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# Adequacy of Physical Activity and its Associated Factors among Hypertensive Patients in the University of Gondar Comprehensive Specialized Hospital, Gondar, Northwest Ethiopia, Institutional Based Cross-Sectional Study

**Molla Fentanew[1*], Gashaw Jember Belay[1], Misganaw Belay[2], Melese Gobezie[1], Gebremariam Bekele[2], Kefale Getie[1], Kassaw Belay Shiferaw[1] and Mihret Dejen Takele[1]**

[1]*Department of Physiotherapy, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia*

[2]*Department of Physiotherapy, College of Health Sciences, Bahir Dar University, Bahir Dar, Ethiopia*

## Abstract

**Background:** Accurate evaluation of inadequacy of physical activity for hypertensive patients is important to determine patients' health outcomes and intervention measures. Information about physical inactivity among patients with hypertension in Ethiopia is not well known. Therefore; this study was aimed to assess the inadequacy of physical activity and its associated factors among hypertensive patients.

**Methods:** An institution based cross-sectional study was conducted from March 11 to June 12, 2021 among 423 selected adult hypertensive patients attending at the university of Gondar comprehensive specialized hospital. Face to face interview was conducted using a structured questionnaire by trained data collectors. Participants were selected through a systematic random sampling technique. Physical activity was assessed by Global Physical Activity Questionnaire (GPAQ). Data were analyzed by using SPSS version-20 statistical software. Both bivariable and multivariable logistic regression analysis was computed and in the multivariable logistic regression analysis model Adjusted Odds Ratio (AOR) with 95% Confidence Interval (CI) and p-value less than 0.05 were used to identify the associated factors with physical activities.

**Results:** Our study showed that 80.9% (95% CI; 76.8-84.5) had adequate physical activity, being old age (AOR: 10.289, 95% CI (3.208-33.006), low or poor self-efficacy (AOR: 10.339, 95% CI (4.894-21.838), poor self-rated health (AOR: 5.905, 95% CI (1.725-20.128), and lack of adequate facilities (AOR: 4.074, 95% CI (1.719-9.658) were significantly associated with inadequate physical activity.

**Conclusion:** Our study found that majority of the hypertensive patients had adequate physical activity. Being old age, poor self-efficacy, lack of adequate facilities, and poor self-rated health were associated factors for inadequate physical activity.

**Keywords:** Hypertension • Adequacy of physical activity • Adult patients • Ethiopia • Hypertensive

## Introduction

Hypertension is becoming a major medical and public health problem in the world [1]. It is the main risk factor of cardiovascular disease worldwide [2]. The global burden of hypertension exceeds 1.4 billion people in 2010 [3]. Between 2000 and 2001, 27.2% of Chinese adults were reported to have hypertension [4]. The number of individuals with hypertension in developing countries was higher than in developed ones [5]. Various researchers have shown that hypertension in Sub-Saharan Africa is in high prevalence [6]. The World Health Organization (WHO) reported that the prevalence of hypertension in the African region was the highest in 2008, with an estimated prevalence of 46% [7]. Approximately 75% (1.04 billion) of people with hypertension live in low and middle-income countries because of their understanding, treatment, and control [8]. The prevalence is the highest in Africa (27%) and the lowest in America (18%) [9].

***Address for Correspondence:** Molla Fentanew, Department of Physiotherapy, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, Tel: 251935686860; E-mail: molefentapt@gmail.com*



