

Socio-Ecological model factors influencing fruit and vegetable consumption among adolescents in Nakawa division, Kampala Capital City Authority, Uganda

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Abstract

There is ample evidence to assert the benefits of fruits and vegetable (F&V) consumption towards health promotion and chronic disease prevention. Despite this, most of the population does not meet the recommendations of consumption. This study assessed the factors that influence fruits and vegetable consumption using a socio ecological model among adolescents in Nakawa division, Kampala Capital City Authority in Uganda. A cross-sectional study was conducted on 301 adolescents, using an interviewer administered questionnaire. Data was analyzed using SPSS and presented as tables. Statistical significance was considered for variables with p values less than 0.05. While 282 (93.7%) of the respondents regarded it vital to eat fruits and vegetables, only 47.2% ate them weekly, 23.6% bi-weekly and 24.6% after every fortnight; with bananas as the most (52.5%). Consumption of fruits and vegetables was significantly associated with variables of: type of school attended, attitude, discussion of community gatherings and lack of religious taboos. Interventions ought to be multi-sectorial to promote fruits and vegetable intake such as health education. Also, increased fruit and vegetable production is desired to augment their uptake as a daily meal serving.

Abbreviation: F&V: Fruits and Vegetables

Background

Fruit and vegetables (F&V) are vital for healthy living, and daily consumption may avert conditions like cardiovascular diseases, cancers and malnutrition [1-3]. Available data affirms the subtle gains of F&V, as poor intake contributes to 16.0 million disability adjusted life years and 1.7 million of global deaths [4]. According to the Food and Agricultural Organization [5], F&V consumption remains less than the daily recommended by 20-50%. More, three-quarters of the global population consume less than the minimum recommended daily serving of 400g/person [6], and this has augmented the risk of chronic diseases [7].

Studies have reported noteworthy deaths due to micronutrient deficiencies and ill health among children [8-10]. The Uganda Demographic Health Survey indicated a high prevalence of nutrient related disorders among children and women of childbearing age, with multiple micro-nutrient deficiency [11]. A report on the Non-Communicable Diseases (NCDs) risk factor survey showed that 87.8% of Ugandans risked diverse infection due to insufficient F&V intakes; and may portend efforts to prevent NCDs [12]. While Uganda is seen as a 'food basket' with varieties for East Africa [13], there remains derisory F&V intake among adolescents. This has augmented preventable micronutrient deficiency disorders, and poor quality of life [12]. We report on the socio-ecological model factors influencing F&V intake among adolescents in Nakawa division, Kampala Capital City Authority in Uganda.

Methods

Study design and site

A cross-sectional study was done in Nakawa Division, Kampala Capital City Authority in Uganda.

Study population and inclusion criteria

This comprised of school going adolescents, aged 10-19 years. Kampala has 1,507,080 million occupants, with various ethnicities. Eligible adolescents were included if they willingly gave consent or assent, spoke English or Luganda, and did not have impaired hearing, vision, reportedly used illicit drugs or too weak.

Sample size estimation

This was estimated using; $n = Z^2 pq / d^2$. Given n = sample size, z = z score at 95% confidence interval (1.96), p = proportion of F&V consumption in Uganda reported at 27% [12], q = 1-0.27 and d = allowable error (0.05). To cater for none response rate of 10%, a total of 334 adolescents were included.

Sampling procedures

Sampling was done in three levels; 1) Stratified random sampling to select Nakawa division. 2) Stratified random sampling to randomly select the 4 parishes out of 23 parishes in Nakawa and selected one school from each parish using simple random sampling. We proceeded to do a probability proportionate by size random sampling to get the number of adolescents from each school to contribute to the sample size. 3) Simple random sampling using a random start to select the adolescents within each school.

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Study variables

Dependent variables: The main outcome variable was F&V consumption. Independent variables were: individual factors like age, sex/gender, knowledge, attitudes and beliefs towards F&V consumption, level of education; cultural factors namely cultural influence, family influence, peer influence and social networks; and institutional factors such as policies, existence of health education, food establishments available, and cost of F&V.

