Low fruit and vegetable intake and its associated factors in Ethiopia: A community based cross sectional NCD steps survey

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Abstract

Background: Non-communicable diseases (NCDs), including cardiovascular diseases, diabetes mellitus, cancers and chronic respiratory diseases, have remained the major burden and threat of the world with quite alarming rise in the developing nations. Eating a diet high in fruits and vegetables is associated with a decreased risk of many chronic diseases.

Methods: Community-based cross-sectional survey based on the World Health Organization (WHO) NCD Stepwise approach was done. The survey was conducted in the 9 regions and two city administrations (Addis Ababa and Dire Dawa) in Ethiopia. The target population for this survey included all men and women age 15-69 years old who consider Ethiopia to be their primary place of residence. A single population-proportion formula was used to determine the sample size: design effect coefficient of 1.5, Z-score of1.96, proportion of 35.2%and marginal error of 0.04. A total of 513 EAs were covered nationwide. Thus, 10,260 study participants were included in the study. A mix of sampling approach namely stratified, three-stage cluster sampling, simple random sampling and Kish method were employed to select the study settings and the study participants. Descriptive weighted analysis was done along with complex sample analysis, and bivariate and multivariate analysis was conducted for fruit and/or vegetable intake.

Result: The prevalence of fruit and/or vegetable consumption in Ethiopia was found to be (1.5%). More female than male ate fruit and vegetable in Ethiopia. When adjusted for included demographic and residence confounders (age, sex, location, income, education), those in rural area of residence ate ≥5 servings of fruits and vegetable [OR and (95% CI) [2.77 (1.60, 4.80)] than their counterparts.

Conclusion and recommendation: Fruits and/or vegetables intake was generally extremely low. As the general level of risk factors rises, more people are put at risk. Preventive interventions to address these behaviours are implemented at individual, group, and community levels and include education, access to fruits and vegetables should therefore aim at reducing risk throughout the population. [*Ethiop. J. Health Dev.* 2017;31(Special Issue):355-361]

Key Words: STEPs survey, fruit, vegetables, Ethiopia

Introduction

In Ethiopia, several studies have been conducted on NCDs over the last few decades which showed a rising trend with immense burden (1,2). Though, there is concurrence in the rise of the NCDs in Ethiopia, it has been argued that the findings and reports are fragmentary, sketchy, inconsistent and even contradictory to reflect the overall status of the nation. Apparently, the 2015 WHO report could give a better guesstimate of the burden of the problem which attributed 30% of all deaths in the country to NCDs (3). Ethiopia also pledged to increase the prevention and control of NCDs and put it as one priority area in the Health Sector Transformation Plan (HSTP)(Ministry of Health, 2015).

NCDs are fuelled by multiple, combined and complex factors. Among the several factors, the major modifiable risk factors include: tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity. It is well-documented and proven that interventions, targeted towards healthy life style by addressing the modifiable risk factors will result significant reduction in the burden of NCDs (3).

According to Global burden of disease report dietary risk s of chronic diseases were responsible for 60,402 deaths (95% CI: 44,943 - 74, 898), which contributes to 8.1% and 23.0% of all and NCD deaths, respectively. The number of daily adjusted life years lost (DALYs) caused by poor diet quality was 1,353,407 (95% CI: 1, 010, 4 33-1,672,828) DALYs (3.0 and 9.8% of DALYs of all causes and NCDs, respectively (5). The WHO has recommended a daily intake of ≥5 portions (400 g) of FV. However, many people have lower intakes, both in high-income and low-income countries (6). Studies in Kenya indicated that nearly _49% of the respondents eat fruit for not more than 3 days a week, only one-third _(33.2%) eat fruit 7 days a week. About 65% of them reported that they eat vegetables throughout the week. The prevalence of lower consumption of both fruit and vegetables (added together) was 57% (63% in women and 53% in men) and the prevalence of low consumption of either of them was 39.4 % (7). A study in Korle-u teaching hospital in Ghana revealed that almost 48% and 70.9% of the participants consumed fruits and vegetables respectively, at least three days in a week (8). Regular healthy diet intake can be