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Adequate Physical Activity (PA) has benefit to people with hypertension. It was shown that regular physical activity ameliorates quality of life for the general public and adults with hypertension in particular [10]. Increasing physical activity to recommended levels would help eliminate 6% to 10% of the major Non-Communicable Diseases (NCDs), including Coronary Heart Disease (CHD), type 2 diabetes, and breast and colon cancers. On the other hand, Physical inactivity contributes to and exacerbates Non-Communicable Diseases (NCDs) like hypertension [11]. People who are inadequately active have a 20% to 30% increased a risk of death compared to people who are adequately active [12]. Several studies have shown that regular physical activity can help patients with hypertension prevent, reduce, and even reverse hypertension, as well as improve their physiological and mental health [13]. Many studies showed that hypertensive patients performed less PA than healthy populations [14]. Moreover, regular physical activity can help the regulation of body weight and reduction of blood pressure [15]. Increasing amounts of physical activity have been shown to favorably affect blood pressure in people with hypertension, independent of changes in body weight [16]. A review of the evidences illustrates that regular exercise and physical activity can attenuate systolic and diastolic blood pressure by ~11 and 8 mmHg, respectively [17]. The American College of Sports Medicine's (ACSM) position on exercise and hypertension recommends individuals with hypertension engage in ≥ 30 min of continuous or accumulated physical activity on most, if not all days of the week, primarily of the endurance type [18].

Physical Activity (PA) significantly reduces all cause of mortality and contributes to the prevention of many Chronic Non-Communicable Diseases (CNDs). However, the proportion of people globally who are active enough to gain these health benefits is low and decreases with ageing [19]. Performing adequate Physical Activity (PA) is a primary modifiable determinant of health [20]. In adults, PA reduces the risk of all cause of mortality, prevents various chronic diseases, and in older adults especially, it reduces the risk of falls and helps maintain physical and cognitive function. Despite the known benefits of regular PA, 23% of adults globally are inadequately active, with some high income countries having inactivity rates of up to 54%. Inactivity rates increase with ageing, with around two-thirds of those between 65-74 years and three-quarters of those over 75 years do not meet PA guidelines of at least 150 min/week of moderate intensity activity in either the US or Australia. Research addressing the most appropriate intervention methods is still inconclusive. A lack of physical activity contributes to 3.2 million deaths and 69.3 million disability adjusted life years each year, due to the development of chronic diseases. Compared to those who are regularly physically active, those who are insufficiently physically active have a greater risk of mortality in hypertension cases. However, early detection and prevention of hypertension is important for patients with hypertension to have a better health outcome, no literature is available on the factors associated with the inadequacy of physical activity among adult hypertensive patients. So, there is a need to know how much physically inactive hypertension patients are, and understand the factors related to it. There is no information about the factors associated with inadequacy of physical activity among adults with hypertension. Considering the increasing prevalence of hypertension in developing countries such as Ethiopia, Therefore, this study aimed to investigate the inadequacy of physical activity and associated factors among hypertension patients in the university of Gondar comprehensive specialized hospital, Northwest Ethiopia.

## Materials and Methods

### Study area and period

The study was conducted at the university of Gondar comprehensive specialized hospital, which is found in Gondar city administration Northwest, Ethiopia. It is located around 730 kilometers far from the Ethiopian capital city (Addis Ababa). Gondar comprehensive specialized hospital is the oldest medical center in Ethiopia. The hypertensive clinic provides its service two days per week (*i.e.*, Tuesday and Wednesday); on average 105 hypertensive patients were treated per week. Within 3 months data collection period, 1240 patients were considered to be available. This study was conducted from March 11 to June 12 2021.

### Study design and population

An institutional based cross-sectional study was conducted at the university of Gondar comprehensive specialized hospital in Northwest part of Ethiopia to assess the inadequacy of physical activity among hypertensive patients. Hypertensive patients, who were severely ill, hearing impairments and gross physical disability, Patients with severe mental disorders, NYHA class IV cardiac patient were excluded. Out 1240 patients of Hypertensive patients, 423 of them were systematically invited to participate in this study based on eligibility criteria and after informed consent request, 420 voluntary hypertensive patients who attending hospital during the study period were recruited.

