Knowledge of Primary Prevention and Management of Type 2 Diabetes and Hypertension among Secondary School Children in Morogoro Municipality, Morogoro Region, Tanzania

Abstract

Purpose: Hypertension and diabetes used to occur in adults but are now prevalent in children but there are not enough information on student's knowledge on prevention and management of these conditions. Therefore, this study aimed at assessing knowledge on prevention and management of hypertension and diabetes among students in Morogoro Municipality.

Methods: A cross-sectional study was conducted at Kihonda and SUA secondary schools among 253 randomly selected students. Data were collected using KAP questionnaire adapted from the FAO and analyzed using the Statistical Package for Social Science™ Version 20.

Results: Over 95% of the students have never tested their blood pressure and glucose, 34.4% have never measured body weight before the study. Majority (75.5%) understood that hypertension and diabetes can be prevented through managing diet and physical activity (19.2%) while 18.7% mentioned engaging in physical activities only. Furthermore, 64.4% and 69.2% did not know the management of diabetes and hypertension respectively. About 42% and 32% did not know any good and food at risk for a hypertension respectively. Also, 38.3% and 35.2% did not know the appropriate and risk foods for diabetes patients respectively. Knowledge on prevention of diabetes and hypertension was associated with age AOR 1.421(95%CI: 1.015-1.989) p=0.040, education level AOR (1.118, 95%CI: 1.039-3.355) p< 0.01 and studying science subjects AOR 1.65 (95%CI: 1.306-1.692) p=0.028.

Conclusion: Majority of students do not actively monitor their health and have limited knowledge on prevention and management of diabetes and hypertension creating a need for improving knowledge as a window of opportunity for prevention of non-communicable diseases.

Keywords: Student's Knowledge, Diabetes and Hypertension, Prevention and Management

Background

Non-communicable diseases such as cardiovascular, diabetes, cancer and chronic respiratory diseases contribute to about a third of all deaths in the country and are a source of an increasing disability in Tanzania.[1] The burden of diabetes and cardiovascular diseases is high with the prevalence of hypertension been estimated to be around 26% and that of hyperglycemic disorders (pre-diabetes and diabetes) being high at all ages with estimated prevalence of around 20%. [2] Likewise, the prevalence of elevated blood pressure was reported to be 18.3 %, of which 10.5% had prehypertension and hypertension being 7.8% among 6 to 16 years children in Mwanza, Tanzania.[3] This prevalence was obtained using adopted reference values for normal (BP<120/80 mmHg); prehypertension (BP 120/80 mmHg - 130/80 mmHg) and hypertension (BP ≥131/80 mmHg). [4] Another study done in Dar es Salaam reported that the proportion of children aged 6–17 years with elevated blood pressure was 15.2% whereby pre-hypertension was 4.4% and hypertension 10.8% using a classification of elevated blood pressure as average systolic or diastolic blood pressure ≥ 90th percentile for age, gender and height. [5]

The prevalence of diabetes among children less than 15 years of age ranged from 10.1 to 11.9 per 100,000 children and the annual incidence of 1.8-1.9/100,000 children, with the highest incidence at the age of 10-14 years.[6] The morbidity and mortality project found that NCDs in Hai-Kilimanjaro, Dar es Salaam and Morogoro are the leading cause of death whereby the prevalence of NCDs and injuries between the ages of 6-15 years was 34% in Hai-Kilimanjaro, 34% in Dar es Salaam and 29% in Morogoro. [7] Although NCDs are reported to be the leading cause of death in these regions, awareness on diabetes was reported to be as low as 35.6% [8] implying that most of the individuals are not well informed about these conditions. This creates a need for improving knowledge on different aspects related to NCDs to prevent their occurrence and/or associated complications. Additionally, lack of knowledge about healthy and unhealthy behaviour's highlights the importance of carrying out regular surveillance for risk factors, and initiating programs for prevention amongst adolescents. [9]

The school provides good opportunities for health promotion among children making a significant contribution to improve health and behaviors of the children and adolescents to reduce the burden of diet related non-communicable diseases (DR-NCDs) in the future.[10] However, the level of knowledge among school students may be relatively low which creates a need to promote supportive environment and strategic delivery of health education to target risk behaviours

among adolescents. More efforts are needed to increase knowledge with a great focus on risk factors and prevention.[11] Most lifestyle-related risk factors for DR-NCDs are laid down during childhood period [12] hence; actions are needed to prevent the establishment of risky behaviours from the early years of life by focusing on adolescents' knowledge about chronic diseases and healthy preventive practices. A review was conducted in Tanzania and found that there are some initiatives to control the burden of NCDs in the country but there is a need to focus more on primary prevention.[13] Therefore, this study assessed knowledge on primary prevention and management of NCDs especially type 2 diabetes mellitus and hypertension among secondary school children as the bases for designing an implementable program to improve their knowledge on primary prevention rather than waiting for treatment.