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considered as quite peculiar in the list of the modifiable risk factors. In addition, unlike the other risk factors the levels of awareness and deliberate life style modifications towards healthy diet have remained quite unsatisfactory and heterogeneous in different parts of the world. There are also significant barriers and factors that affect these healthy life practices which range from policy level down to implementation and from global down to individual level. The pattern of unhealthy diet consumption in Africa and Asia is worsening gradually while the developed nations are showing improvement. The heterogeneity is seen not only across the different parts of the globe but also within the same countries based on income status, residence area of people and other factors (9). Respondents had fruits and vegetables averaging 3 and 4 days respectively in a typical week. Only 11.6 %and 12.7 %of the male and female respondents consuming 5 or more servings according to Uganda 2014 step report on NCD (9). Identifying the magnitude and distribution of the fruit and vegetable consumption will thus be a key step to inform the policy makers, program managers and clinicians to have evidence based plans and decisions. Therefore, the aim of this study is to assess the burden and distribution of NCDs and dietary risk factors by using the WHO STEP wise approach by Ethiopian Public Health Institute in collaboration with FMOH, WHO and other developing partners from April to June 2015.

Methods

Study setting and period: The survey was conducted in the 9 regions and two city administrations (Addis Ababa and Dire Dawa) in Ethiopia. Each region is divided into administrative zones and the two city administrations are divided into sub-cities. The administrative zones in the nine regions and sub-cities in the two city administrations are subdivided into districts or 'Woreda'. The districts 'Woredas' are also further divided into 'Kebele'. The kebeles are the smallest administrative units with clear geographic jurisdiction in Ethiopia. Within Kebeles, there are Enumeration Areas (EAs) which are delineated by the Central Statistical Agency (CSA) of Ethiopia. According to the 2007 population and housing census, there were a total of 15,837 Kebeles in Ethiopia i.e. 14,364 rural and 1,473 urban kebeles. The study was conducted in 513 selected enumeration areas from mid-April to end-June 2015.

Study population: The target population for this survey included all men and women age 15-69 years old who consider Ethiopia to be their primary place of residence who are living at their place of residence for at least six months. This definition included those individuals residing in Ethiopia regardless of their citizenship status. Individuals who were not a permanent resident of Ethiopia, those who were institutionalized-including people residing in hospitals, prisons, nursing homes, and other similar institutions or residents whose primary residences are military camps or dormitories, critically ill, and mentally disabled were excluded from this study.

Sample size determination and sampling procedure: A single population-proportion formula was used to determine the sample size. To adjust for the design effect, a complex sampling design effect coefficient of 1.5 was used to compute the sample size. In order to have an adequate level of precision for each age-sex estimate and place of residence, the sample was multiplied by the number of age-sex and place of residence groups for which the estimates were reported. Thus, Z-score=1.96; proportion =35.2(10) marginal error=0.04; design effect =1.5; age-sex estimate and place of residence - sex estimate =10 groups, and non-response rate=20%. A total of 513 EAs were covered nationwide. Stratifying the sampling design by urban rural, 404 rural EAs and 109 to urban EAs. Taking into account the cost of the study and the level of precision - 20 Households (HHs) per EA and one eligible individual from each HH – the sample size the final sample size is calculated to be 10,260 HHs (10,260 study participants).

Thus, 10,260 study participants were included in the study. A mix of sampling approach namely stratified, three-stage cluster sampling, simple random sampling and Kish method were employed to select the study settings and the study participants. Prior to sampling, supervisors and data collectors visited the selected EAs and conducted a fresh listing of all HHs in that EA in consultation with local health workers and any other active member who have a good understanding of the local context. Eligible individuals were selected from HHs using Kish method. Only one eligible participant in the selected HH was enrolled in the survey. Using the Kish method, eligible participants in each household were ranked in order of decreasing age, starting with men followed by women.

Measurement and ascertainment of fruit and/or vegetables

Assessing fruit and vegetables eating: Respondents were asked for the number of days they ate fruit and vegetables in a typical week and on one of those days how many servings they ate these. One standard serving size equals to 80 grams. Servings were measured by showing pictorial show cards. For raw green leafy vegetables, 1 serving = one cup; for cooked or chopped vegetables, 1 serving = ½ cup; for fruit (apple, banana, orange etc…), 1 serving = 1 medium size piece; for chopped, cooked and canned fruit, 1 serving = ½ cup; and for juice from fruit, 1 serving = ½ cup.

Data collection and management: Data collection was done simultaneously at the 9 regions and 2 city administration by trained nurses and lab professionals (BSc and above degrees) during a face to face interview, using standardized questionnaire. Data were collected digitally using personal digital assistants (PDAs), eSTEPs software was used to design and program the data collection tools in the PDAs. The use of the software and PDAs to collect the data helped to generate the final dataset quickly following the completion of data collection. The collected data were then transferred to a central server located at EPHI via

Internet File Streaming System (IFSS) software. IFSS is an application that connects to and exchanges data with the server component. Data was managed using Excel, SPSS and Stata software.