Data collection, management and quality assurance

Data was obtained from study participants using a structured interviewer administered questionnaire and reviewing the school curriculum and ministry of education's school-health program. The tool was pre-tested to ensure accuracy, consistency, and completeness. Research assistants with a sound understanding of English and Luganda were trained prior to data collection. Validity was ensured by content validity index technique and reliability by Cronbach Alpha method by SPSS [14] of inter term consistence with the Cronbach Coefficient Alpha set at 0.923.

Data analysis

Quantitative data was used to correlate the variables, and insight to profound comprehension of social ecological factors of F&V consumption among adolescents. Statistical Package for Social Scientists (SPSS) version 18.0 was used to summarize data as frequencies and percentages.

Ethical considerations

We obtained ethical approval from research and ethics committee of Clarke International University (Formerly, International Health Sciences University). We too obtained a signed informed consent and assent.

Results

Out of the 333 adolescents that we approached for interview, only 301 (90.39%) responded. Of these, only 47.2% ate F&V once a week, 23.6% twice a week, 11.6% three times a week, 13.0% reported consumption for 5 or more days. The major F&V source was from the community 184 (61.1%), 13(4.3%) from the canteen, 21(7.0%) got them from parents. Bananas were the most eaten fruit accounting for 158 (52.5%), 109 (36.2%) consumed oranges, and 81(26.9%) ate pineapples.

Background factors

Analysis of statistical association indicated that F&V consumption among adolescents was significantly associated with the type of school attended (71-35.5% versus 129, 64.5% $\chi^2= 7.983$, $P= 0.005$). Factors like age (32, 16.0% versus 168-84.0% $\chi^2=.679$, $p=0.410$), gender and school status (72-36.0% versus 128-64.0%: $\chi^2=.012$, $p= 0.914$ and 195-97.5% versus 5-22.5%: $\chi^2=.080$, $p= 0.778$) respectively, class attained (26, 13.0% versus 119-59.5% $\chi^2=.349$, $p=0.840$), the type of school attended (government 176-88.0% versus private 23-11.5%: $\chi^2=2.103$, $p= 0.349$), religious affiliation (protestant 76-38.0% versus Muslim 47-23.5%: $\chi^2=4.325$, $p= 0.504$), and provision of meals at school (181-90.5% versus 19-9.5%: $\chi^2=4.311$, $p= 0.038$) did not show statistical significance.

Knowledge, attitudes and beliefs of adolescents

This study has established that 282 (93.7%) of the respondents considered it important to eat F&V, 74(24.6%) thought they ate enough

daily, and more than half, 157(52.2%) thought that not eating F&V was harmful.

Individual factors

From table1, knowledge on the importance of F&V influenced their consumption (191-97.0% versus 6-3.0%: $\chi^2 = 6.176$ $p=0.013$). The attitude of the adolescents towards eating F&V was found to have a significant association (61-31.3%, F&V 34-17.4%, Local food 57-29.2%, All foods 43-22.1% $\chi^2=13.022$ $p=0.005$). Further, adolescent who acknowledged that not eating F&V was harmful influenced their consumption (104-53.3% versus 91-46.7%: $\chi^2 = .003$ $p=0.957$). The adolescent's preference of a half a plate of F&V was not significantly associated with consumption (137-73.3% versus 50-26.7%: $\chi^2 =.022$ $p=0.883$). Considering F&V as healthy foods influenced their consumption (184-92.0% versus 9-4.5%: $\chi^2=17.542$ $p=0.000$).

Community based factors

There were various community linked factors that barred F&V consumption; namely, religion (N=24, 8.1%) and culture (N=33, 11.0%). On contrary, parents authority on F&V (15-7.7% versus 179-92.3%, $\chi^2 =14.245$ $p=0.000$) positively influenced the uptake. Also, adolescent who saw their friends taking F&V were less likely to eat them (185-95.9% versus 9-4.8%: $\chi^2 = .471$ $p=0.492$). The fact that taking F&V was not forbidden by parents showed statistical significance (15-7.7% versus 179-92.3%: $\chi^2 = 14.245$ $p=0.000$) (Table 2).

Interpersonal factors (Peer influence and social networks)

This study elucidated that 288 (75.7%) of respondents' friends ate F&V; of these, 116 (38.5%) were influenced by their friends. Furthermore, community gatherings that talked about F&V influenced their consumption (37-18.5% versus 112-56.0% $\chi^2=16.138$ $p=.000$ (Table 3).

