



Nutritional Knowledge and Practice among Patients with Non-communicable Diseases Attending Mbale Regional Referral Hospital in Eastern Uganda: A Cross Sectional Study

Esther Nambala¹, Jayne Byakika-Tusiime² and Yahaya Gavamukulya^{3*}

¹*Department of Community and Public Health, Faculty of Health Sciences, Busitema University, P.O. Box 1460, Mbale, Uganda.*

²*Department of Public Health, School of Health Sciences, Soroti University, P.O. Box 211, Soroti, Uganda.*

³*Department of Biochemistry and Molecular Biology, Faculty of Health Sciences, Busitema University, P.O. Box 1460, Mbale, Uganda.*

Authors' contributions

This work was collaboratively carried out. Author EN participated in the conception, execution, data analysis, work review and manuscript writing. Authors JBT and YG contributed equally towards the work and supported the supervision, data validation, manuscript writing and revision and reading and confirmation of the final manuscript. All authors were involved in the manuscript preparation and approval of the final version submitted.

Article Information

DOI: 10.9734/IJTDH/2019/v37i130154

Editor(s):

(1) Dr. Giuseppe Murdaca, Clinical Immunology Unit, Department of Internal Medicine, University of Genoa, Italy.

Reviewers:

(1) Godstime Isi Irabor, Saba University School of Medicine, The Netherlands.

(2) N. S. Kannan, Sri Manakula Vinayagar Medical College Hospital, India.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/49620>

Original Research Article

Received 10 April 2019

Accepted 26 June 2019

Published 03 July 2019

ABSTRACT

Aim: To determine nutritional knowledge and practices among patients with Non-Communicable Diseases (NCD) attending Mbale Regional Referral hospital, in Eastern Uganda.

Study Design: A mixed methods cross sectional study design was used.

Place and Duration of Study: Mbale Regional Referral Hospital among patients attending the NCD clinic from May to July 2017.

Methodology: Two hundred sixty clients were recruited for the study. Quantitative data was

*Corresponding author: Email: gavayahya@yahoo.com;

collected through structured administered questionnaires. Quantitative data was analyzed at univariate, bivariate and multivariate levels. Chi square test and logistic regression were used to determine the association between nutrition knowledge and utilization. Qualitative data was coded first and summarized according to the themes.

Results: The mean age of the respondents was 55 years (SD= 14) and hospital was the main source of nutrition information (n=156, 60%). Most respondents (n=156, 60%) had a high level of nutrition knowledge, however only 48.8% (n=127) were utilizing the knowledge. Those who had attained secondary level of education were 2.308 more likely to utilize the nutrition knowledge than those who had never studied *P* value of .028, 95CI (1.093-4.874). Those with tertiary education were even 9.261 times more likely to utilize the knowledge *P* value <.001 95CI (2.721-31.522). Those with adequate knowledge were about 1.6 times most likely to utilize the nutrition knowledge compared to those with inadequate knowledge level, however, with the adjusted odd ratio of 1.573 at 95% CI (0.923- 2.868) the results were not statistically significant (*P* value .098).

Conclusion: NCD patients had adequate knowledge, with a few of them utilizing the knowledge. High education level was associated with better nutrition practices.

Keywords: Non-communicable diseases; nutritional knowledge; diabetes mellitus; hypertension; Eastern Uganda.

ABBREVIATIONS

CNCDs : Chronic non-Communicable Diseases.
MRRH : Mbale Regional Referral Hospital.
MRRH-REC : Mbale Regional Referral Hospital. Research and Ethics Committee.
NCDs : Non-communicable diseases.
MOH : Ministry of Health.
SDGs : Sustainable Development Goals.

1. INTRODUCTION

Chronic non-communicable diseases (CNCDs) are defined as diseases or conditions which affect individuals over an extended period of time (years, decades or even an entire lifetime) and for which there are no known causative agents that are transmitted from one affected individual to another [1]. The main characteristic features of CNCDs include their chronic and insidious clinical manifestations and the resulting long-term disability. A report by the World Health Organization (2008) indicates that the global disease profile is changing at an astonishing rate, with deaths and disabilities from NCDs exceeding those from infectious diseases and nutritional deficiencies. The Sustainable Development Goals (SDGs) emphasize nutrition and NCDs. One of the 169 targets of the SDGs is to reduce premature deaths from NCDs by one third. Nutrition-related NCDs (NR-NCDs) stand at the intersection between malnutrition and NCDs [2].

