Level of physical activity and its associated factors among adults in southeast Ethiopia: a community-based cross-sectional study

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ABSTRACT

Objective Insufficient levels of physical activity are a well-known modifiable risk factor for a number of chronic conditions including obesity, type 2 diabetes, cardiovascular diseases and certain malignancies. Little is known about the status of physical activity and its associated factors among adults in low-income countries, including Ethiopia. Therefore, this study aimed to assess the level of physical activity and its associated factors among adults in southeast Ethiopia.

Design Analytical cross-sectional study.

Setting Community setting in southeast Ethiopia.

Participants 641 adults aged 18–64 years.

Primary outcome Level of physical activity assessed via the Global Physical Activity Questionnaire (GPAQ).

Results The overall prevalence of insufficient physical activity in this study was 29.48% (95% CI: 25.78 to 33.18). Women were more likely to report insufficient physical activity compared with men (39.0% for women and 12.3% for men, p<0.001). Being: a women (adjusted OR=3.99, 95% CI: 2.15 to 7.40), overweight/obese (OR=1.94, 95% CI: 1.05 to 3.56), a housewife (OR=2.13, 95% CI: 1.01 to 4.47), a person with no formal education (OR=1.93, 95% CI: 1.05 to 3.56), a person with a formal education (OR=1.94, 95% CI: 1.05 to 3.56), and married (OR=3.04, 95% CI: 1.75 to 5.29) were associated with insufficient physical activity. Age, employment status, and marital status were found to be significantly associated with physical activity.

Conclusion The study revealed that three in 10 adults did not achieve the recommended level of physical activity. For chronic disease prevention in Ethiopia, the Ethiopian Ministry of Health and other stakeholders should pay special attention to strategies to improve the population’s physical activity especially among women, housewives, people with no formal education, and married, unemployed and overweight/obese adults.

INTRODUCTION

Physical activity (PA) is defined as ‘any bodily movement produced by skeletal muscles that require energy expenditure. PA occurs during any movement including during leisure time, for transport to get to and from places, or as part of a person’s work’. The WHO recommends that adults should do at least 150–300 min of moderate-intensity aerobic physical activity, or at least 75–150 min of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate-intensity and vigorous-intensity activity throughout the week for substantial health benefits. Physical activity has been shown to be beneficial in maintaining good health and preventing illnesses.

According to the pooled analysis of 358 population-based surveys across 168 countries in the world, more than a quarter of adults (28%) were not achieving the recommended level of physical activity for health in the year 2016. The study further showed that women were less likely to be physically active compared with men, and people in high-income countries (HICs) were more likely to be physically inactive compared with those in low-income countries.
Physical inactivity or insufficient level of physical activity is one of the known risk factors for premature death and a number of non-communicable diseases.\textsuperscript{10–14} About 7.2% of global all-cause mortality and 7.6% of cardiovascular disease deaths were attributable to physical inactivity.\textsuperscript{15} Physical inactivity costs the healthcare system about $53.8 billion in 2013.\textsuperscript{16} Furthermore, physical inactivity-related deaths cost $13.7 billion in productivity loss and 13.4 million disability adjusted life-years (DALYs) with low-income and middle-income countries (LMICs) bearing 70% of the DALYs.\textsuperscript{16} Conversely, increasing the physical activity level of the world's population is projected to save a cumulative US$8.6 trillion for the global economy by 2050.\textsuperscript{17}

The WHO’s Global Action Plan on Physical Activity targeted to reduce physical inactivity by 10% by 2025 and 15% by 2030.\textsuperscript{18} Despite these targets, the global trend of physical inactivity from 2001 to 2016 remained relatively stable and even increased for HICs in this period.\textsuperscript{9}