Institutional factors

Majority (N=151, 50.2%) of the adolescent had not heard of laws on F&V consumption. There were 231(76.7%) participants who had received health education; of these, 109 (36.2%) heard it from schools, 49(16.3%) got it from home, and 9(3.0%) from the community. While F&V were sold in the school canteen, majority (n=146, 48.5%) took F&V once a week, 26(8.6%) daily, 35 (11.6%) every other day and 19 (6.3%) once a month. Most respondents (N=186, 43.0%) revealed that F&V were highly priced, and only 212(74.9%) could afford buying them. Variation in F&V prices (171-95.5% versus 7-3.9% $\chi^2=8.557$ $p=0.14$) prejudiced their consumption (Table 4).

Analysis of determinants of F&V consumption among adolescents

A binary logistic regression model was fitted, and adolescents who were day-scholars were more likely to consume F&V and being in a school clubs increased by 2.7 times chances of F&V consumption (Table 5).

Discussion

There were only 66.4% of the respondents who reportedly consumed F&V. The individual factors that influenced F&V consumption were;

Age/gender; results indicated that while 32(16.0%) of the respondents aged 10-14 years and 168 (84%) respondents aged 15-19 took F&V, there was no statistical significance between the age and consumption ($\chi^2=0.679$ $p=0.0410$). This contravenes a study which

Table 1. Individual factors

Variable	Consumed F&V		Total	Chi-square	p-value
	Yes	No			
Think it's important to eat F&V (n=298)					
Yes	191(97.0)	91(90.1)	282	6.176	0.013*
No	6(3.0)	10(9.9)	16		
Do you eat enough vegetables					
Fruits daily	82(59.9)	67(74.4)	149	5.127	0.024*
Vegetables	55(40.1)	23(25.6)	78		
Not eating F&V is harmful (n=295)					
Yes	104(53.3)	53(53.0)	157	0.003	0.957
No	91(46.7)	47(47.0)	138		
Foods preferred to F&V (n=291)					
Fast food like pizza	61(31.3)	21(21.9)	82	13.022	0.005*
Fruits & vegetables	34(17.4)	33(34.4)			
Local foods such as Matooke, Posho	57(29.2)	18(18.8)			
All foods	43(22.1)	24(25.0)			
Prefers that half the plate are F&V					
Yes	137(73.3)	71(72.4)	208	0.022	0.883
No	50(26.7)	27(27.6)	77		
Thoughts on eating F&V					
Eaten by poor people	9(4.5)	18(17.8)	27	17.542	0.000*
Health foods	184(92.0)	83(82.2)	267		
Others	7(3.5)	0(0.0)	7		

*Statistically significant $P < .05$

Table 2. Community based factors

Variable	Consumed F&V		Total	X ²	p-value
	Yes	No			
Are F&V prohibited by your religion					
Yes	9(4.6)	15(14.9)	24	9.446	0.002*
No	187(95.4)	86(85.1)	273		
Are F&V prohibited by your culture					
Yes	16(8.2)	17(17.0)	33	5.220	0.022*
No	180(91.8)	83(83.0)	263		
Do you eat fruit foods					
Yes	185(95.9)	95(94.1)	280	.471	0.492
No	8(4.1)	6(5.9)	14		
Do you eat these vegetables at home?					
Yes	180(95.2)	89(93.7)	269	.305	0.581
No	9(4.8)	6(6.3)	15		
Did your family eat F&V when you were younger					
Yes	114(64.8)	63(65.6)	177	.020	0.888
No	62(35.2)	33(34.4)	95		
Like to eat choice foods					
Yes	91(46.7)	36(36.7)	127	2.620	0.106
No	104(53.3)	62(63.3)	166		
Take part in shopping for food					
Yes	123(62.4)	73(73.0)	196	3.298	0.069
No	74(37.6)	27(27.0)	101		
Fruits/vegetables forbidden by parents					
Yes	15(7.7)	23(23.5)	38	14.245	0.000*
No	179(92.3)	75(76.5)	254		

