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Knowledge, attitudes, and practices of urban households towards fruit and vegetable consumption in Kavango east region, Namibia

¹CN Jona ²MN Angula ³JN Muzanima and ⁴C Togarepi

¹Senior Lecturer, Department of Animal Production, Agribusiness & Economics, Faculty of Agriculture, Engineering & Natural Sciences, University of Namibia, Windhoek, Khomas Region, Namibia

²Lecturer, Department of Animal Production, Agribusiness & Economics, Faculty of Agriculture, Engineering & Natural Sciences, University of Namibia, Windhoek, Khomas Region, Namibia

³Lecturer, Department of Animal Production, Agribusiness & Economics, Faculty of Agriculture, Engineering & Natural Sciences, University of Namibia, Windhoek, Khomas Region, Namibia

⁴Senior Lecturer, Department of Animal Production, Agribusiness & Economics, Faculty of Agriculture, Engineering & Natural Sciences, University of Namibia, Windhoek, Khomas Region, Namibia

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Corresponding Author: CN Jona

Abstract

This study examined the knowledge, attitudes, and practices of urban households regarding fruit and vegetable consumption in Rundu Urban, Kavango East Region, Namibia. Conducted in 2024, the research involved 202 respondents selected through a multi-stage sampling procedure. Data were collected using a structured interview schedule and analysed using descriptive statistics, mean score ranking, one-way analysis of variance, and chi-square analysis. The results showed that although most respondents demonstrated moderate-to-good knowledge and positive attitudes towards fruit and vegetable consumption, actual intake remained low. Around 61.9% of households fell into the poor-practice category, highlighting a significant gap between awareness and behaviour. High prices, low household income, and limited availability were identified as the main barriers to consumption. Education and gender significantly influenced consumption practices ($P < 0.05$). The study concluded that awareness alone is insufficient to improve dietary habits and emphasised the need for nutrition-sensitive extension interventions that enhance affordability and access to fruits and vegetables among urban households.

Keywords: Fruit and vegetable consumption; nutrition extension; urban households

Introduction

Adequate consumption of fruits and vegetables remains essential for improving dietary quality, reducing the risk of non-communicable diseases, and promoting overall public health. The World Health Organization (WHO) recommends a minimum daily intake of 400 grams of fruits and vegetables for adults and children over 10 years of age as part of a healthy diet. However, intake remains below recommended levels in many low- and middle-income countries, despite growing awareness of the health benefits associated with regular consumption (Micha *et al.*, 2015; Kalmpourtzidou *et al.*, 2020; WHO, 2020) ^[3, 4]. Urbanisation further reshapes food choices by increasing dependence on purchased foods, processed alternatives, and market-based food systems, particularly among low- and middle-income households. In such settings, fruit and vegetable consumption is influenced not only by individual awareness but also by affordability, accessibility, and broader socio-economic conditions (Herforth *et al.*, 2020) ^[2].

The Knowledge-Attitude-Practice (KAP) framework provides a useful basis for examining food-related behaviour. This framework assumes that knowledge influences attitudes,

which in turn shape practices. However, evidence shows that knowledge alone does not always lead to behavioural change when structural and economic barriers are strong. A rapid review of fruit and vegetable consumption in sub-Saharan Africa found that behaviour is shaped by interacting individual, social, physical, and macro-level factors, including education, income, price, and market access (Stadlmayr *et al.*, 2023) ^[8]. In extension education, this is important because household food behaviour is often shaped by both cognitive and contextual factors. Studies published by Silva (2022) ^[7], Vij & Mann (2022) ^[9], and Mondal *et al.* (2024) ^[6], show that behavioural outcomes and adoption patterns are associated with socio-economic characteristics, education, and access-related conditions rather than awareness alone. These findings support the view that dietary practices should be analysed within a broader behavioural and socio-economic context.

In Namibia, urban growth contributes to changing food environments characterised by increased dependence on purchased food and growing concern over diet-related health conditions. Although fruits and vegetables are important components of a healthy diet, empirical evidence on how

urban households understand, perceive, and practise their consumption remains limited. Existing studies in Namibia largely focus on agricultural production, food security, and rural livelihoods, with less attention paid to urban dietary behaviour and the factors that influence household consumption patterns. This creates an important knowledge gap, particularly in rapidly growing urban centres where households rely heavily on markets for food access.

Against this background, the study examined the knowledge, attitudes, and practices of urban households towards fruit and vegetable consumption in Rundu Urban, Kavango East Region, Namibia. The study also analysed selected socio-economic factors associated with consumption practices to generate evidence that will strengthen nutrition-sensitive extension interventions in urban contexts.

