

# NCDs-COVID19 Preventions, Environmental – Nutrition Perspective Approach; (The Case of Tanzanian Students)

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## Research Article

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## Abstract

**INTRODUCTION;** Non-communicable diseases (NCDs) are serious public diseases. They are affecting a larger number of young people who are from developing countries. Characterized by being non-transferrable diseases. The main risk factors include unhealthy behaviors and metabolic syndromes. Unhealthy behaviors include excess use of salts, sugar, fats food and alcohol, other are cigarettes, physical inactive and inadequate intake of fruits and vegetable, but also overweight/obesity, hypertension high cholesterol and hyperglycemic. Common NCDs killers are CVDs, chronic respiratory diseases, diabetes and cancer

**OBJECTIVES;** main objective of this study was to assess the student knowledge on NCD-COVID-19 prevention; environmental – nutrition perspective approach..

**METHOD;** Cross section study design conducted at Dar-es-salaam- Tanzania. Purposive method used to select participants within six secondary schools that are situated at city center. The likert scale questioner used to obtain non-parametric data. The validation and reliability of tool pre-tested before actual data collection. The data were analyzed under ordinal regression analysis under the help of computer with SPSS- 20 version software. The descriptive statistics established frequencies and percentages while statistical measures were median and IQR.

**RESULTS;** about 600 students were recruited and participated, 54.7% were female and 45.3% male, (SD) mean was 18.3 and SD was 0.64. Students were knowledgeable on nutrition perspective by 81% while on environmental perspective was 50%.

**CONCLUSION;** the study concluded that, to speed up NCDs–COVID19 prevention, the multipart environmental education, curriculum education review and adoption of new NCDs strategic action (2018-2020) are needed.

## Background

NCDs are non- infectious diseases. Presently, NCDs are emerging as the leading cause of death worldwide, much reported in Low-Middle-Income Countries (LMIC) (1). Tanzania is among the countries that is experiencing (2). Also has experience the frequencies of climate changes events (3). Increases of these two have been linked with rapid growth of economic activities (citation). further, climate changes has changed the lifestyles of living people (4).

However, most NCDs killers are cardiovascular diseases (CVD), chronic non-infectious respiratory diseases, Cancers and Diabetes Mellitus (5). However, common NCDs risk factors include excessive intake of fat, sugar, salt and alcohol, others are inadequate intake of fruits and vegetable, lack of physical activities and tobacco, cigarette user (6). But, recently, few studies demonstrated climate changes events; extreme weather changes, air pollution, increase of industrial activities, flood and storms are among of risk factors (6,7). Moreover, NCDs and COVID 19 are sharing the risk factors, like inadequate fruits and vegetables intake, excessive intake of alcohol, physical inactivity, air pollution and overpopulation, high intake of trans-fat, salt, as well tobacco use (8,9) and this is the significant of this study on NCDs-COVID 19 prevention.

Besides, the combinations of these two diseases have increased the burden to people's life. NCDs itself kills about 70% people worldwide annually, while 2/3 of them are from developing countries, In 2016, the NCDs reported to kill 71% worldwide, among of them, 4% were young people below 30 years, whereas 38% were people with the age between 30 - 70 years and 58% were people with 70 years and above.80% of deaths were due to cancers, cardiovascular diseases, chronic respiratory diseases, and diabetes and 20% were from slow NCDs killer (10). Majority were are from low-income and middle-income countries specific in sub-Saharan Africa(11). However, NCDs mortality in Tanzania is about 33%, rapidly increasing annually(12).

Furthermore, the NCDs pandemic has been known as barrier for economic development as it affect manpower (13) in that have been abstracting the speed of achieving the SGGs targets. With presences of this COVID 19 crisis, has worsened the situation due to lockdown that limit the economic activities. The COVIDs reported to attacks people who are living with NCDs whereas majority are young(14). Hence adequate Knowledge among new generation needed to speed up awareness within community.