Materials and Methods

The study was conducted in Morogoro region due to a high rate of death and disabilities caused by NCDs and injuries among children.[7] The region was reported to be among the areas with high prevalence (29%) after Dar es Salaam (34%) and Kilimanjaro (34%). In addition, the high level of overweight/obesity was reported in Morogoro (37.5%) among women of reproductive age [14], which may have also partly contribute to the increasing rates of overweight and obesity in children which are risk factors for diabetes and hypertension. The study involved school children from 10-17years in day schools to get the reality of children practices at school and home environments. In this case, two secondary schools were purposively selected due to the presence of school clubs. School clubs are considered as extracurricular activities conducted outside of the class sessions to provide students with a chance to gain and share experiences on different things. The students were classified into clusters based on their classes. Thereafter, form 1 to 3 classes were purposively selected to participate in the study due to fact that the study has a part of intervention that is supposed to be conducted after the baseline data hence, need students who are not finalist for continuity. Individual participants were randomly selected from the three clusters to get a total of 253 students to participate in the study. All students whose parents and themselves consented after getting enough information on the study procedures were included to the study.

Sample Size Determination

Eligible students were randomly selected from forms 1 to 3 until a total of 253 students was recruited for the study. This sample size was obtained using the formula for prevalence studies.[15]

$$n = [z2 * p * q]/d2$$

Where: n = desired sample size

Z = standard normal deviation set at 1.96 corresponding to 95% CI

q = 1.0 – p

d = degree of accuracy desired (0.05)

p= proportion of the target population with DR-NCDs

The proportion of the target population with DR-NCDs were represented by the prevalence of elevated blood pressure (that is p=18%) among primary school children with assumed response rate of 90%.[3,16] The prevalence of hypertension was used during sample size calculation as the study is dealing with NCDs specifically diabetes and hypertension.

Data Collection and Analysis

Demographic information of the participants was collected using a pre-tested questionnaire which included age, class level, sex, family history of diabetes and hypertension etc. Face-to-face interviews were conducted among Secondary school children from the selected schools using a pre-tested questionnaire to get their current level of knowledge and practices on primary prevention and management of type 2 diabetes and hypertension. Information collected included but not limited to students' knowledge on the existence of NCDs, risk factors, prevention and management of diabetes and hypertension, foods to promote and those to be avoided or reduced for hypertensive and diabetes patients. The common practices to prevent (dietary intakes, physical activities etc.), tendency of testing blood pressure and glucose levels were assessed using KAP questionnaire which included both closed- and open-ended questions adapted from FAO[17] and modified to suit the student's contexts.

The questionnaire was validated during pre-testing of the tools where changes were incorporated for improvements. The interpretation of knowledge depended on the scores obtained, that is, those who answered correctly were classified as having adequate knowledge and graded with a score of 1 for each question which was then converted to percent. Hence, knowledge was classified as been better with a score of greater or equal to 75% correct, good between the score

of 51% and 74% correct; average between 26% and 50% and poor knowledge less than or equal to 25%.[18] These scores were used as the bases for identifying knowledge gaps that need attention during the preparation of training program.

Data was cleaned, coded, entered and analysed using the Statistical Package for Social Science™ (SPSS™) Version 20. In this software, descriptive statistics such as frequencies, means and percentages were obtained for risk factors, demographic information and knowledge.

Associations among factors were obtained by binary logistic regression analysis involving univariate and multivariate analysis. The outcome, which was knowing the prevention for diabetes and/or hypertension, were dichotomized into two categories, which were either having or not having the knowledge on prevention of diabetes and/or hypertension. Multiple logistics regression by binary logistic was used to find associations of different factors with knowledge using stepwise backward elimination method to obtain crude and adjusted odd ratios for each factor that was associated with knowledge at $p < 0.05$.[19,20]

Results

Demographics Characteristics

The results showed that Kihonda Secondary had 117 (46.2%) of participants while SUA Secondary accounted for 136 (53.8%) of the participants. Of the 253 individuals, 129 (51.0%) were females. The participants' education levels shown that 99(39.1%) were studying Form 1 while 80 (31.6%) were in Form 2 and 74 (29.2%) in Form 3 class. A notable majority of students 183 (72.3%) were studying science subjects. Seven (2.8%) of the participants had ever used alcohol whereby only 2 (0.8%) of participants reported to have used it within the past 12 months. Regarding family medical history, 63 (24.9%) of students have a family history of diabetes while 8 (3.2%) were unsure. Similarly, 107 (42.3%) of students have a family history of hypertension while 13 (5.1%) were uncertain about their family history of hypertension (Table 1).

