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Original Research Article

Determinants of nutrition status among adolescents in selected secondary schools in rural Kanungu district Uganda

Natukunda Angella*, John Kariuki, Joseph Juma Nyamai

School of Public Health, Mount Kenya University, Uganda

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***Correspondence:**
Dr. Natukunda Angella,
E-mail: natukundaangellah@gmail.com

ABSTRACT

Background: Adolescence, the time between childhood and adulthood, often considered relatively healthy stage of life remain highly vulnerable to malnutrition. One crucial first step in reducing teenage malnutrition may be to attend to their dietary needs. This study examined the determinants of nutrition status among secondary school adolescents in the Kanungu district, Uganda.
Methods: A school-based cross-sectional analytical study was employed in this study where both qualitative and quantitative methods of data collection were used for triangulation purposes. A multi-stage random sampling method was applied to obtain the study respondents. The Cochran formula was utilized to obtain 340 study respondents.
Results: More than a quarter (37.1%) of the study respondents had malnutrition. Households that were father-headed (OR=1.8,95%CI=1.03-3.20), having met the recommended number of meal frequency (OR=2, 95%CI=1.13-3.44), being aware of healthy dietary habits (OR=2.2, 95%CI=0.29-0.71), having a small household size of 1-4 members (OR=4.3, 95%CI=2.38-7.83) and being employed (OR=2.1, 95%CI=1.17-3.93) increased the odds of having a normal nutrition status while having a primary level of education (OR=3.6, 95%CI=0.11-0.68), having an inadequate dietary score (OR=2.1,95%CI=0.28-0.76) reduced the odds of having a normal nutrition status.
Conclusions: From this study, malnutrition was a public health concern. Households that were father-headed, being aware of healthy dietary habits, having a small household size of 1-4 members, and being employed increased the odds of having a normal nutrition status while having a primary level of education, having an inadequate dietary score reduced the odds of having a normal nutrition status.

Keywords: Adolescent, Malnutrition and nutrition status, Schools

INTRODUCTION

Adolescents are not only the largest in Uganda but also in the world (about 1.8 billion). These young people are presently threatened with a double burden of malnutrition most especially in LMIC (low and middle income countries). A study showed that there is an urgency for interventions and policies to prioritize these high-risk groups and future capital for every country.[1] The adolescence period is a critical stage of life that not only offers a window of opportunity to end the intergenerational cycle of malnutrition but also provides multiple benefits for both the present and future of one's adulthood and the next generation of children's health and well-being.[2]

The consequences of adolescent malnutrition range from premature mortality, physical sub-optimal health, impaired neuro-cognitive function, and low productivity.[3] A study showed mortality and morbidity increased 9 to 11 times in cases with severe malnutrition than in those with a good nutrition status.[4] Special attention needs to be paid to understanding the determinants of nutrition of school-aged adolescents so as to implement innovative school programs that improve adolescent nutrition.[5]

Malnutrition has been linked to 225,906 adolescent deaths and is one of the top 10 causes of mortality. About one out of 3 adolescents currently have a form of malnutrition globally. According to the Uganda nutrition survey, 13% of teenage girls, with little known about male adolescents.[3] Malnutrition trends among adolescents are rapidly growing. The UNAP (Uganda Nutrition Action Plan) also showed that malnutrition trends have increased especially among female adolescents and little is known about male adolescents.[6] More so data to inform policies and interventions is scanty, especially for school-aged adolescents.[7] Another study reported that 32.9% and 14.3% were wasted for boys and girls respectively.[8] With high levels of thinness among adolescent mothers increase the risk of maternal mortality rates.[6] In a study in sub-Saharan Tanzania, school-aged children including adolescents were found malnourished with 25% stunted, 11% thin and 5% were overweight or obese with 11.7% underweight.[9,10] The continued less attention given to adolescent nutrition has caused a gradual increase in malnutrition trends with over 10% of adolescents in low- and middle-income countries are underweight.[14]

