Consumption and Perceptions of Indigenous and Non-Indigenous Vegetables: A Case of Adolescents in Schools in Harare, Zimbabwe

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Abstract
Fruit and vegetable consumption is recommended in adolescents for optimal growth, development, and long-term health. Vegetable consumption (indigenous and non-indigenous) is less well documented, especially in adolescents in Zimbabwe. The main objective of this research was to determine the prevalence, patterns, and perceptions of indigenous and non-indigenous vegetable consumption among school going adolescents in Harare, Zimbabwe. Adolescents attending primary and secondary schools in selected low, high density and peri urban localities were interviewed using a food frequency questionnaire (FFQ) adapted to include indigenous vegetables. Data was analysed using SPSSv23. Significance was set at $p<0.05$. A total of 411 participants were enrolled into the study. More than half of the study population were female (52%). About 33.3% fell into the age group of 13-15 years. A total of 74.9% ate vegetables once a day and only 15.3% ate vegetables more than twice a day with no significant difference between boys and girls ($p>0.05$). Over half (65%) consumed at least 60g of vegetables per meal. Consumption of non-indigenous vegetables was more frequent than of indigenous vegetables across both genders. The findings revealed an overall inadequate vegetable intake among adolescents in school in Harare, Zimbabwe. Indigenous vegetables were even less frequently consumed than non-indigenous vegetables. There is a need to support and strengthen interventions that encourage adolescent consumption of vegetables, especially indigenous ones.

Keywords: Adolescent nutrition, indigenous and non-indigenous vegetable consumption, Zimbabwe.

Introduction
Adequate fruit and vegetable consumption is essential for optimal nutrition and health, yet many developing countries face significant challenges in meeting dietary recommendations. Worldwide, vegetable consumption often remains below the recommended 250 grams per day (WHO, 2026) with Asia achieving the highest close to compliance (≥240g/day), as 29% of its countries meet this target (Kalmpourtzidou et al., 2020). In contrast, regions such as Oceania, Africa, Europe, and America have fewer countries meeting these guidelines. For instance, only 13% of African

nations adhere to the World Health Organisation's vegetable intake recommendation. To address these shortcomings, interventions focusing on environmental and behavioural determinants, including community gardens, farm production diversification, and nutrition education have been implemented in sub-Saharan Africa, although with little success among young children (Appleton et al., 2016). Notably, efforts to boost fruit consumption are more extensively documented and successful than those for vegetables (Neville et al., 2015). Research is particularly limited regarding vegetable consumption, especially indigenous varieties, as well as the factors influencing intake among children and adolescents (Appleton et al., 2016; Bel-Serrat et al., 2022).

Indigenous vegetables refer to vegetables that have existed in any community since time immemorial and are part of the culture and traditions of the people resident in that community. Indigenous vegetables may consist of a combination of vegetables that occurred naturally in a certain bio region plus vegetables that were introduced hundreds of years ago and became part of that bio region (Akinola et al., 2020). They are sometimes referred to as traditional vegetables, local crops, adapted, orphan crops, underutilised, neglected, or wild foods. Non-indigenous vegetables are those that were introduced onto the continent through trade or colonisation and are sometimes called exotic vegetables (Chougule & Sakunthala, 2024).

Numerous studies reveal an overall low vegetable consumption among young people, especially for non-indigenous vegetables, a trend shaped by nutrition transition and socioeconomic factors (Kaur, 2023), and is particularly evident in Zimbabwe (Chopera, 2018; Manyeruke et al., 2025). Intake is even lower in specific age groups such as children (Ayana et al., 2024). Adolescence marks a critical phase for developing dietary habits and preferences, which often persist into adulthood. Encouraging greater fruit and vegetable intake during this period is recommended to reduce the risk of non-communicable diseases and mortality later in life (Boeing et al., 2022). Such dietary improvements are associated with decreased risk of conditions like stroke, coronary heart disease, and cancer, and also offer short- and long-term benefits, including enhanced academic performance and improved socioeconomic status (Boeing et al., 2012; Intan Farahana Abdul Rani et al., 2025).

It remains unclear whether gender differences exist in the consumption of both indigenous and non-indigenous vegetables, and whether such differences may inform future consumption patterns and lifestyles. While adults consistently show gender disparities in nutritional awareness, food preferences, choices, and behaviours (Lombardo et al., 2024), studies in younger populations have

sometimes found no such differences (Dada et al., 2024). Additionally, climate change has increased global and national interest in indigenous vegetables, which are valued for their drought-tolerance and rich minerals, vitamins, and phytochemical profile (Sefasi et al., 2026). These vegetables have potential to be incorporated into Zimbabwe's recently launched school feeding programmes (UNICEF, 2025).

