

RESEARCH ARTICLE

A Multi-variable Statistical Assessment of Nutrition Knowledge, Application, and Awareness of Evidence-Based Guidelines for Non-Communicable Disease Prevention Among Health Students in Unguja, Zanzibar

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ABSTRACT

Nutrition is fundamental to the prevention and management of non-communicable diseases (NCDs), and health professional students are anticipated to have adequate knowledge to promote evidence-based dietary practices. However, evidence on nutrition knowledge and its determinants among health students in Zanzibar remains limited. This study assessed nutrition knowledge, practice and awareness regarding the role of nutrition in NCD prevention and identified associated factors among health students in Unguja, Zanzibar. A cross-sectional study was conducted among 503 students from four higher learning institutions. Data was collected using an online and offline self-administered questionnaire. Descriptive statistics summarized participant characteristics, knowledge levels, practical ability, and awareness of evidence-based guidelines. Chi-square tests assessed associations, and ordinal logistic regression (proportional odds model) identified predictors of nutrition knowledge, including age, gender, institution, current enrollment in a nutrition course, and prior formal nutrition training. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported at a significance level of $p < 0.05$. Overall, 61.43% of students demonstrated moderate nutrition knowledge, while 49.30% reported a moderate ability to apply it in practice. Awareness of evidence-based nutrition guidelines was similarly moderate (61.23%). Prior participation in a nutrition course was significantly associated with practical application ($p = 0.0005$), and gender was associated with awareness level ($p = 0.0018$). Students not currently enrolled in a nutrition course had lower odds of higher nutrition knowledge (AOR = 0.57, 95% CI: 0.38–0.85; $p = 0.006$). Compared with students from the State University of Zanzibar, those from Zanzibar School of Health had lower odds of higher knowledge (AOR = 0.46, 95% CI: 0.30–0.70; $p < 0.001$). Age and gender showed no significant association with knowledge. Strengthening nutrition curricula and enhancing exposure to evidence-based guidelines and practical competencies are essential for preparing Zanzibar's future health workforce to effectively contribute to NCD prevention and management.

Keywords: Knowledge; Awareness, Nutrition, Prevention, Non-communicable diseases

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INTRODUCTION

Non communicable diseases (NCDs), including cardiovascular disease, diabetes, cancer, and chronic respiratory disease, account for more than 70% of global mortality, representing a major public health challenge worldwide (World Health Organization, 2023). Dietary practices are among the most important modifiable risk factors, and extensive evidence demonstrates their role in both prevention and management of NCDs (Gropper, 2023; Budreviciute et al., 2021).

Nutritional knowledge, defined as the ability to understand, interpret, and apply nutrition information, is a critical determinant of healthy dietary behaviour (López-Hernández et al., 2020). Yet, studies consistently report insufficient nutrition knowledge among university students, including those in health related programs, despite increased access to nutrition information through formal education and media (Crowley et al., 2019). Misconceptions and poor dietary practices remain particularly prevalent in low and middle income countries, where awareness of evidence based guidelines such as national dietary recommendations and WHO standards is limited (Hebestreit and Bogl, 2019).

Interventions such as nutrition education programs have shown promise in improving knowledge and behaviour, but their implementation in university settings is inconsistent (Shrimpton and Blaney, 2018; Lepre et al., 2022; Raut et al., 2024). In Tanzania, the Ministry of Health has developed comprehensive food based dietary guidelines to promote healthier eating patterns (Ministry of Health, United Republic of Tanzania, 2023). However, little is known about how well university students understand and apply these guidelines. This gap in empirical evidence is particularly critical for health profession students in Unguja, Zanzibar, whose future roles in public health promotion and clinical care will depend on their ability to apply evidence based knowledge of nutrition. Addressing this gap is essential for guiding policy, curriculum development, and capacity building efforts aimed at reducing the burden of NCDs through education and awareness.

METHODS

Study Design and Setting

This study employed a cross-sectional design and was conducted across four major health training institutions in Unguja, Zanzibar: the State University of Zanzibar (SUZA), the Zanzibar School of Health (ZSH), Zanzibar University (ZU), and the Institute of Health and Allied Sciences (IHAS).