The four (4) main types of non-communicable diseases are cardiovascular diseases, cancers,

chronic respiratory diseases and diabetes. In the developing countries, non-communicable diseases are also emerging as a major public health concern [3]. The major causes of morbidity and disability in the developing countries have shifted from a predominance of nutritional deficiencies and infectious diseases to non-communicable diseases [3]. Approximately 75% of the total global individual non-communicable disease cases were recorded in developing countries, especially in sub-Saharan Africa [4].

In the past 10 years , the prevalence of NCDs has rapidly increased and currently NCDs are the among the first 25 main causes of Disability Adjusted Life Years DALYs in Uganda [5]. A survey demonstrated that NCDs and their risk factors are factors are a public health problem in Uganda. The study further revealed that there is a high prevalence of hypertension in the Ugandan population and that the majority of the people with hypertension are not aware of their hypertension status [5]. According HMIS surveillance, the NCD burden in Uganda is on the rise. In the past 10 years the prevalence of NCDs has rapidly increased and currently NCDs are among the first 25 main causes of DALYS in Uganda [5].

A survey demonstrated that NCDs and their risk factors are a public health problem in Uganda. The study further revealed that there is a high prevalence of hypertension in the Ugandan population and that the majority of people with hypertension are not aware of their hypertension status. Furthermore, the survey demonstrated

that approximately one in ten have a more than 3 risk factors for NCDs and that a similar number of persons aged 40-69 years have a 10-year Cardio Vascular Disease (CVD) risk $\geq 30\%$, or with existing CVD. This is a relatively young age group, which still forms the core of the workforce and vital economic investment very difficult to replace [5].

Nutrition is a major modifiable determinant of non-communicable diseases, with scientific evidence supporting the view that alterations in diet and activity have effects on health throughout life. Non-communicable diseases are linked to high consumption of energy dense foods, made of animal origin and of foods processed or prepared with added fat, sugar and salt [6]. One of the clusters in the Uganda minimum health care package is prevention, management and control of non-communicable diseases. However, emphasis is more on prevention of malnutrition among mothers and children. And there seems to be little on specific nutrition information in regard to preventing NCDs and also a Challenge in the implementation and enforcement of the policies [7]. The purpose of this study was to determine nutritional knowledge and practices among patients with Non-Communicable Diseases (NCD) attending Mbale Regional Referral hospital, in Eastern Uganda so as to help bridge the above.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted at the NCD clinic in Mbale Regional Referral Hospital (MRRH) located in the outpatient department. MRRH is the referral hospital for the districts of Budaka, Bukwo, Butaleja, Manafwa, Mbale, Pallisa, Sironko and Tororo in Eastern Uganda. The hospital also serves patients from outside the hospital's catchment area. The hospital is one of the thirteen Regional Referral Hospitals in Uganda with a bed capacity of 355. The hospital conducts special clinics for NCD patients twice a week. On average 120 patients are seen on each clinic day. The most commonly seen NCDs at the clinic are hypertension, diabetes mellitus and cardiovascular diseases.

2.2 Target Population

The target population was Patients attending NCD clinics in Uganda. The study population

comprised patients attending the NCD clinic at Mbale regional referral hospital during the study period. All patients above 18 years of age were included in the study. Patients were excluded if they did not consent to participate in the study and if they were very ill. The study population for the qualitative study was health workers working in the NCD clinic in Mbale Regional Referral hospital. We excluded health workers who didn't consent to participate in the study.

2.3 Study Design

A mixed methods study using a cross sectional study design for the quantitative component and in-depth interviews for the qualitative component was employed.

2.4 Sampling Strategy

A consecutive sampling technique was used. Study participants were identified and recruited as they came for their clinic at the triage desk. Participants who met the criteria and consented were recruited into the study. Purposive sampling was employed for the health workers that participated in the qualitative study. The qualitative study comprised health workers working at the NCD clinic.

2.5 Data Collection

Quantitative data was collected using a standardized questionnaire [8] administered by trained research assistants who were selected from Mbale Regional Referral Hospital. Four research assistants were taken through a 2 days training on the questionnaire, how to interpret the different questions and how to administer the questionnaire.

To evaluate the understandability and the applicability of the instruments one week prior to the main field work, a pre-test was done on 10% of the sample size at the NCD clinic of Mbale RRH. Following the analysis of the pretest study data, ambiguous or unclear questions were rephrased to make it more understandable.

