Research article

Nutrition knowledge, dietary practices and nutritional status of non-academic staff at the Tamale campus of University for Development Studies

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A B S T R A C T

Background: The significance of nutritional status of individuals have economic effects on national development. Non-communicable diseases have shown to increase due to nutrition transition. This study aimed at determining the influence of nutrition knowledge and dietary practices on the nutritional status of non-academic staff at the Tamale campus of University for Development Studies (UDS). The question was, does poor nutrition knowledge result into poor dietary practices and nutritional status?
Methods: A cross-sectional study design was used to take data on 152 non-academic staff of UDS-Tamale campus comprising adults 18–59 years. Non-probability quota sampling was used to collect data. Data processing was done using SPSS version 21. Means and standard deviations were calculated for continuous variables whiles categorical variables were analysed using frequencies and percentages. Chi-square test was used to determine associations between categorical variables. A p-value < 0.05, in all analysis, was considered statistically significant. Semi-structured questionnaires were used in collecting data. Data was taken between May and June 2017.
Results: This study involved 93 males and 59 females' non-academic staff of UDS, Tamale campus. Majority (56%) had good nutrition knowledge of which most of the males had a high percentage compared to the females. Majority (81.6%) had a moderate dietary diversity. Only 15.1% had a higher dietary diversity and rest had low dietary diversity. Overweight and obesity together was 43.4%, though it was more prevalent among women. There was no statistically significant association between nutrition knowledge and overweight (p = 0.253) as well as between dietary diversity and nutritional status (p = 0.686).
Conclusion: The prevalence of good nutrition knowledge was high among non-academic staff of UDS Tamale campus and most of them also had a moderate dietary diversity. The prevalence of overweight/obesity was 43% and nutrition knowledge was not associated with nutritional status. No association was established between dietary diversity and nutritional status.

1. Introduction

Nutritional status of people has a significant effect on the national development. A lot of savings can be made to national development if the citizens are nutritionally sound. The knowledge people have about the consumption of food is very important and will regulate their food choices and habits. Therefore, it will have an impact on their nutritional health. Dietary practices of people will depend largely on their nutrition knowledge (NK).

Nutrition Knowledge (NK) may be referred to as the individual cognitive process in relation to information on food and nutrition that

has something to do with food choices and its success in preventing non-communicable diseases [1]. Individual NK may favour healthy food consumption and thus promotes changes in food habits that may reduce the risks of developing non-communicable diseases (NCDs). The world's chunk of mortalities are attributable to NCDs, and these NCDs could be reduced by lifestyle changes, physical activity and good nutrition [2].

Public education one way of improving the quality of life as far as health and nutrition are concerned. Although strong relationship between people's dietary knowledge and their dietary behavior has not yet been established, public awareness on nutrition and health could greatly help in avoiding the development of diseases including the NCDs [2].

Food insecurity or consumption of a diet that does not contain all the necessary nutrients for good nutritional status is an immediate cause of nutritional deficiencies. In addition, socio-cultural factors greatly influence what food people choose, how they prepare, how they combine types of food, and their eating habits [3]. Furthermore, some traditional food practices and taboos in some societies may contribute to nutritional deficiencies. This is due to the food combination methods, which is one of the primary factors that can affect digestion and absorption of various nutrients.

The effectiveness of policies in place and implemented against chronic NCDs begin to attract red flags as the prevalence and mortalities these NCDs continue to surge. Despite the complex nature of the causes of obesity and other chronic diseases, poor food choices and/or diet quality appear to be some of the clearly modifiable risk factors [4]. In most wealthy societies, the unhealthy food environment tend to worsen the rates of obesity and the risk of chronic NCDs [5].

Over the past three decades there has been a nutrition transition in sub-Sahara African countries characterized by over-nutrition (overweight and obesity) especially among adult women, coupled with the existing high levels of under-nutrition [6]. One serious consequence of this nutrition transition is the global increase in overweight and obesity [7]. World Health Organization (WHO) estimations globally indicates over 1.9 billion adults 18 years above are overweight and over 650 million are obese. The prevalence of obesity in the world has tripled since 1975 [8].