In Ethiopia, a national STEPS survey was conducted in 2015 among people aged 15–69 years revealing 6% of adults with insufficient physical activity.\textsuperscript{19} This figure varies depending on residential area with urban inhabitants more likely to be physically inactive compared with their rural counterparts (12.7% vs 4.2%).\textsuperscript{19} Additional cross-sectional studies conducted among adults in eastern Ethiopia reported that about 45% of adults did not achieve the WHO recommended level of physical activity.\textsuperscript{20,21} Significant variability in reported inactivity levels reflects variation in studied populations, such as patient, adolescents or pregnant women.\textsuperscript{22–30} The recommended level and intensity of physical activity varies for adults, adolescents, pregnant women and people living with different medical conditions.\textsuperscript{3} Evidence on the level of physical activity and its predictors among adults in low-income countries, including Ethiopia, is sparse and inconclusive. This evidentiary gap warrants studying the level of physical activity among adults in the Ethiopian context in order to formulate specific recommendations informing public health actions aimed at increasing the level of physical activity, as well as chronic disease prevention and control. Thus, the current study aimed to assess the level of physical activity and associated factors among adults aged 18–64 years old in southeastern Ethiopia.

METHODS AND MATERIALS

Study setting

The study was conducted in Bale zone in the southeastern part of Oromia, one of the regional states in Ethiopia. According to the Central Statistical Agency (CSA), the Bale zone had a total population of 1,840,746, including 932,224 men and 908,522 women in 2017.\textsuperscript{31} The zone is subdivided into 18 districts and two administrative towns of Robe and Goba. According to the 2021 administrative report, Robe and Goba towns have populations of 73,152 and 52,785, respectively. Furthermore, each administrative town is divided into smaller administrative clusters known as gota. There are 36 and 24 gotas in Robe and Goba towns, respectively.

Study design, and subjects

From May to July 2021, a community-based cross-sectional study assessed levels of physical activity for health among adults (18–64 years) in the administrative towns of Bale zone. There were no COVID-19 activity restrictions in place during this time. All adults residing in the study area for at least 6 months were eligible for inclusion. Individuals were excluded if they had psychiatric problems, hearing impairment, body deformities, other debilitations or disabilities. In addition, pregnant women were excluded. Individuals with psychiatric problems or hearing impairments were excluded from the study to avoid difficulties in getting accurate information during interview. Those with body deformities or disabilities resulting in limitations in performing physical activity were also excluded, as to not confound the results. Additionally, pregnant women were also excluded from the study since their BMI and waist circumference would not be a true reflection of obesity. Exclusion criteria were assessed by data collectors through observation and self-reported history taking.

Sample size determination and sampling techniques

Based on the total zonal population, the study sample size was calculated using Epi-info V.7 software. The parameters of 95% level of confidence, 5% margin of error, 45.1% proportion of insufficient physical activity (in accordance with previous study in Dire Dawa town),\textsuperscript{20} design effect of 1.5 and non-response rate of 10% were considered. A final sample size of 641 individuals was calculated for this analysis and data collection was continued until the determined sample size was achieved. A multistage stratified sampling followed by systematic random sampling was employed to select the study participants. Primarily, the study populations were stratified into Robe and Goba towns. The sample was allocated to each randomly selected ‘gota’ proportional to their respective population size, with random selection of eight (one-third) gotas from Goba town and 12 (one-third) gotas from Robe town. Furthermore, households in the sampled clusters were selected using systematic sampling techniques and one adult per sampled household was selected using the lottery method (figure 1). If the selected interviewee was not available at home during the data collection time, a revisit appointment was secured through available household members.

Data collection, measurement procedures and quality control

Interviewer-administered, structured questionnaires were used to collect data. A standard questionnaire was adapted from the WHO STEPS-wise questionnaire for chronic disease risk factor surveillance.\textsuperscript{32} The English version of the questionnaire was translated into the local languages (ie, Afan Oromo and Amharic) spoken in the study area. After the translation into local languages, the questionnaire was back-translated into English to
check the consistency. The questionnaires comprised sociodemographic and economic factors such as town of residence (Robe or Goba); age (categorised into: 18–29, 30–39, 40–49, 50–59 and ≥60 years); sex (male or female), marital status (categorised as never married or ever married); educational status (categorised as no formal education, primary education and secondary education, or diploma and above); occupational status (employed or unemployed) and wealth index (computed by principal component analysis using household assets and rank-ordered as low, medium or high wealth index terciles). Body mass index (BMI) was calculated using weight and height measurements (categorised into underweight (<18.5 kg/m²), normal (18.5–24.99 kg/m²), overweight or obese (≥25 kg/m²)). Weight was measured using an electronic digital weight scale by putting the scale on a firm flat surface after participants took off footwear, heavy clothes and emptied their pockets of heavy items. Readings were taken in kilograms. A portable height measuring board was put on a stable surface against a wall.