Malnutrition has several negative effects on a nation's health, including increased risk of illness and death, poor health outcomes for the next generation of children, and severe economic damage.[13] Therefore, an adequate and varied diet is necessary to support the growth spurt and normal pubertal development in adolescents due to their extensive physiological changes (rapid growth changes during puberty, such as physical activity and lean tissue accretion) and social processes (cultural and gender norms, acceptable work types, free time activities, early marriages, and physical activities, changes in access to processed and unhealthy food markets, and deficiencies in the household food supply).[11] The need for a good nutrition status rises during adolescence, despite the fact that they receive less attention. The needs of young mothers and adolescents are not given enough priority in nutrition interventions, which primarily target children. However, when it comes to the main causes of morbidity and mortality among adolescents and adults nutrition continues to be the most important risk factor.[12]

There is a need to address the dietary concerns of this special group of young people but adolescent-specific data is scarce regarding school-going adolescents. Therefore, the purpose of this study was to collect data on the determinants that is to say factors influencing adolescents' nutritional status in secondary schools located in rural Uganda's Kanungu district. This data can be crucial in developing effective nutrition interventions targeted at obtaining a good nutrition status.

METHODS

Study design

A school-based cross-sectional analytical study was employed in this study where both qualitative and quantitative methods of data collection were used for triangulation purposes.

The semi-structured questionnaire was researcher-administered via KoBo collect toolbox and asked in English by trained research assistants to ensure a common understanding of the questions asked.

Study area

The study was carried out in Kanungu district a rural area that lies on the fringes of western East African Rift Valley. Kanungu district was purposively selected because few research studies done in such regions given its rural mountainous terrain nature and being far from the capital city 450km from Kampala which causes limitations in transport and a high cost of funds. Kanungu is situated in the southwest region of Uganda and hosts a population of 252,144. The district has a total of 45 secondary schools 25 of which are public secondary schools and the rest are government which hosts adolescents age group. There was little information on the determinants of nutrition status among student adolescents in the secondary schools of the Kanungu district which motivated the aim of the study.

Study period

The study took place from July 2023 to July 2024 for a span of one year from proposal writing to final thesis and results presentation.

Sampling technique

Of the 135 districts in Uganda, Kanungu district was purposively selected as it has the few research studies related to nutrition status in school-aged. Of the 45 secondary schools in Kanungu district, 30% was employed for purposes of representativeness whereby a 30 % calculation was done to obtain the exact number of schools needed to carry out the study.[15]

Out of these experts along with the district administration advised that 4 schools are purposively selected. Multi-stage sampling technique was employed whereby 92 students were randomly selected from each cluster, stratas composed of schools Simple random sampling was applied to select respondents from each stratum.

Sample size determination

This study used a Cochran formula due to the absence of data on the total population of adolescents in the Kanungu district. As a result, a sample size of 370 was obtained for this study.

Data collection

Quantitative data was collected through a research-administered semi-structured questionnaire composed of

4 sections that collected data on nutrition status, social-demographic and economic factors, dietary diversity score, and level of adolescent nutrition knowledge. For the intent of gathering qualitative data, an interview with key informants was carried out and a key informant guide was employed to obtain qualitative data.

Data analysis

Version 26 of SPSS was used to conduct quantitative analyses. Percentages and frequencies were employed in descriptive statistics. The degree of correlations was ascertained using binary logistic regression and the chi-square test for independence in inferential statistics. The threshold for statistical significance was set at $p \leq 0.05$ with 95% CI. For additional analysis, the bivariate analysis's significant variables were imported into binary logistic regression. Narrative analysis was applied to the qualitative data.

Ethical consideration

Ethical clearance was obtained firstly from the Mount Kenya University Institutional Scientific Ethics Review Committee and then TASO Research Ethics Committee was later approved by the Uganda National Council for Science and Technology before data collection. All ethical considerations were considered during and after the study. The head teachers of the selected secondary schools of Kanungu district examined the approvals issued by the research board and the official letter of collaboration from the chief administrative officer and issued a letter granting support to all the selected. Confidentiality, parental consent for minors, informed consent, assent and a right to withdraw with no penalties was assured.

RESULTS

Nutrition status of the study respondents

Of the 340 participating adolescents (male-201, female-139), the majority (62.9%) of the participating adolescents had a normal nutrition status while the rest (37.1%) had a form of malnutrition (<-3SD, <-2SD, <-31D and >+1SD, >+2SD). Most of the study participants (87.4%) had their MUAC above 18.5cm and (12.6%) were undernourished with a MUAC less than 18.5cm. Table 1 below provides a summary of the findings on the study's respondents' nutrition status.

