Knowledge and Determinants of Fruit and Vegetable Consumption among Adults in Hohoe Municipality, Ghana

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Abstract

The World Health Organization (WHO) recommends that a person consumes at least 400g of Fruit and Vegetable (FV) daily to prevent chronic disease risk. We assessed knowledge of current WHO guidelines and other determinants of FV intake among adults (≥ 18 years, n = 397) in Hohoe Municipality, Ghana. Face-to-face interviews using a questionnaire adopted from WHO Risk Factor Surveillance System were undertaken. Knowledge of FV daily servings and determinants of intake were evaluated by descriptive statistics and binary logistic regression. There was a 99.2% response rate with approximately 9% of participants correctly stating the WHO daily recommended amount (P = .296). Most (54%) of respondents' FV intake was affected by unavailability of desired choice (P = .050). Odd of inadequate consumption for persons aware of adequate amount was 1.97 (95% CI: 0.64, 6.05, P = .234) higher than persons without awareness. Participants with problems accessing their desired choice of FV had 0.59 odds (95% CI: 0.36, 0.95, P = .030) of consuming inadequate amount compared to those with easy access. Adequate FV intake depends on availability of consumer preference regardless of knowledge of recommendations. Individual FV cultivation is relevant for availability of preferred choice and adequate consumption for NCDs risk reductions among Ghanaians.

Keywords

fruit, vegetable, knowledge, WHO, adults, chronic diseases

1. Introduction

Inadequate Fruit and Vegetable (FV) consumption is ranked high among behavioural risk factors associated with increasing incidence of global Non-Communicable Diseases (NCDs) such as cardiovascular disease, ischaemic heart disease, stroke, and cancers (WHO, 2016; Oyebode, Gordon-Dseagu, & Walke, 2014; Vaidya, Oli, Aryal, Karki, & Krettek, 2013; Boeing et al., 2012; Hall, Moore, Harper, & Lynch 2009). Other research has also linked the phenomenon to disabilities and mortalities worldwide (WHO, 2016; Hall et al., 2009). Notably, in 2000, almost 27 million Disability Adjusted Life Years (DALYs) reported worldwide was associated with poor FV consumption (Hall et al., 2009). More regrettably, in 2013, low FV intake accounted for an estimated 5.2 million global deaths (WHO, 2016).

Studies have shown positive associations between increased FV intake and NCDs risk prevention (WHO, 2016; Oyebode et al., 2014; Boeing et al., 2012). Consumers of FV hardly become obese and are less likely to develop chronic diseases (WHO, 2016; Oyebode et al., 2014; Boeing et al., 2012). This evidence underpins the World Health Organization (WHO) guidance on individual consumption of ≥ 400g daily (≥ 5 servings of 80 g each) of varieties of FV as reported (Hall et al., 2009; Agudo, 2014). The guideline aims to achieve and maintain adequate FV intake globally for NCDs prevention and has since been translated into diverse national health promotion campaigns in different geographical areas (Agudo, 2004). Notably, in Ghana, the Ministry of Health (MoH) promoted FV intake as "medicine" as part of the regenerative health campaign strategy to enhance

healthy eating and for averting increasing risk of NCDs among residents (MoH, 2008). Despite this, the MoH campaign seems to be silent on WHO recommendations.

There is a lack of data on awareness of the WHO guidance for maintaining adequate intake in previous studies (Amo-Adjei & Kumi-Kyereme, 2015; Nti, Hagan, Bagina, & Seglah, 2011; Hall et al., 2009). In particular, Hall et al.'s global study and similar studies on FV intake in Ghana only focused on consumption (Amo-Adjei & Kumi-Kyereme, 2015; Nti et al., 2011; Hall et al., 2009). More importantly, subsequent assessments of interventions on FV consumption showed negligible successes and warrants further research (Amo-Adjei & Kumi-Kyereme, 2015; Nti et al., 2011; Tagoe & Dake, 2011; Pomerleau, Karen, Cécile, & Mckee, 2005). We therefore aimed to assess knowledge on the WHO guideline of daily FV intake and determinants of consumption among adults in the Hohoe Municipality, Ghana, to provide evidence for future interventions.

2. Materials and Methods

2.1 Study Population and Design

A cross-sectional study was undertaken in three locations (urban, peri-urban and rural) in the Hohoe Municipality, Volta region of Ghana using a multistage sampling method. The Municipality is located in the northern part of Volta region, and shares its border with the Eastern part of the Republic of Togo. Most of the residents are farmers who cultivate cash crops and vegetables and also rear livestock. Farming activity is more popular among the rural dwellers whilst trading and other industrial activities are undertaken by most of the urban inhabitants.