Table 1 Demographic Information of Participants (N=253)

Variables	Frequency	Percent
Kihonda Secondary	117	46.2
SUA Secondary	136	53.8

Sex		
Female	129	51.0
Male	124	49.0
Education level		
Form 1	99	39.1
Form 2	80	31.6
Form 3	74	29.2
Studying science subject		
Yes	183	72.3
No	70	27.7
Have ever used alcohol		
Yes	7	2.8
No	246	97.2
Used alcohol within 12 months		
Yes	2	.8
No	5	2.0
Family history of diabetes		
Yes	63	24.9
No	182	71.9
Don't Know	8	3.2
Family history of hypertension		
Yes	107	42.3
No	133	52.6
Don't Know	13	5.1

Health monitoring practices

The results shown that, only 9(3.6%) of the participants have ever undergone blood pressure test but none of them were confirmed having high blood pressure. Also, a very limited number of participants 3(1.2%) reported having tested their blood glucose levels before the study but they were all having normal levels. Weight monitoring shown that, 121(47.8%) measured their weight rarely and 87(34.4%) had never measured it.

Table 2 Monitoring body weight, blood glucose and pressure before the study

Variables	Frequency	Percent
Ever tested blood pressure (N=253)		
Yes	9	3.6

No	244	96.4
Confirmed with high blood pressure (N=9)		
No	9	3.6
Yes	0	0
Ever tested blood glucose (N=253)		
Yes	3	1.2
No	250	98.8
Confirmed with high blood glucose (N=3)		
No	3	1.2
Yes	0	0
Frequency of measuring body weight (N=253)		
Weekly	2	0.8
Monthly	43	17.0
Rarely	121	47.8
Never	87	34.4

Knowledge on prevention of type 2 diabetes mellitus and hypertension

The results show that 191(75.5%) of the students understood that hypertension and type 2 diabetes mellitus can be prevented. Among those who knew that the conditions can be prevented, 37(19.2%) mentioned the preventive measures to be eating well and doing physical activity while 26(18.7%) mentioned engaging in physical activities as the only preventive measure (Table 3).

Table 3 Knowledge on Prevention of NCDs (Type 2 Diabetes Mellitus and Hypertension)

Variables	Frequency	Percent
Can hypertension and type 2 diabetes be prevented (N=253)		
Yes	191	75.5
No	37	14.6
Don't Know	25	9.9
How to prevent hypertension and type 2 diabetes (191)		
Engaging in physical activities	36	18.8
Eating less sugar foods	26	13.6
Eating less fat foods	12	6.3
Eating less salt foods	1	0.5
Avoiding stress	15	7.9
Eating well and avoiding stress	3	1.6
Eat balanced diet	18	9.4
Eating low sugar, fat and salt foods	27	14.1
Eating low sugar foods and avoiding stress	5	2.6
Eating well and doing physical activity	37	19.4
Eating low fat and avoiding stress	3	1.6
Eating low fat and carbohydrate foods	3	1.6

Don't know	5	2.6

Student's knowledge on management of diabetes mellitus and hypertension

Over half of the students 163(64.4%) declared that they do not know how diabetes is managed and for those who declared to know the managements, majority 67(74.4%) mentioned diet control whereby low fat and sugar foods are concerned. In addition, 175 (69.2%) of the students did not know how to manage hypertension of which 31(39.7%) mentioned dietary management to be the main method for preventing hypertension followed by those who mentioned physical activities 23 (29.5%) and those who mentioned avoiding stress 20 (25.6%) as a management (Table 4).