Study Population and Sampling

The target population consisted of students enrolled in health-related programs that included a dedicated nutrition course or module. A convenience sampling method was utilized to recruit participants. The final sample size of 503 was derived from students who met the inclusion criteria of being enrolled in a relevant curriculum, being present on the data collection days, and providing voluntary informed consent. Absenteeism and unwillingness to participate served as the exclusion criteria.

Data Collection Tool and Variables

Data were collected using a self-administered questionnaire, distributed through both online (via a shared link) and offline (paper-based) modalities. The instrument was structured to assess three primary variables: fundamental nutrition knowledge via multiple-choice questions, applied nutritional knowledge for NCD management through short scenario-based questions, and awareness of global and national evidence-based nutrition guidelines for NCD prevention and management.

Data Analysis

The collected data were cleaned and organized prior to analysis. Descriptive statistics, including frequencies, percentages, and cross-tabulations, were used to summarize the demographic, academic, and primary outcome variables. Pearson's Chi-square test of independence was applied to study statistical association among categorical variables with a predetermined significance level of $p < 0.05$.

Furthermore, an ordinal logistic regression (proportional odds model) was used to identify factors associated with students' nutrition knowledge regarding the role of nutrition in the prevention of non-communicable diseases (NCDs). The outcome variable, nutrition knowledge, was categorized into three ordered levels (low, moderate, and high). Predictor variables included age, gender, current enrollment in a nutrition course, previous formal nutrition course, and institution. Variables were entered simultaneously into the multivariable model, and adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were estimated. Model adequacy was assessed using the likelihood ratio chi-square test, Pearson and deviance goodness-of-fit tests, and Nagelkerke's pseudo-. Statistical significance was set at a two-sided $p < 0.05$.

For outcome variable Y (students' nutrition knowledge regarding the role of nutrition in the prevention of NCDs), the general layout of the

proportional odds model with regression coefficients (β_k) and predictor variables (X_k) is given by:

$$\log \left[\frac{P(Y \leq j)}{P(Y > j)} \right] = \alpha_j - \sum_{k=1}^p \beta_k X_k, j = 1, 2, \dots$$

Using four predictors namely; Age, Gender (G; G=0, Female and G=1, Male), Currently taking a nutrition course (C; C=0, No and C=1, Yes), Having taken nutrition course in the past (P; P=0, No and P=1, Yes), and Institution (I; I₁=ICHAS, I₂=ZSH, I₃=ZU, I₄=SUZA) with an ordinal outcome of three categories (low, moderate, high knowledge), the fitted proportional odds model can be represented as follows:

$$\log \left[\frac{P(Y \leq j)}{P(Y > j)} \right] = \alpha_j - \beta_1(\text{Age}) - \beta_2 G - \beta_3 C - \beta_4 P - \beta_5 I_1 - \beta_6 I_2 - \beta_7 I_3$$

Y = student's nutrition knowledge regarding the role of nutrition in the prevention of NCDs (ordered as Low, Moderate, High)

j = cumulative threshold ($j = 1, 2$)

α_j = threshold (cut-point) for category j ,

β_1 = effect of age,

β_2 = difference between females and males,

β_3 = effect of currently taking a nutrition course,

β_4 = effect of having taken a nutrition course in the past,

β_5 = difference between ZSH and ICHAS institutions,

β_6 = difference between ZU and ICHAS institutions,

β_7 = difference between SUZA and ICHAS institutions.

Ethical Considerations

Ethical approval for the study was secured from the Zanzibar Health Research and Ethics Committee (Approval No: ZAHREC/02/ST/MAR/2025/229). Administrative permissions were also obtained from each participating institution. The principle of informed consent was strictly adhered to, with all participants providing consent prior to their involvement in the study.

RESULTS

Of the 503 respondents in this study, Table 1 shows that the majority (302; 60%) were female. In terms of the program of study, SUZA contributed about 47%, followed by ZSH (35.2%), while the highest response rate (41.6%) was observed among students taking the General Nursing course, suggesting strong participation from nursing students. Furthermore, it was noted that out of 503 respondents, only 38.6% have taken formal nutrition courses in a previous program, while 70.4% were taking nutrition courses during the study data collection period. This indicates an improved integration of nutrition education across study programs.