Descriptive statistics on social demographic and economic factors

Table 2 below provides descriptive statistics on the social demographic and economic factors of the study respondents. The majority (59.1%) of the study respondents were males while the rest (40.9%) of the study participants were females. The majority (84.7%) of the study respondents were aged between 16-19 years while only a few (15.3%) of the study partakers were aged between 13-15 years. Concerning the education status of the guardians, only a few (13.8%) of the study respondents' guardians had attained a tertiary level of education while more than a quarter (34.4%) had attained a primary level of education. The majority (71.2%) of the study guardians were married while only a few (5.6%) reported being windowed. Close to half (62.6%) of the study partakers were employed while only a few (16.5%) were self-employed. More than half (57.9%) of the study respondents reported a household size of 1-4 members. Concerning the head of the household, most adolescents (75.3%) had a father as the head of the household. Lastly concerning the area of residence of the study partaker, more than half (58.5%) of the study respondents were from rural areas, while only a few (3.5%) were from urban areas.

Table 1: Nutrition status of the study respondents.

Independent variables	Categories	Frequency	Valid percentage
Nutrition status	Well-nourished	214	62.9
	Mal-nutrition	126	37.1
Malnutrition	Overweight	90	71.4
	Underweight	36	28.6
MUAC reading	<18.5	43	12.6
	>18.5	297	87.4

Table 2: Descriptive statistics on social demographic and economic factors.

Independent variables	Categories	Frequency	Valid percentage
Age	13-15	52	15.3
	16-19	288	84.7
Gender	Male	201	59.1
	Female	139	40.9
Guardian education level	Primary	117	34.4
	Secondary	95	27.9
	Vocational	81	23.8
	Tertiary	47	13.8
Guardian marital status	Single	79	23.2
	Married	242	71.2
	Window	19	5.6
Guardian occupation	Employed	213	62.6
	Self-employed	56	16.5
	Casual labour	71	20.9
Size of household	1-4	197	57.9
	5-8	60	17.6
	>8	83	24.4
Head of household	father	256	75.3
	mother	84	24.7
Area of residence	urban	12	3.5
	Peri-urban	129	37.9
	rural	199	58.5

Social demographic and economic factors associated with nutrition status

In the social demographic and economic factors associated with nutrition status, the following variables were found to be statistically significantly associated with the nutrition status of the study respondent. Guardian education level (X^2=10.034, df=3, p=0.01), study respondents' gender (X^2=9.214, df=3, p=0.002), Occupational status of the guardian (X^2=16.625, df=2, p≤0.001), household size (X^2=36.915, df=2, p≤0.001) and head of household (X^2=11.229, df=1, p=0.001) hence they were imported for binary logistic regression analysis. The nutrition status of the study respondents was not statistically associated with, the age of the study respondents (X^2=2.196, df=3, p=0.138), guardian marital status (X^2=1.348, df=2, p=0.51), and study respondent rea of residence (X^2=0.976, df=2, p*=0.615).

As indicated in Table 3 below, study partakers who had guardians with a primary level of education were 3.6 times less likely to have normal nutrition status. Study partakers whose guardians were employed were 2.1 times less likely to have malnutrition. Furthermore, study respondents with a household size of 1-4 were 4.3 times more likely to have a normal nutrition status as compared to households that had more than eight members.

These findings were contrary to the qualitative data where one of the key informants narrated that:

"Families, regardless of size, that have access to support systems, community programs, and resources may better navigate the challenges associated with providing a nutritious diet. Its mainly financial reasons. Support systems can provide assistance in areas such as healthcare access, nutritional education, for households with large families ……" (KII,1).

Lastly, households that had a father as the head of the household were 1.8 times to have adolescents with normal nutrition status as compared to female-headed households.

These findings were in agreement with the qualitative data where one of the key informants narrated that:

"Most adolescents are dependents and usually, fathers contribute to the overall access to resources, affecting the quality and quantity of food available to adolescents. Higher-income and stable employment can positively impact resource availability. Fathers guardians in our school usually pay school fees earlier than mother headed households which can be be correlated to ability to providing diverse healthy diets to the adolescents. Mother headed households in communities should be assisted in terms of income generating activities which in turn affects their nutrition status……" (KII,4).