Thus study based among students. Mainly to assess the students' knowledge on NCDs-COVID 19 prevention; environmental=nutrition perspectives. The findings will lead to provide detailed roadmaps that will assist to reduce premature deaths and then to speed up the SDGs achievement. To achieve study objective, the study was guided by the following research questions; what is the student's social-demographic characteristic level of NCDs knowledge (sex, education and specialization), also What is the student's level of knowledge on nutrition and environmental towards NCDs-COVID 19 prevention respectively?

## Methods

The methodological approach of study was quantitative approach- survey. It focused on the research design to study objectives. Also the limitations and executions were addressed.

### Study Areas

Dar-es-salaam was selected purposively sampling research method applied during as the study area because it is risk areas. It is the center for economic activities in Tanzania such as it occupies larger number of industries, people, tourist areas, vehicles and collages and it is a city that is

growing rapidly. With this has been experiencing frequently climate changes events include like frequency natural disasters events, flood, earthquake and weather changes (5). However, Tanzania is in East of Africa, founded with Kenya, Uganda in north part, Congo, Burundi and Rwanda at west part, Zambia, Zimbabwe, and Malawi at south part while eastern part is Indian Ocean.

### Sample Size

The confidence interval or margin error used to obtain sample size was 5. This established an estimated representation either +/- 5% of the total population. The population size used was 10,000 and a confidence level was 95 percent was used to calculate the sample size by using Cochran equation formula (Cochran 1963). Obtained sample size 400 but was approximately to 600 to add the value of the study.

### Sampling procedure

Purposive sampling procedure was used to select the participants regarding their age. The student's age between 16-21 years were purposively selected equally from both private and governments secondary schools that are in city center, with the ratio of 50; 50 male and female. However, only students who have been schooling in Dar-es-salaam for six and above months,

### Data collection and management

#### Data collection

A Likert 5-scale form was developed whereas the responses were valued from 1-strongly agree to 5 strongly disagree. The questionnaire development was guided by theme of the study following the specific objectives and then the data was collected from August to September 2020. But, prior to actual data collection, a tool was a pre - tested and validated, and a written informed consent was given to each participant who was above 18 years. However, below 18, their request was directed to their parents/caretaker.

#### Data analysis

Then, the non- parametric data were cleaned and analyzed through ordinary regression analysis. Before, ordinary regression analysis, the descriptive statistics analysis was performed to establish the frequency and percentages in tabulation form and then the ordinal regression analysis was performed to disseminate the median, mode and IQR and Chi-square test value to determine variance. Moreover, the findings were supported by relevant reviewed literatures and the data analyzed through the stages. description, data classification, and interpretation (15) Creswell, 2013. Nonetheless, the value of tool validation accepted by p-value was (.000).

#### Ethical clearance

Before get into site, the research protocol was observed, whereby the letter for ethical approval was offered by the Ethical Review Board of Universities' Muhimbili Health alliances, Tanzania Ref no; MUHAS-REC-92020.0.046

## Results

Before, ordinal regression analysis, , the data was pre- tested to find out the fitness and accurate of tools. The pre-test results demonstrated that, the tool was acceptable p -value of (.891) of which about 32 items was tested, whereas the p-value was higher than standard (>.70) (15). Subsequently, the ordinary regression analysis was done to determine the relationship between variables (Table1), of which, the findings was statistical significant as the p -value was equal to (.000), whereas the goodness of fit was below (.005) by (.001) which was statistically significant fit

**Table 1a; demonstrates the model of fitting**

	Chi-Square	df	Sig.
Environmental			
Pearson	107.608	56	.000
Deviance	97.402	56	.001

**Table 1b; illustrates the Goodness-of-Fit of the tool**

	-2 Log Likelihood	Chi-Square	Sig.
Environmental			
Accepted Only	266.038		
Model	227.680	38.358	.000

### Participant's characteristics

A total of 600 participants comprising 328 (54.7%) female and 272 (45.3%) males. were interviewed with regard to their understanding on the socio-demographic factors. The statistical mean age and standard deviation were 18.3 and SD = 0.64 respectively. 87% were advanced students and 12.3% were ordinary education students while 45% were sciences students, 21.3% art, and 21.5% economy and (11%) were general knowledge students (Table; 2). Generally, half of the participants - 300 (50%), were knowledgeable. Female were statistical significant higher than men.