### Sample size determination, and sampling technique

The sample size was calculated by using a single population proportion formula ($n=(Z\alpha/2)^2 \times P\ (1-P)/(d)^2$): Since no study has been done in the study area with the same population was assumed to be 50% estimated population, 5% margin of error (d), 95% confidence level (alpha, $\alpha=0.05$) and with estimated number of populations 1240. Therefore, the total sample size by adding 10% non-response rate was 423. Systematic random sampling technique was used to ensure the equal chance of selection among participants. The sample interval was determined by dividing the expected number of hypertensive patients (1240) during the data collection period (3 months) divided by the sample size (423) of the study which resulted sample interval of 3. The first respondent was selected randomly with a lottery method to the first number included in the data collection. Then, every three patients were interviewed until the total sample size was reached.

### Operational definitions

**Physical activity:** It refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. It also comprises routine daily tasks such as commuting, occupational tasks, or household activities, as well as purposeful health enhancing movements/activities.

**Exercise:** A set of planned, structured, repetitive, and purposeful movements performed with the goal of physical fitness in mind.

**Hypertension:** A sustained high blood pressure, systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg (SBP ≥ 140 or DBP ≥ 90 mmHg).

**Inadequate physical activity:** based on GPAQ-2 scoring protocol the respondents whose total physical activity is <600 MET-minutes per week. And the total score is >600 MET-minutes per week represents inadequate physical activity.

### Data collection tools and data quality control issues

A structured questionnaire was prepared to collect socio-demographic information, behavioral, psychological and environmental factors endeavored from different literature. The medical factors were collected from recorded patient file.

The Global Physical Activity Questionnaire version 2 (GPAQ-2) was used to measure physical activity. It has three domains in which physical activity is performed. We used the GPAQ scoring protocol to create the following indicators: Total MVPA MET-min and domain-specific MVPA MET-min (*i.e.*, work, transport, recreation). METs (Metabolic Equivalent Tasks) are commonly used to express the intensity of PA. When calculating a person's overall energy expenditure using GPAQ-2, moderate-intensity activities during work, commuting, and recreation are assigned a value of 4 METs; vigorous-intensity activities are assigned a value of 8 METs. The total MVPA MET-min score is computed as the sum of all MET-min/week from MVPA performed in work, commuting, and recreation.

Study participants were asked if they had engaged in vigorous and moderate work and leisure time activities continuously for at least 10 min. Transport related activities include only moderate intensity activities worked out continuously for at least 10 min. Participants responding affirmatively of their engagement in a specific activity were asked about the number of days engaging in each activity in a typical week, and the time spent in each activity in a typical day. The responses to the frequency and duration questions are used to calculate the total amount of time a person spent doing physical activity or MET minutes per week. Vigorous-intensity activity is defined as an activity that makes an individual breathe much harder than normal, and a moderate-intensity activity makes an individual breathe somewhat harder than normal. We used the generic GPAQ show cards to aid in obtaining consistent and valid measurements.

In the GPAQ, sedentary behavior was assessed through the question "How much time do you usually spend sitting or reclining on a typical day?" only activities with a duration of >10 min were included. The time spent on the three physical activities was truncated to a maximum of 180 min, and it was verified that there were no values >7 d/week.

Walking MET-minutes/week=4* walking minutes* walking days, moderate MET minutes/week=4.0* moderate intensity activity minutes* moderate days, vigorous MET minutes/week=8.0* vigorous intensity activity minutes* vigorous intensity days.

A combined total physical activity MET-min/week could be computed as the sum of walking+moderate+vigorous MET-min/week scores. Then participants were classified into sufficiently active (adequate physical activity) and insufficiently active (inadequate physical activity) groups based on the overall cut-off point level of 600 METsminute/week used. The total physical activity of ≥ 600 MET-minutes per week denotes adequate physical activity or being physically active, and an inadequate level of physical activity or physical inactivity was represented by <600 MET-minutes per week.

Questions were answered by patients about the frequency and duration of PA in the 7 days prior to the survey. The data was used to estimate the weekly time spent in PA (min/week.). The height and weight of the participants was measured by trained nurses, with the participants without wearing their shoes. Height was measured using Tape measure, with the participant standing barefoot. Weight was measured using weighting scale (mini).