Data analyses: Descriptive weighted analysis was done along with bivariate and multivariate analysis was conducted for fruit and/or vegetable intake. Further statistical analyses were done by using chi- squared tests and logistic regression models. Chi- squared tests were used when comparing groups. All factors with a p-value <0.05 in the bivariate analysis were further entered into the multivariate model to control for confounding effects. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was accepted at the 5% level (p<0.05. To identify the association of Fruit and/or Vegetable intakes with socio demographic characteristics, bivariate and multivariate logistic regression analysis was conducted. After performing bivariate analysis, based on the significance levels and categories of risk factors (modifiable and non-modifiable risk factors) of each independent variable multivariate analysis was conducted.

Result

Socio-demographic characteristics: In this survey, a total of 9800 study participants were enrolled with 95.5 % response rate of the 10,260 originally estimated sample size. Among all the study participants 3959 (40.2 %) were found in the age group 15- 29 years and 653 (6.7%) were in the age group 60-69 years of age. Six out of ten study participants were females and _7113 (72.6 %) of the study participants were dwellers from the rural area. Oromo (28.3 %) and Amhara (27.2%) ethnic groups together comprised more than half of the study participants. Nearly half 4843 (49.4%) of the respondents attended no formal education and only 12(0.1%) of them attended postgraduate level training. Around two thirds (67.3 percent) of the study participants were married and 41 (0.4%) of them were cohabitating. The study, based on the income status, showed that more than half of the respondents (53.6 percent) were in the first quintile group of annual income (Table 1).

Table 1: **Socio-demographic characteristic of study participants, Ethiopia, 2015 (n-9800)**

Variable	Category	Number (n)	Percentage (%)
Age Group (Years)	15-19	3959	40.2
	30-44	3499	35.7
	45-59	1690	17.2
	60-69	653	6.7
Sex	Male	3977	40.6
	Female	5823	59.4
Residence Area	Urban	2687	27.4
	Rural	7113	72.4
Educational Level	No formal schooling	4843	49.4
	Less than Primary school	2818	28.8
	Primary school	975	9.9
	Secondary school	653	6.7
	College/University undergraduate	499	5.1
	Post graduate degree	12	0.1
Marital Status	Never married	1705	17.4
	Currently married	6593	67.3
	Separated	386	3.9
	Divorced	402	4.1
	Widowed	669	6.8
	Cohabitating	41	0.4
	Refused	3	0.0
Annual Income	1st Quintile	4597	53.6
	2nd Quintile	1364	15.9
	3rd Quintile	1220	14.2
	4th Quintile	1373	16.0
	5th Quintile	18	0.2

Fruit and/or vegetable intake: The mean intake off fruits was 0.3 (SD 0.7) servings/day in urban areas and 0.4 (SD.1) servings/day in rural areas, while the mean intake of vegetables was 0.5 (SD 0.1) servings/ day in urban areas and 0.7 (0.9) servings/day in rural areas. Few participants (1.5%) reached the recommended five servings a day (Table 2). The intake of fruits and vegetables (FV) varied with socio-demographic variables (table 3). The prevalence of fruit and/or vegetable consumption in Ethiopia was found to be 157 (1.5%) in which female respondents consumed fruit and/or vegetable more (1.8% vs 1.2%) than male respondents Rural dwellers consumed fruit and/or vegetable better than their urban counterpart 129 (1.6%) versus 28(0.9%) respectively). Only 7 (1%) of respondents in the age group 60-69 years consumed the recommended amount of fruit and/or vegetable. Similarly, one percent of respondents who had college

and above education ate the recommended amount of fruit and/or vegetable. A little higher percentage of married respondents consumed fruites and or vegetable compared to single ones (1.7% verses 1.0%). Unemployed respondents 85 (2%) were more likely to consume the recommended amount of fruit and/or vegetable as compared to the employed ones 71 (1.2%). About 3 %of the respondents in the second quartile income category consumed the recommended amount of fruit and/or vegetable (Table 2 and Table 3).