**Table 2; demonstrate the frequency distribution of demographic characteristics**

<i>Social-demographic factors</i>	<i>Item</i>	<i>f</i>	<i>%</i>
Age	16-17	186	31.0
	18-19	330	55.0
	20-21	84	14.0
Gender	Male	272	45.3
	Female	328	54.7
Education level	ordinary level	74	12.3
	advanced	526	87.7
Subject	Science	273	45.5
	Economic	128	21.3
	Arts	129	21.5
	General	70	11.7

**Student level of Knowledge on socio-demographic characteristics perspective (sex education and subject specialized)**

Cross-tabulation was done to examine the association between socio-demographic variables and the knowledge of the participants on NCDs prevention on environmental-nutrition perspective approach. Specifically Age, sex, education were significantly associated with the knowledge of participants. Education was significantly associated with NCDs prevention knowledge in univariate analyses. In the multivariable analysis, age sex and education area were significantly associated with knowledge of NCDs prevention on aspect of environmental- nutrition approach. A clear dose-response association was observed with educational level (P-for linear trend from logistic regression <0.000). The female and science student's respondents were more likely to have knowledge than other social- demographic characteristics (Table 3)

**. Table3; association between knowledge and social-demographic characteristics (age, sex, education and subject specialize**

<i>Variable</i>	<i>NCDs prevention education</i>					<i>statistics</i>
Age	S/agreed	Agree	Neutral	S/disagree	Disagree	
16-17	186.000 (10.5%)	217.000 (12.3%)	87.000 (4.9%)	57.000 (3.2%)	16.000 (.9%)	Chi-square=62.820
18-19	383.000 (21.7%)	369.000 (20.9%)	95.000 (5.4%)	84.000 (4.8%)	34.000 (1.9%)	df =8
20-21	63.000 (3.6%)	91.000 (5.1%)	36.000 (2.0%)	19.000 (1.1%)	30.000 (1.7%)	P =.000
sex						
Male	273.000 (15.4%)	275.000 (15.6%)	124.000(7.0%)	89.000 (5.0%)	33.000 (1.9%)	Chi-square= 26.267
Female	359.000 (20.3%)	402.000 (22.8%)	94.000 (5.3%)	71.000 (4.0%)	47.000 (2.7%)	df =4
						P =.000
level of .education						
Ordinal	89.000 (5.0%)	85.000 (4.8%)	30.000 (1.7%)	23.000 (1.3%)	11.000 (.6%)	Chi-square= 823
Advanced	543.000 (30.7%)	592.000 (33.5%)	188.000(10.6%)	137.000 (7.8%)	69.000(3.9%)	df =4
						P =.935
By Subject specialization						
sciences	257.000 (14.5%)	295.000 (16.7%)	136.000 (7.7%)	42.000 (2.4%)	39.000 (2.2%)	Chi-square= 74.548
economic	140.000 (7.9%)	167.000 (9.5%)	19.000 (1.1%)	40.000 (2.3%)	22.000 (1.2%)	df =12
Arts	148.000 (8.4%)	127.000 (7.2%)	37.000(2.1%)	55.000(3.1%)	9.000 (.5%)	P =.000
General knowledge	87.000 (4.9%)	88.000 (5.0%)	26.000 (1.5%)	23.000 (1.3%)	10.000 (.6%)	