Figure 1  Schematic presentation of sampling procedure.
to take participants’ height measurements in a standing position. Readings were taken in centimetres with subjects facing the data collector, feet together and eyes aimed at the ears (to the nearest millimetre). Further details on the study’s physical measurement protocols are consistent with the WHO STEPS-wise instrument guideline.32

Six data collectors (three male-female pairs) with bachelor’s degrees in health sciences (Nursing, Public Health or Midwifery) conducted data collection, enabling participant-data collector sex matching. The data collection process was overseen by two supervisors with master’s degrees in public health. Data collectors and supervisors were provided with a 2-day intensive training session on the objectives of the study, data collection instruments and principles of research ethics. A pretest was conducted with 5% of the total sample size in another study setting and a few amendments were made before actual data collection. The questionnaires were checked every day by data collectors for completeness before leaving the data collection site (household) with supervisor’s assistance as necessary.

Measurement of the level of physical activity
The level of physical activity was the outcome variable for this study, which was measured using the Global Physical Activity Questionnaire (GPAQ) V.2 adopted from the WHO STEPS instrument.32 The tool has a series of questions organised in three domains namely: work-related physical activity, activities related to travel to and from places and leisure time activities. Each question in the three domains queries frequency of the activities in a typical week, and the duration of time spent in the activities on a typical day. According to the WHO recommendations on physical activity for health throughout a week, including activity for work, during transport and leisure time, adults should do at least 150 min of moderate-intensity physical activity or 75 min of vigorous-intensity physical activity or an equivalent combination of moderate-intensity and vigorous-intensity physical activity achieving at least 600 MET-min.32 In this study, we used metabolic equivalents (MET) min to examine the intensity of physical activity. MET is the ratio of a person’s working metabolic rate relative to the 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/hours.32 Applying MET values to activity levels allows us to calculate total physical activity.

For the analysis of GPAQ data, existing guidelines were adopted. It is estimated that, compared with sitting quietly, a person’s caloric consumption is four times as high when being moderately active, and eight times as high when being vigorously active. Therefore, for the calculation of the categorical indicator of the recommended amount of physical activity for health, the total time spent in physical activity during a typical week and the intensity of the physical activity were taken into account. Further details on the calculation of the MET values are consistent with the WHO STEPS-wise instrument guideline.32

Accordingly, we categorised study participants using the total MET values from the three domains. Adults achieving an equivalent combination of moderate-intensity and vigorous-intensity physical activity of less than 600 MET-min were considered as not meeting the WHO recommendation of physical activity for health (insufficient physical activity) and coded as ‘1’ and those who achieved 600 MET-min or higher were considered as doing sufficient physical activity and coded as ‘0’ in this analysis.