Methodology

The study was conducted in Rundu Urban, Kavango East Region, Namibia, in 2024. The area was purposively selected due to its rapid urban expansion and the increasing reliance of households on purchased food. This urban setting provided an appropriate context for examining knowledge, attitudes, and practices related to fruit and vegetable consumption. A cross-sectional research design was employed to capture household dietary behaviour at a specific point in time. The study population comprised adult household members responsible for food purchasing and preparation decisions. A multi-stage sampling procedure was followed. Residential areas in Rundu Urban were first identified, after which households were randomly selected. A total of 202 respondents participated in the study, with one eligible adult interviewed per household. Primary data were collected using a structured interview schedule. The instrument covered socio-economic characteristics, knowledge of fruit and vegetable consumption, attitudes towards dietary practices, reported consumption behaviour, purchasing patterns, and perceived constraints. Knowledge was assessed through awareness-based questions, while attitudes were measured using five-point Likert-type statements. Practices were examined through reported consumption frequency and household purchasing behaviour.

Data were coded and analysed using the Statistical Package for the Social Sciences (SPSS), Version 29. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise respondent characteristics and key variables. Mean score ranking was used to assess the relative importance of the reported constraints. One-way analysis of variance (ANOVA) was used to compare the mean scores across the knowledge, attitude, and practice categories, while chi-square analysis was used to examine the association between selected socio-economic characteristics and practice categories. Statistical significance was considered at the 5% level. Ethical considerations were observed throughout the study. Participation was voluntary, and informed consent was obtained from all respondents prior to the interviews.

Results

Socio-economic characteristics

Table 1 presents the socio-economic characteristics of the respondents. The findings show that female respondents constituted the majority of the sample and were primarily

responsible for household food purchasing and preparation. The respondents were distributed across different age groups, with a larger proportion falling in the economically active categories. This indicates that most participants were within age ranges commonly associated with active involvement in household management and food-related decision making.

The results further revealed variation in the educational profile of the respondents. A substantial proportion had completed secondary education, while smaller proportions had attained primary and tertiary education or had no formal education. This distribution reflects differences in formal educational attainment among the sampled households. Household income levels also varied among the respondents, with many households concentrated in the low- to middle-income categories. This pattern points to differences in the economic circumstances of the households and their potential purchasing capacity.

Table 1: Socio-economic characteristics of the respondents (N = 202)

Variables	N (%)
Age group (years)	
18-24	24 (11.9)
25-34	55 (27.2)
35-44	36 (17.8)
≥45	87 (43.1)
Gender	
Male	70 (34.7)
Female	132 (65.3)
Education level	
No formal education	15 (7.4)
Primary	42 (20.8)
Secondary	109 (54.0)
Tertiary	36 (17.8)
Household income (monthly)	
< N\$5 000	71 (35.1)
N\$5 000-10 000	59 (29.2)
N\$10 001-20 000	43 (21.3)
> N\$20 000	29 (14.4)

Knowledge of fruit and vegetable consumption

The findings revealed variation in the respondents' knowledge regarding fruit and vegetable consumption (see Table 2). A considerable proportion of households (39.1%) fell within the moderate knowledge category, while 28.2% were classified as having good knowledge. In contrast, 32.7% of the respondents fell in the low knowledge category. The mean knowledge scores increased progressively from the low to the good knowledge category, which showed a clear distinction among the three groups. The differences across the categories were statistically significant ($P < 0.001$), which indicates that knowledge levels varied significantly among the sampled households.

Attitude towards fruit and vegetable consumption

Table 2 further shows that more than half of the respondents (51.3%) fell within the positive attitude category, while 33.8% had a neutral attitude and 14.9% had a negative attitude. The mean attitude scores increased progressively from the negative to the positive category. The differences across the categories were statistically significant ($P <$

0.001).

Practice of fruit and vegetable consumption

With regard to practice, the majority of the respondents (61.9%) fell within the poor practice category, while 24.8%

were classified under moderate practice and 13.3% under good practice. The mean practice scores increased progressively across the three categories. The differences across the categories were statistically significant ($P < 0.001$).

Table 2: Mean scores of knowledge, attitude, and practice dimensions related to fruit and vegetable consumption (N = 202)

Dimension	Category	N (%)	Score (mean $\pm$ SD)	p-value
Knowledge	Low knowledge	66 (32.7)	42.1 $\pm$ 15.8	
Knowledge	Moderate knowledge	79 (39.1)	68.4 $\pm$ 14.6	<0.001*
Knowledge	Good knowledge	57 (28.2)	88.7 $\pm$ 12.3	
Attitude	Negative attitude	30 (14.9)	45.3 $\pm$ 17.1	
Attitude	Neutral attitude	68 (33.8)	64.2 $\pm$ 15.0	<0.001*
Attitude	Positive attitude	104 (51.3)	86.9 $\pm$ 13.2	
Practice	Poor practice	125 (61.9)	39.8 $\pm$ 14.7	
Practice	Moderate practice	50 (24.8)	62.5 $\pm$ 13.9	<0.001*
Practice	Good practice	27 (13.3)	89.4 $\pm$ 11.6	