A total sample size (n) of 397 adults (18 years and above) was estimated using low FV intake population prevalence (p = 38%), margin of error (e = 5%), confidence level desired ($Z_{\alpha/2}$ = 1.96), 95% confidence interval (CI) and published formula $n = (Z_{\alpha/2})^2 P (1-P) \div e^2$ (Hall et al., 2009; Snedecor & Cochran, 1989). Selected adults are eligible since in Ghana they represent a constitutionally acceptable and self-informed decision-making body whose decisions can invariably impact households eating habits. Adolescents below 18 years and those whose mental judgement could influence responses including proxy respondents were excluded in this study.

2.1.1 Sampling Techniques

Eligible respondents were selected with probability proportionate to sample size in each location: urban (232), sub-urban (117) and rural (48). This ensures that the information gathered represent rural/urban dynamics. Researchers grouped the municipality into three strata and one community was randomly selected from each stratum using lottery method where individual units were interviewed.

In the chosen community, the investigators located the centre, spun a pen on the ground and followed the direction in which the head of the pen indicated to select the first house where a household was interviewed at random. This method (spin-the-pen) for selecting respondents has been discussed elsewhere (Grais, Angela, & Jean-Paul, 2007). Subsequently, the investigators visited the next house whose entrance was facing them in that manner until the number of respondents was interviewed. The procedure was repeated throughout in each selected stratum.

2.1.2 Ethical Approval

Individual written informed consent was obtained from all participants. The study was approved by Ghana Health Service Ethical Review Committee (GHS-ERC, ID: 02/04/15).

2.1.3 Data Collection

A face-to-face interview was undertaken between May and June 2015 by trained research assistants using the pre-tested semi-structured questionnaire adapted from WHO STEP wise approach to surveillance of Non-Communicable Diseases (NCDs) FV module (WHO, 2015; WHO, 2008). The tool is reported to be valid and data gathered reflects the usual consumption reflecting positively on respondents' habitual rather than actual intake (Agudo, 2004). The questionnaire was translated from English to the local language (Ewe and Akan) by an independent bilingual researcher or translator prior to field implementation for ease of understanding by the

subjects and used as appropriate. It was back translated by members of the research team following http://www.who.int/substance_abuse/research_tools/translation/en/;
http://www.dgim.ucsf.edu/cadc/cores/measurement/translationguide.pdf
Researchers also used a pictorial show card that presented samples of locally available FV and their amounts, excluding juices, in line with WHO standard amounts (modified from Hall et al., 2009; WHO, 2008). Field pre-testing of the show card was undertaken prior to data collection. The show card supported the interview processes for standard estimation of serving size and number of servings reported (Hall et al., 2009; WHO, 2008; Agudo, 2004). This ensured participants understood how each count was calculated in relation to the responding question and enhanced the content validity of the survey tool.
The study examined data on sex, age, marital status, education, occupation and monthly income, and source of information. Knowledge of experts' daily recommendation was measured by asking participants the following questions:

1. In your opinion, are you eating enough FV to be healthy? Limited to a yes or no response.
2. What is the WHO minimum recommended FV servings day/person? Responses selected from 1, 2, 3, 4 and ≥ 5 servings respectively.

Other determinants of FV intake were analysed by perceived barriers/facilitators including access to materials to cultivate, (land, seeds and equipment) quality, availability of preferred choice, initiatives and FV information source.

2.1.4 Statistical Analysis

Data was coded, entered and analysed using the Statistical Package for Social Sciences (SPSS) version 20, 2011 (IBM Inc.). Of the 397 questionnaires, a total of 394 respondents' completed questionnaires were analysed representing a 99.2% useable response rate due to 0.8% missing data. Participants' knowledge of adequate FV consumption was classified based on their response to WHO defined criterion (Hall et al., 2009; Agudo, 2004). Dependent variables included FV intake grouped into inadequate serving (< 5 servings) and adequate intake (≥ 5 servings) whereas independent variables were respondents' background characteristics, knowledge and factors of FV consumption. Statistical analysis performed included descriptive and binary logistic regression to establish odds ratio of factors influencing consumption among adequate (≥ 5 servings coded "0") and inadequate (< 5 servings coded "1") respondents. A chi-square test was used to test for statistical difference for categorical variables and p-value 0.05 was considered significant.

