0.001	0.028±0.001
Zinc	0.047±0.002	0. 102±0.001	0.086±0.002	0.086±0.002

* BDL = Below Delectable Level
Before = Before treatment application
After = After treatment application
Results are means of duplicates measurements/determination for two years

Table 2: *The magnitude of heavy metal variability with sampling stations*

	Waterbefore			Waterafter			Fishbefore			Fishafer		
Metal (mg/l)	Mean(x)	SD	CV%	Mean(x)	SD	CV%	Mean(x)	SD	CV%	Mean(x)	SD	CV%
Lead	0.060	0.02	33.24	0.150	12.0	39.21	0.150	0.03	35.12	0.250	0.07	48.59
Nickel	0.054	0.08	13.14	0.288	14.14	43.47	0.128	0.07	27.15	0.526	0.24	62.75
Vanadium	0.141	12.0	31.42	0.159	0.07	29.86	0.179	0.06	26.55	0.242	0.08	52.09
Iron	0.219	14.0	25.16	0.293	13.10	28.15	0.316	10.12	32.91	0.479	0.21	48.63
Copper	0.174	0.08	31.40	0.219	10.12	32.91	0.174	0.08	31.40	0.351	13.74	49.46
Cadmium	0.097	0.06	26.33	0.110	14.56	31.14	0.116	0.05	34.26	0.369	0.05	54.95
Mercury	0.091	0.07	28.45	0.140	0.06	24.70	0.155	0.05	33.21	0.179	0.08	47.09
Chromium	0.098	0.08	20.26	0.136	0.05	23.56	0.151	0.05	25.29	0.171	0.05	36.17
Arsenic	0.072	0.07	25.15	0.123	0.07	28.92	0.072	0.05	29.27	0.157	0.06	37.36
Zinc	0.0161	0.07	28.38	0.198	27.12	59.12	0.566	0.09	36.93	0.676	0.28	57.18
pH	4.3	-	-	3.5	-	-	3.5	-	-	3.2	-	-

Table 3: *World Health Organization Recommendation for Water (1991)*

Metal	For domestic use	For drinking
Cd	-	0.05
Fe	1.00	0.30
Ni	-	0.05
Pb	-	0.05
Cr	-	0.50
Co	-	0.05
Cu	1.50	1.00
Zn	-	-
Mn	1.50	1.50

WHO (1999)

2.4 Concentration of the Heavy Metals in Nsidung Beach river tributaries fishes

The concentration of the heavy metals: lead, Nickel, Vanadium, Iron, Copper, Cadmium, Mercury, Chromium, Arsenic and Zinc are presented in tables 1-4 respectively. The highest concentration of lead (Pb) in January 0.220mg/l was from sample A4, taken from the Estuary, while the least 0.065mg/l came from sample A3 (Table 1). This value of lead recorded in January was higher than all other values on lead, recorded for either February, or March and those of April, (Udosen et al., 1990).

The concentration of lead in the water was higher in the dry season than in the rainy season. Equally the highest value of Nickel (Ni) was higher in sample A4 and this value tended to be higher than all other mean values recorded for February, March and April under similar experimental condition. The lowest value of Nickel 0.027mg/l was recorded in March from sample A1 (Table, 3). The highest value of vanadium 0. 119mg/l was recorded from A1 in the month while the lowest value 0.023mg/l came from A2 sample in April (Tables 2 and 4). The highest iron (Fe) content 0.231mg/l was obtained from A4, in April while the lowest value 0.028mg/l came from A2 in April

(Table 4). The highest concentration of copper 0. 186mg/l came from A4 in April, while the lowest 0.017mg/l came from station A1 in January. The highest concentration of cadmium (Cd) 0.071mg/l was recorded from sample A4 in April while the lowest 0.016mg/l came from sample A3 in March. The highest concentration of mercury 0.076mg/l was recorded from sample A4 in January while the lowest value 0.012mg/l was recorded from A2 in April (Table 4). The highest concentration of chromium 0.087mg/l was highest in A1 in February while the lowest 0.012mg/l came from A2 in the month of May. The highest value of Arsenic 0.035 was recorded from A4 in April, while the lowest value was 0.016mg/l recorded from sample A3. The highest Zn concentration 0.593mg/l was obtained from A2 in April while the lowest value 0.023mg/l came from A1 in January (Warren, 1981).

2.5 pH (acidity and alkalinity)

Hydrogen ions (H^+) render water acidic. A hydrogen ion or proton designated H^+ cannot exist as an independent entity in water because it is strongly attracted or chemically bonded to the oxygen atom of the water molecule. The resulting hydrated proton is formulated as H (H2O) $^+$, or $H3O^+$.When the hydrogen ion concentration is greater than $1.0x10^{-7}$ moles per liter at 25^oC,the solution is acidic. Hydrogen ion concentration are usually expressed logarithmetrically as pH values, where pH = -log10 (hydrogen ion concentration). Recall that the logarithm of a number "to the base 10" is simply the number of times 10 is multiplied by itself to give the number. The pH of the samples of water taken from different sampling stations (A1 to A4) and different months (January to April) are presented in Tables 5 and 6. The highest pH value 4.3 came from sampling station A1 while the lowest (3.1) came from the sampling station A4 with a mean of 3.7. Equally, sampling among the months from January to April showed that the highest pH value (4.1) was recorded in January when the water volume was low while the lowest (3.2) came from April, with a mean of 3.6. The results showed that the sampling station A4 and the month of April with higher concentration of these metals had the highest pH, while stations with higher pH had lower metallic concentration. The implication is that the concentration of metals in the study area was pH dependent which of course was influenced by treatment.Each of the metals increasing with increase in pH level, such that their availability and level of concentration was pH dependent (Ashraf *et al.,* 1991).

2.6 Counseling options for fisher folks in Nsidung beach to reduce associated health an environmental hazard

1. Strongly discourage the use of snipper (dichlorvous) chemical by fisher folks in the area
2. Educate fisher folks on the consumer health and environmental hazards associated
1. with the use of chemicals like snipper and others in fishing
2. Fisher folks should develop domestication of fishes in homes using modern fishing techniques
3. Fisher folks should be granted access to credit facility that can enable them acquire fishing tools
4. Looking for ready market for fishes produced by fisher folks
5. Link fisher folks foreign fish markets
6. Help government to formulate good policies that will benefit the fisher folks

Conclusion

From the findings of this study, we are able to establish the distribution of injurious heavy metals in the water and fishes as influenced by treatment, analyzed for their various concentrations between sampling stations and between months. Their various concentrations in relation to their various critical levels spelt out by WHO, (1991) was noted. However, some metals have been found to be above the widely acceptable standards,

thereby constituting menace and chemical poisoning in the study area. These levels are believed to be caused by the treatment, which reduced the pH of the water in the study area. The lower the pH of a body of water, the more prone it is to be corrosive and toxic, thereby making it polluted with metallic compounds resulting to metallic poisonings, which of course form a serious hazard for both human and aquatic animals as
well as on the environment in developed and developing countries. The ions of metallic elements are electrically positive. These ions are attracted to the negative ends of the water molecules (oxygen atoms). Therefore, rivers with highly charged metal ions tend to be acidic and our study area features well in this case.

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