*Statistically significant $P < .05$

Table 3. Interpersonal factors

Variable	Consumed F&V		Total	X ²	p-value
	Yes	No			
Peer influence N=301					
Do you friends eat F&V					
Yes	153(76.5)	75(74.3)	228	.419	0.811
No	7(3.5)	5(5.0)	12		
Don't know	40(20.0)	21(20.8)	61		
Do you eat F&V because of your friends					
Yes	79(40.5)	37(36.6)	116	.420	0.517
No	116(59.5)	64(63.4)	180		
Do your friend tease when you eat F&V					
Yes	33(17.4)	23(22.8)	56	1.239	0.266
No	157(82.6)	78(77.2)	235		
Do you feel comfortable eating F&V					
Yes	125(65.1)	79(80.6)	204	7.480	0.006*
No	67(34.9)	19(19.4)	86		
Social networks n=301					
School clubs that talk about F&V					
Yes	42(21.0)	39(38.6)	81	15.078	0.001*
No	131(65.5)	43(42.6)	174		
Don't know	27(13.5)	19(18.8)	46		
Gatherings in the community on F&V					
Yes	37(18.5)	35(34.7)	72	16.138	0.000*
No	112(56.0)	33(32.7)	145		
Don't know	51(25.5)	33(32.7)	84		
Obtain info on F&V from Google					
Yes	80(40.0)	52(51.5)	132	3.882	0.144
No	113(56.5)	45(44.6)	158		
Don't know	7(3.5)	4(4.0)	11		

Table 4. Institutional factors

Characteristics	Consumed F&V		Total	Chi-square	P-value
	Yes	No			
Policies & laws on fruits & vegetables					
Ever heard of rules or laws on F&V					
Yes	76(38.0)	49(48.5)	125	4.484	0.106
No	109(54.5)	42(41.6)	151		
Don't know	15(7.5)	10(9.9)	25		
If yes, where?					
At school	24(30.8)	12(24.0)	36	7.551	0.109
In the community	1(1.3)	5(10.0)	6		
In hospitals	35(44.9)	18(36.0)	53		
On social media	9(11.5)	5(10.0)	14		
Television	9(11.5)	10(20.0)	19		
Health education on fruits & vegetables					
Receive health education on F&V					
Yes	158(79.0)	73(72.3)	231	1.699	0.192
No	42(21.0)	28(27.7)	70		
If yes, where?					
At school during lessons	76(48.1)	33(45.2)	109	6.376	0.095
At school but outside the lessons	49(31.0)	15(20.5)	64		
In the community	4(2.5)	5(6.8)	9		
At home	29(18.4)	20(27.4)	49		
Food establishment					

F&V sold at the canteen					
Yes	171(95.5)	81(86.2)	252	8.557	0.014*
No	7(3.9)	9(9.6)	16		
Don't know	1(.6)	4(4.3)	5		
Are F&V served at school					
Yes	111(61.3)	55(56.7)	166	.562	0.454
No	70(38.7)	42(43.3)	112		
If yes, how often					
Everyday	12(8.1)	14(18.2)	26	5.598	0.133
Every other day	23(15.4)	12(15.6)	35		
Once a week	102(68.5)	44(57.1)	146		
Once a month	12(8.1)	7(9.1)	19		
How much of the F&V are served					
Half a plate	9(5.4)	11(13.6)	20	11.496	0.003*
A small piece	127(76.0)	45(55.6)	172		
Medium size	31(18.6)	25(30.9)	56		