### Knowledge on Nutrition perspective approach towards NCDs-COVID 19 prevention

The study had two perspectives approaches; nutrition and environmental. Table 3 illustrated the nutrition findings, in whole; Participants have average knowledgeable. The factors accepted between 81%  $\geq$  (55%). However clearly known factors included; proper Hazard Analysis and Critical Control Point practices (HACCP)( 81%), food law practices 67.3%. In house food budget 67.4% and Physical Activity 65.5%, reduction of processed food 61.4% nutrition analysis 55.0% as well as balance diet 58.0% with statistically median 4 and IQR 2 which comprise were adequately knowledgeable. The factors that are not well clear included Fruits and Vegetable intake (36.7%), GMO 39.9%, high price for processed food 43.4%, practicing moveable patch (44%) and riding bicycle 45.6%. Statistically median and IQR was 3 and 2 respectively (table 4&5).

**Table 4; shows the responses of the participants on their nutrition knowledge on NCDs prevention**

Variable		f (%)	%(600)
Balance diet consumption prevent NCD's	Disagreed	163	27.2
	Neutral	89	14.8
	Agreed	348	58.0
Fruits and Vitamin (FV) campaign reduce NCDs outbreak.	Disagreed	247	41.5
	Neutral	131	21.8
	Agreed	232	36.7
Good food policy, support the movement of NCD's prevention.	Disagreed	133	22.1
	Neutral	118	19.7
	Agreed	349	68.1
A good food law practice is one way of NCDs prevention	Disagreed	107	17.9
	Neutral	89	14.8
	Agreed	404	67.3
Reduction of processed food helps to prevent NCDs.	Disagreed	85	12.5
	Neutral	157	26.2
	Agreed	378	61.4
Raise the price of processed foods reduce NCD's.	Disagreed	246	41.0
	Neutral	100	16.7
	Agreed	254	43.4
Raise the price of GMO foods help to decrease NCD's.	Disagreed	217	36.1
	Neutral	144	24.0
	Agreed	239	39.9
Proper food budget reduces NCD's outbreak.	Disagreed	116	19.4
	Neutral	80	13.3
	Agreed	404	67.4
Nutrition analyses help to prevent NCD's.	Disagreed	174	29.0
	Neutral	96	16.0
	Agreed	330	55.0
HACCP	Disagreed	17	2.9
	Neutral	95	15.8
	Agreed	488	81.3
Active Physical activity prevents NCD's.	Disagreed	126	21.0
	Neutral	81	13.5
	Agreed	393	65.5
Riding a bicycle is one way of fighting a NCD's	Disagreed	227	37.9
	Neutral	99	16.5
	Agreed	274	45.6

**Table 5; illustrate the statistical approval on nutrition perspective approach (n = 600) percentage total 100 % responses**

	B/ diet	FV comp policy	food law P	Moveable garden	Processed foods	GMO food budget	Nutrition analysis	HACCP	Physical activity	Riding bicycle	
Valid	600	600	600	600	600	600	600	600	600	600	600
Missing	0	0	0	0	0	0	0	0	0	0	0
Median	4.00	3.00	4.00	4.00	3.00	3.00	3.00	4.00	4.00	4.00	3.00
Std. D	1.285	1.302	1.222	1.179	1.274	1.362	1.272	1.197	1.296	.802	1.357
Range	4	4	4	4	4	4	4	4	4	4	4
Percentiles 25	2.00	2.00	3.00	3.00	2.00	2.00	2.00	3.00	2.00	4.00	3.00
50	4.00	3.00	4.00	4.00	3.00	3.00	3.00	4.00	4.00	4.00	3.00
75	4.00	4.00	5.00	5.00	4.00	4.00	4.00	5.00	5.00	5.00	4
											.00

### Student's Knowledge on Environmental Perspective Approach towards NCDs-COVID 19 Prevention

Generally, the respondents were statistically significant clear by many factors assessed were almost had median of 4 and IQR of 4 (Table 6). The factors evaluated included environmental education, 73.5%, environmental protection (70.7%), environmental management (50.1%), sustainable agriculture practices (57.3%), fruit tree plantation (51.6%), reforestation (54.7%) and close monitoring of imported equipment (60.8%) (Table; 7) Except preparing of movable garden as help to initiate to prevent NCDs-COVID 19 had median of 3 and IQR 2 of which means was not accepted