To ensure accuracy, completeness and consistency of data, the research assistants checked for completeness and accuracy before they could interview the next person and also the principal investigator checked the questionnaires to ensure completeness and accuracy. Where they were inaccurate and incomplete the research assistants were sent back to participants to complete the interviews.

2.6 Data Management

After collection, data were entered into the computer using Epi Data software Version 3.1 from where it was exported to STATA Version 14 for analysis. Before analysis data were coded, value labels were defined, edited and data manipulations were done. For example age was transformed from continuous to categorical. And the principal investigator did the exploratory analysis to check for denominator consistency. Data security was ensured by having passwords the personal computers to ensure that no person accessed the data without permission. The questionnaires after data entry were arranged and kept in a safe place and data was stored on different hard discs.

2.7 Data Analysis

Univariate analysis was used to summarize socio economic and demographic characteristics and was presented in tables. For the continuous

variable, the mean, standard deviation, frequencies and percentages were used.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Socio-demographic characteristics of participants

As shown in Table 1, majority of the participants (n=157, 60.4%) were female. Most of the participants were in the age group of 35-59 (n=138, 53.04%). The mean age was 55 years and a standard deviation of 14. the youngest patient was 19 years and the oldest was 90 years One hundred eighteen (45.4%) had attained primary level of education. Most of the respondents (n=125, 48%) were earning below 50000ugx (less than 15 US dollars where by 1 USD=3750 UGX). Most of the respondents were Protestants by religion (n=110, 42.3%).

Table 1. Distribution of demographic and socio-economic characteristics of participants

Socio-demographic characteristic	Frequency n (N = 260)	Percent
Sex		
Male	103	39.6
Female	157	60.4
Age group		
19-34	24	9.2
35-59	138	53.1
60-90	98	37.7
Average income		
<50000	125	48.1
50001-100000	67	25.8
100001-250000	26	10.0
250001-500000	30	11.5
>500000	12	4.6
Religion		
Pentecostal	11	4.2
Protestant	110	42.3
Catholic	64	24.6
Moslem	69	26.5
Seventh Day	3	1.2
Others	3	1.2
Marital status		
Married	184	70.77
Single	17	6.54
Widow	48	18.46
Divorced	11	4.23
Education level		
Primary	118	45.4
Secondary	59	22.7
Tertiary	36	13.9
Never Studied	47	18.1

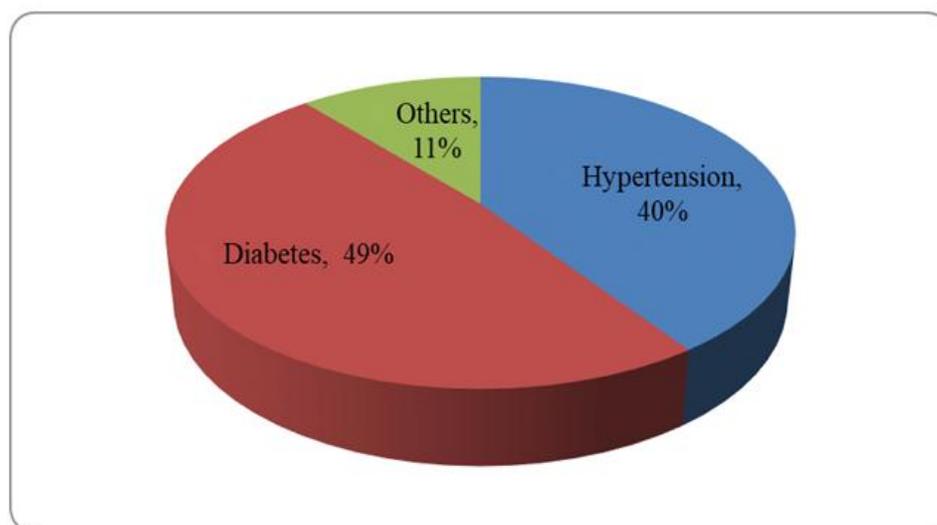


Fig. 1. The distribution of non communicable diseases among patients attending Mbale regional referral hospital

Hypertension and diabetes were the most common NCDs among patients attending the clinic at 40% (n=105,) and 49% (n=126) respectively.

More females 60 (57.1%) had hypertension as compared to the 45 (42.9%) male, 79 (62.7%) female had diabetes mellitus whereas only 47 (37.3%) male had diabetes.