Table 4 Knowledge on management of type 2 diabetes and hypertension

Variables	Frequency	Percent
Do you know how to manage type 2 diabetes mellitus (n=253)		
Yes	90	35.6
No	163	64.4
How is type 2 diabetes mellitus managed (n=90)		
Using medication	2	2.2
Dietary management (low fat and sugar foods)	67	74.4
Physical activities	13	14.4
Medication and physical activity	1	1.1
Avoiding stress	1	1.1
Dietary management (low fat and sugar food) and physical activity	6	6.7
Know how to manage blood pressure (n=253)		
Yes	78	30.8
No	175	69.2
How is blood pressure managed (n=78)		
Dietary management (Low fat and salt foods)	31	39.7
Physical activities	23	29.5
Dietary management and Physical activity	2	2.6
Less fat and salt	1	1.3
Avoid stress	20	25.6
Eating garlic	1	1.3

Knowledge on foods to promote and limit for hypertensive patients

Knowledge on diets for hypertensive patients indicated that 41.9% (n=106) of the students do not know any foods that are good for a hypertensive patient while 20.2% (n=51) mentioned good foods for hypertension to be fruits and vegetables. When the same students were asked on the foods that are not good for hypertension patient, 32% (n=81) did not know the foods completely while 32% (n=81) mentioned high fat foods to be bad for hypertensive individuals (Table 5).

Table 5 Knowledge on diets for hypertension (n=253)

Variables	Frequency	Percent
Foods to be promoted for hypertensive patients		
Cereals	20	7.9
Roots/tubers	5	2.0
Vegetables and/or fruits	51	20.2
Less fatty foods	5	2.0
fish and fish products	2	0.8
milk and milk products	1	0.4
Less sugar foods	32	12.6
Unrefined foods	3	1.2
Low sugar or fatty and salt foods	8	3.2
Honey	1	0.4
High protein food	8	3.2
Proteins, Vitamins, Carbohydrate	11	4.3
Don't know	106	41.9
Foods that expose individuals at risk for hypertension		
Cereals	12	4.7
Roots/tubers	3	1.2
Vegetables and/or fruits	12	4.7
Less fat foods	1	0.4
Meat and meet products	5	2.0
Refined, too salty and sugar foods	7	2.8
High sugar foods	7	2.8
High fat foods	81	32.0
High sugar foods	1	0.4
High salt and fat foods	27	10.7
High salt	13	5.1
High protein food	3	1.2
Don't know	81	32.0

Knowledge on foods to promote and limit for diabetes mellitus patients

About 38.3% (n=97) of the students did not know appropriate foods for diabetes patients while 30% (n=76) mentioned the appropriate foods to be vegetables and fruits. On the other hand, 35.2% (n= 89) of the students do not know foods to be limited to diabetes patients while 40.3% (n=102) mentioned high sugar foods (Table 6).

Table 6 Knowledge on diets for diabetes mellitus patients

Variables	Frequency	Percent
Foods to be promoted for diabetes patients to consume		

Cereals	18	7.1
Roots/tubers	5	2.0
Vegetables and/or fruits	76	30.0
Low fat foods	11	4.3
Meat and meet products	2	0.8
fish and fish products	6	2.4
milk and milk products	1	0.4
Milk, fruits, vegetables, legumes	2	0.8
Low salt foods	4	1.6
Low sugar and salt foods	4	1.6
Low sugar and fat	2	0.8
Protein, Vitamin, carbohydrates	13	5.1
Low fat and salt	5	2.0
Vegetables /fruits and carbohydrates	7	2.8
Don't know	97	38.3
Foods which are limited for diabetes patient to consume		
Cereals	11	4.3
Roots/tubers	4	1.6
Vegetables and/or fruits	10	4.0
High fat foods	9	3.6
Meat and meet products	3	1.2
fish and fish products	1	0.4
Too much fat and salt	5	2.0
High sugar foods	102	40.3
High energy foods (Refined foods)	4	1.6
High sugar foods or honey	2	0.8
High salt and sugar	4	1.6
Too much fat and sugar	9	3.6
Don't know	89	35.2

Factors Associated with Students' knowledge on Prevention of Hypertension and Type 2 Diabetes Mellitus

Multivariate analysis results shown that students' knowledge on prevention of diabetes and hypertension was increasing with age AOR 1.421(95%CI: 1.015-1.989) at p=0.040, level of education AOR (1.118, 95%CI: 1.039-3.355) at p< 0.01 and studying science subjects AOR 1.65 (95%CI: 1.306-1.692) at p= 0.028 even after adjusted for family history of diabetes and hypertension, sources of knowledge on health and sex of the student (Table 7).

