Magnitude and determinants of physical inactivity in Ethiopia: Evidence form 2015 Ethiopia National NCD Survey

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Abstract

Background: Physical activity can significantly reduce burden of NCDs. Physical activity is a low-cost and high impact interventions that can be easily implemented among majority of the population throughout the life. Global reports show that physical inactivity has become unique feature. As per the 2014 WHO report, globally, 20 percent of adult men and 27 percent of adult women did not meet the normal- recommendations of physical activity for health most of these being from urban settings.

Objective: To assess the magnitude and determinants of physical inactivity among Ethiopian population.

Methods: Community-based Cross-sectional study based on the World Health Organization (WHO) NCD Stepwise approach was conducted in Ethiopia from April to June 2015. All men and women age 15-69 years old were the target of this 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. A total of 9801 from 513 enumerations areas were involved with response rate of 95.5%.

Result: Among the study participants, 94.2% (95% of male, and 91% of female) of the participants reported physical activity as per WHO recommendations. Based on multivariate analysis, rural residents were 2.5 (AOR=2.46, (95% - CI: 2.12, 2.86) times more likely to engage in physical activity as compared to urbanites. The youngest age group 15-29 were 3.5 (AOR=3.46, (95% - CI: 2.74, 4.36) times more likely to be physically active than the older age group 60-69 years old. Participants who had college and above education were 28 percent (AOR=0.72, (95% - CI: 0.55, 0.96) less likely to do physical activity compared to respondents with no formal education.

Conclusion: Considerable proportion of the study population did not meet WHO recommendations on physical activity for health. It showed that, individuals in rural areas were more engaged in physical activity while individuals who had college and above education were less likely to do physical activity. The highest percentage of individuals not meeting the WHO recommendations for physical activity were the older ones in the age group 60–69 years. [*Ethiop. J. Health Dev.* 2017;31(Special Issue):348-354]

Key Words: STEPs survey, physical inactivity determinants, Ethiopia

Introduction

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. As the leading cause of death globally, NCDs particularly cardiovascular diseases (CVDs), diabetes, chronic respiratory diseases and cancer were responsible for 38 million (68%) of the World's 56 million deaths in 2012. Almost three quarters of all NCD deaths (28 million), and the majority of premature deaths (82%) occur in low-and middle-income countries (1). The globe has recognized the huge impact of NCDs and committed to the prevention and control of NCDs as reflected in the Sustainable Development Goals (SDG) agenda – NCDs are one of the major health priorities in the

health-focused third goal of the SDG with four NCD-related targets (2).

In Ethiopia, several studies were conducted on NCDs over the last few decades showing a rising burden of NCDs (3,4,5). Yet, available evidences are fragmented, sketchy, inconsistent and even contradictory failing to provide concrete picture on the state of NCDs in Ethiopia. World Health Organization's report of 2015 is best available estimate on the burden of NCD that attributes 30% of all deaths in the country to NCDs (6). NCDs are fueled by multiple, combined and complex factors. Among the several factors, the major modifiable risk factors include: tobacco use, harmful use of alcohol, physical inactivity, and unhealthy diet. It is well-documented and proven that interventions, targeted towards healthy life style by addressing the

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modifiable risk factors, will result significant reduction in the burden of NCDs.

Regular physical activity can be considered as quite peculiar in the list of the modifiable risk factors. Physical activity can significantly reduce NCDs burden with low-cost and high impact interventions that can be addressed uniformly to the majority of the population throughout the life course and everywhere. Physically active life style is one of the *'best buys'* in the prevention and control of NCDs.

Global reports shows that physical inactivity has remained a major pandemic with deteriorating patterns and yet with little attention mainly in the developing nations (8). As per the 2014 WHO report, globally, 20 percent of adult men and 27 percent of adult women did not meet the normal- recommendations of physical activity for health; more than a quarter of adolescents also did not meet the recommendations for their respective age – girls with disproportionately higher rate of inactivity (9). The level of activity is also factored by different conditions including economic status, place of residence, level of education and others. There are barriers that affect the practice of this healthy life practices ranging from policy level down to implementation and from global down to individual level (7).

Although Ethiopia also pledged to improve its prevention and control of NCDs and considered this in the Health Sector Transformation Plan (HSTP) (3), little is known about the burden and distribution of NCDs and the protective. Identifying the magnitude and distribution of the protective factors will key step to inform the policy makers, program managers and clinicians to have evidence based plans and decisions. Therefore, a national survey was conducted to assess the magnitude of physical inactivity and it's determinates among the adult population in Ethiopia.

Methods and material
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 (10). The study was conducted 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. 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% (11); 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 (12), eligible participants in each household were ranked in order of decreasing age, starting with men followed by women.