From Table 3, one hundred fifty-six (60%) patients had high nutrition knowledge level where high knowledge level was defined as all those

patients who passed 5 and more questions on knowledge.

As shown in Table 4, only (n=127, 48.8%) utilized nutrition knowledge in the management of their condition.

As shown in Table 5, knowledge utilization was more among those with high level of knowledge 89 (70.1%). There was statistical significance between patients' nutrition knowledge and utilization with a *P*-value of .001.

Table 2. Sex distribution among NCD patients attending MRRH

NCD type	Sex		Total
	Male N(%)	Female N(%)	
Hypertension	45 (42.9)	60 (57.1)	105 (100)
Diabetes	47 (37.3)	79 (62.7)	126 (100)
Others	11 (37.9)	18 (62.1)	29 (100)

Table 3. Level of nutrition knowledge among NCD patients

Level of nutrition knowledge	Frequency (N=260)	Percentage (%)
Inadequate knowledge	104	40
Adequate knowledge	156	60

Table 4. Proportion of NCD patients attending MRRH that utilize nutrition knowledge in management of their condition

	n (N=260)	Percentage (%)
Utilized nutrition knowledge	127	48.8
Did not utilize nutrition knowledge	133	51.2

Table 5. Association between patient nutrition knowledge and its utilization

Patient nutrition knowledge	Utilization of nutrition knowledge		P-value(chi-square)
	No	Yes	
Level of knowledge of patients on nutrition at Mbale regional referral hospital			.001(10.51)
Low Knowledge	66(49.6)	38(29.9)	
High knowledge	67(50.4)	89(70.1)	

From Table 6 below, after adjusting for confounders, those with adequate nutrition knowledge level were 1.573 times more likely to utilize the nutrition knowledge CI (0.923-2.682) however there was no statistical significance with a *P* value .098. Those who had attained secondary level of education were 2.308 more likely to utilize the nutrition knowledge than those who had never studied *P* value of .028, 95CI (1.093-4.874). Those with tertiary education were even 9.261 times more likely to utilize the knowledge *P* value < .001, 95CI (2.721-31.522).

Only 36% of those who received the nutrition information from hospital had received it at the last clinic visit.

3.2 Discussion

This study had more female than male respondents (60.4% versus 39.6%). These findings are similar to other studies in Uganda that show that females have better health seeking behavior [9]. Also, MRRH being a

government hospital probably the men seek for treatment elsewhere for example in private hospitals since they can afford the treatment because they control the funds in most homes.

Most of the NCD patients were in the age groups of 35 to 59 and 60 to 90 years (53.1% and 37.7 % respectively). Our findings corroborate those from Miranda's study that noted that NCDs cause more than half of deaths in adults aged 15-59 in all regions except south Asia and sub-Saharan Africa. In this study very few patients were younger than 35 years (n=24, 9.2%), [3]. Research has shown that NCDs affect all age groups and regions and are often associated with older age groups. The age groups of 19-34 and 35-59 are age groups that can afford junk foods, consume alcohol and thus their lifestyle exposes them to develop these diseases, above 60 years the main risk factor is age. These findings are also in line with Tawa's study which revealed that increasing age is a factor significantly associated with the development of risk factors for NCDs [10]. Currently all age groups are at risk of

Table 6. Factors associated with nutrition knowledge utilization among NCD patients from multivariable logistic regression

Factors	AOR (95% CI)	P-value
Sex		
Female	1.129(0.677-1.881)	.64
Age group		
35-59 years	0.559(0.284-1.101)	.09
60-90 years	0.510(0.269-0.969)	.04
Average income of respondents		
50001-100000	0.791(0.409-1.531)	.49
1000001-250000	0.466(0.173-1.249)	.13
2500001-500000	0.764(0.249-2.336)	.64
>500000	1.081(0.182-6.429)	.93
Education level		
Secondary	2.308(1.093-4.874)	.028
Tertiary	9.261(2.721-31.522)	< .001
Never studied	0.825(0.406-1.678)	.596
Patients' Knowledge on nutrition		
Adequate knowledge	1.573(0.923-2.682)	.098

Note: COR=Crude Odd Ratio, AOR=Adjusted Odd Ratio and demographics were used cofounders

Table 7. Different sources of nutrition information and association between provision of nutrition information and its utilization

Source of nutrition information	n (N=260)	Percentage (%)
Family	10	4
Friends	9	3.5
Newspaper	24	9
Hospital	156	60
Internet	8	3
TV	10	4
Radio	26	10
Other sources	17	6.5