3. Results

The demographic characteristics for the respondents are provided in Table 1. Respondents mean age was 35.6 years (standard deviation [SD] ± 12.6y). Urban participants represented the majority (58.4%) and almost 52% were within low income group with 33.5% of them being traders. Junior High/Middle School and Tertiary graduates respectively dominated respondents' educational background. Although, the respondents' marital status, income and educational levels show no statistical significance with FV intake, there was statistical significant relationship between their location and occupation and FV consumption.

Table 1. Background Characteristic Stratified with Subjects' Fruit and Vegetable Intake

Variables	Fruit and vegetable daily consumption			P-value
	< 5, n =108(27.4%)	≥ 5, n =286(72.6%)	Total n = 394(%)	
Age (years)				
Mean age 35.6(SD 12.6)				
18-29	55 (50.9)	114 (39.9)	169 (42.9)	.287
30-39	25 (23.1)	70 (24.5)	95 (24.1)	
40-49	17 (15.7)	54 (18.9)	71 (18.0)	
50-59	7 (6.5)	31 (10.8)	38 (9.6)	
60 plus	4 (3.7)	17 (5.9)	21 (5.3)	
Gender of respondents				.820
Male	45 (41.7)	124 (43.4)	169 (42.9)	
Female	63 (58.3)	162 (56.6)	225 (57.1)	
Marital status of respondents				.748
Single	34(31.5)	77(26.9)	111(28.2)	
Married/co-habiting	66(61.1)	185(64.7)	251(63.7)	
Divorced	2(1.9)	9(3.1)	11(2.8)	
Widowed/Widower	6(5.6)	15(5.2)	21(5.3)	
Respondents Community of residents				.001
Urban	80 (74.1)	150 (52.4)	230 (58.4)	
Sub-urban	23 (21.3)	93 (32.5)	116 (29.4)	
Rural	5 (4.6)	43 (15.0)	48 (12.2)	
Educational level of respondents				.593
None	6 (5.6)	18 (6.3)	24 (6.1)	
Primary	20 (18.5)	38 (13.3)	58 (14.7)	
Junior High School	39 (36.1)	122 (42.7)	161(40.9)	
Senior High School	23 (21.3)	52 (18.2)	75 (19.0)	
Tertiary	20 (18.5)	56 (19.6)	76 (19.3)	
Occupation of respondents				.044
Artisan	28 (25.9)	64 (22.4)	92 (23.4)	
Farming	6 (5.6)	34 (11.9)	40 (10.2)	
Government/private employee	16 (14.8)	62 (21.7)	78 (19.8)	
Trading	37 (34.3)	95 (33.2)	132 (33.5)	
Unemployed	21 (19.4)	31 (10.8)	52 (13.2)	
Income status of respondents				.800
Low	145 (50.7)	58 (53.7)	203 (51.5)	
Average	127 (44.4)	44 (40.7)	171(43.4)	
High	14 (4.9)	6 (5.6)	20 (5.1)	

SD: Standard Deviation, n: sample size; % Per cent; < Less than; ≥ Greater than or equal to.

Table 2 shows there is no significant association between knowledge of recommended daily quantity of FV and its consumption. Although the majority (80.2%) of respondents affirmed they consumed adequate FV to remain healthy (P = .667), this did not reflect their knowledge as only 8.9% could indicate correctly the WHO recommendation (P = .296). About 43% and 39% of the respondents had access to land and seed/equipment respectively for their own FV cultivation. Majority (more than 80%) of both adequate and inadequate consumption participants indicated they could easily obtain good quality FV (P = .288). However, a significant association existed between availability of the kind of FV and what kind a participant's desire to eat at a particular time (season of the year). Of 54.3% participants who were challenged with their desired choice of FV, 46.3% consumed below WHO predefined standard (P = .050).

In relation to where knowledge is obtained from the highest proportion (78%) of participants reported they were informed about FV intake via radio (P = .903), compared to television (45.6%) (P = 1.00) and 37.3% by health workers (P = 1.00) though there was no statistically significant association (Bonferroni correction due to multiple comparison).