Evidence of vegetable consumption among adolescents in the context of Zimbabwe remains limited, and understanding variations across gender first could be essential to guide programming. School-going adolescents provide a practical and structured setting for accessing large numbers of adolescents within the target age group in a consistent and efficient manner while also providing insights that can inform future school-based nutrition interventions and policies aimed at improving vegetable consumption among adolescents in diverse urban settings. However, baseline consumption patterns, perceptions and attitudes require exploring first. These insights underscore the importance of understanding vegetable consumption patterns in this age group, as they are essential for designing effective strategies to improve adolescent health. Dietary habits formed during adolescence strongly predict future behaviour. Consequently, interventions targeting this group represent a valuable opportunity for lasting change (Parajuli & Prangthip, 2025). This study aims to determine the prevalence, patterns, and perceptions of indigenous and non-indigenous vegetable consumption among adolescents still in school in Harare, the capital city of Zimbabwe.

Methods

Study setting

The study was carried out in Harare (17.8263° S, 31.0504° E), the capital city of Zimbabwe. Harare is representative of many major cities undergoing nutrition transition and rapid urbanisation. A multi-stage sampling method was employed. The city is divided into four zones: residential (high- and low-density), commercial, industrial, and special purpose. The first stage involved selecting the study zone. The residential zone was chosen, as it included all registered schools relevant to the research, with three sub-zonal regions selected to facilitate comparison among high-density, low-density, and peri-urban participants. In the subsequent stage, schools were selected from each sub-zone. This included lists of primary, secondary, and high schools obtained from the District Education Offices, and one school from each category recruited randomly using a random number generator on MS Excel. In the low-density zone, Mt Pleasant High, Marlborough High School, and Vainona Primary were selected. In the peri-urban zone (Domboshava), a communal area located 27 km northeast of Harare, Zimbiru Primary, Munyawiri Secondary School, and Parirehwa High School were chosen. For the high-density zone, Chiedza

Primary, Epworth High School, and Harare High School in the old high density township of Mbare were selected. The total sample size was allocated equally across the nine selected schools, irrespective of school enrolment size. Within each school, a sampling frame was developed using the register of adolescents aged 10–19 years. Participants were then selected by simple random sampling using the random number generator function in Microsoft Excel until the required sample size for each school was attained.

Sample size

The target population consisted of adolescents aged 10 to 19 years. The inclusion criteria included only those adolescents who were present at the time of data collection, and willing to participate in the study. In addition, they were supposed not to have any chronic health conditions that could influence their intake of vegetables. The Cochran formula (Cochran, 1977) was used to determine the sample size using an unknown proportion of 50%. $\mathbf{N} = [\boldsymbol{Z^2 p}\ (\mathbf{1} - \mathbf{p})] \div \boldsymbol{e^2}$

Whereby Z was the desired confidence level 1.96, P was the estimated proportion of the attribute present in the population. We used 50% for an unknown prevalence of consumption. The margin of error 'e' was set at 0.05. The required sample was therefore 384. Then factoring in a non-response rate of 10% resulted in a sample size of 422 participants.

Data collection and tools

A vegetable food frequency questionnaire (FFQ) adapted from a similar study was used (Li & Levy-Milne, 2008). The questionnaire consisted of 3 main sections covering demographic characteristics of the participants, knowledge, attitude, practices and perceptions (KAP) and a vegetable consumption frequency section. A list of indigenous vegetables commonly consumed in Zimbabwe were obtained from literature (Macheka et al., 2022). From the regional distribution a shortened list of 7 most commonly consumed in Harare were listed after consultation with teachers and pupils as well as with guidance from the Zimbabwe Food Based Dietary Guidelines (guidelines not published). The non-indigenous vegetables were selected after a brief market survey in the study locations, followed by a discussion and a consensus by the research team. The frequency of consumption ranged from never, once a month, once a week, 2-4 times a week, once a day, more than twice a day (Traynor et al., 2006).

To estimate the amount consumed, participants were shown three common household measures during data collection: a dishing spoon, a half mug, and a full mug. They then selected the portion size that best reflected what they usually ate per meal. These portion sizes were converted into

grams for analysis. To assess the questionnaire's validity, a focus group discussion was first conducted with a similar target group at a different school to evaluate comprehension, ambiguity, and other relevant factors. Local names were used instead of botanical names, and household measures were standardised as a dishing spoon, half mug, and full mug. The questionnaire was revised accordingly. To evaluate the internal consistency reliability of the instrument, Cronbach's alpha coefficient was calculated (Dorsah, 2026). The resulting coefficient of 0.72 indicated an acceptable level of reliability for the scale.

Data analysis

Data from the survey were analysed to investigate the relationships between vegetable consumption and various socioeconomic and family characteristics using IBM SPSS Statistics 23. Descriptive statistics were used to obtain frequencies, means, median, standard deviation and range. Chi-square test was used to find the association between vegetable consumption and the demographic and socio-economic variables. Significance level for all tests was set at $p<0.05$.

Ethical considerations

Ethical approval was obtained from the Medical Research Council (MRCZ/B/2080/83/98). Approval to conduct the study in the selected schools was granted by the Ministry of Primary and Secondary Education through the District Educational Officer's office (DEO). All data was treated as confidential with no association to individual participants. Written parental assent and adolescent consent were obtained before data collection.