Five data collectors (two optometrists and three nurses) were trained by the principal investigator for two days before data collection. The study tool was pre tested by trained data collectors with close supervision of the principal investigator to insure the consistency of the interview and examination. The questionnaire was pretested on 5% (15) of the sample among HTN patients who were not included in the main study area, in Felege Hiwot comprehensive specialized hospital to detect potential problems, unanticipated interpretation as well as to make an amendment and cultural issue to each question. The acquisition of quality of data random checks were carried out by the investigators and the questionnaire was modified and corrected based on the pretest result.

### Data processing and analysis

Data was entered in EPI info version 7 and transferred to SPSS version 20. Descriptive statistics of the collected data was done for most variables in the study using statistical measurements. Binary logistic regression analysis was used to assess the association between dependent and independent variables. All independent variables with p-value <0.20 in bivariate logistic regression analysis were fitted in to multivariate logistic regression to identify independently associated with dependent variable in the final model. A 95% CI and p-value <0.05 were considered statistically significant. Significance of categorical variable was checked using *chi-square* test. The model fitness was checked using Hosmer and Lemeshow test (0.87).

## Results

### Socio-demographic characteristics of the study participants

Out of four hundred twenty three study participants, 420 have participated in the study with a response rate of 99.3%. Those three hypertensive patients who were selected for a sample could not participate due to refusing to take the interview. Of the total respondents, the majority of them 233 (55.1%) were male, 348 (82.3%) were orthodox christian and 142 (33.6%) were housewives. Regarding age distribution, the mean and standard deviation of participant's ages were 57.4 ± 13.4 respectively (Table 1).

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Gender | | |
| Male | 233 | 55.1% |
| Female | 190 | 44.9% |
| Age in years | | |
| 30-40 | 59 | 13.90% |
| 41-50 | 99 | 23.4% |
| 51-64 | 112 | 26.5% |
| >64 | 153 | 36.2% |
| Religion | | |
| Orthodox christians | 348 | 82.3% |
| Muslim | 62 | 14.7% |
| Protestant | 13 | 3% |
| Educational status | | |
| No formal education | 163 | 38.5% |
| Primary education | 131 | 31% |
| Secondary education | 56 | 13.2% |
| College and above | 73 | 17.3% |
| Residence | | |
| Urban | 352 | 83.20% |
| Rural | 71 | 16.80% |
| Occupation | | |
| Farmer | 37 | 8.70% |
| Self employed | 105 | 24.80% |
| Government employed | 85 | 20.10% |
| Housewife | 142 | 33.60% |
| Others | 54 | 12.80% |
| Monthly income | | |
| <1000 | 79 | 18.70% |
| 1000-3000 | 111 | 26.20% |
| 3001-5000 | 96 | 22.70% |
| >5000 | 137 | 32.40% |

**Table 1.** Sociodemographic characteristics of study participants in the university of Gondar comprehensive specialized hospital, Gondar, Northwest Ethiopia, 2021 (n=423).

## Behavioral and anthropometric characteristics of the study participants

Seventeen participants (4%) were declared that they were cigarettes smoker and 58 (13.7%) of them were also alcohol consumers. Most of the participants 215 (50.8%) were overweight, 168 (39.7%) were normal and 38 (9%) were obese (Table 2).

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Smoking status | | |
| Yes | 17 | 4% |
| No | 406 | 96% |
| Alcohol consumption | | |
| Yes | 58 | 13.7% |
| No | 365 | 86.3% |
| Body mass index | | |
| Normal | 170 | 40.2% |
| Over weight | 215 | 50.8% |
| obese | 38 | 9% |

**Table 2.** Anthropometric measurements and behavioral characteristics of a study participant in the university of Gondar comprehensive specialized hospital, Gondar, Northwest Ethiopia, 2021 (n=423).

## Psychological and environmental factors

From study participants, about 326 (77.1%) of respondents had high self-efficacy and almost all of respondents 420 (99.3%) had a good attitude towards physical activity and also from study participants, about 136 (32.2%) have poor self-rated health.