The trend in Ghana is not different as the prevalence of overweight and obesity among women has increased steadily from 25% in 2003 to 40% in 2014 and among men was 16% as at 2014 [9]. In addition, estimates show that 43% of adult Ghanaians are either overweight or obese [10]. These increment in overweight and obesity increases the risk of individuals to chronic non-communicable diseases such as Type II diabetes and cardiovascular diseases. Non-communicable diseases cause more deaths globally than all causes. Globally an estimated 42% of all deaths caused by non-communicable diseases occur by the age of 70 years, and 48% of the deaths occur in low and middle-income countries [6]. As indicated, the distribution of nutritional imbalance is moving from the more predominance of under-nutrition to over-nutrition in low and middle-income countries. This poses a lot of challenge to governments and other institutions interested in addressing malnutrition problems [10].

A number of factors are attributable to this double burden of malnutrition, such as, high socio-economic status, urban residence, gender and low dietary diversity [7]. Diet is one regulating factor of many chronic diseases. A diet characterized by the consumption of five food groups and by varied consumption within each group, is critical for reducing the risk of non-communicable diseases such as diabetes [11]. Several studies have tried establishing the relationship between NK and dietary intake. However, these attempts have been met with doubts due to the complex nature of the relationship between them [12]. The aim of this study was to assess the influence of (NK) and dietary practices on the nutritional status of non-academic staff of University for Development Studies, Tamale campus.

2. Methods

2.1. Study design

The study implored the use of analytical cross-sectional design. This design was cost effective and allowed for the measurement of many factors at the same time.

2.2. Study area

The study was carried out at the University for Development Studies-Tamale campus in Tamale Metropolis of Northern Ghana. Tamale campus is made up of two schools and a faculty namely; School of Medicine (SMS), School of Allied Health Sciences (SAHS) and Faculty of Education (FoE). It also hosts the central administration of the university. The Central Administration (CA) coordinates the general administrative functions of all the University four campuses, namely; Tamale, Nyankpala, Wa and Navrongo.

2.3. Ethics approval and consent to participate:

This study was approved by the Ethics Committee of University for Development Studies, Tamale, Ghana with approval number UDSEC/20181015/CMNST/253. Consent from participants was verbally taken before the data was taken. Participants were also assured of confidentially of information, there was no recording of names of participant on questionnaires to ensure confidentiality. There was no physically invasive process in the study. Study participants were recruited into the study after we have explained to them about what we sought to do, and they agreed to participate.

2.4. Study population

Adults, 18–59 years who met the inclusion criteria participated in this study. The study participants were drawn from the various Schools, Faculty offices, and units and offices of the central administration situated at the Tamale Campus. The study consisted of both males and females.

2.5. Sampling

2.5.1. Sample size determination

Using the formula for estimating sample size of single proportion with 95% confidence level and the prevalence of overweight and obesity among adult men and women in northern region which according to GDHS [9] is 10%, the sample used was 152.

2.5.2. Sampling procedure

Non-probability sampling method, specifically quota sampling was used. The Central Administration (CA), School of Medicine and Health Sciences (SMHS), School of Allied Health Sciences (SAHS), Faculty of Education (FOE), Graduate School and the Institute for Interdisciplinary Research and Consultancy Services (IIRaCS) were allocated percentages of the total sample size based on their relative number of staff. Participants were then selected from these groups randomly.

Out of a total of 552 non-academic staff, the CA constituted 426 (77.2%), SMHS, 81 (14.7%), SAHS 8 (1.4%), FoE, 21 (3.8%), Graduate School and IIRaCS 16 (2.9%).

Therefore, the CA, SMHS, SAHS, FoE, and Graduate School and IIRaCS were respectively allocated 77% representing 117, 14% representing 21, 2% representing 3, 4% representing 6 and 3% representing 5 non-academic staff of the total sample size.

2.6. Data collection

2.6.1. Data collection methods

Respondents were interviewed on their knowledge concerning nutrition and their dietary practices using questionnaires. Weight and height measurements were taken for anthropometric data of respondents to assess their nutritional status. Participants were also asked through the questionnaire, to indicate all foods and drinks that were consumed over the previous 24 h whether at home or outside the home. As part of data collection, a table was created with various food groups and participants indicated which foods they consumed. Data was taken between May and June 2017.