Table 1:

Respondents' Demographic and Academic Characteristics (n = 503)

Study Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	201	40.0
	Female	302	60.0
Institution	State University of Zanzibar	237	47.1
	Zanzibar School of Health	177	35.2
	Zanzibar University	10	2.0
	Institute of Health and Allied Sciences	79	15.7
Program of Study	Bachelor of Environmental Health	42	8.3
	Bachelor of Science in Nursing	33	6.6
	Diploma in Clinical Dentistry	36	7.2
	Diploma in Clinical Medicine	114	22.7
	General Nursing	209	41.6
	Doctor of Dental Surgery	19	3.8
	Medical Doctor	50	9.9

Formal Nutrition Taken in Past Program	Yes	194	38.6
	No	309	61.4
Nutrition Course Taken in Current Program	Yes	354	70.4
	No	249	29.6

Source: Research survey (2025)

Regarding the role of nutrition knowledge in the prevention of non-communicable diseases, Figure 1 shows that 309 (61.4%) respondents had moderate knowledge, while only 81 (16.1%) had high knowledge and 113 (22.5%) had low knowledge. This observation suggests that while basic awareness of nutrition's preventive role is widespread, there remains a substantial gap in advanced or applied understanding among health students. Figure 1 displays the contingency

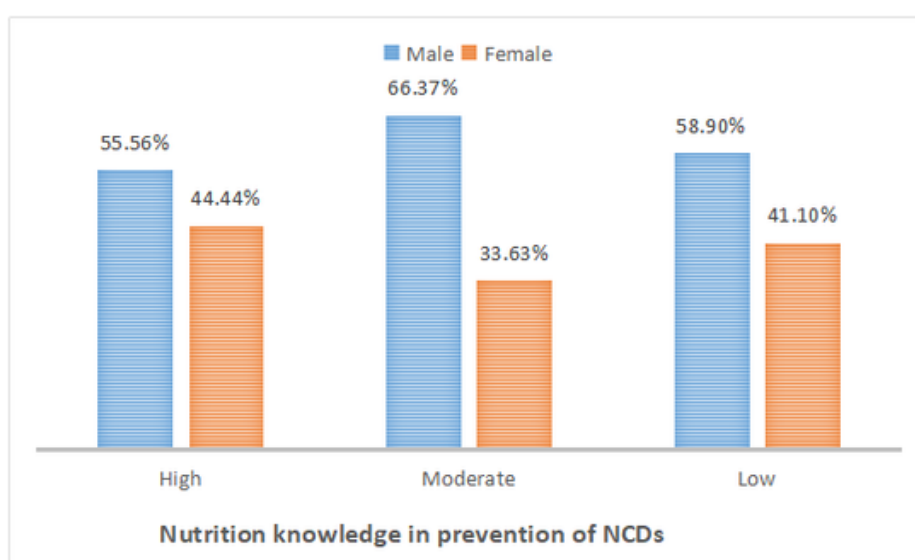


Figure 1: Distribution of knowledge on NCDs by gender of respondents

In the case of the ability to apply nutrition related program, only 6.13% demonstrated a high knowledge in the management of NCD's among a total of 503 respondents, nearly half (248, or 49.30 %) demonstrated a moderate ability to apply nutrition knowledge in managing NCDs. A smaller subset of 63 individuals (12.53 %) exhibited high competence in translation of knowledge into practice, while 192 respondents (38.17 %) were characterized as unable to apply their nutrition knowledge. These results indicate a substantial gap, while many possess knowledge, fewer can effectively put it into action.