Regarding the environmental factors, the majority of participants 333 (78.7%) was reported that they have lack adequate facilities to do physical activity, as well as 240 (56.7%) of them, has social support (Table 3).

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Self-efficacy | | |
| High | 326 | 77.10% |
| Low | 97 | 22.90% |
| Attitude | | |
| Good | 420 | 99.30% |
| Poor | 3 | 0.70% |
| Self-rated health | | |
| Very good | 49 | 11.60% |
| Good | 121 | 28.60% |
| Fair | 117 | 27.70% |
| Poor | 136 | 32.20% |
| Adequate facilities | | |
| Yes | 90 | 21.30% |
| No | 333 | 78.70% |
| Safe side walks | | |
| Yes | 303 | 71.60% |
| No | 120 | 28.40% |
| Safe work | | |
| Environment to do PA | | |
| Yes | 298 | 70.40% |

| | | |
|---|---|---|
| No | 125 | 29.60% |
| Social support | | |
| Yes | 240 | 56.70% |
| No | 183 | 43.30% |

**Table 3.** Psychological and environmental characteristics of study participants in the university of Gondar comprehensive specialized hospital, Gondar, Northwest Ethiopia, 2021 (n=423).

## Medical factors

Among total participants 140 (33.1%) have comorbidities. As to comorbid diseases, 97 (30%) were diagnosed with DM (Table 4).

| Variables | Frequency | Percentages (%) |
|---|---|---|
| DM | | |
| Yes | 97 | 22.90% |
| No | 326 | 77.10% |
| Coronary heart disease | | |
| Yes | 28 | 6.60% |
| No | 395 | 93.40% |
| Others | | |
| Yes | 15 | 3.50% |
| No | 408 | 96.5% |

Hint: Others include chronic kidney disease, back pain, and other musculoskeletal problems.

**Table 4.** Comorbid factor the characteristics of study participants in the university of Gondar comprehensive specialized hospital, Gondar, Northwest Ethiopia, 2021 (n=423).

## Inadequacy of physical activity among hypertensive patients

Participants were categorized into adequate physical activity (active) or inadequate physical activity (inactive) based on accumulated METs per week. The overall inadequacy of physical activity among participants with hypertension was 19.1% ((95% CI (15.5-23.2)) and 80.9%, ((95% CI (76.8-84.5)) of them did achieve the weekly requirements of WHO physical activity guideline (Figure 1).

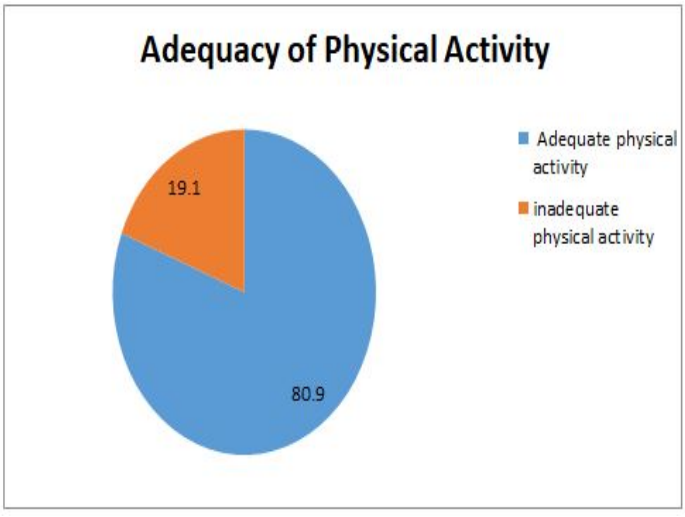


**Figure 1.** Adequacy of physical activity among patients with hypertension in the university of Gondar comprehensive specialized hospital, Gondar, Northwest Ethiopia, 2021 (n=423).