Most respondents at 60% (n=156) received their information from hospital

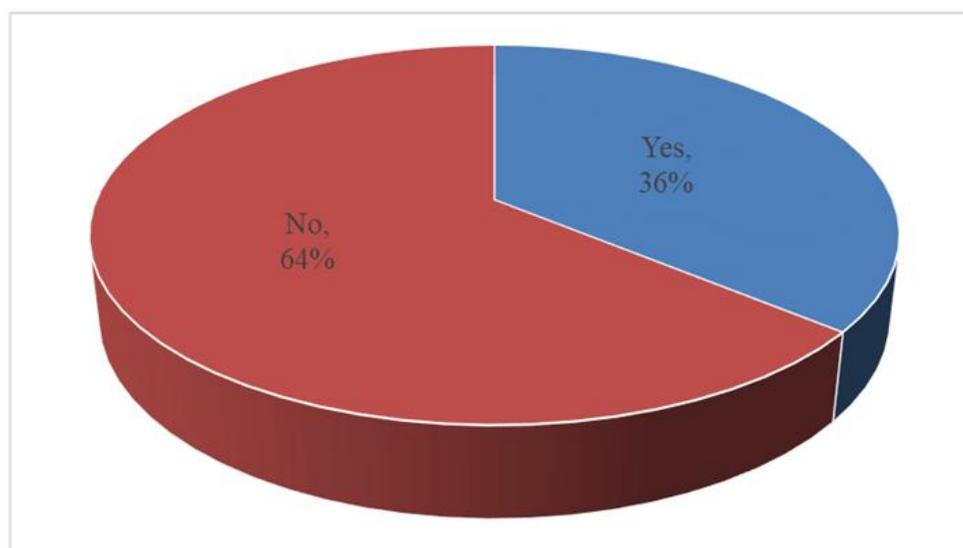


Fig. 2. Proportion of NCD patients that received nutrition information from their health provider at the last clinic visit (N=156)

developing NCDs. However, the elderly and those that have access to junk foods, exposed to smoking and alcohol stand a higher risk. Shakkour in his study also noted that there were many factors that affect a person's eating choices: age, gender, income levels and education level may affect a person's eating habits [11].

Most of the respondents were below the poverty line earning less than 1 Dollar per day. The national poverty line in Uganda ranges from US Dollars 0.88 to US Dollars 1.04 daily. Uganda's poverty lines are much lower so the poverty line in Uganda is perhaps too low [12]. Both the rich and poor are exposed to unhealthy exposed to harmful products, such as tobacco, or unhealthy dietary utilization, and have limited access to health services [13]. As noted, the rapid rise in NCDs is predicted to impede poverty reduction initiatives in low-income countries, particularly by

increasing household costs associated with health care. Poverty is the major underlying factor for hypertension and cardiovascular diseases [14]. This corroborated WHO's report that human social and economic diets predisposing them to NCDs. There is a close link between poverty and NCDs. This finding concurs with the WHO's assertion that vulnerable and socially disadvantaged people get sicker and die sooner than people of higher social positions, especially because they are at greater risk of being consequences of NCDs are felt by all countries but are particularly devastating in poor and vulnerable populations [15].

Only 37% (n=95) of the respondents had attained secondary school level of education and above. Low level of education is one of the factors seen to be significantly associated with the development of risk factors for non-communicable diseases [10]. Those who had

attained secondary level of education were 2.308 more likely to utilize the nutrition knowledge than those who had never studied, *P* value of .028, 95CI (1.093-4.874). Those with tertiary education were even 9.261 times more likely to utilize the knowledge *P* value <.001, 95CI (2.721-31.522). Education is an important factor affecting use of nutrition information and higher education levels also enhance patients' ability to understand and interpret any nutrition information given to them. Mbale RRH is a public facility where services are free and thus its mainly the lower-class people who utilize the services at this hospital. Those with better education and probably a better pay probably seek treatment in private facilities where services are better since they can afford the treatment. The higher the level of education the more access there is to the nutrition information.

It was earlier on revealed that among the supermarket customers, highly educated participants held more positive attitude towards lower consumption frequencies of energy dense foods. The study also showed that nutrition knowledge was higher among participants who had attended tertiary institution and those with health/nutritional related qualification [16]. As seen in one of the studies, nutrition behavior is significantly and positively related to use of food labels and BMI. Though nutrition information on food labels is helpful, it is only applicable among those who can read [17].