Table 2 displays the contingency between the ability to apply nutrition knowledge and the current nutrition-related program of study. Among participants who did not take a nutrition-

related program, only 6.13% demonstrated a high ability to apply nutritional knowledge, 45.40% a moderate level, and a large majority (79; 84.50%) were unable to apply their knowledge. In contrast, among those who did take the program, 15.60% reached a high level of ability, 51.20% a moderate level, and just 33.40% failed to apply their knowledge. These figures indicate that participation in a nutritional program is highly associated with better capacity to put nutrition knowledge into practice ($p\text{-value} 0.0005 < 0.05$). Thus, there is a statistically significant relationship between having taken a nutrition course and the ability to apply such knowledge.

Table 2:*Contingency Between Having Taken Nutrition Courses and the aAbility to Apply*

Application of Nutritional Knowledge	Yes, n (%)	No, n (%)
High ability	53 (15.6)	10 (6.1)
Moderate ability	174 (51.2)	74 (45.4)
Unable to apply	113 (33.2)	79 (48.5)

Regarding awareness of evidence-based nutrition guidelines for the prevention and management of non-communicable diseases (Table 3), 308 (61.2%) respondents showed moderate awareness, 93 (18.5%) demonstrated high awareness, and 102 (20.3%) reported being unaware.

Table 3:*Awareness of Nutrition Guidelines for NCDs*

Gender	Awareness of nutrition guidelines for the prevention and management of NCDs		
	High	Moderate	Unaware
Female	41 (44.09%)	193 (62.66%)	68 (66.67%)
Male	52 (55.91%)	115 (37.34%)	34 (33.33%)
Total	93 (100%)	308 (100%)	102 (100%)

These results suggest that although a majority possess a general understanding of such guidelines, only a small proportion exhibits a high level of awareness, indicating a need for targeted interventions to enhance comprehensive nutrition knowledge among participants. An association between gender and awareness of evidence-based nutrition is highly significant ($p\text{-value} = 0.0018 < 0.05$), indicating gender differences, with males more likely to be aware than females.

The fitted ordinal logistic regression model (Table 4) indicates that the overall model was statistically significant compared with the intercept-only model $X_2(7) = 37.984, p < 0.001$, indicating that the included predictors jointly contributed to explaining variation in nutrition knowledge. The model explained approximately 86% of the variance in nutrition knowledge (Nagelkerke $R^2 = 0.86$).

Table 4:*Proportional Odds Model Parameter Estimates*

Predictor Variable	Estimate (β)	AOR (e^{β})	95% CI for β	Wald χ^2	p-value
Age	-0.015	0.99	0.95–1.02	0.764	0.382
Female (vs. Male)	-0.211	0.81	0.56–1.17	1.261	0.262
No current nutrition course (vs. Yes)	-0.564	0.57	0.38–0.85	7.648	0.006
No previous formal nutrition course (vs. Yes)	0.534	1.71	1.18–2.47	7.950	0.005
Institute of Health and Allied Sciences (vs. SUZA)	-0.435	0.65	0.38–1.11	2.506	0.113
Zanzibar School of Health (vs. SUZA)	-0.775	0.46	0.30–0.70	13.116	<0.001
Zanzibar University (vs. SUZA)	0.741	2.10	0.63–7.01	1.451	0.228
Thresholds estimates					
Knowledge category = 1	-1.962	-	-	-	<0.001
Knowledge category = 2	1.114	-	-	-	0.020

Model diagnostic summary	
Statistic	Result
Model fitting	$\chi^2(7) = 37.984, p < 0.001$
Pearson goodness-of-fit	$p = 0.016$
Deviance goodness-of-fit	$p = 0.050$
Nagelkerke R^2	0.086

Students not currently enrolled in a nutrition course had significantly lower odds of having higher nutrition knowledge than those currently taking a nutrition course (AOR = 0.57, 95% CI: 0.38–0.85, $p = 0.006$). Conversely, students with no previous formal nutrition course had significantly higher odds of having higher nutrition knowledge than those who had previously taken a formal nutrition course (AOR = 1.71, 95% CI: 1.18–2.47, $p = 0.005$). Compared with students from SUZA, those from ZSH had significantly lower odds of being in a higher nutrition knowledge category (AOR = 0.46, 95% CI: 0.30–0.70, $p < 0.001$). Age (AOR = 0.99, $p = 0.382$), gender (AOR = 0.81, $p = 0.262$), institutional affiliation (ICHAS versus SUZA; AOR = 0.65, $p = 0.113$), and ZU versus SUZA (AOR = 2.10, $p = 0.228$) were not significantly associated with nutrition knowledge. Figure 2 (forest plot) summarizes the findings from

the fitted proportional odds model using adjusted odds ratios (AORs) and 95% confidence intervals for factors associated with students' nutrition knowledge regarding the role of nutrition in NCD prevention.