Measurement and Operational definitions
Assessing physical activity: According to WHO STEPS, physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity was categorized into vigorous and moderate and sedentary activity. A vigorous-intensity activity was defined as any activity that causes large increase in breathing or heart rate, if continued for at least 10 minutes (e.g. running, carrying or lifting heavy loads, digging or construction work). Moderate-intensity activity was defined as any activity that causes small increase in breathing or heart rate, if continued for at least 10 minutes (brisk walking or carrying light loads). Physical activity related to work,

transportation and leisure time was assessed in terms of minutes that caused them breathless or feel palpitation. Based on the above definition, physical activity was assessed based on intensity, duration and frequency of physical activity at work, in recreational settings and involving transportation (journeys), using a set of 16 questions. Data were collected on the number of days, hours and minutes of physical activity performed at work, involving transportation and in recreational settings for at least 10 minutes or more continuously each day. Self-reports initially seem like the obvious choice in many situations, but this method results can be misleading and would affect perceptions of the programmers of the problem of inactivity.

The complex questionnaire has the advantage of assessing not only the duration, but also the intensity of physical activity. Show cards were used to depict different types of physical activity. The total time spent on physical activity per day at work, involving transport and in recreational activities was measured by using a continuous indicator: the metabolic equivalent time (MET) in minutes per week spent in physical activity. The population was classified into specific groups according to their amount of physical activity. METs are commonly used to express the intensity of physical activities, and are used for the analysis of General Physical Activity Questionnaire (GPAQ) data. MET is the ratio of a person's working metabolic rate relative to their resting metabolic rate. One MET is defined as the energy cost of sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour. For the analysis of GPAQ data, existing guidelines have been adapted. It was estimated that, compared with sitting quietly, a person's caloric consumption is four times as high as when being moderately active, and eight times as high as when being vigorously active.

In order to calculate the categorical indicator for the recommended amount of physical activity for (good) health, the total time spent carrying out physical activity during a typical week and the intensity of the physical activity were taken into account. According to WHO global recommendations on physical activity for health for adult 18-64 years of age during a typical week should do 150 minutes of moderate-intensity physical activity; or 75 minutes of vigorous-intensity physical activity; or An equivalent combination of moderate- and vigorous-intensity physical activity achieving at least 600 MET-minutes (12). This physical activity could be in the form of walk, work in the form of household chores, leisure time as well as planned exercise. The limitation of self-report is that it initially seem like the obvious choice in many situations of physical activity measurement, but this method results can be misleading and would affect perceptions of the programmers, policy makers and decision makers.

For comparison purposes, tables presenting cut-offs from WHO recommendations (12) were also used during the data analysis. The three levels of physical activity suggested in these recommendations for classifying populations are: (1) low, (2) moderate, and (3) high. High-level physical activity involves a person reaching any of the following criteria: vigorous-intensity activity at least three days per week, achieving at least 1500 MET-minutes per week; or seven or more days of any combination of walking, moderate- or vigorous-intensity activities achieving a at least 3000 MET-minutes per week. Moderate level physical activity involves a person not meeting the criteria for the high-level category, but meeting any of the following criteria: Three or more days of vigorous-intensity activity of at least 20 minutes per day; or five or more days of moderate-intensity activity or walking for at least 30 minutes per day; or Five or more days of any combination of walking, moderate- or vigorous-intensity activities achieving at least 600 MET-minutes per week. Low level physical activity involves a person not meeting any of the above-mentioned criteria for the moderate- or high-level categories.

Data collection and management: Data collection was done simultaneously at the 9 regions and 2 city administration by trained nurses and lab professionals during a face to face interview, using s 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 datasets were stored in the device as well as the memory card in Requirements Modeling Language (rml) format. The rml files from the PDAs were transferred to the supervisors tablet computers via the Windows Mobile Device Centre. The files 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. Supervisors managed tablets supported by the third generation (3G) wireless internet technology and run the IFSS icon (IfssClientPC.exe) located in their desktop to send all the updated data files to central server by entering their user name and password. Finally IFSS automatically perform Automatic packaging and delivering file and Automatic receiving of incoming files. Data was managed using soft wares namely: Excel, SPSS and Stata.

Data analyses: Descriptive weighted analysis was done along with complex sample analysis, and further statistical analyses was done by using logistic regression models (bivariate and multivariate analysis) for physical activity. 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).

Ethical approval: Principles of Ethics were considered. Data were collected unlinked anonymously, without any personal identifiers. Informed consent was obtained from the study

participants before administering the questions and for under eighteen (age <18 years) survey participants, informed assent and consent from their parents or guardians was obtained. Ethical clearance was obtained first from the EPHI Institutional review board (IRB) then from National research and Ethics review committee.