NCD clinic attends to about 120 patients per clinic day and most of them were diabetic and hypertensive as seen from the results. This is in line with the statement that cardiovascular disease and diabetes are among the NCDs that account for around 80% of the total burden of chronic disease mortality in developing countries [18]. Having more of hypertension and Diabetes mellitus cases can be explained by the fact that high consumption of calories will first cause diabetes mellitus which in turn will predispose one to other NCDs. Distribution of sex per the most common NCDs showed there were more females with hypertension 60 (57.1%) and diabetes 79 (62.7%) as compared to their male counterparts. Our findings concur with Tawa's study which showed that more females have more risk factors to develop NCDs compared to their male counterparts [10].

Majority of the respondents (n=156, 60%) were found to have adequate nutrition knowledge, however not all of them knew that their condition

was diet related. These risk factors are preventable but most patients were ignorant about this which is not good. Boutayeb noted that urgent preventive actions are needed and efficient strategies should deal seriously with risk factors like smoking, alcohol, physical inactivity and western diet [19]. These findings Our findings differ from a study conducted in Lilongwe-Malawi among pregnant women which showed that there was limited health and nutrition knowledge among them either due to the limited content of the information that the nurses provided or due to their own limited health and nutrition literacy skills [20].

Educational interventions can be high-yielding, low-cost approach to combat NCDs and yet lack of awareness can have negative impact on health outcomes as has been documented in other studies and therefore it is a major barrier to control [21]. Thus, something has to be done about increasing awareness on nutrition among these patients. Lack of knowledge about healthy and unhealthy behaviors highlighted the importance of carrying out regular surveillance for NCD risk factors, and initiating programs for prevention of NCDs among adolescents [22].

Not all the NCD patients were utilizing the nutrition knowledge much as the knowledge scale showed that most of them had high level of nutrition knowledge, only (n=127, 51.2%) were utilizing the knowledge. Muthike's study indicated that there was significant positive association between nutritional knowledge of the patients and their dietary utilizations especially for foods like fruits and vegetables and protein [23]. A study indicated that patients who proactively seek nutrition information from various sources have improved nutrition [11,23].

Patients who had adequate knowledge were about 1.6 times most likely to utilize the nutrition knowledge compared to those with inadequate knowledge level. AOR = 1.573 95% CI (0.923-2.868) Policy makers need to pay attention to programs that will help deal with these risk factors like nutrition education and counseling. This means that there is need to empower the patients with knowledge because there is evidence that those with the knowledge utilize it. NCD patient possession of adequate knowledge is 1.65 times most likely to utilize nutrition knowledge (AOR = 1.65, 95CI 0.954-2.868).

These findings are similar to findings from another study which indicated that there was

significant positive association between nutritional knowledge of the patients and their dietary utilizations especially for foods like fruits and vegetables and protein [23]. Nani in her study on relationship between nutrition knowledge and food intake of college students also recommended that future nutrition interventions to improve dietary quality in college students should focus on improving nutrition knowledge. Nutrition knowledge among graduates has been found to be poor; not a single graduate identified with good knowledge [24,25].

Few of the respondents who said have access to nutrition information had received information from a health service provider in the last clinic visit 56 patients (36%). There is need to integrate nutrition education in the management of NCDs since it's an essential component in improving dietary habits and food choices, in order to reverse the under nutrition and improve the nutritional diagnosis. Previous studies have shown a positive impact of nutrition education on the nutritional status of older adults has been confirmed by many studies [26]. There was no adequate personnel to offer nutrition education and yet nutrition education increases nutrition knowledge, nutrition attitudes, and dietary habits among patients significantly [27]. Increased nutrition knowledge among health workers improves on the management of malnourished patients [28].

Only 36% of those receiving nutrition information had received nutrition information from a health worker at their last clinic visit. In sub-Saharan Africa there is an increasing need to leverage available health care workers to provide nutrition care for NCDs. This will therefore pave the way towards task shifting of NCD care to nurses to help relieve the significant healthcare gap in developing countries [29].

