ISSN 2348-1218 (print)
International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online)
Vol. 3, Issue 2, pp: (45-48), Month: April - June 2015, Available at: www.researchpublish.com

Rapid Appraisal of Climate Change Impact on Household's And Juvenile Diet in the Lake Victoria Basin, Kenya

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Abstract: **Changes in heat and precipitation as a result of climate change are expected to have adverse effects on health, particularly among the most vulnerable populations. The World Health Organization estimate that 34% of all juvenile (under age 14) health problems globally, are due to climate modifiable environmental factors. In the Lake Victoria basin (LVB) Kenya, projected impacts include food scarcity, child mulnutrition, enteric diseases and malaria. In this study, we sought to assess the impact of drought on the household's food options and juvenile diet in the LVB, Kenya. A cross-sectional survey was conducted in 168 randomly selected households in Gwasi hills and Kano flood plains, LVB, Kenya. Data collected included socio-demographic factors, types of foodstuff available for households and juveniles. A twelve-hour household's weighed food uptake assessement was conducted for five days (i.e Monday to Friday). An interviewer-administered questionnaire was used to the collect. Respondents were 40% (67) and 60% (101) male; female respectivly in two sites. Gwasi hills had a higher level of education (3.9± 2.5 y vs. 2.2± 1.6 y, p=0.05); were more likely to be bread winners (53.2% vs. 6.7%, p<0.001), had better monthly incomes ($6.8± 2.7 vs. 3.9± 2.4, p<0.001) and fewer children (3.5± 1.4 vs. 4.2± 2.2, p=0.01) than the households in the Kano flood plains. Maize meal was dorminantly consumed by households. Dry fish (locally known as *omena*), was the predominant source of protein. Foodstuff consumed in the households did not meet juvenile diet requirements. Climate change adaptation strategies to improve household's sources of food are needed in the LVB, Kenya.**

Keywords: **Climate change, Adaptation, diet.**

1. INTRODUCTION

Changes in heat and precipitation as a result of climate change are expected to have adverse effects on health, particularly among the most vulnerable populations [1]. The World Health Organization (WHO) recently estimated that 34% of all childhood illness in the world (compared to 24% of all age illness) and 36% of deaths in juveniles (< 14 years) are due to modifiable environmental factors [2].

In the developing countries, the effects of climate change induced extreme weather events on juveniles health are exacerbated by households' poverty [3][4]. The pathways between poverty and poor developmental outcomes are numerous and well established. Sofar, there is not enough hard knowledge about the implications of climate change on poor households' diet during extreme weather events, to present a comprehensive picture [5].

In Kenya, climate change poses an increasingly recognizable threat to households' food supplies [6][7]. In the Lake Victora Basin (LVB), Kenya, these threats range from crop failure to reduced sources of livelihood. However, knowledge gap still exist on juvenile dietery supply by households especially in the face of climate change induced extreme weather events in the LVB. Kenya. We sought to carryout a rapid appraisal of climate change impact on household's and juvenile diet in the Lake Victoria Basin, Kenya.

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2. MATERIALS AND METHODS

This study was undertaken in Gwasi in the south and Kano flood plains in the north of LVB, Kenya. The LVB had not received any rainflall in a record three months.The area has a population of approximately six million inhabitants with about one million juveniles [8] .

A cross-sectional survey was conducted in 168 randomly selected households in Gwasi hills and Kano flood plains, LVB, Kenya. Seventy nine (79) and eighty nine (89) juveniles from Gwasi hills area and Kano flood plains respectively were randomly enrolled from local primary schools.The juveniles were followed up to their homes and their parents or caregivers (household heads) requested to participate in the study. A total of 168 (Gwasi hills n=79; Kano flood plains n=89) took part in the study.

All the participating household heads gave their informed consent to the study. Data collected included socio-demographic factors, types of foodstuff available for households and juveniles during drought. A twelve-hour household's weighed food uptake assessement was conducted for five days (i.e Monday to Friday). An interviewer-administered questionnaire was used to the collect data. Two different semi-structured questionnaires were used to (1) juvenile dietary data were collected using a 12-hour weighed food record for two days while (2) data on the types and frequency of foods eaten by juveniles during a one week period was collected using a questionnaire. Juvenile dietary diversity was determined based on the consumption of food from the following eleven food groups: (i) maize meal and rice (ii) ground nuts, (iii) Cassava tubers, (iv) oils and fats, (v) Poultry or meat, (vi) eggs, (vii) fish (viii) milk, (ix) traditional vegetables (x) other vegetables, and (xi) fruits. All questionnaires were administered by trained research assistants. Data analysis was conducted using SPSS version 16.0. Juvenile dietary data was analysed after conversion to energy and nuitrient intakes using a food composition table [9]

3. RESULTS

The mean age of household heads and marital status were not significantly different between the participants in Gwasi and Nyando area. However, Nyando households had significantly higher level of education (3.9± 2.5 y vs. 2.2± 1.6 y, p=0.05), were more likely to be sole providers of juvenile diet (53.2% vs. 6.7%, p<0.001).

