KNOWLEDGE OF IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH AND FOOD CROP PRODUCTION AMONG SECONDARY SCHOOL STUDENTS IN UZO-UWANI, ENUGU STATE: IMPLICATIONS FOR NATIONAL ECONOMY

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Abstract

This study determined knowledge of impacts of climate change on human health and food production among secondary school students in Uzo-Uwani Local Government Area, Enugu State. Two research questions and two hypotheses guided the study. The study adopted a descriptive cross-sectional research design. The population comprised of 14,725 secondary students. The sample size of 600 students were drawn using multi-stage sampling technique. The result indicated that overall knowledge of impacts of CC on human health was moderate (52.0%). The result also showed that knowledge of impacts of CC on human health with regards to increase in spread of infectious diseases was (67.05%), increase in the spread of respiratory diseases (65.7%) and increased deaths (64.03%). Also, overall knowledge of impacts CC on food crop production was low (38.8%). The students' knowledge of impacts of CC on crop food production were moderate floods destroying farmlands and crops (46.89%), decline in agricultural yields (46.38%) and increased food shortage and food insecurity (42.85%). The Independent T-test analysis indicated that there was significant difference (p<.05) in the knowledge of impacts of CC on human health based class level and gender but there was no significant difference based on age(p>.05). There was no significant difference in the knowledge of impacts of climate change on food production based on age and class level (p>.05) but there was a significant difference based on gender (p>.05). The study recommended that there should be increased sensitization of the students and general public on the negative impacts of CC on human health and food crop production.

Sub-theme: Climate change.

Keywords: Climate change, perceived impacts, human health and food production, national economy.
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Introduction

Climate change (CC) is a global issue affecting humans and natural resources.CC is acknowledged to pose great threat on health, agricultural production and food system in many parts of the world (Food and Agricultural Organization, 2015 and Ali et al., 2020). Nigeria has been identified as one of the sub-Saharan African countries that are vulnerable to changing climatic conditions and noted that recurring environmental disasters in parts of Nigeria have worsened food productivity and human suffering (Ughaelu, 2017, Ikem 2218). The decrease in food production may result to poverty, hunger, repeated hospitalization and these has implication for national economic development. It was estimated that between 2030 and 2050, CC is expected to cause an additional 250,000 deaths per year due to malnutrition, malaria, diarrhea and heat stress alone (World Health Organization, 2023). This is a serious public health issue that need to addressed to avert or minimize the adverse effect of CC as projected.

Climate change caused by both human activities and natural events such as flooding and extreme weather conditions. CC is caused by human activities and natural processes (Baer et al., 2019 & Sulistyawati et al., 2018). They stressed that CC is a phenomenon that is mostly caused by human activity and is associated with the growing emission of greenhouse gases

(GHGs) to the atmosphere. (ii) Anthropogenic factors, which are factors that are linked with human activities. The human activities causing CC includes the emission of large quantities of GHGs into the atmosphere through, for example, fossil fuel burning, gas flaring, industrialization, biomass burning, animal farming, and solid waste incineration and deforestation (Akrofi et al., 2019, Yang et al., 2018). CC have serious negative impacts on human health and food production. Impacts on human health include man-made heat-related morbidity and mortality, increases in vector-borne diseases (e.g. Dengue fever, malaria), increased respiratory illness, and morbidity and mortality due to extreme weather events (Blashki et al., 2018, Adogu et al., 2015).Previous researchers reported that CC increases the incidence of heat related illnesses and infectious diseases, vector-borne diseases, mental health problems, nutritional diseases (Haines & Ebi 2019, Ebi et al., 2018, Zhu et al., 2018, Scheelbeek et al., 2018).CC also has negative impacts on food crop production which affects the food security and socio-economic development. Negative impacts of CC on agriculture include proliferation of insect attacks and diseases of crops (Olaniyi, et al., 2019); species extinction and biodiversity loss (Akrofi et al., 2019 & Olaniyi et al., 2019); reduction in the area under cultivation, crop damage, crop loss (Dhanya & Ramachandran, 2016); and low crop yields and, thereupon, reduced agricultural production (Akrofi et al., 2019). Uzo-Uwani L.G.A. is an agricultural area in Enugu State. They produce variety of food crops, engage in fishing and livestock farming. The climate variability may be affecting the health and food crop production in the area. Secondary school students are expected to have knowledge of impacts of CC on human health and food crop production so that they can educate their parents who are illiterate farmers. However, CC may not have been included in the school curriculum and the students in the area may not have knowledge of impacts of CC on human health and food crop production, thus it becomes necessary to conduct research study to determine the level knowledge of impacts of CC on human health and food crop production among secondary school students in Uzo-Uwani, Enugu State. Two research questions and two hypotheses guided the study.