Results

In total, there were 411 adolescents invited to participate in the study. The participants consisted of 46.5% boys and 53.5% girls. Most adolescents were aged 16-18 years (42.3%). Over a third (36.7%) were from the high-density suburbs, with 31.9% and 31.4% were from low density and peri-urban suburbs, respectively. Almost all (93.4%) spoke Shona fluently, 4.1% and 2.4% spoke Ndebele and other languages, respectively. Approximately 85.9% of the population had a parent as their breadwinner, and 13.9% were in the care of a guardian. The analysis showed that 35.3% family heads were formally employed, with 43.3% having secondary school as their highest educational level followed by university education at 31.1%. The average family size was 5±1.4. The family head's income ranged from $120 to $300 with a median of $200.

Table 1: Demographic variables of the study participants[1]

Variable*	Total n (%)	Males n (%)	Females n (%)	P value[2]
Age (mean±SD)	14.9±2.3	15.2±2.3	14.7±2.4	0.053
Language				
Shona	384 (93.4)	177 (92.7)	207 (94.1)	*0.031
Ndebele	17 (4.1)	12 (6.3)	5 (2.3)	
Other	10(2.4)	2 (1.0)	8 (3,6)	
Locality				
low density	131 (31.9)	62 (32.5)	207 (94.1)	0.546
high density	151 (36.7)	74 (38.7)	5 (2.3)	
Peri-urban	129 (31.4)	55 (28.8)	8 (3.6)	
Family head				
Parent	353 (85.9)	172 (90.1)	181 (82.3)	*0.015
Guardian	58 (13.9)	19 (9.4)	39 (17.7)	
Family head main occupation				
Formal	145 (35.3)	67 (35.1)	78 (35.5)	0.937
Informal	266 (64.7)	124 (64.9)	142 (64.5)	
Family head highest level of education				
None	3 (0.7)	2 (1.0)	1 (0.5)	0.720
Primary	18 (4.4)	7 (3.7)	11 (5.0)	
Secondary	178 (43.3)	84 (44)	94 (42.7)	
A level	84 (20.4)	35 (18.3)	49 (22.3)	
University	128 (31.1)	63 (33)	65 (29.5)	
Household size	5±1.4	4.9±1.5	5.1±1.4	0.177
Income	200[120, 300]	180[150, 300]	200[120, 300]	0.388
Hours watching television	3[2, 4]	3[2, 4]	3[2, 5]	0.076

Notes: *Total N=411. [1]All values are presented as n and (percentage) except for household size and age which are presented as mean and standard deviation and income and hours watching television which are displayed as median and IQR. [2] CHI square test used for proportions, Fishers exact test when cell counts were less than 5. Independent samples T-test for linear normal distributed and Mann Whitney U test for non-normal data.*P value significant at $p< 0.05$.

Frequency of consumption of all types of vegetables

Figure 1 provides a summary of the combined frequency of consuming all vegetable types aggregated by gender. In overall, 74.9% of the adolescents consumed vegetables once a day. About 15.3% consumed vegetables more than twice a day. Approximately 6.6% of the adolescents

consumed vegetables 2-4 times in a week, 2.2% and 1.0% consumed vegetables once in a week and once in a month, respectively.