A study by Peck in Tanzania showed that most outpatient services for NCDs in are provided at hospitals, despite present policies stating that health centers and dispensaries should provide such services [29]. This explains the overwhelming numbers at the NCD clinic in Mbale RRH. Even when the lower facilities have the capacity to handle the NCDs, they don't do so, they instead refer the cases to RRH yet some of the patients are stable and they could be handled at the lower facilities. Results from in-depth interviews revealed that health workers were aware that nutrition therapy in combination with medication reduces the severity of the NCD

condition. In Tanzania, front-line health-care workers (such as non-medical-doctor clinicians and nurses) didn't have knowledge and experience of NCDs [29]. This was not different from the Mbale RRH NCD clinic where it was mainly the nurses, medical student interneers and clinical officers managing these patients. The senior medical officers and physicians visit the clinic once in a while. And thus, not only are the health workers inadequate in knowledge but they also lack the time to give the nutrition information.

Mowe noted that the importance of nutrition education and training for healthcare professionals must not be overlooked, because the lack of nutrition knowledge among them has been reported as the most common cause for inadequate nutritional care [30]. There is need to increase the nutritional knowledge of healthcare professionals since it has been demonstrated to improve the management of malnourished patients [28].

The country needs to design non-communicable disease programmes with focus on disease prevention and management as well as awareness activities in urban and rural settings at community level. Major efforts are needed to strengthen health services for the prevention, early detection and treatment of chronic diseases [21,31].

4. CONCLUSION

This study found a high nutrition knowledge level among patients with Non-Communicable Diseases with few of them utilizing the knowledge. This study also showed a significant association between high nutrition knowledge level and its utilization among Non-Communicable Diseases. Therefore, more nutrition education programmes targeting NCD patients should be designed in order as a strategy in improving their treatment outcomes.

CONSENT

Written consent was obtained from patients' study participants. Confidentiality of the information was assured and privacy of each respondent was maintained throughout the data collection process. Confidentiality of the information was assured and privacy of each respondent was maintained throughout data collection. Codes were used on the questionnaires instead of names and the filled questionnaires were kept under lock and key.

ETHICAL APPROVAL

The study was approved by the Busitema University Faculty of Health Sciences Higher Degrees and Research Committee as well as the Mbale Regional Referral Hospital Research and Ethics Committee (Ref No. MRRH-REC-IN-COM 078/217).

ACKNOWLEDGEMENTS

This work forms part of EN's Masters of Public Health dissertation at Faculty of Health Sciences, Busitema University, Uganda. The authors therefore wish to thank colleagues and all staff members in the Department of Public Health at the Faculty for their tireless contribution towards the completion of this project. We further thank the patents, research assistants and the technical staff at MRRH who rendered their support during the data collection period. Finally, we thank the HEIST Fund for the research grant that enabled successful completion of this work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Daar AS, Singer PA, Leah Persad D, Pramming SK, Matthews DR, Beaglehole R, et al. Grand challenges in chronic non-communicable diseases. *Nature*. 2007;450:494–6. DOI:10.1038/450494a
2. World Health Organization. Global action plan for the prevention and control of NCDs; 2013–2020. World Health Organization; 2015.
3. Miranda JJ, Kinra S, Casas JP, Smith GD, Ebrahim S. Non-Communicable diseases in low and middle-income countries: Context, determinants and health policy. *Trop Med Int Heal*. 2009;13:1225–34. DOI:10.1111/j.1365-3156.2008.02116.x
4. Bloom DE, Cafiero E, Jané-Llopis E, Abrahams-Gessel S, Reddy Bloom L, Fathima S, et al. The Global Economic Burden of Noncommunicable Diseases; 2011. DOI:10.1192/bjp.184.5.393
5. Kumar Aryal K, Mehata S, Neupane S, Vaidya A, Dhimal M, Dhakal P, et al. The burden and determinants of non communicable diseases risk factors in Nepal: Findings from a Nationwide STEPS Survey; 2015. DOI:10.1371/journal.pone.0134834.
6. Steyn NP, Mann J, Bennett PH, Temple N, Zimmet P, Tuomilehto J, et al. Diet, nutrition and the prevention of type 2 diabetes. *Public Health Nutr*. 2004;7:147–65. DOI:10.1079/PHN2003586.
7. Uganda Ministry of Health. The Second National Health Policy, July 2010. Promoting People's Health to Enhance Socio-Economic Development - Uganda. Kampala, Uganda; 2010.
8. Nambala E, Byakika-Tusiime J, Gavamukulya Y. Data for nutritional knowledge and practice among patients with non-communicable diseases attending Mbale Regional Referral Hospital in Eastern Uganda. *Mendeley Data*. 2019;1. DOI:10.17632/y5kdzmzj7b.1
9. Schwartz JI, Guwatudde D, Nugent R, Kiiza CM. Looking at non-communicable diseases in Uganda through a local lens: An analysis using locally derived data. *Global Health* 2014;10:1–9. DOI:10.1186/s12992-014-0077-5.
10. Tawa N, Newlove AA, Hannah AA, World Bank. The impact of lifestyle variables and dietary patterns on non-communicable diseases. *J Chem Biol Phys Sci*. 2013;3:264–75.
11. Shakkour E. The relationship between nutritional knowledge and application. Liberty University; 2007.
12. World Bank Group. Poverty Assessment Report; 2016.
13. World Health Organization. Global status report on noncommunicable diseases; 2010. Venice, Italy; 2011.
14. Seedat Y. Why is control of hypertension in sub-Saharan Africa poor? *Cardiovasc J Afr* 2015;26:193–5. DOI:10.5830/CVJA-2015-065
15. World Health Organization. Global status report on noncommunicable diseases 2014. Geneva, Switzerland; 2014.
16. Mwana EK. Consumer attitude, knowledge and use of nutrition information in relation to energy dense foods: A case study of Dar-es-salaam, Tanzania. University of Ghent; 2013.
17. Qamar Z. Dietary behaviours and nutrition knowledge among South Asians. Texas A&M University; 2011.
18. Abegunde DO, Mathers CD, Adam T,