Table 7 Factors associated with students' knowledge on prevention of hypertension and Diabetes

Variables	COR	95%CI	P-Value	AOR	95%CI	P-value
Education level						
Form 1	Reference					
Form 2	2.936	1.21 – 7.128	0.017	0.449	0.202-0.999	0.057
Form 3	4.125	1.77 – 9.59	0.001	1.118	1.039-3.355	0.000
Age of students (continuous)	1.907	1.713-2.153	0.005	1.421	1.015-1.989	0.040
Studying science subject						
No	Reference					
Yes	1.133	1.591-2.171	0.046	1.65	1.306-1.692	0.028
Family history of diabetes and/or hypertension						
No	Reference					
Yes	0.900	0.175-4.626	0.900	NA	NA	NA

Note: The model involved other factors but were not significant including students school, sources of health information and sex hence they were removed in the model. The association is significant at P<0.05, NA=means not applicable in the multivariate analysis, CI= means confidence interval, AOR=Means adjusted Odd ratio and COR=Means crude odd ratio.

Discussion

The current study aimed at assessing knowledge on prevention and management of hypertension and diabetes among Secondary school children in Morogoro Municipality. This acts as the basis for designing implementable education program for improving knowledge among school children as a window of opportunity for primary prevention of type 2 diabetes mellitus and hypertension in adulthood.

Knowledge on Prevention of Type 2 Diabetes Mellitus and Hypertension

Majority of students knew that type 2 diabetes and hypertension can be prevented; however, there was low knowledge on the specific preventive measures whereby many students mentioned single action as a preventive measure. This is due to fact that when students were asked about the specific preventive measures for type 2 diabetes and hypertension, very few mentioned that both eating well and doing physical activities can prevent the conditions while others mentioned engaging in physical activities as the sole preventive measure for diabetes and hypertension. This implies that students do not know that causes of hypertension and diabetes are multidimensional in a way that they cannot be prevented by addressing a single cause. Unadike and Chineye [21] in Nigeria support these findings that knowledge and awareness of certain aspects of diabetes among adolescents is poor; however, adequate health education had a positive impact on their

knowledge and awareness. This creates a need for more health education to be offered to increase knowledge on all aspects of diabetes. Another similar study revealed that nearly about three-fourths of participants were not aware that diabetes can be controlled through a combination of physical exercise, regulated diet intake and recommended medication.[22] Another similar study was done in Tanzania among adults and found that majority of the participants know that diabetes can be prevented however, they mentioned either engaging in physical activities or eating balanced diet to be the determinants but majority could not consider the multisectoral nature of the problems.[23]

Knowledge on prevention of diabetes and hypertension was increasing with age, level of education and studying science subjects even after adjusted for family history of diabetes and hypertension, sources of knowledge on health and sex of the students. Age of the students and level of education were determinants of knowledge on prevention of the conditions due to fact that as a student grows there is an increase in the level of education leading to more experience on the conditions as one may have got information from different sources. It may also be due to fact that these students are grown enough to be conscious to their health status. At the Form three level, the students may have been informed of the conditions in some science subjects such as Biology as it was also found that taking science subjects is associated with knowledge on prevention of type 2 diabetes and hypertension. A study done among adolescents aged 18 years old and above in Malaysia supports the current findings that knowledge and practice regarding hypertension were associated with age but not with other socio-demographic characteristics studied.[24] A similar study done in Sri-Lanka among school adolescents aged 13–17 years supports this study that a good knowledge about NCDs was associated with studying in a science stream. [9] It is also reported in Nepal that a higher grade of study was an independent predictor of a student's knowledge and good attitude with regards to different aspects of diabetes and hypertension.[25]

As the results and other findings reveal that studying science subject is influencing knowledge on prevention of diabetes, hypertension and NCDs generally, there is a possibility of leaving behind many students who are not studying science subjects. Hence, there is a need to develop a suitable strategy that accommodates majority of the students in acquiring knowledge on prevention of the conditions regardless of their study subjects.