Research Questions

i. What is the level of knowledge of impacts of CC on human health among secondary school students in Uzo-Uwani, Enugu State?
ii. What is the level of knowledge of impacts of CC on food production among secondary school students in Uzo-Uwani, Enugu State?

Hypotheses

Two hypotheses were postulated and tested at .05 level of significance

i. There is no significant difference in the level of knowledge of impacts of CC on human health among secondary school students in Uzo-Uwani, Enugu State based on socio-demographic variables of age, level of study and gender.
ii. There is no significant difference in the level of knowledge of impacts of CC on food production among secondary school students Uzo-Uwani, Enugu State based on socio-demographic variables of age, level of study and gender.

Methodology

Design of the study: This study adopted a descriptive cross-sectional research design. The study was conducted in Uzo-Uwani Local Government Area (LGA), Enugu State, Nigeria.

The LGA is made up of 18 communities with its headquarter at Adani. The LGA is one of rural local government area in the state with vast land mass and fertile soil for agricultural activities. The majority of inhabitants are mostly agrarians and depend heavily on agriculture as their means of livelihood. The farmers engage in fishery and livestock farming. These farmers use heavy farming machines and engage in deforestation in the course of farming and hunting which are capable of emitting greenhouse gas into the atmosphere. The LGA also has some streams and river for fishing and other domestic purposes. The river (Adani river) in the past years had overflown its bank due to climate destroying the aquatic inhabitants, farmlands and crops, submerging some houses and displacing the human inhabitants. The inhabitants may not know the implications of these activities and the impacts on human health and food crop production. The LGA has many secondary schools managed by the Post Primary School Management Board (PPSMB). The secondary school students may not have possessed the basic knowledge of impacts of CC on human health and food crop production. Thus, this study was conducted to determine the level of knowledge of CC on human health and food crop production among secondary school students in Uzo-Uwani LGA, Enugu State.

Population for the study: The population comprised of public secondary school students in Uzo-Uwani LGA of Enugu State. The population as at 2022/2023 academic year was (14.725) fourteen thousand, seven hundred and twenty-five (Post Primary School Management Board, 2023). The sample for the study was 600 secondary school students in the LGA. The sample size was computed using (Yamane, 1967) sample size determination formula. Also, 1,5% design effect and 2,5% non-response rate were added to the sample size. A multi-stage sampling procedure was used to select respondents for the study. Stage one involved the use of simple random sampling to select 15 out of 25 secondary schools in the area. Stage two involved the use of purposive sampling technique to select 15 classes from JSS 1, JSS 2, SSS 1 and SSS 2classes. This is because the JSS3 and SSS3 students are busy taking their Junior and Senior Certificate Examinations. This produced a total of 60 classes from the schools. Stage three involved the use of simple random sampling of balloting without replacement to select ten secondary school students made up of 245 males and 355 females. This gave a total of 600 students used for the study. The random selection was conducted using class registers with the help of the form masters/mistresses to ensure equal representation.

Instruments for Data Collection: The instrument used for data collection was a 20 item questionnaire developed through extensive literature review (Hussein & Ibrahim, 2024; Tajudeen et al., 2022; Sulistyawati et al., 2018). Ten items elicited information on knowledge of impacts of CC on human health and ten items gathered information on knowledge of impacts of CC on food crop production. The instrument had a response options of "Yes or No". The respondents were requested to place a tick (√) against the option as it applies to them. The face validity of the instrument was established by three experts, two from the Department of Human Kinetics and Health Education and one from Department of Agriculture both in University if Nigeria Nsukka. Twenty copies of the instrument were administered to twenty public secondary school students in Igbo-Eze North LGA that shares the same characteristics with the study population. The result of the trial test was used to establish the reliability index of the instrument. The Reliability index of the instrument was established using Kuder-Richardson correlation coefficient. A reliable index of .71and .71 was obtained for each instrument and the instrument was considered reliable for the study.