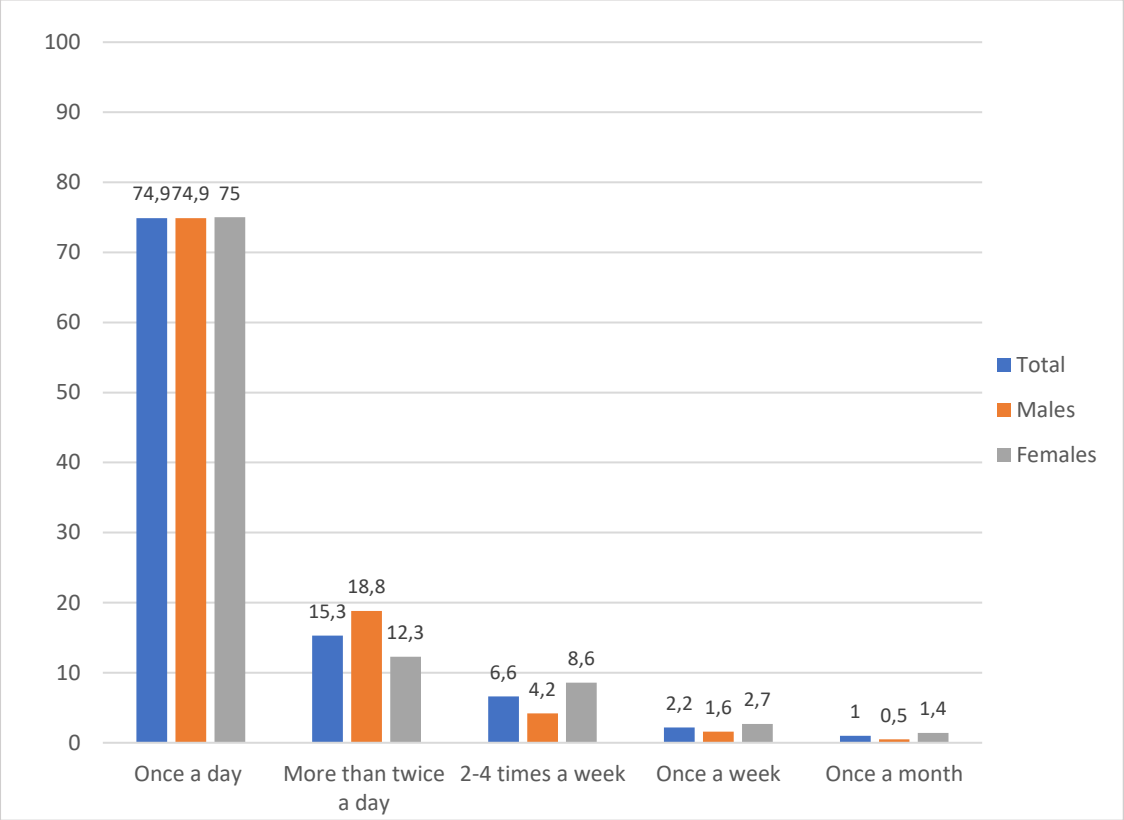

Figure 1: Combined frequency of consumption all vegetables by gender

Frequency of consumption of non-indigenous vegetables

Overall, non-indigenous vegetables were consumed more frequently than indigenous ones by both males and females (Table 2 and 3). The most frequent daily consumption was recorded for non-indigenous vegetables such as Rape (*Brassica napus*) at 29.9%, followed by Tsunga (*Brassica juncea*) at 5.8% for more than twice a day. Additionally, 43.3% reported consuming it 2-4 times a week, and pumpkin leaves had a notable 10.9% rate for 2-4 times weekly. Weekly consumption rates showed Tsunga (*Brassica juncea*) consumed by 17.3% of the participants and Rape ((*Brassica napus*) consumed by 15.6% of the participants. Among monthly consumption, Chinese cabbage (*Brassica rapa subsp. Pekinensis*) had highest prevalence of consumption at 35.0%, followed by pumpkin leaves (*Cucurbita maxima*) (31.6%). No significant gender differences were observed in consumption frequency for both indigenous and non-indigenous vegetables, although male participants exhibited higher rates of non-consumption for cowpea leaves (*Vigna unguiculata*), pumpkin leaves (*Cucurbita maxima*), okra (*Abelmoschus esculentus (L.) Moench)*, and Tsunga (*Brassica juncea*) compared to females. For most vegetables, girls tended to consume them more frequently (at least once per day) than boys.

Table 2: Frequency of consuming non-indigenous vegetables by gender

Variable	**Total** (n=411) **n (%)**	**Males** (n=191) **n (%)**	**Females** (n=220) **n (%)**	**P value**[1]
Rape (*brassica napus)*				
Never	15 (3.6)	6 (3.1)	9 (4.1)	0.119
Once a day	123 (29.9)	57 (29.8)	66 (30)	
More than twice a day	20 (4.9)	5 (2.6)	15 (6.8)	
2-4 times a week	170 (41.1)	77 (40.3)	93 (42.3)	
Once a week	64 (15.6)	37 (19.4)	27 (12.3)	
Once a month	19 (4.6)	9 (4.7)	10 (4.5)	
Choumoellier / African kale (*Brassica oleracea)*				
Never	397 (96.6)	184 (96.3)	213 (96.8)	0.904
Once a day	0 (0)	0 (0)	0 (0)	
More than twice a day	0 (0)	0 (0)	0 (0)	
2-4 times a week	3 (0.7)	2 (1.0)	1 (0.5)	
Once a week	0 (0)	0 (0)	0 (0)	
Once a month	11 (2.7)	5 (2.6)	6 (2.7)	
Mustard Spinach (*Brassica junceat*)				
Never	45 (10.9)	17 (8.9)	28 (12.7)	0.840
Once a day	38 (9.2)	17 (8.9)	21 (9.5)	
More than twice a day	24 (5.8)	11 (5.8)	13 (5.9)	
2-4 times a week	178 (43.3)	83 (43.5)	95 (43.2)	
Once a week	71 (17.3)	36 (18.8)	35 (15.9)	
Once a month	55 (13.4)	27 (14.1)	28 (12.7)	
Covo (*Brassica oleracea)*				
Never	9 (2.2)	4 (2.1)	5 (2.3)	0.701
Once a day	141 (34.3)	70 (36.6)	71 (32.3)	
More than twice a day	0 (0)	0 (0)	0 (0)	
2-4 times a week	221 (53.8)	96 (50.3)	125 (56.8)	
Once a week	26 (6.3)	13 (6.8)	13 (5.9)	
Once a month	14 (3.4)	8 (4.2)	6 (2.7)	
Chinese cabbage (*Brassica rapa subsp. Pekinensis)*				
Never	133 (32.4)	58 (30.4)	75 (34.1)	0.391
Once a day	17 (4.1)	9 (4.7)	8 (3.6)	
More than twice a day	0 (0)	0 (0)	0 (0)	
2-4 times a week	60 (14.6)	28 (14.7)	32 (14.5)	
Once a week	57 (13.9)	33 (17.3)	24 (10.9)	
Once a month	144 (35.0)	63 (33.0)	81 (36.8)	

[1] CHI square test used for proportions, Fishers exact test when cell counts were less than 5. Mann Whitney U test for non-normal data.*P value significant at $p< 0.05$.