Table 6; Demonstrate the frequency distribution of student knowledge on Environmental perspective on NCD's-COVID19 Prevention

<i>Item</i>	<i>F(n=600)</i>	<i>%( 100)</i>
Environment Education speed up NCDs- prevention.		
Disagreed	86	14.3
Neutral	73	12.2
Agreed	441	73.5
Environment protections interrelated to NCDs prevention.		
Disagreed	92	15.3
Neutral	84	14.0
Agreed	424	70.7
The environment management prevents NCD's		
Disagreed	204	34.0
Neutral	95	15.8
Agreed	301	50.1
Sustainable agriculture practices prevent NCD's		
Disagreed	138	23
Neutral	118	19.7
Agreed	344	57.3
Moveable garden initiate NCDs prevention		
Disagreed	192	32
Neutral	144	24.0
Agreed	264	44
Fruits trees plantation complain around stress, home and school		
Disagreed	170	28.3
Neutral	120	20.0
Agreed	310	51.6
Reforestation is a source of NCDs reduction.		
Disagreed	155	25.8
Neutral	120	20.0
Agreed	325	54.1
Close monitor of imported equipment's reduce NCD's		
Disagreed	147	25.5
Neutral	88	14.7
Agreed	365	60.8

Table 7; Statistical level of environmental knowledge among Tanzanian secondary students on NCDs-COVID 19 prevention

		Environment protections.	Environment Education.	Environment management.	Imported equipment's	Reforestation	Sustainable agriculture	Moveable garden initiate	Fruits trees plantation
N	Valid	600	600	600	600	600	600	600	600
	Missing	0	0	0	0	0	0	0	0
Mean		3.84	3.88	3.22	3.52	3.42	3.48	3.19	3.36
Median		4.00	4.00	4.00	4.00	4.00	4.00	3.00	4.00
Mode		4	4	4	4	4	4	4	4
Std. Deviation		1.130	1.125	1.353	1.272	1.216	1.222	1.274	1.283
Variance		1.277	1.265	1.830	1.619	1.479	1.492	1.622	1.646
Range		4	4	4	4	4	4	4	4
Percentiles	25	3.00	3.00	2.00	3.00	2.00	3.00	2.00	2.00
	50	4.00	4.00	4.00	4.00	4.00	4.00	3.00	4.00
	75	5.00	4.00	4.00	4.00	4.00	4.00	4.00	

## Discussion

This study is the first significant quantitative study attempt in Tanzania to assess the concepts of students on environmental- nutrition perspective on NCD –COVID-19 prevention. We found that more than half of the participated secondary students have inadequate environmental-nutrition knowledge. Further the study discovered that, acquired knowledge among students was through experience and education attained. Adequate engagement and involvement of youths, speed up awareness within community, use as are fasting adopting and keep in action the new changes. In other way, youth are source for promoting quick healthy behavior changes in a society. And education institute is center for youth capacity building that also empowering and strengthen on decision making, transforming information now and for the future generations. thus, youth have influencer for diseases prevention (16). But the findings revealed that, students were lacking the knowledge of which the findings were likely the same with study conducted at Indonesia(17). But different from study conducted among high secondary students in Bangladesh (18).