Data processing and analyses
The data were coded and entered into EpiData V.3.1. After cleaning and processing, data were analysed using SPSS V.25 and STATA V.14. The variables were described using median, frequencies, proportions, IQR and tables. Normality was checked for continuous variables (total MET-min and time spent sitting or reclining) using the Kolmogorov-Smirnov test. The χ² test was used to check the statistical difference of the distribution of categorical independent variables between men and women. A two-sample Wilcoxon rank-sum (Mann-Whitney) test was used to check the statistical difference of continuous independent variables between men and women given the difference in prevalence of physical inactivity noted in the results. Factors associated with physical inactivity were assessed for both men and women in combined model rather than separate model, due to inadequate number of cases in each stratum. Both bivariant and multivariant binary logistic regression analyses were used to identify factors associated with the outcome variable. Variables having a p-value of less than 0.2 in the bivariable binary logistic regression model were included in the multivariant binary logistic regression analysis model to control potential confounding effects. The enter method was used to run the model. The logit of the dependent variable was checked for outliers and nine outlying values (having standardised residual of >2.58 at a level of α<0.01) were excluded from the analysis. The Hosmer and Lemeshow’s goodness of model fit was checked and the data fit the model well (p=0.44). Multicollinearity between independent variables was checked using the variance inflation factor (VIF), the mean VIF was 1.94 which is less than the recommended cut-off value.34 Finally, adjusted ORs with 95% CI were used to estimate the strength of associations between the outcome and independent variables. All tests were two-tailed and statistical significance was declared at p-value<0.05. The results were reported using the strengthening the reporting of observational studies in epidemiology cross-sectional reporting guidelines35 (S1 table).

Patient and public involvement
Patients or the public were not involved in the design, conduct, reporting or dissemination plans of our research.

RESULTS
Sociodemographic and economic characteristics of adults
A total of 641 adults aged between 18 and 64 years participated in the study. Three hundred and eighty (59.28%)...
were from Robe town and 261 (40.72%) were from Goba town. Four hundred and thirteen (64.43%) of the participants were females. The median age of participants was 32 years with an IQR of 25–46 years (table 1).

**Self-reported level of physical activity by specific domains**

Of the total sample, 7.2% of the study participants reported doing vigorous-intensity physical activity at work. Thirty-three per cent of the study participants reported moderate-intensity physical activity on travel to and from places. A total of 9.7% of the study participants did vigorous physical activity in both work and leisure domains. The proportion of men who did vigorous physical activity was more than twofold higher compared with women (70.97% vs 29.03%, p<0.001). Total MET-min achieved per week were significantly higher for men compared with women (2040 vs 840, p<0.001). Similarly, women spent more time on sedentary activities such as sitting/reclining at work place, home or in transportation compared with men. Women had higher median sitting minutes per day than men (180 min vs 120 min, p<0.001) (table 2).

**MAGNITUDE OF INSUFFICIENT LEVEL OF PHYSICAL ACTIVITY BY SEX**

A total of 29.5% (95% CI: 25.9 to 33.2) of the study participants had insufficient level of physical activity (<600 MET-min). A higher proportion of women were below the recommended level compared with the men (39.0% vs 12.3%, p<0.001) (figure 2).

**Factors associated with physical insufficient physical activity**

The final model of the logistic regression analysis identified that being women (AOR=3.99, 95% CI: (2.15 to 7.40)), overweight/obese (AOR=1.95, 95% CI: 1.23 to 3.09), ever-married (AOR=2.13, 95% CI: 1.01 to 4.47), adults with no formal education (AOR=1.94, 95% CI: 1.05 to 3.56), housewives (AOR=3.04, 95% CI: 1.75 to 5.29) and unemployed (AOR=3.30, 95% CI: 1.55 to 7.02) were statistically significantly associated with insufficient physical activity (table 3).

**DISCUSSION**

Similar to many other low-income and middle-income countries, Ethiopia continues to be in a state of health transition which includes both demographic and epidemiological changes that are leading to varying patterns of morbidity and mortality from infectious and non-communicable diseases. These disease patterns are often accompanied by increasing physical inactivity, urbanisation and changes in sociocultural norms; creating health problems similar to those seen in the ‘developed’ world, but occurring in resource poor settings. This study assessed level of physical activity and associated factors among adults aged 18–64 years in southeast Ethiopia. The findings revealed that 29.5% of the study