Frequency of consumption of indigenous vegetables

Table 3 presents the frequency of consuming indigenous vegetables segregated by gender. There were no gender based difference ($p>0.05$) in consumption frequency for both indigenous and non-indigenous vegetables, although male participants exhibited higher rates of non-consumption for cowpea leaves (*Vigna unguiculata*), pumpkin leaves (*Cucurbita maxima*), and okra (*Abelmoschus esculentus (L.) Moench*), compared to females. It is important to note that these differences were

not significant. For most vegetables, girls tended to consume them more frequently (at least once per day) than boys.

Table 3: Frequency of consuming indigenous vegetables and gender

Variable	**Total** (n=411) **n (%)**	**Males** (n=191) **n (%)**	**Females** (n=220) **n (%)**	**P value**[1]
Spindle pod *(Cleome monophyla)*				
Never	397 (96.6)	185 (96.9)	212 (96.4)	0.124
Once a day	3 (0.7)	0 (0)	3 (1.4)	
More than twice a day	0 (0)	0 (0)	0 (0)	
2-4 times a week	0 (0)	0 (0)	0 (0)	
Once a week	2 (0.5)	0 (0)	2 (0.9)	
Once a month	9 (2.2)	6 (3.1)	3 (1.4)	
Okra (*Abelmoschus esculentus (L.) Moench)*				
Never	133 (32.4)	68 (35.6)	65 (29.5)	0.565
Once a day	21 (5.1)	8 (4.2)	13 (5.9)	
More than twice a day	7 (1.7)	4 (2.1)	3 (1.4)	
2-4 times a week	91 (22.1)	35 (18.3)	56 (25.5)	
Once a week	71 (17.3)	34 (17.8)	37 (16.8)	
Once a month	85 (20.7)	41 (21.5)	44 (20)	
Pumpkin leaves (*Cucurbita maxima*)				
Never	96 (23.4)	50 (26.2)	46 (20.9)	0.158
Once a day	14 (3.4)	7 (3.7)	7 (3.2)	
More than twice a day	5 (1.2)	1 (0.5)	4 (1.8)	
2-4 times a week	45 (10.9)	22 (11.5)	23 (10.5)	
Once a week	121 (29.4)	45 (23.6)	76 (34.5)	
Once a month	130 (31.6)	66 (34.6)	64 (29.1)	
Cowpea leaves (*Vigna unguiculata*)				
Never	241 (58.6)	115 (60.2)	126 (57.3)	0.290
Once a day	0 (0)	0 (0)	0 (0)	
More than twice a day	3 (0.7)	2 (1.0)	1 (0.5)	
2-4 times a week	3 (0.7)	2 (1.0)	1 (0.5)	
Once a week	11 (2.7)	2 (1.0)	9 (4.1)	
Once a month	153 (37.2)	70 (36.6)	83 (37.7)	
African Spider Flower Leaves (*Cleome gynandra)*				

Variable	**Total** (n=411) **n (%)**	**Males** (n=191) **n (%)**	**Females** (n=220) **n (%)**	**P value**[1]
Never	210 (51.1)	95 (49.7)	115 (52.3)	0.832
Once a day	9 (2.2)	4 (2.1)	5 (2.3)	
More than twice a day	0 (0)	0 (0)	0 (0)	
2-4 times a week	12 (2.9)	4 (2.1)	8 (3.6)	
Once a week	19 (4.6)	10 (5.2)	9 (4.1)	
Once a month	161 (39.2)	78 (40.8)	83 (37.7)	
Amaranth / African spinach (*Amaranthus thunbergii*)				
Never	352 (85.6)	158 (82.7)	194 (88.2)	0.352
Once a day	3 (0.7)	1 (0.5)	2 (0.9)	
More than twice a day	0 (0)	0 (0)	0 (0)	
2-4 times a week	3 (0.7)	2 (1.0)	1 (0.5)	
Once a week	0 (0)	0 (0)	0 (0)	
Once a month	53 (12.9)	30 (15.7)	23 (10.5)	
Black Jack / Mutsine (*Bidens Pilosa*)				
Never	375 (91.2)	174 (91.1)	201 (91.4)	1.000
Once a day	0(0)	0 (0)	0 (0)	
More than twice a day	0(0)	0 (0)	0 (0)	
2-4 times a week	0(0)	0 (0)	0 (0)	
Once a week	4 (1.0)	2 (1)	2 (0.9)	
Once a month	32 (7.8)	15 (7.9)	17 (7.7)	

[1] CHI square test used for proportions, Fishers exact test when cell counts were less than 5. Mann Whitney U test for non-normal data.*P value significant at $p< 0.05$.