2.6.2. Data collection tools

Semi-structured questionnaires were used in collecting data. Components of the questionnaires included.

i. Section A: Socio-demographic characteristics of respondents
ii. Section B: Nutritional Knowledge of Respondents
iii. Section C: Dietary Assessment of Respondents
iv. Section E: Anthropometric data of respondents

2.6.3. Section A: socio-demographic characteristics

This included background information on respondents (age, sex, occupation, marital status etc.).

2.6.4. Section B: nutrition knowledge (NK)

Respondents were asked questions on the various food groups, their sources and their functions. A thread of 16 questions were asked to understand respondents' NK, which were adopted from a standard NK questionnaire by Parmenter and Wardle [5]. According to Parmenter and Wardle [5] nutrition knowledge questionnaire has high internal consistency (Cronbach's alpha = 0.70 ± 0.97) and the test-retest reliability above 0.7. Construct validity was reported that Nutrition experts scored significantly better than computer experts [F(1167) = 200.5, P < 0.001], Answers given by the respondents were used in determining their level of NK. Based on the responses given by respondents, it was categorized into poor, fair and good NK, depending on their score.

2.6.5. Section C: dietary diversity

Information on dietary intake were obtained using the Food and Agriculture Organization (FAO) guidelines for measuring household and individual dietary diversity, which was modified to suit the foods available in Ghana. This questionnaire which was adopted from FAO [13] predicts how adequate nutrient intake differ in various places and categories of people.

Participants were asked to indicate all foods and drinks that were consumed over the previous 24 h whether at home or outside the home. A tabular representation was made with the 14 food groups which respondents were asked to indicate.

2.6.6. Section D: anthropometric measurements

Weight and height of respondents were measured by trained interviewers using a Seca electronic portable scale and a wall-mounted infantometer. Weight was measured to the nearest 0.1 kg using an electric portable scale and height was measured to the nearest 0.1 cm using a vertical wall-mounted infantometer. BMI was computed as weight (kg) divided by the squared of height in meters (m), and the WHO cut-offs were used to classify the respondents.

To ensure the accuracy of the results gotten from the anthropometric measurement, measures were put in place to mitigate possible barriers. Some of the mitigating measures included: no heavy clothing during weight measurement, taking off shoes and all other forms of footwear amongst others.

2.7. Data analysis

Data was entered and analysed using Statistical Package for Social Sciences (SPSS) version 21. The means and standard deviation were calculated for continuous variables (examples; age, height, weight). The categorical variables (sex, level of education or level of knowledge) were analysed using frequencies and percentages. Frequencies and cross tabulations were calculated in relation to relevant characteristics. The dependent variables were under weight, normal, and overweight/obesity, whiles the independent variables were NK and dietary diversity (low and high dietary diversity) scores. Chi-square test was used to determine associations between categorical variables. A p-value of <0.05 was considered statistically significant.

2.7.1. Nutrition knowledge (NK)

Level of NK of adults were based on scores obtained after answering the questions under the NK section of the questionnaire. Each response

attracted a mark. Interpretation of scores obtained for NK is represented in the Table 1 below.

2.7.2. Dietary diversity

Dietary diversity was measured by Dietary Diversity Score (DDS) based on the respondents' 24-hour dietary recall. Dietary diversity for adult food consumption score was based on 14 food groups consumed in the past 24-hour [13]. Foods were categorized into 14 groups based on FAO recommendations as follows;

i. Cereals
ii. White Tubers and root
iii. Dark green leafy vegetables
iv. Vitamin A rich vegetables and tubers
v. Vitamin A rich fruits
vi. Other fruits and vegetables
vii. Organ meat
viii. Flesh meat
ix. Eggs
x. Fish and other sea foods
xi. Legumes, nuts and seeds
xii. Milk and milk product
xiii. Oil and fats
xiv. Spices, condiments and beverages

Commonly consumed foods were incorporated into each food group. The response categories were 'Yes' if at least one food items in a group were consumed which attracted a score of one (1) point, and 'No' if no food item was consumed in a group, attracting a score of zero (0) point. Dietary Diversity Score (DDS) was obtained by summing the total number of food and food item consumed on each food group separately. The total score ranged from 0 – 14. DDS was used to classify adults as having low dietary diversity if they had DDS less than or equal to 4, moderate diversity if DDS is 5–9 and high diversity if DDS is 10–14. Mean scores were calculated for each of the food groups.