Table 3: Logistic regression analysis on social demographic and economic factors influencing nutrition status.

		B	S.E.	Wald	df	Sig.	Exp (B)	95% CI for EXP (B)	
								Lower	Upper
Step 1a	Gender	0.179	0.257	0.484	1	0.487	1.196	0.723	1.978
	Female						ref		
	Education level			9.979	3	0.019			
	Primary	-1.284	0.461	7.762	1	0.005	3.6	0.112	0.683
	Secondary	-1.241	0.473	6.877	1	0.009	0.289	0.114	0.731
	Vocational	-0.703	0.483	2.118	1	0.146	0.495	0.192	1.276
	Tertiary						ref		
	Occupation			9.777	2	0.008			
	Employed	0.760	0.310	6.027	1	0.014	2.139	1.166	3.925
	Self-employed	1.267	0.431	8.632	1	0.113	3.550	1.525	8.265
	Casual labor						ref		
	Household-size			24.446	2	0.000			
	1-4	-1.462	0.304	23.115	1	0.000	4.313	2.377	7.827
	5-8	1.412	0.399	12.501	1	0.070	4.103	1.876	8.975
	>8						ref		
	Household head	-0.596	0.290	4.229	1	0.040	1.814	1.028	3.200
	mother						ref		
	Constant	-0.586	0.558	1.105	1	0.293	0.556		

Table 4: Binary logistic analysis between dietary diversity score and nutrition status.

		B	S.E.	Wald	df	Sig.	Exp(B)	95% CI for EXP (B)	
								Lower	Upper
Step 1[a]	Dietary diversity			9.217	2	0.010			
	Inadeqaute	-0.770	0.256	9.065	1	0.003	2.1	0.280	0.764
	Moderate	-0.431	0.358	1.445	1	0.229	0.650	0.322	1.312
	Adequate						ref		
	Meal frequency	0.677	0.285	5.624	1	0.018	1.967	1.125	3.441
	no						ref		
	Constant	0.286	0.284	1.010	1	0.315	1.331		

Table 5: Binary logistic analysis analysis between adolescent nutrition knowledge and nutrition status.

		B	S.E.	Wald	df	Sig.	Exp(B)	95% CI for EXP(B)	
								Lower	Upper
Step 1[a]	Dietary habits awareness	-0.797	0.234	11.591	1	0.001	2.2	0.285	0.713
	Constant	-0.056	0.256	0.048	1	0.826	0.945		

Association between dietary diversity score and nutrition status

Concerning the association between dietary diversity score and nutrition status. There was a significant statistical association when the chi-square test for independence was between dietary diversity and nutrition status (X^2=11.524, df=2, p=0.003) and meal frequency and nutrition status (X^2=8.011, df=1, p=0.005). Hence the two variables were imported for binary logistic regression analysis.

As indicated in Table 4 below, study participants who had met the required meal frequency were 1.9 to have a normal nutrition status. In addition, study respondents who had inadequate dietary diversity were 2.1 times more likely to have malnutrition.

These findings were in agreement with the qualitative data where one of the key informants narrated that:

"*The diet diversity is made possible because school students often pack fruits like avocado, which is also sold at the school canteen. Those who go home most families are able to afford vegetables such as cabbages. During vegetable seasons the school purchases vegetables such as cabbages and adds to the beans served at lunchtime. But this is a seasonal activity .....".* (KII,3).

Association between adolescent nutrition knowledge and nutrition status

Regarding the association between adolescent nutrition knowledge and nutrition status. There was a significant statistical association between awareness of healthy dietary habits and nutrition status (X^2=12.077, df=1, p=0.001) when the chi-square test for independence was done. As indicated in Table 5 below, study respondents who were aware of healthy dietary habits were 2.2 times more likely to have a normal nutrition status as compared to their counterparts.

These findings were in agreement with the qualitative data where one of the key informants narrated that:

"I would say the association between knowledge of healthy dietary habits and nutrition status is profound, as dietary choices directly impact the intake of essential nutrients, energy balance, and overall well-being. Choosing which food to eat is often governed by the dietary habits we attribute to being healthy. Though we have not concentrated much on including these in the curricula of the school, our canteens usually sell bananas and avocados because they are widely grown in the region." (KII,7).