Method of Data Collection: Six hundred (600) copies of the questionnaire were administered to the respondents by the researcher with the help of one research assistant from each school

who were briefed on modalities of data collection. Out of the 600 copies administered, 595 were properly completed giving a return rate of 99.2% that were used for data analysis. Five copies that were not properly completed were discarded. Data were analyzed using frequencies, percentages and T-tests at 0.05 level of significance. In determining the knowledge of impacts of CC on human health and food crop production, percentage scores below 20 percent were interpreted as very low knowledge; 20-39 percent low; 40-59 percent average/moderate; 60-79 percent high while >80 percent was considered very high knowledge.

Results

Table 1: Level of knowledge of impacts of CC on human health among secondary school students (n=595)

S/N	Tick as many options as possible.	Yes f (%)	No f (%)
1.	Increases the prevalence of nutritional health problems (hunger)	285(47.9)	310(52.1)
2.	Increased heat related diseases due to rise in temperature	281(47.2)	314(52.7)
3.	Increases the spread of infectious diseases like gastroenteritis.	399(67.05)	196(32.9)
4.	Increases the spread of vector-borne diseases such as malaria	401(67.39)	194(32.6)
5.	Increases the incidence of respiratory health problems such as asthma.	391(65.7)	204(34.2)
6.	Increased mortality (deaths).	381(64.03)	214(35.9)
7.	Floods submerging houses causing displacement of residents.	233(39.2)	362(60.8)
8.	Increased or worsened mental problems of the farmers.	232(38.9)	363(61.0)
9.	Increase in heart diseases	287(48.2)	308(51.7)
10.	Skin diseases such as skin cancer	206(34.6)	389(65.4)
	Overall %	52.0	48.0

Key: 0-19% very low, 20-39%= low, 40-59%= moderate, 60-79%=high, 80% and above= very high knowledge.

Result in Table 1 shows that overall, secondary students' level of knowledge of impacts of CC on human health was moderate (52.0%). The knowledge of impacts of CC on human health with regards to increase in spread of infectious diseases was high (67,05%), increase in the spread of vector diseases (67.39%), increase incidence of respiratory diseases (65.7%) and increased deaths (64.03%)

Table 2: Level of knowledge of impacts of CC on food production among secondary school students (n=595)

S/N	Tick as many options as possible	Yes f(%)	No f(%)
1.	CC causes decline in soil fertility.	202 (33.94)	393(66.59)
2.	Increased insects and pests' infestation destroying	205(34.45)	390(65.54)
3.	farm crops.	211(35.46)	384(64.53)
4.	CC causes loss of aquatic lives like fishes.	279(46.89)	316(53.10)
5.	Floods destroying farmlands and crops.	210(35.29)	385(64.70)
6.	Droughts and insufficient water supply for farm	255(42.85)	340(57.14)
7.	works.	276(46.38)	319(53.61)
8.	Increased food shortage and insecurity	215(36.13)	380(63.86)
9.	Decline in agricultural crop yield.	237(39.83)	358(60.16)
10.	Erosion of the soil.	220(36.97)	375(63.02)
	Reduced the quality of crops produced.	38.8	61.2
	Spoilage of farm produce.		
	Overall%		

Key: 0-19%=very low, 20-39%= low, 40-59%= moderate, 60-79%=high, 80% and above= very high knowledge.

Result in Table 2 shows that overall, level of knowledge of impacts of CC on food crop production among secondary school students was low (38.8%). The Table further shows that students have moderate knowledge on floods destroying farmlands and crops (46.98%), decline in agricultural yields (46.38%) and increased food shortage and food insecurity (42.85%).

Table 3: Summary of Independent T-test showing difference in the level of knowledge of impacts of CC on human health among secondary school students (n=595)

Variables	$(\bar{X})$	SD	S.E	Df	t-cal	p-value
Age (years)						
9-14(360)	13.4	2.98	.1568	593	-.107	0.943
15 and above (235)	13.2	3.14	.2047			
Class level						
JSS(378)	13.297	3.25	.167	593	1.723	0.006
SSS(217)	12.853	2.2.63	.178			
Gender						
Female(351)	12.853	2.82	.145	593	3.08	.000
Male (244)	13.59	3.33	.218			

P<.05 = significant, p>.05 = not significant, SD=Standard deviation, S.E= Standard error.