| Variables                          | Frequency | Per cent |
|------------------------------------|-----------|----------|
| **Town of residence**              |           |          |
| Robe                               | 380       | 59.28    |
| Goba                               | 261       | 40.72    |
| **Sex**                            |           |          |
| Male                               | 228       | 35.57    |
| Female                             | 413       | 64.43    |
| **Age category in years**          |           |          |
| 18–29                              | 262       | 40.87    |
| 30–39                              | 134       | 20.90    |
| 40–49                              | 103       | 16.07    |
| 50–59                              | 92        | 14.35    |
| 60–64                              | 50        | 7.81     |
| **Educational status**             |           |          |
| No formal education                | 79        | 12.35    |
| Primary and secondary              | 396       | 61.87    |
| Diploma and above                  | 165       | 25.78    |
| **Ethnicity**                      |           |          |
| Oromo                              | 512       | 79.87    |
| Amhara                             | 97        | 15.13    |
| Wolaita                            | 10        | 1.56     |
| Somali                             | 1         | 0.16     |
| Refused                            | 21        | 3.28     |
| **Religion**                       |           |          |
| Muslim                             | 275       | 42.90    |
| Orthodox Christian                 | 298       | 46.49    |
| Protestant Christian               | 67        | 10.45    |
| Catholic                           | 1         | 0.16     |
| **Marital status**                 |           |          |
| Never-married                      | 134       | 21.20    |
| Ever-married                       | 498       | 78.80    |
| **Occupational status**            |           |          |
| Employed                           | 283       | 44.57    |
| Housewives                         | 238       | 37.48    |
| Unemployed*                        | 114       | 17.95    |
| **Wealth index**                   |           |          |
| Low                                | 257       | 40.10    |
| Medium                             | 149       | 23.24    |
| High                               | 235       | 36.66    |
| **Body mass index**                |           |          |
| <18.5 kg/m²                        | 57        | 9.16     |
| 18.5–24.99 kg/m²                   | 402       | 64.63    |
| ≥25 kg/m²                          | 163       | 26.21    |

*Unemployed adults, students and retired.
Table 2  Level of physical activity by specific domains among adults aged 18–64 years, southeast Ethiopia, 2021

| Physical activity by domains                                    | Total, n (%) | Men, n (%) | Women, n (%) | Pearson $\chi^2$ (df) | P value |
|----------------------------------------------------------------|--------------|------------|--------------|------------------------|---------|
| Vigorous-intensity activity at work                             |              |            |              |                        |         |
| Yes                                                            | 46 (7.19)    | 25 (11.01) | 21 (5.08)    | 7.72 (1)               | 0.005*  |
| No                                                             | 594 (92.81)  | 202 (88.99)| 392 (94.92)  |                        |         |
| Moderate-intensity activity at work                             |              |            |              |                        |         |
| Yes                                                            | 216 (33.70)  | 96 (42.11) | 120 (29.06)  | 11.12 (1)              | <0.001* |
| No                                                             | 425 (66.30)  | 132 (57.89)| 293 (70.94)  |                        |         |
| Moderate intensity activity on travel to and from place        |              |            |              |                        |         |
| Yes                                                            | 626 (97.81)  | 223 (35.62)| 403 (64.38)  | 0.00 (1)               | 0.99    |
| No                                                             | 14 (2.19)    | 5 (35.71)  | 9 (64.29)    |                        |         |
| Vigorous-intensity sports, fitness or recreational (leisure) activities |              |            |              |                        |         |
| Yes                                                            | 26 (4.06)    | 20 (8.77)  | 6 (1.45)     | 20.22 (1)              | <0.001* |
| No                                                             | 615 (95.94)  | 208 (91.23)| 407 (98.55)  |                        |         |
| Moderate-intensity sports, fitness or recreational (leisure) activities |              |            |              |                        |         |
| Yes                                                            | 62 (9.67)    | 44 (19.30) | 18 (4.36)    | 37.52 (1)              | <0.001* |
| No                                                             | 579 (90.33)  | 184 (80.70)| 395 (95.64)  |                        |         |
| Vigorous physical activity from work and leisure domains       |              |            |              |                        |         |
| ≥75 min/week                                                   | 62 (9.67)    | 44 (70.97) | 18 (29.03)   | 19.81 (1)              | <0.001* |
| <75 min/week                                                   | 579 (90.33)  | 184 (31.78)| 395 (68.22)  |                        |         |
| Moderate physical activity from work, transport and leisure domains |              |            |              |                        |         |
| ≥150 min/week                                                  | 449 (70.05)  | 198 (44.10)| 251 (55.90)  | 47.57 (1)              | <0.01*  |
| <150 min/week                                                  | 192 (29.95)  | 30 (15.63) | 162 (84.38)  |                        |         |
| Total MET-min/week (median and IQR)                            | 1200 (480, 3200) | 2040 (1140, 5560) | 840 (360, 2040) | Z=8.67                  | <0.001* |
| Level of physical activity category by MET-min/week*           |              |            |              |                        |         |
| ≥3000 MET-min/week                                             | 167 (26.51)  | 92 (55.09) | 75 (44.91)   | 66.33 (2)              | <0.001* |
| 600–2999 MET-min/week                                          | 285 (45.24)  | 108 (37.89)| 177 (62.11)  |                        |         |
| <600 MET-min/week                                              | 178 (28.25)  | 24 (13.48) | 154 (86.52)  |                        |         |
| Meeting WHO recommendations of physical activity for health†    |              |            |              |                        |         |
| Yes                                                            | 452 (70.51)  | 200 (87.72)| 252 (61.02)  | 50.37 (1)              | <0.001* |