Result
In this survey, a total of 9801 study participants were enrolled with 95.5 percent response rate of the 10,260 originally estimated sample size.

Socio-demographic Characteristics: The study participants (40.2 percent) were in the age group 15- 29 years and 6.7percent were in the age group 60-69 years

of age. Six out of ten study participants were females and 72.6 percent of the study participants were dwellers from the rural area. Oromo (28.3 percent) and Amhara (27.2 percent) ethnic groups together comprised more than half of the study participants. Nearly half (49.4 percent) of the respondents attended no formal education and only 0.1percent of them attended postgraduate level training. Around two thirds (67.3 percent) of the study participants were married and 0.4 percent 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 10: **Socio-demographic Characteristics of study participants by NCD STEPs survey Ethiopia, 2015**

Variable	Number (n)	Percentage (%)
15-29	3959	40.2%
30-44	3499	35.7%
45-59	1690	17.2%
60-69	653	6.7%
Total	9800	100.0
Sex		
Male	3977	40.6
Female	5823	59.4
Residence area		
Urban	2687	27.4
Rural	7113	72.6
Ethnic Group		
Oromo	2773	28.3
Amhara	2666	27.2
Tigray	1059	10.8
Somali	597	6.1
Wolayita	222	2.3
Sidama	339	3.5
Gurage	316	3.2
Hadiya	156	1.6
Afar	334	3.4
Gamo	159	1.6
Others	1175	12.0
Refused	4	0.0
Total	9800	100.0
Educational Level		
Less than primary school	4843	49.4
Primary school	2818	28.8
Secondary school	975	9.9
College/University undergraduate	653	6.7
Post graduate degree	499	5.1
Total	12	0.1
Marital Status	9800	100.0
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
Total	9799	100.0
Mean 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
Total	**8572**	**100.0**

Physical activity as per WHO recommendations
Among the study participants, 94.2% of them did physical activity as per WHO recommendations (95 % of male, and 91 % of female). Relatively, rural dwellers were physically active than their urban counterparts (94.8 % versus 86 % respectively). With an increases in age, percentage of physically activity decreases (ranging from 94.3% in an age group 15-29 to only 76.6 % in age group 60-69). More than 86 percent of participants with college and above educational level were physically active as compare to 95 percent participants with primary education. However, there is no observed marked difference in physical activity in participant's marital status and employment status. Eighty three percent of the highest quintile participants did WHO recommended physical activity as compared to more than 92 percent of the lowest quintiles counterparts.

Table 11: **Number and percentage of physical activity as per WHO recommendation, Ethiopia, 2015**

Variable	Met WHO Recommendations Physical Activity	
	Number (n)	**Percentage (%)**
Sex		
Male	3668	94.7
Female	5031	91.1
Total	8699	94.2
Residence		
Rural	6542	94.8
Urban	2157	85.9
Age		
15-29	3591	94.3
30-44	3177	94.4
45-59	1450	90.3
60-69	481	76.6
Educational Status		
No Formal Education	4266	92.0
Primary Education	3449	94.8
Secondary Education	561	91.8
College (Bothe Undergrad and Postgrad)	423	86.5
Marital Status		
Single	2734	92.5
Married	5963	93.4
Employment Status		
Employed	5464	93.7
Unemployed	3116	92.1
Income		
1st Quintile	4074	92.6
2nd Quintile	1229	93.2
3rd Quintile	1102	95.3
4th Quintile	1223	93.8
5th Quintile	14	83.2
Total	**7642**	**93.3**

Factors Associated with Physical Activity (PA):
To identify the predictors/determinants of physical activity, with socio demographic characteristics, bi-variate and multivariate logistic regression analysis was conducted. After performing bi-variate analysis, based on the significance levels of each independent variables multivariate analysis was conducted. Based on multivariate analysis, rural residents were 2.5 (AOR=2.46, (95% -CI: 2.12, 2.86) times more likely to practice physical activity as compared to their urban counterparts. The youngest age group 15-29 were 3.5 (AOR=3.46, 95% - CI: 2.74,4.36) times more likely to be physically active than the oldest age group 60-69 years old; and age group 45-59 and 30-44 were also two times (AOR=2.04, 95% - CI:1.62,2.58) and three times (AOR=3.19, 95% -I:2.54,3.99) respectively more likely to do physical activity as per WHO recommended as compared to the reference category 60-69 age group. Participants who had college and above education were 28 percent (AOR=0.72, 95% - CI: 0.55, 0.96) less likely to do the WHO recommended activity compared to respondents with no formal education. Participants with primary education were 1.3 (AOR=1.30, 95% - CI: 1.10, 1.54) times more likely to do the recommended physical exercise as compared to the reference category being with no formal education. Married participants were 1.3 (AOR=1.32, 95% -CI: 1.15, 1.52) times more likely to be physically active as compared with the single respondents. Employed respondents were 1.2 (AOR=1.24, 95% - CI: 1.07, 1.43) times more likely to be physically active as compared to unemployed ones.