*Statistically significant $P < 0.05$

Table 5. Model summary

Variable	Coefficient (B)	Standard Error (S.E.)	Wald's chi square	df	Sig.	Odds Ratio Exp(B)
School category(Day)	.251	.477	.277	1	0.599	1.285
Food provided at school(yes)	.212	1.033	.042	1	0.837	1.237
Eating avocado	-.865	.469	3.401	1	0.065	0.421
Important eat F&V(Yes)	-1.776	.835	4.523	1	0.033	0.169
Eating enough fruits(yes)	.999	.474	4.430	1	0.035	2.715
Prefer to eat other types of foods			5.951	3	0.114	
<i>Fast foods</i>	-.105	.611	.030	1	0.864	0.900
<i>Fruits (pawpaw) & veggies (nakati)</i>	1.049	.588	3.184	1	0.074	2.856
<i>Local foods</i>	-.120	.659	.033	1	0.855	0.887
Religious taboos against fruits(Yes)	1.065	.786	1.833	1	0.176	2.900
Cultural taboos against F&V(Yes)	-.208	.849	.060	1	0.806	0.812
Family does not fruits(Yes)	.939	.682	1.894	1	0.169	2.557
Friends eat F & V(Yes)	.250	.513	.238	1	0.625	1.284
Community gatherings on F&V						
<i>Gatherings (Yes)</i>	.355	.633	.314	1	0.575	1.426
<i>Gatherings (No)</i>	.107	.600	.031	1	0.859	1.112
Quantity of F & V served						
<i>Half a plate</i>	.065	.772	.007	1	0.933	1.067
<i>A small piece</i>	-.833	.511	2.653	1	0.103	0.435
F&V cost the same						
<i>Yes</i>	-.411	.865	.225	1	.635	0.663
<i>No</i>	-.289	.755	.146	1	.702	0.749
School clubs			2.231	2	.328	
<i>Yes</i>	1.008	.910	1.228	1	.268	2.740
<i>No</i>	.021	.813	.001	1	.979	1.021
Constant	.293	1.614	.033	1	.856	1.340

-2Log likelihood 159.535

Cox & Snell R square .241

Nagelkerke R square .327

revealed that F&V consumption decreased with increase in age [15]. This is probably ascribed to the fact that majority of the respondents were school going with a uniform distribution of school meals regardless of age. Thus, interventions to improve F&V consumption for this category ought to be considered. Regarding gender, more females (N=128, 64%) consumed more F&V, although this did not show statistical association ($\chi^2=0.12$ $p=0.914$). This is contradicts a study in Finland the Baltic countries [16].

Knowledge was an important predictor of F&V consumption, with a positive impact (N=282, 93.7%) and statistical association (OR 0.69, (191-97.0% versus 6-3.0% $\%: \chi^2 = 6.176$ $p=0.013$). This agrees with a

study by Razan et al. [17]. On this basis, interventions that highlight the value of F&V could benefit the increment of their intake.

Attitudes: The preference reflected the adolescent's attitudes towards F&V consumption as seen by eating fast foods, and this showed a statistical significance ($p=0.005$). This is in agreement with a study by Razzan et al. [17].

Education: At multivariate level, the type of school influenced F&V consumption ($p= 0.005$). Thus, the ability of a school to offer meals to the adolescents was found to influence their consumption, similar to a finding as earlier reported [18,19].

Beliefs: In this study, religious beliefs and taboos pertaining F&V consumption did not negatively impact. The study findings revealed that adolescents who felt that they ate enough F&V were more likely to consume more, and this showed statistical significance as earlier reported [21].

The socio-cultural factors influencing F&V consumption

Cultural influence in form of taboos on F&V did not influence consumption. This finding is in agreement with earlier reports [22,23].

Peer influence: This study showed that adolescents were more likely to consume F&V if their friends and families ate them ($p=625$). This contravenes previous findings [22]. Further, social networks in which having an F&V club at school (social networks) influenced their consumption, a finding that affirms previous findings [24-26].

The institutional factors influencing F&V consumption

The F&V availability in the school canteen was found to positively influence consumption ($p=0.014$). This agrees with previous reports [27, 28]. To this, it's imperative that institutions ought to avail these to adolescents at a reasonable price [29].

Conclusions

Based on the findings, a few of the adolescents consumed F&V, and the consumption was less than the 400g daily recommendation. Background factors, individual factor, knowledge, attitude and beliefs among adolescents were key drivers to F&V consumption. While most communities are in possession of F&V, this did not enhance their uptake. As the nutritional benefits of F&V are irrefutable, we recommend multi-sectorial promotion, awareness and availability of F&V to enhance their daily consumption.

Declarations

Ethics approval and consent to participate

We received ethical approval from the research and ethics committee of Clarke International University (Formerly known as International Health Sciences University). All respondents provided written informed ascent and consent.

Availability of data and materials

The data used for this manuscript has been included, further information on datasets can be availed on request from the corresponding author.

Authors' contributions

MN, PK, CA & IMT conceived the study idea, participated in study design; data acquisition, analysis, and interpretation; and manuscript drafting and revision. CA & IMT drafted and revised the manuscript. All authors read and approved the final manuscript.

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