## Factors associated with inadequate (insufficient) physical activity among hypertensive patients

Explanatory variables that were significantly associated in bivariate logistic regression ($p<0.20$) were fitted to multivariate logistic regression analysis as physical activity was the outcome variable. After controlling potential confounders, variables such as age, self-efficacy, self-rated health, and adequate facilities were significantly associated with inadequate physical activity among hypertension patients ($p<0.05$), while variables such as educational status, occupation, monthly income, sex, safe side walks, comorbidities, residency were not significantly associated in multivariate analysis ($p>0.5$).

Participants whose age is 64 years and above were 10.289 times more likely to be physically inactive (AOR: 10.289, 95% CI (3.289-33.006)) compared with the younger age group. Regarding self-efficacy of participants towards physical activity, those respondents with low self-efficacy were 10.339 times more likely to be physically inactive (AOR: 10.339, 95% CI 95 (4.894-21.838)) than the high self-efficacy group. Regarding self-rated health, those respondents with poor self-rated health were 5.905 times more likely to be physically inactive (AOR: 5.905,95% CI (1.725-20.128)) than those who have good self-rated health. Participants who have no adequate facilities have 4.074 odds of being physically inactive than those who have adequate facilities (AOR: 4.074, 95% CI (1.719-9.658)) (Table 5).

| Variables | Physical activity | | | |
|---|---|---|---|---|
| | Inactive | Active | COR (95% CI) | AOR (95% CI) |
| Sex | | | | |
| Male | 36 | 197 | 1 | 1 |
| Female | 45 | 145 | 1.698 (1.043-2.766) | 1.42 (0.312-6.451) |
| Age | | | | |
| 30-40 | 5 | 58 | 1 | 1 |
| 41-50 | 5 | 98 | 0.592 (0.164-2.132) | 0.936 (0.228-3.846) |
| 51-64 | 8 | 99 | 0.937 (0.293-3.00) | 2.380 (0.615-9.212) |
| >64 | 63 | 87 | 8.400 (3.186-22.1457) | 10.289 (3.208-33.006)* |
| Education | | | | |
| No formal education | 45 | 118 | 0.152 (0.052-0.441) | 0.197 (0.018-2.178) |
| Primary school | 21 | 110 | 0.304 (0.100-0.922) | 0.378 (0.045-3.147) |
| Secondary school | 11 | 45 | 0.237 (0.071-0.791) | 0.085 (0.007-1.040) |
| College and above | 4 | 69 | 1 | 1 |
| Residence | | | | |
| Urban | 77 | 275 | 0.213 (0.075-0.603) | 0.218 (0.026-1.855) |
| Rural | 4 | 67 | 1 | 1 |
| Occupation | | | | |
| Farmer | 2 | 35 | 10.294 (2.233-47.457) | 1.143 (0.064-20.405) |
| Self employed | 11 | 94 | 5.027 (2.184-11.571) | 2.449 (0.429-13.983) |
| Government employed | 8 | 77 | 5.662 (2.270-14.120) | 0.856 (0.107-6.885) |
| Housewife | 40 | 102 | 1.500 (0.773-2.909) | 5.0249 (0.494-51.071) |
| Others | 20 | 34 | 1 | 1 |
| Self-efficacy | | | | |
| Poor self-efficacy | 58 | 39 | 19.592 (10.894-35.234) | 10.339 (4.894-21.838)* |
| Good self-efficacy | 23 | 303 | 1 | 1 |
| Self-rated health | | | | |
| Very good | 4 | 45 | 1 | 1 |
| Good | 6 | 115 | 0.587 (0.158-2.178) | 0.519 (0.124-2.178) |
| Fair | 9 | 108 | 0.938 (0.275-3.201) | 0.812 (0.206-3.201) |
| Poor | 62 | 74 | 9.426 (3.211-27.668) | 5.905 (1.725-20.128)** |
| Adequate facilities | | | | |
| Yes | 21 | 69 | 1 | 1 |
| No | 60 | 273 | 1.385 (0.789-2.431) | 4.074 (1.719-9.658)*** |
| Safe work place | | | | |
| Yes | 36 | 262 | 1 | 1 |
| No | 45 | 80 | 0.244 (0.147-0.405) | 0.394 (0.139-1.115) |
| Social support | | | | |