Continued
participants had insufficient level of physical activity (ie, less than 600 MET-min per week). This finding is almost five-times higher than the Ethiopian national STEPS survey that reported an overall magnitude of 6%.19 39 This discrepancy may be explained by the fact that the national study sample included both urban and rural population, and the current study included only urban population which are known to be relatively physically inactive than rural adults;19 39–41 additionally, the sex makeup of the national study was almost one to one. On the other hand, the current study's level of insufficient physical activity is lower than the subnational study conducted in Dire Dawa and Harar, eastern Ethiopia.20 21 The reason for that variation might be due to that Dire Dawa and Harar being large cities where the level of insufficient physical activity could be expected to be higher as associated with urbanised life-style. Furthermore, the study conducted in Dire Dawa included adults aged 25–64 years, whereas ours included adults aged 18–64 years. The present study's MET level of insufficient physical activity as per the WHO recommendation was comparable with a study conducted by Guthold et al based on pooled analyses of 22 African countries.42

In this study, women were four times more likely to have insufficient physically activity compared with men. This finding was supported by evidence from a previous study in the eastern part of Ethiopia which reported that men were more likely to achieve the recommended level of physical activity than women.20 21 Similarly, a study conducted among adolescent students in Debre Berhan town, central Ethiopia reported that male students were more physically active compared with female students.30

The current study finding also reveals that higher proportion of women spend more time on sedentary activities such as sitting or reclining at work, at home, getting to and from places compared with men (180 min vs 120 min, p=0.04). Previous evidence showed women were more physically inactive than men.20 43 44 The reason for this trend might be related to variation in gender roles, and in availability of physical infrastructures suitable for women. These findings strengthen evidence of insufficient physical activity in the study populations and call for

| Physical activity by domains | Total, n (%) | Men, n (%) | Women, n (%) | Pearson $\chi^2$ (df) | P value |
|-----------------------------|-------------|------------|--------------|-----------------------|---------|
| No                          | 189 (29.49) | 28 (12.28) | 161 (38.98)  |                       |         |
| Time spent sitting/reclining on typical day (median and IQR) in min | 120 (60, 240) | 120 (60, 240) | 180 (60, 240) | Z=-2.00 | 0.04* |

Vigorous-intensity activity refers to physical activities that causes large increases in breathing or heart rate; moderate-intensity activity refers to activities that causes small increases in breathing or heart.

*Sample does not include those who report no activity. IQR (Q1, Q3).
†Yes, ≥600 MET-min/week, no, <600 MET-min/week; n, sample size; Z, critical value for two-sample Wilcoxon rank-sum (Mann-Whitney) test. MET, metabolic equivalents.