Result in Table 3 shows that there was no significant difference in the level of knowledge of impacts of CC on human health based on age (p=>.05) but there was significant difference based on class level and gender (p = <.05).

Table 4: Summary of Independent T-test showing differences in the knowledge of impacts of CC on food crop production among secondary school students (n=595)

Variables	$(\bar{X})$	SD	S.E	Df	t-cal	p-value
Age (years)						
9-14(360)	13.5	2.98	.1568	593	-1.154	0,639
15 and above(235)	13.8	3.59	.234			
Class level						
JSS(378)	14.28	3.56	.1829	593	2.120	0.282
SSS(217)	13.62	3.34	.1568			
Gender						
Female(351)	13.77	3.52	.187	593	2.120	0.040
Male (244)	14.42	3.78	.241			

P<.05 = significant, p>.05 = not significant, SD=Standard deviation, S.E=Standard error.

Result in Table 4 shows that there was no significant difference in the knowledge of impacts of CC on crop food production based on age and class level (p = >.05) but there was a significant difference based on gender (p<.05).

Discussion

Result in Table 1 indicated that overall knowledge of impacts of CC on human health among students was moderate (52.0%). This result may be attributed to the knowledge the students gained through internet sources and books. Recently, CC have been a public health issue that attracted the attentions of the federal government and environmental health protection authority. This is at variance with the study of (Lianping et al., 2018) in which the respondents indicated that CC was generally bad (83%) and bad for human health (88%). The result disagrees with the findings of studies done by (Husein & Ibrahim, 2024, Odonkor et al., 2020, Sulistyawati et al., 2018) which reported that high percentage (69%, 83.4% and 81.1%) of the respondents had knowledge of impacts CC on human health. The result of the study in Table 1 further revealed that students' knowledge of impacts of CC on human health were high: increase in spread of infectious diseases (67.05%) and increase in the spread of vector-borne diseases (67.39%). The justification for this result may be that the incidence of these diseases are alarming in extreme weather conditions. This result aligns with the finding of study done by (Hanies & Ebi, 2019, Ebi et al., 2018). The result of the study also showed that students' knowledge on impacts of CC on human health was high in increased incidence of respiratory diseases (65.7%) and increased deaths (64.03%). This is consistent with the findings of (Zhu et al., 2018, Scheelbeek et al., 2018) which reported that CC increases the incidence of respiratory diseases, nutritional diseases, mental health problems and mortality rates. The authors went further to state that if no additional actions are taken, then over the decades, substantial increases in morbidity and mortality are expected in association with a range of health outcomes, including heat related illnesses, illnesses caused by poor air quality, undernutrition, from reduced food quality and security, and selected vector-borne diseases in some locations and associated decrease in workers' productivity. The result also indicated students' knowledge on mental health problems as impact of CC on human health was low (38.9%). This concurs with the assertion of Haines & Ebi (2019) which stated that the effects of CC on mental health are increasingly recognized for example, exposure to floods and other extreme events increases the risk of depression and anxiety which may

disproportionately affect people with preexisting mental health problems. This can be attributed to losses incurred by the farmers from the attack of pests and insects, flooding and extreme heat destroying the crops. Sometimes, the whole farmland, houses and the crops are submerged by rise in sea level rendering the farmers homeless and jobless. Sometimes, the stream for fishing may dry up and the livestock's (birds, goats, pigs and cows) die in extreme weather conditions which can cause or worsen the mental health problems of the farmers. May be the students being residents in the area may have witnessed such negative impacts on the farmers.