Table 2: **Fruit and/or Vegetable Intakes by locality of residence, Ethiopia, 2015**

Fruit and/or vegetable intake	Locality of the respondents				National	
	Urban		Rural			
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Servings of fruits per day, mean (SD)	2687	0.3 (.7)	7113	0.4(.1)	9800	0.30(.1)
Servings of vegetables per day, mean (SD)	2687	0.5(.1)	7113	0.7(.9)	9800	0.6(0.8)
Fruits and vegetables (%)	n	%	n	%	n	%
0 servings of fruit/veg per day	2157	83.7%	6167	85.8%	8324	85.4%
1-2 servings of fruit/veg on average per day	432	13.3%	642	10.5%	1074	11.0%
3-4 servings of fruit/veg on average per day	65	2.0%	161	2.0%	226	2.0%
5 or more servings of fruit/veg on average per day	28	0.9%	129	1.6%	157	1.5%

Table 3: **Percentage of Fruit and/or Vegetable Intakes as per WHO recommendation and other characteristics, Ethiopia, 2015**

Variable characteristics	Fruit and/or Vegetable As Per WHO Recommendation (>=5 servings)	
	N	%
Sex		
Male	46	1.2%
Female	111	1.8%
Locality of the respondents		
Urban	28	0.9%
Rural	129	1.6%
Age Group		
15 - 29	60	1.3%
30 - 44	63	1.7%
45 - 59	27	1.8%
60 - 69	7	1.0%
Level of Education		
No Formal Education	70	1.4%
Primary Education	70	1.7%
Secondary Education	7	0.8%
College and above	10	1.0%
Employment status		
Employed	71	1.2%
Unemployed	85	2.0%
Quartiles of income		
Q1	41	1.9%
Q2	45	2.8%
Q3	31	2.0%
Q4	25	1.6%
Prevalence of raised blood glucose (.>=126mg/dl)		
Normal	142	1.5%
Raised (>=126)	5	1.9%
Body mass index classification		
Underweight	28	1.0%
Normal	97	1.5%
Overweight & Obese	18	2.4%
Prevalence of raised waist circumference		
Normal	117	1.4%
Raised	26	1.2%
Waist hip ratio level		
Normal WHR	103	1.5%
Raised WHR	40	1.3%
Level of systolic Blood pressure		
Low	133	1.4%
High	20	1.5%
Level of Diastolic BP		
Low	134	1.5%
High	19	1.4%

Table 3: **Cont'd**

Variable characteristics	Fruit and/or Vegetable As Per WHO Recommendation (>=5 servings)	
	N	%
Low density lipoprotein level		
<130	113	1.7%
>=130	20	0.9%
High Density Lipoprotein Level		
Normal HDL	52	1.7%
Low HDL	98	1.5%
Total Cholesterol level		
<200	146	1.6%
>=200	4	0.6%
Prevalence of metabolic syndrome		
Normal	140	1.5%
At risk of CVD	7	0.9%
Total	147	1.4%

Factors Associated with Fruit and/or Vegetable Intakes (FVI): Among the non-modifiable factors, place of residence, marital status, employment status and income of the respondent were associated with fruit and vegetable intake. Based on the findings, Fruit and Vegetable intake is significantly associated with gender [AOR and 95% CI 1.66, 95% (1.18, 2.35)], marital status [AOR and 95% CI 1.68(1.10, 2.56)], and employment status [AOR and 95% CI 2.45(1.63, 3.67)]. Women were 1.66 times, married 1.68 times and unemployed 2.45 more likely to consume fruit and vegetables than their counter parts. There is no statistical significant different among age groups and among educational status. Similarly, there is no significant different between the fourth quintile and the reference category (first quintile).

Table 4: **Bivariate and Multivariate Analysis of Fruit and Vegetable Intakes and Socio-demographic Characteristics of NCD STEPs survey Participants, Ethiopia, 2015**

Variable	Categories	Fruit and/or Vegetable As Per WHO Recommendation n (total %)	Bivariate COR [95%CI]	Multivariate AOR [95%CI]
Sex	Male	46(1.2%)	1	1
	Female	111(1.8%)	2.77(1.60,4.80)	1.66 (1.18, 2.35)
Residence	Rural	129(1.6%)	1.75 (1.16,2.65)	
	Urban	28(0.9%)	1	
Age	15-29(Ref)	60(1.3%)	1	
	30-44	63(1.7%)	1.19 (0.83,1.70)	
	45-59	27(1.8%)	1.06 (0.67, 1.67)	
	60-69	7(1.0%)	0.71 (0.32,1.55)	
Educational Status	No Formal Education(Ref)	70(1.4%)	1	
	Primary Education	70(1.7%)	1.28 (0.92, 1.79)	
	Secondary Education	7(0.8%)	0.74 (0.34, 1.61)	
	College (Both Undergrad and Postgrad)	10(1.0%)	1.36 (0.70, 2.66)	
Marital Status	Single(Ref)	39(1.0%)	1	1
	Married	118(1.7%)	1.48(1.03, 2.13)	1.68(1.10, 2.56)
Employment Status	Employed(Ref)	71(1.2%)	1	1
	Unemployed	85(2.0%)	2.02 (1.47, 2.78)	2.45(1.63, 3.67)
Income	1st Quintile (Ref)	48(0.7%)	1	1
	2nd Quintile	37(2.6%)	2.64 (1.71, 4.08)	2.78(1.80, 4.30)
	3rd Quintile	34(3.1%)	2.72 (1.74, 4.24)	2.94(1.88, 4.60)
	4th Quintile	15(1.0%)	1.05 (0.58, 1.88)	1.17(0.64, 2.14)