The plot shows that the current enrollment in a nutrition course was the strongest modifiable factor associated with higher nutrition knowledge regarding NCD prevention. Students who were not currently taking a nutrition course had 43% lower odds of having higher nutrition knowledge (AOR = 0.57, 95% CI: 0.38–0.85), while students from ZSH also had significantly lower odds than those from SUZA (AOR = 0.46, 95% CI: 0.30–0.70). Most other factors, including age and gender, were not significantly associated with nutrition knowledge after adjustment.

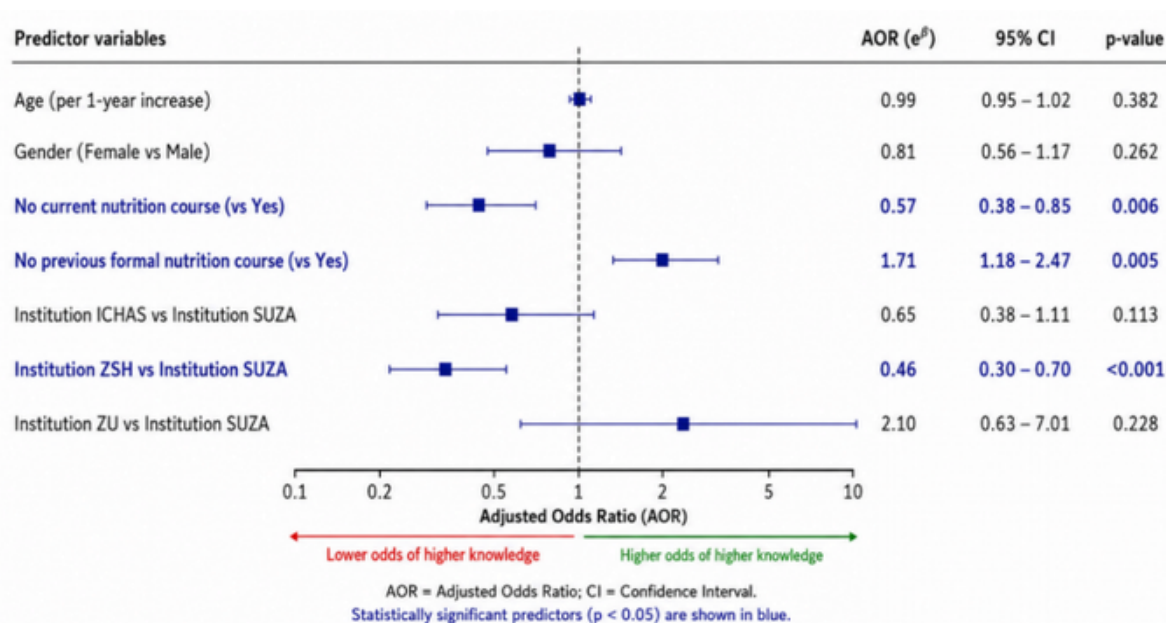


Figure 2: Forest plot of adjusted odds ratios (AORs) for factors associated with higher nutrition knowledge regarding the role of nutrition in the prevention of NCDs (Ordinal logistic regression)

DISCUSSION

This study assessed nutrition knowledge, its application, and awareness of evidence based guidelines for NCD prevention among health-professional students in Unguja, Zanzibar. The demographic profile, with a predominance of female respondents and strong participation from nursing programs, reflects broader gendered trends in health education across sub-Saharan Africa, where women often dominate nursing and allied health professions. Such patterns have been documented in Tanzanian and regional studies examining occupational preferences and sociocultural expectations in health training institutions (Conti et al., 2023).