The result in Table 2 showed that overall, the students' knowledge of impacts of CC on food crop production was low (38.8%). This might be that the respondents are students still in school and may not regularly be going to farms with their parents. This result is consistent with the studies by (Wossen et al., 2019, Uwazie 2020) which reported that extreme climacteric conditions that manifest as desertion, high rainfall and flooding have adverse consequences for food crop production. The result of study also indicated that the students' knowledge on impacts of CC on food crop production was moderate for floods destroying farmlands and crops (46.98%), decline in agricultural yields (46.38%) and increased food shortage and food insecurity (42.85%). This result disagrees with the findings of (Ikpe et al., 2023) which reported that high percentage of respondents perceived diseases and pest infestations affecting crop yields, rise in temperature, excessive rainfall, flooding to be negatively impacting on food production. The differences can be linked to the fact that the reviewed studies were farmers. The finding corroborates with the result of (Tajudeen et al., 2022, Hassn & Yahaya 2022) that reported that the respondents had low knowledge on reduced crop yield, decreased soil fertility, increased pests and diseases, loss of aquatic organisms as the impacts of CC on food production. The similarities can be linked to the differences in the area of study and level of education of the participants. The result of the study showed students' have moderate knowledge (39.83%) for reduced quality of crops as impacts of CC on food crop production. This aligns with the study of (Berhami & Wolde 2019) which indicated that composition of soil mineral elements are affected by extreme weather conditions which have adverse effects on food crop production. The reduced quality of the food crops may lead to nutritional related diseases. The students' have low knowledge (36.97%) for spoilage of farm produce as negative impacts of CC on food crop production which concurs with the findings of (Ikem 2018 and Ufot 2019). This is because the adverse weather conditions had seriously affected the crops and partly the farmers may not have the capacity for the storage of the farm products. The similarities may be that the respondents in different studies are aware of the spoilage nature of food crops such as onions, tomatoes, pepper, pumpkins, yams, cassava and other vegetables. To buttress this, Ufot stated that over 2000 tons of yams and 2500 tons of vegetable crops are lost annually as a result of decay in Nigeria. This need urgent attention by the government to assist farmers in storage and preservation of food crops.

Result in Table 3 shows that there was significant difference in the knowledge of impacts of CC on human health based on age and class level ($p = <.05$) but there was no significant difference based on gender ($p>.05$). The influence of age and level of study can be explained that those senior secondary school students and older are likely to be more knowledgeable about the impacts of CC on human health based on knowledge gathered at the senior classes at older age compared with those at junior classes and younger age. The similarities may be attributed that older age and higher level of study or education are indicators of higher knowledge. The result is in contrast with the findings of (Hussein & Ibrahim, 2024, Tajudeen et al., 2022, Waheed, 2020) that reported that gender, educational level and age are

significantly associated with knowledge of negative impacts of CC on human health (p = < .05). The difference in the findings could be linked to level of education and method of data collection and data analysis.

Result in Table 4 shows that there was no significant difference in the knowledge of impacts of CC on food crop production based on age and class level (p = >.05) but there was a significant difference based on gender (p<.05). The implication for gender being associated might be that females possessed more knowledge about the impacts of CC on food crop production than males. The reason might be that females are more concerned about food for the family, and may be motivated to acquire more knowledge on impacts of CC on food crop production to ensure sufficient food for the family and to prevent nutrition related diseases. The justification for this result might be that the respondents are not farmers and may not have knowledge of the impacts of CC on food crop production. This result is inconsistent with the result of (Hussein & Ibrahim, 2024, Tajudeen et al., 2022, Waheed, 2020) which reported that gender, level of education and age are significantly associated with knowledge of impacts of CC on food crop production among the participants. The difference could be attributed to area of study and educational qualifications of the respondents.

Conclusion

The study concluded that negative impacts of CC on human health and food crop production was enormous but knowledge of the impacts among students was low. The study recommended that there should be increased sensitization of the students and general public to increase their knowledge on the negative impacts CC on human health and food production by health educators and teachers. The general public and students' knowledge should be increased by classroom education, mass media, workshops/seminars on CC and mitigation strategies for CC to ensure good health and food security. Also, CC should be included in academic curriculum at all levels of education by policy makers and Ministry of Education.
Implication of the study for national economy.

The result of the study showed that more than half of the students lacked knowledge of impacts of CC on human health on food crop production. This can be a concern for policy makers, Ministry of Education, teachers, health educators, government and non-governmental organizations to provide adequate knowledge on adverse effects of CC. The result of the study indicated that overall students' knowledge of impacts of CC on human health was (52.0%) and food crop production was (38.8%). This has serious implications regarding human health and food security. The severe damage caused by climatic variability have serious effects on the human health causing or increasing morbidity and mortality rates. The negative impacts on food crop production causing decline in crop yields and quality, pests and insects infestations destroying farmlands and crops, increased food shortage, loss of aquatic lives and live stocks, etc. affects the nation's nation food security and result to hunger, poverty and increased crimes. These have serious implications as more money would be spent on cost of treatment, maintaining the farms, rebuilding submerged houses which indirectly and seriously affect food production, food security as well as threatens the national economy for national development.

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