Discussion

Fruits and vegetables are important components of a healthy diet. Reduced fruit and vegetable consumption is linked to poor health and increased risk of (NCDs). An estimated 5.2 million deaths worldwide were attributable to inadequate fruit and vegetable consumption in 2013 (WHO). The mean intake of fruits was 0.3 (SD 0.7) servings/day in urban areas and 0.4 (SD.1) servings/day in rural areas, while the mean intake of vegetables was 0.5 (SD 0.1) servings/ day in urban areas and 0.7 (0.9) servings/day in rural areas. Which is lower than the findings from Myanmar where

the mean intake of fruits was 0.8 (SE 0.1) servings/day in urban areas and 0.6 (0.0) servings/day in rural areas, while the mean intake of vegetables was 2.2 (SE 0.1) servings/day in urban areas and 1.2 (0.1) servings/day in rural areas (11). In this survey more female 1.8% than male 1.2% of female respondents consumed five or more servings of fruit and/or vegetable. This was consistent with findings in United states where the estimated prevalence of eating fruits and vegetables five or more times per day was lower for men than women (12). Differences between studies may have several explanations. The types of fruits and vegetables (FV) commonly eaten may vary between countries and the availability and accessibility of FV in different countries.

This survey revealed that 8324 (85.4%) % of the participants did not eat fruit in any of the weekdays. This finding was different from a telephone interview in Brazil where 57.1 % of the participants consumed fruit regularly (13). And this finding was also different from a National Health Survey at a household level(PNS) and a telephone based interview (Vigitel)in Brazil where 41.8% and 23.6% of the participants in the PNS and Vigitel consumed fruit and vegetable respectively (14).

However, there was difference in proportion among male and female fruit eaters in Ethiopia. This finding was similar to the study in Brazil that shows that women had highest frequency in the consumption of fruit and vegetables (15). In addition, sixty-four %of the participants who completed college and above did not eat fruit in any of the weekdays. On the contrary, more schooling was related with highest intake of fruit and vegetable both in men and women among Brazilian adults (14). Furthermore, fruit and vegetable intake was significantly associated with being woman, married and unemployed. In which women were 1.66 times, married 1.68 times and unemployed 2.45 more likely to consume fruit and vegetables than their counter parts. In a recent analysis of fruit and vegetable intake data that used the MyPyramid recommendations for different groups according to age, sex, and activity level, fewer than 1 in 10 Americans ate enough fruits and vegetables(16). MyPyramid, released by the USDA Centre for Nutrition Policy and Promotion, was an update on the American food guide pyramid. The icon stresses activity and moderation along with a proper mix of food groups in one's diet.

Conclusions:

Fruits and/or vegetables intake was generally extremely low. Consumption of fruit and/or vegetable in middle income category (third quintile) was a little higher as compared to other wealth category. There was difference in proportion among male and female fruit eaters and urban and rural dwellers in Ethiopia. Women, married and unemployed consumed fruit and/or vegetable better than their counter parts. As the general level of risk factors rises, more people are put at risk. Preventive interventions to address these behaviours are implemented at individual, group, and community levels and include education, access to fruits and vegetables should therefore aim at reducing risk throughout the population.

Availability of data and material

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request

Competing interests

The corresponding author declares that there is no financial or non-financial competing interest

Funding

There is fund received from WHO and also we have got technical and administrative support

Authors' contributions

All authors contributed equally during the process of proposal development and report write of the research

Acknowledgements

Authors would like to thank WHO supporting this work from the very beginning both financially and technically. We also like to extend our gratitude to the staff of different partners, professional associations. Special thanks to Health System and Reproduce Research Directorate of EPHI that coordinate the survey from the start until its end.

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