However, the study assessed student's concepts on NCDs-COVID 19 on nutrition prevention perspective. The study mainly conducted to identify the nutrition education coverage among students in achieving adequate and healthier. The quality of food and nutrition has crucial role in NCDs-COVID- 19 prevention. But in COVID 19 episode measures reported to limit the accesses and availability of healthier foods and also limit physical activity(8). However, many nutrition studies have been directed to individually dietary intakes of which it is different from this. But this study is the first as assessed the nutrition knowledge among students towards NCDs-COVID 19 prevention was directed to assess the provision of healthier food and quality nutrition in public and not individual diet consumption. Like one study that conducted to assessed the potential of performing nutrition analysis and Hazard Analysis Critical Control point in public health for NCDs prevention of which suggested it is important to provide nutritional quality (19) However, the study basically evaluated the student's concepts on nutrition knowledge towards NCDs-COVID 19 prevention. present findings revealed that, the students had average knowledge. Nonetheless, the highest knowledge were on proper Hazard Analysis and Critical Control Point practices (HACCP), food law practices, In house food budget, and Physical Activity reduction of processed food, nutrition analysis, and balance diet. These was statistically identified by median = 4 and IQR 2. Although Fruits and Vegetable intake, GMO, high price for processed food, practicing moveable patch and riding bicycle statistically shown had average nutrition knowledge as many factors had media of 4 and IQR 2. The study findings revealed that, students have average knowledge. in this perspective, further the literatures are conspicuous missing on NCDs-COVID -19 prevention. But, in Gujarat-India m the study conducted among higher secondary school students of which was based on NCDs preventive m the findings illustrated that, students had sufficient knowledge (20).

Regardless of nutrition assessed but also the study evaluated the student's knowledge on environmental towards NCDs-COVID 19 prevention.. In this, the study assessed the concept of fruits tree plantation, moveable vegetable patch around home, tree plantation campaign. Also, assessed an increase of price processed foods as measures for NCDs-COVID-19 prevention, not only that but also evaluated the concepts of genetically modified food products reduction, organics food reduction (GMO) and friendly infrastructure for bicycle riding. Generally, variables assessed scored between 70% and 50%, whereas statistically was approved that. The students were adequate knowledgeable by median of 4 and IQR 4. Besides, the student were highly clear on environmental education, protection and management, fruits tree plantation campaign, reforestation and exported items while FV, GMO, processed foods, practices movable patch was not clearly. However, the study wanted to expose the level of student knowledge on environmental protection towards NCDs-COVID-19 prevention. However, Environmental is good source for providing natural food/ healthier foods whereas are power for diseases prevention. However, farther investigations are needed as the literatures were conspicuously missing on NCDs-COVID 19 prevention-environmental perspective. Nonetheless, like findings to study conducted Pulchowk Campus, Lalitpur, (21) but dissimilar to study conducted at Maharagama Educational Division in Sri Lanka, mainly assessed the knowledge on NCDs, and lifestyle choices include health diet and physical activity the students had low level of knowledge (4)

## Conclusions

The results of this study demonstrated that, majority of the students have average knowledge in both approaches; environmental and nutrition but clearly was on environmental than in nutrition perspective. so, further investigations is needed in this perspective. Conversely, the study suggested multipart approaches on NCDs- COVID 19 prevention. Further the curriculum education review and adoption of new NCDs strategic action (2018-2020) are recommended.

## Abbreviations

CC;	Climate changes
COVID;	Corona virus diseases
FV;	Fruits and Vegetables
CVD	Cardiovascular diseases
SMGs	Sustainable Development Goals
HACCP;	Hazard Analysis Critical Controls Point
LMIC;	Low Middle Income Country
NCDs;	Non -communicable diseases
WHO;	World Health Organization

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## Declarations

### Ethics approval and consent to participate

Informed consent was obtained from all participants and from the secondary schools headmasters/ mistress. Ethical approval for the study was obtained from the Muhimbili University of Health and Allied Sciences (MUHAS) Institutional Review Board (IRB) number MUHAS-REC-9-2019-046. Permission to start the project was given by the Dar es Salaam regional commissioner officer (RCO).

### Consent for publication

Not applicable

### Availability of data and materials

The data used to support the findings of this study are available from authors upon special request.

### Competing interests

The authors declare no conflict of interest.

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This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

### Contributions

UNK wrote the main manuscript text and prepared the tables

EB supervised the whole process, procedure of manuscript preparation, revised and critically reviewed and edited the manuscript

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## Supplementary Files

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- [Tables1NCDscovid19.docx](#)