Figure 2  MET-min level of physical activity by metabolic equivalent per week by sex, among adults aged 18–64 years, southeast Ethiopia, 2021. MET, metabolic equivalents.
health-promotion and preventive initiatives that target women for effective prevention of chronic conditions in the country. However, because this study did not investigate the reasons why women were less likely to undertake physical activity, it is worthwhile to further investigate the predictors of sex disparity in physical activity to effectively inform recommendations that would help policy makers and public health programmers.

In this study, ever-married adults were two times more likely to undertake insufficient physical activity as compared with those never-married. A study conducted by Alqahtani et al among Saudi Arabian adults reported unmarried individuals were more physically active than their married counterparts. Similar associations were also noted in Malaysia. Determinants of high level of insufficient physical activity among married adults might

| **Table 3** Factors associated with insufficient physical activity (<600 MET-min per week) among adults aged 18–64 years, southeast Ethiopia, 2021 | **Level of physical activity** | **COR (95% CI)** | **AOR* (95% CI)** |
|---|---|---|---|
| **Variables** | **<600 MET-min** | **≥600 MET-min** | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** |
| **Residential town** | | | | | | | | |
| Goba | 84 (32.18) | 177 (67.82) | 1.53 (0.91 to 1.84) | 1.51 (0.99 to 2.31) |
| Robe | 105 (27.63) | 275 (72.37) | 1 | 1 |
| **Sex** | | | | | | | | |
| Male | 28 (12.28) | 200 (87.72) | 1 | 1 |
| Female | 161 (38.98) | 252 (61.02) | 4.56 (2.93 to 7.10)† | 3.99 (2.15 to 7.40)‡ |
| **Age categories in years** | | | | | | | | |
| 18–29 | 82 (31.42) | 179 (68.58) | 0.76 (0.40 to 1.44) | 1.54 (0.67 to 3.35) |
| 30–39 | 32 (24.43) | 99 (75.57) | 0.53 (0.26 to 1.09) | 0.71 (0.31 to 1.66) |
| 40–49 | 25 (24.75) | 76 (75.25) | 0.54 (0.26 to 1.14) | 0.73 (0.35 to 1.74) |
| 50–59 | 23 (25.27) | 68 (74.73) | 0.56 (0.26 to 1.19) | 0.83 (0.34 to 2.04) |
| 60–64 | 18 (37.50) | 30 (62.50) | 1 | 1 |
| **Marital status** | | | | | | | | |
| Never married | 27 (20.15) | 107 (79.85) | 1 | 1 |
| Ever married | 153 (30.72) | 345 (69.28) | 1.75 (1.10 to 2.79)† | 2.13 (1.01 to 4.47)‡ |
| **Educational status** | | | | | | | | |
| No formal education | 36 (45.57) | 43 (54.43) | 2.28 (1.38 to 3.74)† | 1.94 (1.05 to 3.56)‡ |
| Primary and secondary | 105 (26.85) | 286 (73.15) | 1 | 1 |
| Diploma and above | 39 (24.22) | 122 (75.78) | 0.87 (0.56 to 1.33) | 1.57 (0.91 to 2.72) |
| **Occupational status** | | | | | | | | |
| Employed | 37 (13.45) | 238 (86.55) | 1 | 1 |
| Housewives | 108 (45.38) | 130 (54.62) | 5.34 (3.47 to 8.21)† | 3.04 (1.75 to 5.29)‡ |
| Unemployed§ | 33 (29.20) | 80 (70.80) | 2.65 (1.55 to 4.52)† | 3.30 (1.55 to 7.02)‡ |
| **Wealth index** | | | | | | | | |
| Low | 76 (29.57) | 181 (70.43) | 1 | 1 |
| Medium | 48 (32.21) | 101 (67.79) | 1.13 (0.73 to 1.74) | 1.13 (0.66 to 1.74) |
| High | 65 (27.66) | 170 (72.34) | 0.91 (0.61 to 1.34) | 1.19 (0.67 to 1.89) |
| **Body mass index** | | | | | | | | |
| <18.5 kg/m² | 22 (38.60) | 35 (61.40) | 1.89 (1.06 to 3.38)† | 1.82 (0.95 to 3.50) |
| 18.5–24.99 kg/m² | 100 (24.88) | 302 (75.12) | 1 | 1 |
| ≥25 kg/m² | 14 (48.28) | 15 (51.72) | 2.81 (1.31 to 6.04)† | 1.95 (1.23 to 3.09)‡ |