Note: Values are presented as frequency and percentage (N, %) or mean $\pm$ standard deviation. *Significant at $P < 0.05$ using one-way ANOVA

Association between socio-economic characteristics and practice level

The association between selected socio-economic variables and fruit and vegetable consumption practices is presented in Table 3. The results show that education level was strongly and statistically significantly associated with practice category ($\chi^2 = 42.46$, $P < 0.001$). Gender also demonstrated a statistically significant association with practice level ($\chi^2 = 10.75$, $p = 0.005$). In contrast, age group was not significantly associated with practice level ($\chi^2 = 76.61$, $p = 0.994$), and household income also showed no statistically significant relationship with practice level ($\chi^2 = 2.88$, $p = 0.579$). Overall, the findings indicate that fruit and vegetable consumption practices varied significantly by education and gender, but not by age or household income.

Table 3: Association between selected socio-economic characteristics and fruit and vegetable consumption practices (N = 202)

Variable	Chi-square (χ^2)	P-value
Education level	42.46	<0.001
Gender	10.75	0.005
Age group (years)	76.61	0.994
Household income (monthly)	2.88	0.579

Major constraints that affect fruit and vegetable consumption

The major constraints that influence fruit and vegetable consumption among urban households are presented in Table 4. High prices emerged as the highest-ranked constraint, with a mean score of 4.21. Low household income was ranked second, with a mean score of 3.98, followed by limited availability of fruits and vegetables, which recorded a mean score of 3.65. Lack of storage facilities was ranked fourth, with a mean score of 3.10. The ranking pattern indicates that the respondents experienced multiple constraints, with economic factors featuring most prominently among the reported barriers. Market-related limitations, particularly the availability of fruits and vegetables, also contributed to reduced consumption. Overall, the findings in Table 4 show that affordability and access-related challenges were the main factors that constrain fruit and vegetable consumption among

urban households.

Table 4: Major constraints that affect fruit and vegetable consumption

Constraint	Mean score	Rank
High prices	4.21	I
Low income	3.98	II
Limited availability	3.65	III
Lack of storage	3.10	IV

Discussion

The findings of this study revealed an important gap between knowledge and actual fruit and vegetable consumption practices among urban households. Although a substantial proportion of respondents demonstrated moderate to good knowledge levels, practice outcomes were comparatively low, with many households in the poor practice category. This suggests that awareness alone may not be sufficient to influence dietary behaviour. Recent evidence from sub-Saharan Africa shows that fruit and vegetable consumption is shaped not only by individual knowledge but also by broader social, physical, and macro-level influences, such as price, market access, neighbourhood food environments, and household resources (Stadlmayr *et al.*, 2023) [8]. Similarly, Miller *et al.* (2016) [5], showed across 18 countries that low affordability is strongly associated with low fruit and vegetable consumption, particularly in lower-income settings. These findings support the view that dietary behaviour is shaped by both cognitive and structural factors. Education level emerged as a key determinant of fruit and vegetable consumption practices in this study. Respondents with higher educational attainment were more likely to report better dietary practices than those with no formal education. Education may improve the ability to access, interpret, and apply nutrition-related information in daily food choices. This interpretation is supported by evidence from Namibia, where Yaya and Bishwajit (2018) [11], found that socio-demographic characteristics, including education, were associated with adequate fruit and vegetable intake among adults. Stadlmayr *et al.* (2023) [8], also identified education as one of the commonly reported determinants of fruit and vegetable consumption and purchasing behaviour in sub-

Saharan Africa. The present results therefore suggest that nutrition-sensitive extension programmes should incorporate educational approaches that strengthen both awareness and practical understanding of recommended dietary behaviour. Gender differences were also evident, with female respondents demonstrating comparatively better consumption practices than male respondents. This pattern is consistent with earlier studies that showed that women tend to report higher fruit and vegetable intake and more favourable attitudes towards such foods than men. Emanuel *et al.* (2012)^[1] found that women reported more favourable attitudes and greater perceived behavioural control regarding fruit and vegetable intake, and that these factors helped to explain the observed gender difference. In the context of this study, the result may reflect women's central role in household food purchasing, preparation, and meal planning. This finding highlights the importance of targeting women in nutrition education programmes while also encouraging greater male participation in dietary decision making in urban households.

In contrast, age did not show a statistically significant association with fruit and vegetable consumption practices. This suggests that poor or moderate practice levels were distributed across age categories rather than concentrated within a specific age group. A possible explanation is that the barriers that affect fruit and vegetable consumption in the study area operate more broadly across the adult population. Stadlmayr *et al.* (2023) note that while age is sometimes examined as a determinant of fruit and vegetable consumption behaviour, structural conditions such as food access, cost, and the local food environment may be more influential in many African settings. This finding therefore suggests that age alone may not be a sufficient predictor of household consumption behaviour in an urban context where food is largely purchased.