Knowledge on appropriate diets for hypertension and type 2 diabetes

Specifically, the study revealed that a significant portion of the surveyed students have limited knowledge on the suitable foods for type 2 diabetes and hypertensive patients, with only a few mentioning vegetables and fruits as appropriate options. This low level of knowledge regarding dietary management for type 2 diabetes and hypertension among secondary school students has significant implications on prevention and management of the conditions.[26,27] One notable consequence is the potential inability of these students to effectively make appropriate dietary choices.[28] Given that dietary modifications play a crucial role in the management and prevention of these chronic conditions [29], the absence of proper guidance regarding food selection can hinder students' ability to make informed decisions about their health.[30] To address this gap in knowledge and ensuring that students are equipped with enough dietary knowledge to provide appropriate dietary intake advice to individuals with type 2 diabetes and hypertension, targeted educational interventions may be necessary. [31] These interventions could include incorporating nutrition education into school curricula or implementing workshops and seminars specifically focused on healthy eating habits for prevention of these conditions. By enhancing students' understanding of the relationship between diet and chronic disease management, can empower them to offer valuable guidance and contribute to improved health outcomes within their communities.[32] Furthermore, it is essential for policymakers and educators to recognize the importance of early intervention in promoting healthy lifestyle behaviors among adolescents. By instilling knowledge about proper nutrition and disease prevention during adolescence, individuals can develop lifelong habits that support their overall health and well-being.[33] Therefore, investments in comprehensive health education programs that address not only dietary considerations but also other aspects of chronic disease prevention and management are warranted.

Student's knowledge on management of type 2 diabetes mellitus and hypertension

Over half of the students declared that they do not know how type 2 diabetes mellitus and hypertension are managed. For those who declared to know, majority mentioned the management to be diet control whereby low fat and sugar foods are concerned followed by those who declared that physical activity is a main method on preventing the conditions with few adding avoiding/reducing stress as the way of managing the conditions especially hypertension. This

shows how students are lacking the pressing information on management of NCDs as they mentioned a single strategy as the sole way of managing without considering that management of the conditions need multisectoral approach as they have multiple causes as well. Knowledge on management of hypertension and diabetes among students who are expected to be the near future adults is very crucial as they may be living with these patients at their homes but not able to advise them accordingly while the community expects the educated individuals to be their reputable sources of information. Another similar study was done in Tanzania however, it was a community based focusing on adults which found that half of the respondents did not know how to manage diabetes while those who declared to know, mentioned diet as the only management strategy and very few mentioned physical activities alone.[23]

Health Monitoring Practices

The current study revealed that students have no tendency of monitoring their health status as majority have never measured their blood glucose levels and pressure as well as body weight which is rarely measured or not done completely by most of the students. Lack of health status monitoring indicates poor self-care practices which may limit individuals from practicing some preventive measures including physical activities, diet control, weight control, and other life styles. Childhood practices determine the health status of an individual in adulthood. Literature reveals that some NCDs develop slowly and among them is hypertension which develops slowly and its pathogenesis begins in childhood.[34] As it has been reported that a large number of adults who suffer from hypertension worldwide, had high blood pressure since childhood and any child who develops high blood pressure during childhood have a great risk of developing hypertension in adulthood.[34, 35] Hence, knowledge and skills on monitoring and controlling of blood pressure during childhood is vital.[36] Additionally, cardiovascular and metabolic diseases in adulthood have been reported to originate during childhood therefore, frequent monitoring of the health status is very important for early detection of negative changes. In addition, about 97% of the participants had never voluntarily checked for hypertension. Similarly, 97.6% of the participants did not know if they had T2DM or not which may be attributed by limited health monitoring. This is stressed by the same study that 98% of the participants had not voluntarily checked their blood glucose level.[37]

Conclusion and Recommendations

Conclusively, there was low knowledge with regards to primary preventive and management of hypertension and diabetes among students. This was revealed in failure to understand the multidimensional nature of the conditions which made majority of them to think that prevention and management of the conditions can be done using a single factor and not in combinations. The low knowledge was also revealed in failure of most of the students to understand the foods that need to be promoted and those which need to be limited for the person with hypertension and diabetes. However, the level of knowledge was significantly influenced by age, level of study and studying science subject. Hence, there is a need for developing an education program that can accommodate majority of the students to acquire the knowledge without interrupting their daily curricula activities. This will provide equal opportunities for all students to get the knowledge on prevention of hypertension and diabetes for their own consumption and for their families and their community at large.

Ethical Approval

The study was approved by the Tanzanian National Institute of Medical Research (NIMR) with reference number NIMR/HQ/R.8a/VOL.IX/4239. The permission for conducting an interview was provided by the respective administrators in Morogoro Municipal.

Consent

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

Abbreviations

NCDs: Non-communicable diseases
DR-NCDs : Diet-related non-communicable diseases
BP: Blood pressure
T2DM: Type 2 diabetes mellitus

Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

Disclaimer (Artificial intelligence)
Author(s) hereby declare that no generative AI technologies such as large language models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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