- Mathers C. The burden and costs of chronic diseases in low-income and middle-income countries. *Lancet*. 2007;370:1929–38. DOI:10.1016/S0140-6736(07)61696-1.
19. Boutayeb A, Boutayeb S. The burden of non communicable diseases in developing countries. *Int J Equity Health*. 2005;4:1–8. DOI:10.1186/1475-9276-4-2.
20. Mvula N. Investigating health and nutrition messages given to pregnant women at Bwaila hospital in Lilongwe. Akershus University College; 2010.
21. Kavishe B, Biraro S, Baisley K, Vanobberghen F, Kapiga S, Munderi P, et al. High prevalence of hypertension and of risk factors for non-communicable diseases (NCDs): A population based cross-sectional survey of NCDS and HIV infection in Northwestern Tanzania and Southern Uganda. *BMC Med*. 2015;13. DOI:10.1186/s12916-015-0357-9.
22. Gamage AU, Jayawardana PL. Knowledge of non-communicable diseases and practices related to healthy lifestyles among adolescents, in state schools of a selected educational division in Sri Lanka. *BMC Public Health*. 2017;18:1–9. DOI:10.1186/s12889-017-4622-z
23. Muthike CW. Nutritional knowledge in association with dietary practices of cancer patients: A case study of Kenyatta National Hospital cancer treatment center, Nairobi. University of Nairobi; 2013.
24. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014;384:766–81. DOI:10.1016/S0140-6736(14)60460-8
25. Nani MO. Relationship between nutrition knowledge and food intake of college students. Kent State University; 2016.
26. Wunderlich S. The importance of appropriate nutrition assessment and nutrition education for older adults. *J Nutr Food Sci*. 2013;3.
27. Brendah Cheptikai Ndiema. Status of utilization of nutrition information on processed meat products in making purchasing decisions among consumers in Nakuru town, Kenya. Kenyatta University; 2017.
28. Kennelly. An evaluation of a community dietetics intervention on the management of malnutrition for healthcare professionals. *J Hum Nutr Diet*. 2010;23:567–74. DOI:10.1111/j.1365-277X.2010.01111.x.
29. Peck R, Mghamba J, Vanobberghen F, Kavishe B, Rugarabamu V, Smeeth L, et al. Preparedness of Tanzanian health facilities for outpatient primary care of hypertension and diabetes: A cross-sectional survey. *Lancet Glob Heal*. 2014;2. DOI:10.1016/S2214-109X(14)70033-6.
30. Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unosson M, Rothenberg E, et al. Insufficient nutritional knowledge among health care workers? *Clin Nutr*. 2008;27:196–202. DOI:10.1016/j.clnu.2007.10.014.
31. Mishra SR, Neupane D, Bhandari PM, Khanal V, Kallestrup P. Burgeoning burden of non-communicable diseases in Nepal: a scoping review. *Global Health* 2015;11. DOI:10.1186/s12992-015-0119-7.

© 2019 Nambala et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle3.com/review-history/49620>