Gwasi households had significantly higher weekly incomes ($5.8± 2.7 vs. 3.9± 2.4, p<0.001) and significantly higher number of births (3.5± 1.4 vs. 4.2± 2.2, p=0.01) than households in the Nyando study site.

Maize meal was consumed by juveniles in all the participating households during the two-day observation period (Table 1). The "other vegetable" category, comprised of onions and tomatoes and were used as food flavours only. More Juveniles in Nyando area consumed rice and traditional vegetables than their Gwasi counterparts. Fish was the most commonly consumed animal based protein by both groups. Consumption of poultry/meat, eggs, milk and fruits was very limited.

Over 70% of all the juveniles had low intakes of energy, riboflavin and calcium. Compared to the Juveniles in Gwasi hills area the juvenile living domicile in the Kano flood plains had relatively low intakes of protein vitamin A, riboflavin and niacin (Table 1).

The diets of juveniles in the Gwasi hills area had significantly higher diversity than the diets of Juvenile from the Kano flood plains. A dietary diversity score < 5 was used as an indicator for diet diversity was [10]. About 48% of juveniles in the Kano flood plains had low diet diversity compared to 32% in Gwasi hills area.

Table:1. Types of foodstaffs consumed by juveniles in two ecological zones in the Lake Victoria Basin, Kenya (based on 12-hour weighed food records). [1]Chi square test significant at p<0.05.

	Study sites		
	Gwasi region(n=36)	**Nyando region (n=36)**	**p-value[1]**
Type of foodstuff eaten	**N (%)**	**N (%)**	
Maize meal	36(100.0)	36(100.0)	
Cassava tubers	29(80.6)	7(19.4)	<0.001
Oils and Fats	28(77.8)	15(41.7)	0.032

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Ground nuts	23(63.8)	36(100.0)	<0.001
Traditional vegetables	7(19.4)	30(83.3)	<0.001
Onions and Tomatoes	36(100)	36(100.0)	
Poultryl/Meat	4(11.1)	1(2.8)	0.16
Eggs	4(11.1)	0(0.0)	0.05
Fish	36(100.0)	24(66.7)	0.005
Milk	8(22.2)	1(2.8)	0.001
Fruits	2(5.6)	1(2.8)	0.33

A T-test was performed to estimate the average food intake in the two study sites.

Table: 2. Juvenile energy and nutrient intakes and dietary diversity in the two study sites in the Lake Victoria Basin, Kenya (based on a two-day 12-hour weighed food records).

[1]Estimated Average Intake (EAI) for Juvenile. [2]Student t-test, significant; p<0.05.,[3]Recommended Daily Intake (RDI).

	Study Sites							
	EAI[1]	**Gwasi l Hills (n=36)**			**Kano flood plains (n=36)**			**p-value[2]**
		mean ± SD						
Energy(kcal)	2200	1926.2	±	906.8	1735.1	±	493.7	0.271
Protein(g)	46[a]	57.1	±	34.5	35.2	±	8.99	<0.001
Vitamin A(ug RE)	500	1291	±	1041.9	153.3	±	300.7	<0.001
Thiamine(mg)	0.9	0.78	±	0.39	0.77	±	0.38	0.90
Riboflavin(mg)	0.9	0.79	±	0.52	0.35	±	0.19	0.005
Niacin	11	15.9	±	11.2	7.37	±	3.2	<0.001
Iron(mg)	8.1	23.2	±	12.7	28.7	±	12.2	0.061
Calcium(mg)	1000[3]	471.2	±	323.9	395.0	±	167.2	0.214
Zinc(mg)	6.8	8.9	±	4.6	7.6	±	23.7	0.060
Dietary diversity score		6.3	±	0.9	5.1	±	1.7	0.002
	n (%)							
Dietary diversity score <5		8(22)			24(68)			<0.001

4. DISCUSSION

This study focused on the juvenile dietery implication of climate change, specifically in low income households. Modifiable environmental factors have been mentioned as contributing to juvnile health, more so, in the developing countries. Household's adaptation to climate change will largely depend on the level of awareness since climate change induced events dictate sources of food supply and inturn influence juvenile dietary intakes.

From the study findings, more households in Gwasi hills provided more animal protein based diet to juveniles than the households in the Kano flood plains. However, the diets in the two study sites did not meet the estimated average Intake (EAI) for juvenile energy requirements. Recognising that the climate change related factors that determine juvenile health lie outside the health sector, there is need for the households to be made aware of the interconnections that exist between climate change, food supply and juvenile health. Future adaptation programmes in the LVB should therefore mainstream juvenile diet requirements in the climate change agenda.

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