Table 3. **Bivariate and Multivariate Analysis of Physical Activity and Socio-demographic Characteristics of NCD STEPs survey Participants, Ethiopia NCD STEPs 2015.**

Variable	Physical Activity As Per WHO Recommendation	Bivariate	Multivariate
	Yes n (%)	COR [95%CI]	AOR [95%CI]
Sex			
Male	3668 (94.7%)	1.87(1.63, 2.15)	
Female	5031 (91.1%)	1	
Residence			
Rural	6542 (94.8%)	2.82(2.48, 3.20)	2.46(2.12,2.86)*
Urban	2157 (85.9%)	1	1
Age			
15-29	3591 (94.3%)	3.47 (3.47, 2.83)	3.46(2.74, 4.36)*
30-44	3177 (94.4%)	3.51 (3.51,2.85)	3.19(2.54, 3.99)*
45-59	1450 (90.3%)	2.15 (2.15,1.72)	2.04(1.62, 2.58)*
60-69	481 (76.6%)	1	1
Educational Status			
No Formal Education	4266(92.0%)	1	1
Primary Education	3449(94.8%)	1.36 (1.18, 1.56)	1.30(1.10, 1.54)*
Secondary Education	561(91.8%)	0.83 (0.65, 1.05)	1.02(0.78, 1.33)*
College (Both Undergrad and Postgrad)	423(86.5%)	0.65 (0.51, 0.83)	0.72(0.55, 0.96)*
Marital Status			
Single	2734(92.5%)	1	1
Married	5963(93.4%)	1.62 (1.43, 1.85)	1.32(1.15, 1.52)*
Employment Status			
Employed	5464(93.7%)	1.54 (1.35, 1.74)	1.24(1.07, 1.43)*
Unemployed	3116(92.1%)	1	1
Income			1
1st Quintile	4074(92.6%)	1	
2nd Quintile	1229(93.2%)	1.17 (0.96, 1.43)	
3rd Quintile	1102(95.3%)	1.20 (0.97, 1.48)	
4th Quintile	1223(93.8%)	1.05 (0.86, 1.27)	
5th Quintile	14(83.2%)	0.45 (0.15, 1.37)	

*Significant during multivariate analysis

Discussion

The "Global Strategy on Physical Activity and Health", adopted by the World Health Assembly in 2004, describes the actions needed to increase physical activity worldwide. The Strategy urges stakeholders to take action at global, regional and local levels to increase physical activity. The "Global Recommendations on Physical Activity for Health", published by WHO in 2010, focus on primary prevention of NCDs through physical activity (13). This finding revealed that more than 95 percent and 91 percent of males and females did physical activity as per the WHO recommendation. This finding is almost similar with a 2014 NCD Steps wise survey conducted in Uganda which showed that about 3.7 percent of the men and 4.9 percent of the women were not meeting the WHO recommendations on physical activity for health (14). In addition, our finding revealed that the prevalence of physical activity in Ethiopia higher than a study conducted in 2015 in Nairobi slum dweller population where prevalence of insufficient physical activity was 14.4% (95% CI: 13.5%, 15.4 (15). And finding from this survey was much higher compared to a study conducted in southern Brazil where 47.3% and 61.4 % of men and women were physically inactive. However, the finding from Southern Brazil included only leisure time physical inactivity (16). In addition, a different study in Brazil showed that men were more active in their free time than women. Furthermore, participants who had college education and above were 0.3 times less likely to exercise the WHO recommended physical activity compared to those who had no formal education. This finding was similar to different studies where leisure time physical activity was less prevalent among higher educated participants (17). However, this finding was different from a study conducted in Brazil where higher physical inactivity was associated with lower schooling (16). The above inconsistency might be due to the other studies were conducted on physical inactivity during leisure time only.

Conclusion and recommendations:

Near six percent (5.8%) of the study population did not meet WHO recommendations on physical activity for health.   The highest percentage of individuals not meeting the WHO recommendations for physical activity was identified in the age group 60–69 years (21.2%). It also showed that individuals in rural areas were more practiced physical activity, among both men and women. Study participants' place of residence, age, educational status, marital status and employment

status have association with the required WHO recommended physical activity.

The result of this survey also recommend that, to fulfill WHO recommended physical activity level, more physical activity expected from Ethiopian female, single, unemployed, urban residents and individuals in age group 60-69 and those have college level of education.

Conflict of Interests
The author declare that there is no financial or non-financial competing of interest.

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