The amount of vegetables consumed per portion served and other consumption habits

A significant percentage of participants consumed 60g of vegetables daily (65.2%), with males consuming slightly less (62.3%) compared to females (67.7%). This difference was statistically significant (p=0.041). A large majority (88.6%) reported consuming meals as a family, with females slightly more likely to do so (89.5%) compared to males (87.4%). Only 11.4% did not consume meals as a family, with males slightly more likely to eat separately (12.6%) compared to females (10.5%). This difference was not significant (p=0.502).

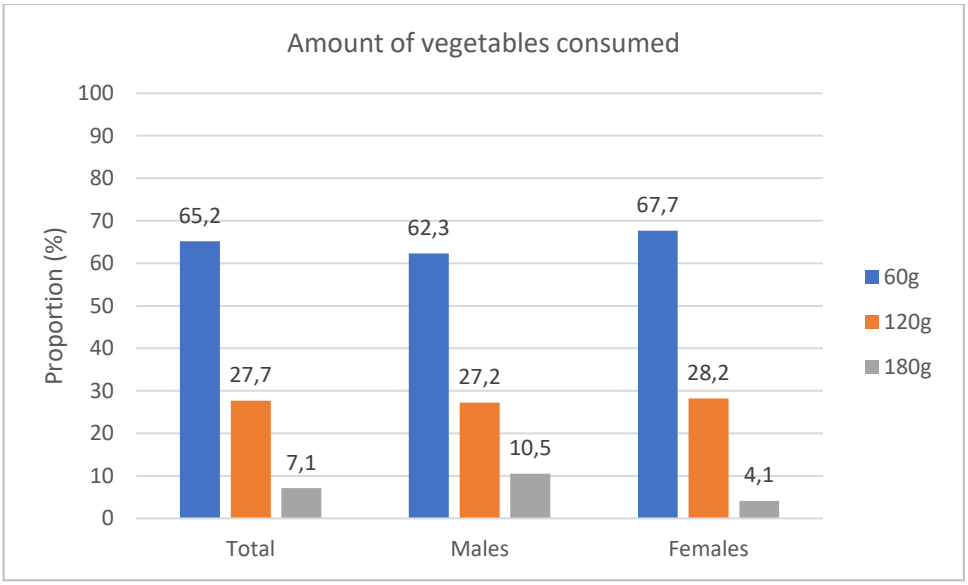

Figure 2a: The amount of vegetables consumed daily and consumption with family

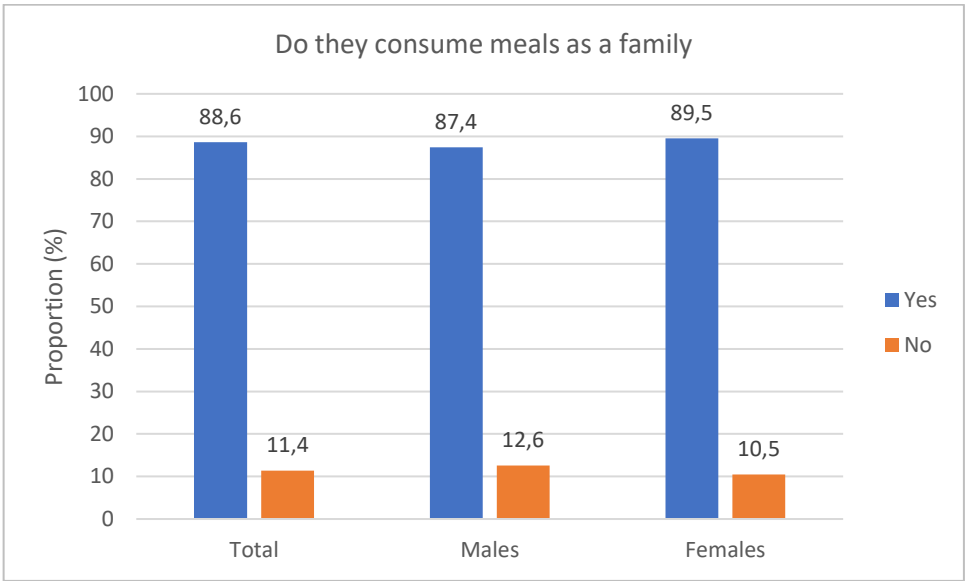

Figure 2b: The amount of vegetables consumed daily and consumption with family

Perceptions and attitudes regarding vegetable consumption

Table 4 illustrates the perceptions and attitudes of adolescents (411) regarding their consumption of vegetable by gender. Regarding perceived effects on *weight loss*, 27.7% of participants reported that vegetable consumption may contribute to weight reduction, with responses distributed relatively evenly across genders. *Non-communicable diseases (NCDs)*: A significant proportion (82%) agreed that vegetables reduce the risk of NCDs, with a slightly higher but non-significant agreement among females. *Dietary recommendation*: Almost all adolescents (97.1%) agreed that vegetables are highly recommended, with females showing slightly higher agreement. This difference was significant (p=0.015). *Health impact*: Over half (56.4%) perceived current food

choices as affecting future health, with no major gender differences. *Health benefits*: A high proportion (86.1%) agreed that frequent vegetable consumption is beneficial for health. There was a slightly higher agreement among males than females. *Taste:* Only 30.4% think vegetables taste great, with similar opinions across genders. *Socioeconomic status*: A small proportion (8%) viewed vegetables as food for the poor, with more females in agreement than males. This difference was significant (p=0.028). *Availability*: About half (50.9%) would eat more vegetables, if they were readily available. This attitude was evenly split between genders. *Family preferences*: Only 18% mentioned that their families disliked vegetables, with similar responses from both genders. *Cost*: About a quarter (25.7%) consider vegetables expensive, with no significant gender difference. *Preparation time*: 15.6% think vegetables take long to prepare, with similar responses from both genders. *Traditional perception*: 62.8% of participants considered most indigenous vegetables to be weeds, with this view reported equally by boys and girls.