DISCUSSION

From this research, more than half of the study respondents had normal nutrition status while more than a quarter had malnutrition. However, another study carried out in India recorded a higher prevalence rate (46%), while another study carried out in Ethiopia recorded a lower prevalence rate of 26.4%.[16,17] The difference in the prevalence of malnutrition could be linked to differences in sampling and finally different study areas. Study respondents who had guardians with a primary level of education were 3.6 times less likely to have normal nutrition status. Uneducated guardians may have limited nutrition knowledge, leading to challenges in understanding the dietary needs of adolescents during their critical growth and development stages. The findings from this study were in agreement with those of a study done in Zambia.[18] However, another study conducted in Ethiopia was contrary to these findings.[19]

Study participants whose guardians were employed were 2.1 times less likely to have malnutrition. Employed

guardians are more likely to provide a stable and secure food environment for adolescents, reducing the risk of food insecurity. Stable employment may contribute to consistent access to food, preventing periods of inadequate nutrition. The findings from this study were consistent with those of a study carried out in Ethiopia, but contrary to a study carried out in Somalia.[20,21] Furthermore, study respondents with a household size of 1-4 were 4.3 times more likely to have a normal nutrition status as compared to households that had more than eight members. In families with many members, there may be increased competition for food, and adolescents may face challenges in accessing sufficient portions of nutrient-dense meals. The findings from this study agreed with those of a study carried out in Uganda.[22]

Households that had a father as the head of the household were 1.8 times to have adolescents with normal nutrition status as compared to female-headed households. Fathers often serve as the primary financial provider for the family. Their income level and financial decisions influence the household's ability to afford nutritious food for adolescents. The study findings were in agreement with those of a study done in Ethiopia and Tunisia.[23,24] However, another study conducted in Rwanda was contrary to these outcomes.[25]

Study respondents who had inadequate dietary diversity were 2.1 times to have malnutrition. A diverse diet provides adolescents with a broad spectrum of essential nutrients, including vitamins, minerals, proteins, and carbohydrates. Consuming a variety of foods helps meet the specific nutritional needs required for growth, development, and overall well-being. Study findings were in harmony with those of a study carried out in Ghana where dietary diversity was associated with having a normal nutrition status.[26] Study partakers who had met the required meal frequency were 1.9 more likely to have a normal nutrition status. The relationship between meal frequency and nutrition status can influence various aspects of health and well-being. Regular meals contribute to a more even distribution of nutrient intake throughout the day, reducing the risk of nutrient deficiencies. Ensuring an adequate intake of essential nutrients supports overall health and growth. These findings were in agreement with two other studies carried out in Ethiopia and Somalia.[27,28]

Study respondents who were aware of healthy dietary habits were 2.2 times more likely to have a normal nutrition status as compared to their counterparts. Awareness of healthy dietary habits collectively contributes to positive nutrition outcomes, reduces the risk of nutrient deficiencies or excesses, and supports overall health and well-being. Study findings were in harmony with those of a study carried out in Uganda where awareness of healthy dietary habits was associated with good nutrition status.[26]

This study has few limitations. The schools were located in hard-to-reach areas, but this was overcome by using KoBo toolbox software to collect instead of plain paper for data collection to reduce on traveling load. The adolescents were prone to recall bias, especially on the foods consumed, this was overcome by using a 24-hour recall tool that made it easy for adolescents to remember. The study used a cross-sectional design which is limited to collecting data at a particular point in time but a mixed methods approach was used to further enrich the data. The schools selected might not be representative of the situation of adolescents in schools, therefore a multi-stage sampling technique was used to select the schools.

CONCLUSION

Concerning the nutrition status of the study respondents, More than a quarter (37.1%) of the study respondents had malnutrition which is a public health concern. Overweight was the prevalent form of malnutrition. Concerning, social demographic and economic factors associated with nutrition status; households that were father-headed, having a small household size of 1-4 members, and being employed increased the odds of having a normal nutrition status while having a primary level of education reduced the odds of having a normal nutrition status. Regarding the association between dietary diversity score and nutrition status; having met the recommended number of meal frequency increased the odds of having a normal nutrition status while having an inadequate dietary score increased the odds of having malnutrition. Lastly, regarding the association between nutrition knowledge and nutrition status; being aware of healthy dietary habits increased the odds of having a normal nutrition status.

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