2.7.3. Nutritional status

Nutritional status was determined by anthropometric measures, using body mass index. Body mass index (BMI) was computed as weight (Kg) divided by the square of height (m^2), and WHO cut-offs for BMI were used to classify the nutritional status of respondents are in Table 2.

3. Results

In total 152 questionnaires were administered. There were no missing data because the authors made follow-ups until a 100% was achieved.

3.1. Descriptive data

This study involved 93 males and 59 females making a total of 152 of non-academic staff of University for Development Studies, Tamale campus. The Central Administration were 77% representing 117, the School of Medicine and Health Sciences were 14% representing 21, School of Allied Health Sciences were 2% representing 3, Faculty of Education were 4% representing 6, the Graduate School together with the Institute for Interdisciplinary Research and Consultancy Services were 3% representing 5 of the total sample size.

3.2. Nutrition knowledge (NK) scores

The results represent the NK scores of respondents. This study showed majority (55.9%) of the respondents had a good NK whiles just a few (4.6%) had poor NK with the rest (39.5%) having fair knowledge (Table 3).

Table 1. Nutrition knowledge (NK) scores and description.

NK score	Description
0–5	Poor knowledge
6–11	Fair knowledge
12–16	Good knowledge

Table 2. BMI categories.

Body Mass Index (BMI)	Nutritional status
<18.5 kg/m^2	Underweight
18.5–24.9 kg/m^2	Normal
25.0–29.9 kg/m^2	Overweight
≥30 kg/m^2	Obese

Table 3. Nutrition knowledge (NK) scores.

NK score	Description	Frequency	Percentage (%)
0–5	Poor	7	4.6
6–11	Fair	60	39.5
12–16	Good	85	55.9
Total		152	100.0

3.3. Dietary Diversity Scores (DDS)

The mean dietary diversity score was 7.6 ± 1.8. Majority (81.6%) of the respondents had moderate Dietary Diversity Score, 15.1% had high Dietary Diversity Score while just a few 3.3% recorded low Dietary Diversity Scores (Table 4).

3.4. Nutritional status of the respondents

Majority (53.3%) of the respondents had normal weights and overweight and obese were 27% and 16.4% respectively. The study revealed that the prevalence of overweight and obesity together was 43.4% among non-academic staff of UDS, Tamale campus (Table 5).

3.5. Association between nutrition knowledge (NK) and nutritional status

We tried to find the association between NK and nutritional status of non-academic staff. The study showed that NK was not significantly associated with nutritional status ($X^2_{(1)} = 7.800$, p = 0.253) though most of respondents (31.1%) had normal weight with good nutritional status (Table 6).

3.6. Association between dietary diversity and nutritional status

From this study, no statistically significant association was observed between dietary diversity and nutritional status. Most of respondents (43.0%) had a moderate dietary diversity and a normal weight (Table 7).

Table 4. Dietary diversity scores (DDS).

DDS	Description	Frequency	Percentage (%)
0–4	Low DDS	5	3.3
5–9	Moderate DDS	124	81.6
10–14	High DDS	23	15.1
Total		152	100.0

3.7. Association between dietary diversity and Nutrition Knowledge (NK)

Association between NK and dietary diversity showed no statistically significant association (Table 8).

4. Discussion

4.1. Nutrition knowledge (NK)

This study revealed that, majority (55.9%) had a good NK with only a few (4.6%) having poor NK. The rest had a fair NK. More men (36.9%) from the study had a good NK than women (19.1%). Contrary to this findings, Spronk et al. [1] reported that NK is higher in women than in men. This variability of findings could be due the different study types. Spronk et al. [1] had their findings from a systematic review of different studies whilst the current study was a cross-sectional study. The study revealed that NK was significantly associated with educational level (p = 0.005). Generally, increase in educational level was associated with increase NK. This is in line with other studies which reported that NK is influenced by educational level [1].