Food safety concerns: 19.7% believed vegetables were grown in unsanitary conditions, such as near open sewer lines, with slightly more males in agreement.

Table 4: Perceptions and attitudes concerning vegetable intake

Variable	Total n(%)	Males n (%)	Females n (%)	P value[1]
Eating vegetables assists in weight loss				
Agree	114 (27.7)	52 (27.2)	62 (28.2)	0.912
Disagree	297 (72.3)	139 (72.8)	158 (71.8)	
Eating vegetables reduces chances of developing NCDs				
Agree	337 (82)	152 (79.6)	185 (84.1)	0.249
Disagree	74 (18)	39 (20.4)	35 (15.9)	
Vegetables are highly recommended for you				
Agree	399 (97.1)	181 (94.8)	218 (99.1)	0.015*
disagree	12 (2.9)	10 (5.2)	2 (0.9)	
Current food choices and habits cannot affect your future health				
Agree	232 (56.4)	114 (59.7)	118 (53.6)	0.348
Disagree	176 (42.8)	75 (39.3)	101 (45.9)	
Frequent consumption is good for your health				
Agree	354 (86.1)	168 (88.0)	186 (84.5)	0.391
Disagree	57 (13.9)	23 (12.0)	34 (15.5)	
Vegetables taste great				

Variable	Total n(%)	Males n (%)	Females n (%)	P value[1]
Agree	125 (30.4)	56 (29.3)	69 (31.4)	0.669
Disagree	286 (69.6)	135 (70.7)	151 (68.6)	
Vegetables are for poor people				
Agree	33 (8.0)	9 (4.7)	24 (10.9)	0.028*
Disagree	378 (92.0)	182 (95.3)	196 (89.1)	
I would consider eating more vegetables if they were readily available				
Agree	209 (50.9)	97 (50.8)	112 (50.9)	1.000
Disagree	202 (49.1)	94 (49.2)	108 (49.1)	
My family doesn't like to eat vegetables				
Agree	74 (18)	37 (19.4)	37 (16.8)	0.522
Disagree	337 (82)	154 (80.6)	183 (83.2)	
Vegetables are expensive				
Agree	85 (25.7)	42 (22.0)	43 (19.5)	0.625
Disagree	326 (79.3)	149 (78.0)	177 (80.5)	
It takes long to prepare vegetables				
Agree	64 (15.6)	30 (15.7)	34 (15.5)	1.000
Disagree	347 (84.4)	161 (84.3)	186 (84.5)	
Most traditional vegetables are weeds				
Agrees	258 (62.8)	119 (62.3)	139 (63.2))	0.919
disagree	153 (37.2)	72 (37.7)	81 (36.8)	
Most vegetables are cultivated in unsanitary places, e.g., open sewer lines				
Agree	81 (19.7)	41 (21.5)	40 (18.2)	0.256
Disagree	330 (80.3)	150 (78.5)	180 (81.8)	
Why I eat vegetables				
I am forced to have them	19 (4.4)	8 (4.2)	11 (5.0)	0.249
They grow in our garden	230 (53.9)	100 (52.4)	130 (59.1)	
I like them, they are delicious	162 (37.9)	83 (43.5)	79 (35.9)	

*n=411; female n=220 males n=191

[1] CHI square test used for proportions, Fishers exact test when cell counts were less than 5

Discussion

The primary objective of this study was to determine the prevalence, patterns, and perceptions of consumption of indigenous and non-indigenous vegetable by school going adolescents in Harare, Zimbabwe. Rape (*Brassica napus*) and Covo (*Brassica oleracea*) were the vegetables most commonly consumed by participants, likely reflecting their widespread availability in Zimbabwean kitchen gardens and supermarkets (K & Mativha, 2012). In contrast, indigenous vegetables were comparatively less preferred and exhibited the lowest frequency of consumption relative to non-indigenous vegetables. This pattern is noteworthy given the established nutritional value of African indigenous vegetables (AIVs), which have considerable potential to enhance diet quality and dietary diversity. AIVs are nutrient-dense foods that can contribute substantially to the prevention of micronutrient deficiencies and hidden hunger, with potential downstream benefits for health, well-being, and productivity (Sefasi et al., 2026). Relative to commonly consumed non-indigenous vegetables, AIVs often contain substantially higher concentrations of essential micronutrients, including vitamins, iron, and calcium. In addition, their drought tolerance and generally lower cost may improve accessibility, particularly in resource-constrained settings in a changing climate (Kansiime et al., 2018).