Table 2. Knowledge and Factors of Fruit and Vegetable Consumption among Respondents

Variables	Daily Amount of fruit and vegetable consumed			P-value
	< 5, n =108(27.4%)	**≥ 5, n= 86(72.6%)**	**Total n=394**	
In your opinion, are you eating enough fruit and vegetable to be healthy?				.667
Yes	84 (77.8)	232 (81.1)	316 (80.2)	
No	13 (12.0)	26 (9.1)	39 (9.9)	
Don't know	11 (10.2)	28 (9.8)	39 (9.9)	
What is the WHO daily recommended minimum amount of fruit and vegetable per person?				.296
1 serving	15(13.9)	33(11.5)	48(12.2)	
2-4 servings	16(14.8)	36(12.6)	52(13.2)	
≥ 5 servings	5 (4.6)	30(10.4)	35 (8.9)	
Do not know	72(66.7)	187(65.4)	259(65.7)	
Do you think eating a diet high in fruit and vegetable can decrease chances of developing NCDs?				
Yes	77 (71.3)	206 (72.0)	283 (71.8)	.626
No	19 (17.6)	41 (14.3)	60 (15.2)	
Don't know.	39 (13.6)	12 (11.1)	51 (12.9)	
Is it easy for you to get good quality fruit and vegetable?				.288
Yes	87(80.6)	243(85.0)	330(83.8)	
No	21(19.4)	43(15.0)	64(16.2)	
Do you have problem getting your choice of fruit and vegetable to consume?				.050
Yes	50(46.3)	164(57.3)	214(54.3)	
No	58(53.7)	122(42.7)	180(45.7)	
Do you have access to an area to grow your own fruit and vegetable?				.066
Yes	38 (35.2)	130(45.5)	168(42.6)	
No	70 (64.8)	156(54.5)	226(57.4)	
Can you easily obtain seeds/equipment you need to grow your own fruit and vegetable in your area?				.079
Yes	33(30.6)	120(42.0)	153(38.8)	
No	5(4.6)	13(4.5)	18(4.6)	
Not Applicable	70(64.8)	153(53.5)	223(56.6)	
Are there initiatives promoting fruit and vegetable intake?				.617
Yes	75(69.4)	207(72.4)	282(71.6)	
No	33(30.6)	79(27.6)	112(28.4)	
Where do you get information on fruit and vegetable intake?				
Radio	50(84.7)	138(75.8)	188 (78.0)	.903
Television	24(40.6	86(47.3)	110(45.6)	1.000
Newspaper	1(1.69)	7(3.8)	8(3.3)	1.000
Leaflet	1(1.6)	7(3.8)	8(3.3)	1.000
Poster	2(3.4)	15(37.9)	17(7.1)	1.000
Health workers	21(35.5)	69(37.9)	90(37.3)	1.000

% Per cent; < Less than; ≥ Greater than or equal to; n: sample size.

Table 3 illustrates possible influence of availability on FV consumption using binary logistic regression analysis. The Odds Ratio (OR) of consuming inadequate serving of FV was 0.59 (95% CI: 0.36, 0.95, P = .030) among participants with problem getting a desired choice of FV compared with persons without problem of choice. This result was statistically significant. The OR of having inadequate servings for persons who are aware of what an adequate serving is, was 1.97 (95% CI: 0.64, 6.05, P = .234). This is higher than persons with no awareness, although the result is not statistically significant.

Table 3. Logistics regression analysis of Knowledge and Determinants of fruit and vegetable intake

< 5 Fruit and Vegetable Servings	β	S.E.	P-Value	Odds Ratio	95% CI	
					Lower	Upper
Is it easy for you to get good quality fruit and vegetable?	-.431	0.313	.168	0.650	0.352	1.199
Do you have area to grow fruit and vegetable?	-.384	0.238	.107	0.681	0.427	1.087
Do you get your desired choice of fruit and vegetable?	-.531	0.245	.030	0.588	0.364	0.950
Can fruit and vegetable intake prevent NCDs?	-.003	0.260	.990	0.997	0.599	1.658
Do you know the recommended amount fruit and vegetable to be consumed daily?	.680	0.572	.234	1.974	0.644	6.054
Are there initiatives promoting fruit and vegetable intake?	.035	0.263	.893	1.036	0.619	1.734

< Less than; β: Regression Coefficient; S.E: Standard Error of the Mean, CI: Confidence Interval.

4. Discussion

We established that less than 10% of the respondents knew the WHO predefined daily minimum intake amount of FV (P = .296). This finding did not correspond with the majority who indicated they consumed adequate amounts to remain healthy (P = .667). The odds ratio of having inadequate servings to persons aware of adequate servings was rather higher (OR > 1) than among persons without awareness. Therefore, awareness about WHO predefined criterion had no positive influence on quantity of FV consumption. Indeed, the low level of knowledge found in this study corroborates a previous study in Ghana (Aitken et al., 2014). In contrast, a review that extensively discussed adequate FV intake and chronic diseases risk reduction benefits fell short of finding out whether people know what adequate consumptions are (Boeing et al., 2012). Of note, Hall and colleagues reported intake below standard globally, including Ghana (Hall et al., 2009). Studies conducted in three zones of Ghana involving the study region also documented poor intake (Amo-Adjei & Kumi-Kyereme, 2015; Nti et al., 2011). However, these studies did not adequately address subjects' knowledge of health experts' recommended amount that could possibly trigger individual adequate consumption and this is a clear limitation to assessing population FV consumption (Agudo, 2004). Certainly, measuring population FV consumption in relation to the quantity consumed to derived health benefits strongly reinforces public health strategies of which our study supports (Agudo, 2004).