Overall, most respondents demonstrated moderate nutrition knowledge (61.4%), with only a minority exhibiting high knowledge. This mirrors findings from systematic reviews showing that nutrition knowledge among medical and health students is frequently limited, despite its importance for preventive practice (Crowley et al., 2019; Mogre et al., 2023). The gap between knowledge and practice observed in our study, in which fewer students could effectively apply their nutrition knowledge, reinforces evidence that knowledge alone does not guarantee behaviour change. Ilori et al. (2022) reported that Nigerian patients with chronic diseases often had satisfactory knowledge but poor dietary practices, underscoring barriers such as cultural norms, resource constraints, and limited self efficacy.

Awareness of evidence based guidelines was also moderate, with significant gender differences. Male students were more likely to report higher awareness, consistent with studies highlighting gender disparities in nutrition literacy and engagement with scientific resources (Grant et al., 2022; Nyamekye Osei et al., 2023). These findings suggest that gender sensitive educational strategies are needed to ensure equitable access to nutrition information.

Importantly, current enrollment in nutrition courses was strongly associated with higher knowledge, confirming the value of structured, continuous nutrition education. Evidence from intervention studies shows that targeted nutrition curricula improve knowledge, competence, and preparedness among health students (Amoore et al., 2023; Mogre et al., 2023). Conversely, the unexpected finding that students with prior formal nutrition training had lower odds of higher knowledge than those without such training may reflect differences in course quality, recency, or the integration of nutrition content. This highlights the need for standardization and updating of curricula across institutions.

Institutional differences were also evident, with students from ZSH showing significantly lower odds of higher knowledge than those from SUZA. Such disparities likely reflect variations in curriculum content, teaching strategies, faculty expertise, and resource allocation, which have also been identified as key contributors to the nutrition knowledge gap among health professionals (Khiri and Howells, 2025). Addressing these gaps requires harmonized curricula and investment in faculty development. Taken together, these findings emphasize the importance of strengthening nutrition education in health training institutions in Zanzibar. Integrating evidence based guidelines, practical competencies, and gender responsive approaches will better prepare future health professionals to contribute to NCD prevention and management.

Limitations

The study's design and methodological choices introduce important considerations when interpreting the findings. Although the cross-sectional approach limits causal inference and convenience sampling may have introduced selection bias, the focus on health-profession students also limits generalizability to broader university students and other populations. Reliance on self-administered questionnaires introduces potential recall, reporting, and social desirability biases, and the assessment of nutrition knowledge application was based on self-report rather than objective verification. Furthermore, despite using multivariable regression to adjust for measured covariates, residual confounding from unmeasured factors cannot be fully excluded. Nonetheless, the study provides valuable, context-specific evidence on nutrition knowledge and its determinants among future health professionals in Zanzibar, offering an important foundation for curriculum strengthening and policy action.

Conclusion

Health profession students in Unguja demonstrate moderate theoretical knowledge of nutrition for NCD prevention, but a substantial gap between knowledge and practical application. Current enrollment in nutrition coursework is a strong, positive predictor of higher knowledge, while institutional differences and the unexpected inverse association with prior training suggest variability in curriculum quality, recency, or instructional effectiveness. To address these gaps, priority actions are standardize and updating nutrition curricula, implementing competency based, practice oriented training, and investing in faculty development and curriculum monitoring. Future research should use

curriculum mapping and qualitative methods to identify causes of institutional and training history disparities and evaluate targeted educational interventions for their effects on both competence and real world practice.

Recommendations

To address the identified gaps, health training institutions in Unguja needs to consider standardizing and update nutrition curricula to a common, evidence based competency framework; implement longitudinal, competency based, practice oriented training (clinical placements, case based counselling, and assessed skills); invest in regular faculty development and a centralized, accessible digital repository of current guidelines and teaching resources; adopt gender sensitive learning strategies to close awareness disparities; and establish routine curriculum mapping, outcome monitoring, and iterative review to ensure teaching quality, curricular currency, and measurable improvements in students' ability to apply nutrition knowledge for NCD prevention.

Conflict of Interest

The authors declare no conflict of interest.

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