Household income was also not significantly associated with practice level in this study, even though low income ranked among the major constraints reported by the respondents. At first glance, this may appear unexpected, since many studies show that economic status is linked to dietary quality. However, the absence of a statistically significant association in this case may indicate that high food prices and weak market access constrain a wide range of households, not only the poorest. Miller *et al.* (2016)^[5] found that the affordability of fruits and vegetables relative to household income plays a major role in determining consumption. Likewise, Yaya and Bishwajit (2018)^[11] reported low fruit and vegetable consumption among adults in Namibia and identified socio-economic inequalities in intake. In this study, it is therefore possible that affordability pressures affected multiple income groups in similar ways, thereby reducing visible differences in reported practice levels.

The ranking of constraints provides further insight into these structural barriers. High prices emerged as the most important constraint, followed by low income and limited availability. This pattern is consistent with broader evidence from low- and middle-income settings that show that fruit and vegetable consumption is often limited by affordability and physical access rather than lack of awareness alone. Miller *et al.* (2016)^[5] demonstrated that the cost of recommended fruit and vegetable intake represents a substantial share of household income in many countries, especially poorer ones.

Stadlmayr *et al.* (2023)^[8] further identified price, distance to markets, and neighbourhood food environments as important influences on fruit and vegetable purchasing and intake in sub-Saharan Africa. Taken together, these studies support the conclusion that households may value fruits and vegetables but still consume them inadequately when market conditions and purchasing power are unfavourable.

The Namibian context makes this interpretation especially relevant. Yaya and Bishwajit (2018)^[11] reported that adequate fruit and vegetable consumption was generally low among adults in Namibia, which indicates that poor intake is already a national public health concern. This study contributes local evidence from Rundu Urban by showing that this broader nutritional challenge persists even where households exhibit moderate knowledge and generally positive attitudes. This strengthens the argument that interventions should not focus solely on raising awareness. Instead, nutrition-sensitive extension systems should combine behaviour change communication with practical and market-oriented measures, including the promotion of household or community gardening, improved local distribution of fresh produce, and strategies to make fruits and vegetables more affordable in urban food environments. The findings should, however, be interpreted in light of the study's cross-sectional design and reliance on self-reported household practices, which may limit causal inference and introduce reporting bias.

Overall, the study demonstrates that fruit and vegetable consumption practices among urban households are shaped by a combination of educational, gender-related, and structural factors. Education and gender help to explain differences in practice levels, while the ranking of constraints shows that affordability and availability remain central barriers to improved dietary behaviour. The findings therefore support a more integrated, nutrition-sensitive extension approach that addresses both behavioural and food-environmental limitations to improve fruit and vegetable consumption in urban Namibia.

Conclusion

This study examined the knowledge, attitudes, and practices of urban households towards fruit and vegetable consumption in Rundu Urban, Kavango East Region, Namibia. The findings showed that although many respondents possessed moderate to good knowledge and generally favourable attitudes towards fruit and vegetable consumption, actual consumption remained comparatively low. This confirms that awareness and positive perceptions alone do not necessarily result in healthier dietary behaviour at the household level.

The study further demonstrated that education and gender are significantly associated with fruit and vegetable consumption practices. Respondents with higher educational attainment were more likely to report better consumption practices, while female respondents generally exhibited more favourable practices than their male counterparts. In contrast, age and household income were not significantly associated with practice levels. However, the respondents consistently identified high prices, low income, and limited availability as the major constraints that affected their fruit and vegetable consumption. These findings suggest that fruit and vegetable consumption among urban households is influenced not only

by individual knowledge and attitudes but also by broader socio-economic and market-related conditions.

The study concludes that improving fruit and vegetable consumption in urban Namibia requires more than nutrition awareness campaigns. Effective interventions should combine nutrition education with practical, context-specific strategies to enhance affordability, accessibility, and the regular availability of fresh produce. Nutrition-sensitive extension programmes should place greater emphasis on household-level dietary education, support for urban and peri-urban gardening, market access initiatives, and the promotion of affordable fruit and vegetable options for low- and middle-income households.

The study contributes useful empirical evidence on urban dietary behaviour in Namibia and highlights the need for integrated approaches that address both behavioural and structural barriers to healthy food consumption. Future research may build on these findings by exploring seasonal effects, market dynamics, and household food decision making in other urban centres to strengthen evidence for nutrition policy and extension programming.

Declarations

Ethics approval and informed consent

Informed consent was obtained from all respondents prior to data collection.

Conflict of interest

The authors declare no conflict of interest.

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