In this study, we affirm that media advertisement serves as one of such platform to facilitate increased FV intake, notwithstanding the result of our study showing no statistical significance. Radio and television were two main ways found in this study to have informed segment of Ghanaian population about the nutritional benefits of FV as had been reported (Nti et al., 2011). Adequate health education on healthy lifestyle benefits supposedly influences healthy behaviour changes among African American women (Delores, Harville, Efunbumi, & Martin, 2015). A well-informed people likely adopted healthy lifestyles and equally applied such information obtained based on the source (Delores, 2015). Also, several other reviews of wide ranges of worldwide intervention and local policies on FV intake implemented provide evidence to suggest that intensification of healthy life campaigns may be a determinant of improvement in FV intake, though data revealed just modest increase on the amount consumed (Amo-Adjei et al., 2015; Tagoe et al., 2011; Pomerleau et al., 2005).

Interestingly though, awareness of the WHO recommendation reflected poorly on quantity consumed, evidence from this study suggest that lack of desired choice of FV and location negatively influenced subjects' consumption. Our result shows association between participants' consumption at a particular time (season of the year) and availability of choice and their locations. Indeed, the greater proportion of the respondents who could easily obtain good quality FV even consumed poorly as a result of not finding what they desired for and this increased disproportionally from among rural to urban respondents (P = .288). In our study, we also established that the odds ratio of consuming inadequate serving for persons who had challenges accessing their desired choice of FV was lower compared with persons without problem of desired choice. Possibly, the respondents

limited access to land and materials for cultivating their own FV threatened availability and thus consumption. The decision to consume FV has strong linkages with numerous factors ranging from personal to the environment (Amo-Adjei et al., 2015; Ting, Wojciech, Sarpong, Manjeet, & Anna, 2014; Marie, Minot, & Lisa, 2004; Pollard, Kirk, & Cade, 2002). Previous studies elucidated individual preference, accessibility and availability (quality and quantity), sensory appeal (taste or texture) and location, all of which our result substantiates (Ting et al., 2014; Marie et al., 2004; Pollard et al., 2002). Indeed, we confirmed that those who consumed adequate FV actually got their best choice that they wanted regardless of what health experts have indicated to be the appropriate amount. Moreover, although we did not examine ethnicity and cultural preference, which has strong influence, it has been reported in other studies (Di Noia, Monica, Cullen, Pérez-Escamilla, Gray, & Sikorskii, 2015; Marie et al., 2004). Our finding therefore advances the understanding of drivers of FV intake and recognition of WHO guideline and practices of which just few studies were examined (Aitken, 2014).

This study employed quantitative terms to defining FV intake and used same to explain respondents' views about experts' advice on consumption. This method has been proven valid for evaluating population FV consumption (Agudo, 2004). The WHO System for NCDs Risk-Factor Surveillance FV intake assessment model is validated, flexible and easily applicable and reports reliable estimate of usual consumption and therefore our finding from recruiting respondents from three strata enhanced views from diverse background is justified for population comparisons (WHO, 2008; Agudo 2004).

However, the study had limitations. FV intake knowledge was measured by self-reporting relying on respondent recall, thus there existed a natural tendency of recall bias, random error and social desirability (Oyebode et al., 2014; Agudo 2004). Additionally, cultural preferences were not assessed and determining the amount of servings pictorially from show card of which the questionnaire did not measure FV juices could lead to imprecise estimation of intake (Agudo, 2004). The strength of the study includes the use of field investigators who were trained using appropriate protocols (Hall et al., 2009; WHO, 2008). They also explained the portion size and how it is counted from the show card to the participants before the interview enhancing understanding of reliability of information gathered.

5. Conclusion

We established poor knowledge on daily FV consumption based on the WHO guideline and furthermore the few knowledgeable participants tended to consume below the recommended levels. Importantly, the absence of desired choice of FV impacted negatively on consumption. Adequate FV intake depends on consumer preference and availability regardless of health experts' advice. This suggests individual FV cultivation is relevant for availability of preferred choice and adequate consumption to mitigate risk of NCDs among Ghanaians.

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