4.2. Dietary diversity

Majority (81.6%) of the participants recorded a moderate dietary diversity. This is contrary to the study by Akinlua et al. [14] among undergraduate students which observed that most participants had a poor dietary diversity score. This moderate diversity could be attributed to the employment status of our respondents. They are able to diversify their diet as they have a regular source of income. The mean Dietary Diversity Score (DDS) from the study was 7.6 ± 1.8. This is higher compared with other studies by Jayawardena et al. [15] which recorded 6.35 ± 1.55 among adults and Kiboi et al. [16] which recorded 6.84 ± 1.46 among pregnant women. This difference in the mean may be as a result of employment status and the educational levels among our participants. This could also be due the difference in the locations. As recorded, half (50%) of the respondents had a higher education. This is in line with the other studies indicating that educational level influences dietary diversity [16, 17]. This is because as one educational level increases their knowledge about food choices increases and they tend to diversify their diet.

4.3. Nutritional status

This study revealed that majority (53.3%) of the participants had a normal Body Mass Index (BMI) dominated by men (39.5%) leaving women with 13.8%. Prevalence of overweight and obesity was found to be 43.4% among respondents. This result is consistent with a study by Ofori-Asenso et al. [10] which found that among Ghanaians about 43% of adults are either overweight or obese. This higher prevalence of overweight and obesity could be attributed to the nutrition transition that Ghana is undergoing as reported by Ofori-Asenso et al. [10].

The GDHS [9] reported a 16% and 40% prevalence of overweight and obesity among men and women respectively. However, this study found a 19.1% among men and 23.7% among women. This shows a similar trend among men and women non-academic staff in UDS – Tamale campus. Similar trend was also recorded in the northern region of Ghana among men and women according to the GDHS report [9]. Consistently, it is realized that overweight and obesity are prevalent more in women than men. This could be due to their presence in kitchen mostly which may make them overeat most of the times without knowing. The increasing trends in overweight and obesity indicates how Ghana as a nation is gradually undergoing nutrition transition as this is also reported by Ofori-Asenso et al. [10]. This increasing burden of over-nutrition has been reported [18]. This could be due to the higher dietary diversity among men compared to women as observed from our findings 10.5% and 4.5% respectively. In this study, no significant association was

Table 5. Nutritional status.

Body Mass Index (BMI)	Nutritional Status	Frequency	Percentage (%)
<18.5	Underweight	5	3.3
18.5–24.9	Normal	81	53.3
25–29.9	Overweight	41	27.0
>30	Obese	25	16.4
Total		152	100

Table 6. Nutritional knowledge and nutritional status.

		Nutrition Knowledge (NK) categories			P-value
		Poor NK	Fair NK	Good NK	
Nutritional status	Underweight	0 (0.0%)	2 (1.3%)	3 (2.0%)	0.253
	Normal	2 (1.3%)	32 (21.2%)	47 (31.1%)	
	Overweight	5 (3.3%)	15 (9.9%)	21 (13.9)	
	Obese	0 (0.0%)	11 (7.3%)	13 (8.6%)	

P-value < 0.05.

Table 7. Dietary diversity and nutritional status.

		Nutritional status				P-value
		underweight	Normal	Overweight	Obese	
Dietary Diversity Score	Low DDS	0 (0.0%)	2 (1.3%)	1 (0.7%)	2 (1.3%)	0.686
	Moderate DDS	5 (3.3%)	65 (43.0%)	35 (23.2%)	19 (12.6%)	
	High DDS	0 (0.0%)	14 (9.3%)	5 (3.3%)	3 (2.0%)	

P-value < 0.05.

observed between dietary diversity and nutritional status, however, the prevalence of good NK among men (36.8%) were higher than women (19.1%). Jayawardena et al. [15] however, reported that increased dietary diversity was significantly associated with increased BMI among adults in Sri Lanka.