Although more than half (65%) of the participants consumed at least 60 g of vegetables per day, comparison with published literature remains challenging because many studies do not distinguish vegetable intake between indigenous and non-indigenous types. Nevertheless, when the World Health Organisation threshold of 240 g/day is applied (set for everyone older than 10 years) (WHO, 2026), all children in the present study would be classified as having inadequate overall vegetable intake. This finding is consistent with broader evidence indicating suboptimal vegetable consumption in both adolescent and adult populations. For instance, Giguère-Johnson et al. reported a mean vegetable intake of 32 g/day among Senegalese adolescent girls (Giguère-Johnson et al., 2021), while Nago et al. documented an average daily intake of 97 g/day among school-going adolescents in Benin (Nago et al., 2010). Similarly, a multi-country review of vegetable consumption reported generally low per capita intakes across several countries. These include Tanzania (91 g/day), Burkina Faso (44 g/day), Ethiopia (42 g/day), Nigeria (138 g/day), India (186 g/day), Nepal (214 g/day), and Bangladesh (57 g/day), although these data were derived primarily from adult populations (Dijkxhoorn et al., 2021). So far, no previous studies have quantified vegetable intake among adolescents and primary school-aged children in Zimbabwe, limiting direct contextual comparison within the local setting. Accordingly, this study provides novel evidence on vegetable consumption patterns in this population. Furthermore, it

extends literature by specifically examining the intake of indigenous vegetables in a previously under-characterised age group.

The study shows that a large number of adolescents have, however, a positive attitude towards the benefits of eating vegetables. A few perceptions were significantly associated with gender, with more girls than boys believing vegetables are 'highly recommended', but are 'food for the poor'. In general, for most vegetables, girls tended to eat them more frequently (at least once a day) than boys. This pattern is consistent with evidence that boys and girls often exhibit distinct dietary behaviours driven by different motivational factors (Deslippe et al., 2023). Another possible explanation is that girls may be more likely than boys to follow dietary recommendations and to place greater importance on health-related and appearance-related motivations when making food choices. Additionally, there may be social and cultural factors at play, as boys and girls may be socialised differently when it comes to food choices (Lommi et al., 2021).

Strengths and limitations of the study

One major strength of this study was investigating vegetable consumption in adolescents, a demographic group with scarce data. The study successfully determined how frequently adolescents consume indigenous and non-indigenous vegetables and their perceptions of vegetable consumption. This information can be useful in creating interventions to increase overall vegetable consumption, which in turn can improve adolescents' nutritional status with downstream benefits such as lower prevalence of the risk of developing cardiovascular diseases. A limitation of this study was its cross-sectional design, which prevents causal inference. Self-reported data has limitations of recall and social desirability bias. The results may not be generalised to adolescents out of school as well as adolescents in rural areas. There was also a lack of full capture of seasonal variation. Though non-indigenous vegetables are available all year round, indigenous vegetables are more prevalent during the rainy season, which may have affected the frequency of consumption. This study was conducted in summer before the start of the rains, which may explain the high prevalence of non-consumption of indigenous vegetables. Despite its exploratory design, this study is the first to examine vegetable consumption in adolescents in Zimbabwe. The findings therefore provide an important basis for further studies, as well as public health interventions aimed at increasing vegetable consumption among urban school-going adolescents.

Recommendations for school curriculum, programming, and policy

At the school curriculum level, the findings support strengthening school-based food and nutrition education with greater emphasis on the preparation, cultural and nutritional relevance of indigenous vegetables. Integrating practical nutrition content into science, agriculture, and life-skills teaching may help address misconceptions, including the perception that 'indigenous vegetables are weeds' or 'a poor man's food' while increasing children's familiarity, acceptability, and willingness to consume these foods. A whole-school approach (Edwards et al., 2024) that combines classroom instruction with experiential learning, such as school gardens, food preparation demonstrations, product development (Famuwagun et al., 2023) and learner-led nutrition activities, is likely to be more effective than information-only approaches in shifting dietary behaviours.

Zimbabwe's home-grown school feeding programme, introduced in 2016 to address hunger and improve school attendance, may provide an important platform for promoting appreciation and consumption of indigenous vegetables. In this context, school feeding programmes should aim to improve the diversity and nutritional quality of foods provided in schools through more systematic inclusion of vegetables, including locally available indigenous species where feasible. At - policy level, the findings indicate the importance of embedding adolescent and school-age nutrition more explicitly within school health, food environment, and education-sector strategies.

Promotion of indigenous vegetables through policy could additionally support nutrition-sensitive agriculture, preservation of local food biodiversity, and climate-resilient dietary strategies, particularly in vulnerable and resource-constrained communities.

Conclusions

The findings revealed an overall inadequate vegetable intake among adolescents in schools in Harare. Indigenous vegetables were less frequently consumed than non-indigenous vegetables. These results emphasise the importance of implementing intervention programmes geared towards promoting increased consumption of vegetables, especially indigenous vegetables. Such programmes should target both proximal factors, such as individual perceptions and attitudes, family home environment, and distal factors like the food environment.

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