*Significant at p<0.05 (crude).
†Significant at p<0.05 (adjusted).
§Unemployed adults, students and retired.
AOR, adjusted OR; COR, crude OR.
partly owe to household commitments often borne by married individuals which could hinder frequent physical activity.\(^{47}\)

Adults with no formal education had two times higher odds of insufficient physical activity as compared with educated individuals. This finding is consistent with previous studies in Germany,\(^ {48}\) the Netherlands,\(^ {49}\) and the USA,\(^ {50}\) potentially indicating the importance of education in engaging in physically active life-styles. However, the finding in the current study differed from the national study findings, which reported adults with higher education were 28% less likely to be physically active compared with those without formal education.\(^ {39}\) The possible variation could be due to differences in the source population in which the former study included participants from rural population where the majority of adults engage in agricultural related activities and use walking for travel to and from places due to limited transport access,\(^ {22}\) whereas the current study focused solely on urban adults.

Unemployed adults were three times more likely to report insufficient physical activity compared with employed adults. A previous study conducted by Shaw\(^ {30}\) indicates that unemployment is negatively associated with physical activity but it interacts with level of education. Shaw reported that ‘at lower than average levels of education, employment was positively associated with physical activity, whereas at higher than average levels of education, employment became negatively associated with physical activity’.\(^ {47}\) Further studies investigating the role of employment and its interaction with education level in Ethiopia are instrumental to make specific recommendations for public health interventions.

Finally, overweight or obese adults had twofold likelihood of insufficient physical activity than adults with normal BMI. Overweight and obesity are correlated with physical inactivity in several previous studies.\(^ {51–55}\) For example, a longitudinal study conducted by Petersen et al suggested that obesity may lead to physical inactivity.\(^ {51}\) Another longitudinal study by Wanner et al reported that remaining and becoming physically inactive were associated with weight gain while remaining and becoming active had a favourable effect on weight status.\(^ {57}\) The evidence indicates that the association between ‘overweight or obesity’ and ‘physical (in)activity coexist’ and creates a vicious circle\(^ {51}\) of poor health outcomes in populations such as cardiovascular disease, fatty liver and type 2 diabetes mellitus.\(^ {58}\)

**Strengths and limitations**

The use of the GPAQ tool and adherence to the analysis protocol may be among the strengths of the current study, which facilitates fair comparison with studies from different settings. The findings of the current study should be interpreted in light of the following limitations. First, the study used self-reported level of physical activities, which might affect the estimation of the intensity and duration of activities. For instance, social desirability bias may have played a role in reporting. Second, identifying enabling and reinforcing factors of physical activity including built environment to support physical activity (eg, play grounds, peer influences and social supports) were beyond the scope of this study. Third, the sample sizes for men and women were not adequate for separate modelling of factors and the prevalence of insufficient physical activity between these groups. As such, future studies should consider allocating separate sample sizes for both sexes in order to examine the role of sex-specific factors related to insufficient physical activity in Ethiopia. Finally, because of the cross-sectional nature of the study, the temporal relationship between explanatory and outcome variables could not be established.

**CONCLUSION**

Three in 10 urban adults in this study in southeast Ethiopia did not achieve the WHO recommended level of physical activity. A higher percentage of women reported insufficient physically activity compared with men. Physical inactivity is a current global challenge which is contributing to non-communicable diseases and premature deaths; hence, the Ethiopian Ministry of Health and other stakeholders should pay special attention to improving physical activity among women, married, those without formal education, unemployed and overweight or obese adults. Furthermore, longitudinal observational and interventional studies are required to assess the level of physical activity and/or to evaluate the effectiveness of different interventions aiming to improve the level of physical activity in Ethiopia.

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