4.4. Association between nutrition knowledge (NK) and nutritional status

This study revealed 31.1% of non-academic staff had a good NK and normal weight. Nutrition knowledge (NK) was not found to be significantly associated with overweight. This is consistent with the findings of Hankey et al. [19] in a study among health professionals which found no significant association between their nutritional status and NK. However, Spronk et al. [1] reported that, food choices were influenced by NK which might influence nutritional status of individuals.

Furthermore, many studies have reported significant association between NK and dietary intake [1]. This is similarly reported by other researchers that increased NK improves food consumption practices [20, 21].

4.5. Association between dietary diversity and nutritional status

This study observed that, there was no statistically significant association between dietary diversity and nutritional status (p = 0.686) but most of respondents (43.0%) had a moderate dietary diversity and a normal weight. This indicates no association between diversity in diet and nutritional status and that is in contrast with other findings suggesting that dietary diversity is associated with nutritional status of adults [7]. This difference could be due to the difference in study types. The findings of Steyn and McHiza [7] was done by systematic review whereas the present study employed a cross-sectional study design. In other related studies, the researchers did not find an association between dietary diversity and nutritional status [22, 23]. Furthermore, in Democratic Republic of Congo a study found that there was no statistically significant relationship observed between dietary diversity and the three indices of malnutrition [24].

However, the findings of Jayawardena et al. [15] among Sri Lankan adults indicated that higher dietary diversity is associated with obesity. The differences observed between the two study results could be due to differences in the study area, sample size, educational level and incomes

Table 8. Association between nutritional knowledge and dietary diversity.

		Dietary diversity score (DDS)			P-value
		Low DDS	Moderate DDS	High DDS	
Nutrition knowledge (NK)	Poor NK	0 (0.0%)	7 (4.6%)	0 (0.0%)	0.789
	Fair NK	2 (1.3%)	48 (31.6%)	10 (6.6%)	
	Good NK	3 (2.0%)	69 (45.4%)	13 (8.6%)	

P-value < 0.05.

of the respondents. Educational level is shown to have a positive significant impact on dietary diversification in other studies and it is suggested that consumption of diversified diet, ensuring intake of different nutrients prevents a number of chronic diseases and obesity [17].

4.6. Association between nutrition knowledge (NK) and dietary diversity

In this study, no significant association was observed between NK and dietary diversity. However, Spronk et al. [1] found that NK has an association with dietary intake. Other studies observed that high dietary diversity is significantly related to good health [25] as reported by Conklin et al. [11] in the United Kingdom that high dietary diversity is associated with low risk of diabetes.

The mean dietary diversity score (DDS) in this study was 7.6 ± 1.18 and more than half of the respondents (51.3%) had their DDS more than the average. A contrary observation was made by a study among women in Northern Ghana where more than half of them recorded DDS below the average [26]. The mean dietary diversity score in this study (7.6 ± 1.18) is slightly higher compared to that of a findings from a study by Kiboi et al. [16] which recorded a mean dietary diversity score of 6.84 ± 1.46 among pregnant women in Kenya. This difference could be due to the difference in study participants and study settings. The mean DDS in this study is relatively lower than a mean observed by Quarshie [27] among adult mothers in Greater Accra region of Ghana (8.31 ± 2.83). This difference could be due to the sex composition difference between the two. This study composed of both males and females whiles that of Quarshie [27] involved only females.

5. Conclusion

The prevalence of good nutrition knowledge (NK) was high among non-academic staff of University for Development Studies (UDS), Tamale campus and it was more prevalent among men than in women. They were moderately diverse in their diet.

Most of non-academic staff had a normal nutritional status. However, the prevalence of overweight and obesity was 43% which is quite high.

Nutrition knowledge was not associated with nutritional status and there was no association between dietary diversity and nutritional status.

The generalization of these findings is limited to this study setting, because the findings needs to be interpreted taking into consideration the study setting is a higher institution of learning and may not be applicable to the general society.

5.1. Recommendations

Individuals should diversify their diet and engage in enough physical activity to help halt the rising prevalence of overweight and obesity.

Government and other agencies should intensify intervention efforts to educate the public on good nutrition to improve good health.

Declarations

Author contribution statement

Iliasu Issahaku: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Mustapha Alhassan: Conceived and designed the experiments; Wrote the paper.

Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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