| | | | | |
|---|---|---|---|---|
| Yes | 23 | 217 | 1 | 1 |
| No | 58 | 125 | 0.228 (0.134-0.388) | 0.836 (0.270-2.592) |
| Comorbidities | | | | |
| Yes | 38 | 102 | 1 | 1 |
| No | 43 | 240 | 2.079 (1.269-3.408) | 1.125 (0.411-3.079) |
| Body mass index | | | | |
| Normal | 14 | 156 | 1 | 1 |
| Overweight | 50 | 165 | 0.296 (0.157-0.557) | 0.572 (0.162-2.016) |
| Obese | 17 | 21 | 0.111 (0.048-0.257) | 0.305 (0.044-2.121) |

Key: 1=Reference category, *statistically significant at P<0.01. **Highly statistically significant at **P<0.005 and *** highly statistically significant at p<001, COR=Crude Odd Ratio, AOR=Adjusted Odd Ratio, CI=Confidence Interval

**Table 5.** Factors associated with the level of physical activity on bivariate and multivariate logistic regression analysis of study participants in the university of Gondar comprehensive specialized hospital, Gondar, Ethiopia, 2021(n=423).

## Discussion

This study found out that the percentage of those who did an insufficient physical activity and sufficient physical activity based on WHO guideline among adult hypertension patients was 19.1% and 81.9% respectively. Outdoor walking (travel to and from places) was the most commonly reported physical activity practice among the respondents whereas Recreational activities were the least commonly reported physical activity practice among the respondents this may be due to lack of adequate facilities to do physical activity. It might be due to the cost of joining to gym and exercise facilities, fear of injured by practicing high intensity activities, self-belief like embarrassed to wear sportswear especially old age and women. This study prevalence was lower than the institutional based prospective cohort study conducted in the USA, 95% of participants did the inadequate physical activity. This difference might be due to different methodologies, different tools, sample size, and study designs and study subjects and way of life style. This study prevalence was lower than community based cross-sectional study conducted in China, 58.6%. These discrepancies might be due to sample size and methodological differences. The further explanation might be due to differences in Sociodemographic factors and lifestyles differences. Developed countries people like china May spend most time being sedentary because of their industrial work. But in this study, participants may perform different physical tasks to carefully balance or lead their way of life.

This study prevalence was not comparable with a similar study conducted in South Africa. Found out relatively different prevalence which was 28.4% with different tool (IPAQ was used). This difference might be due to different methodology, sample size, and study populations. Prevalence of physical inactivity in this study was lower than institutional based cross-sectional studies conducted in Nigeria, with most participants (56.1%) being physically inactive. In line with the above studies, this study prevalence was lower than a similar study conducted on Rwanda, Kigali 69.44%. According to the author's report, the important barrier reported by more than half of the participants (55.6%) was “lack of motivation”. Other major barriers identified were “health conditions” (47.2%) and “lack of knowledge of the benefits of exercise” (33.3%). Adults with hypertension also reported that “lack of time” (28.6%), and “limited financial resources” (16.3%) decreased their willingness to engage in physical activity. This might be a possible reason for higher prevalence compared with our study in which the majority of the populations working high demanding work use an active mode of transport due to financial constraints. This study prevalence is also lower than a similar study conducted in Kenya, 63%. The possible reason for this difference might be variation in the study population, study setting, and heterogeneity of the sample. In this study, majorities of participants were urban residents, and studies in the African context have shown that urban dwellers had inadequate physical activity. Although our participants were patients live in urban, it is expected that they would have some similarity with the general population in terms of adequacy of physical activity. The reason why most of the participants in other studies presented with a high prevalence of inadequate physical activity could be because the general population from which they were recruited might be equally physically inactive. Another reason might be due to the limited sample size of some studies so that it is not possible to make any definite conclusions for this small sample size participant. In other studies, the intervention for hypertension may not focused on physical activity.

In multivariate logistic regression analysis, this study found out that (being old age, poor self-efficacy, lack of adequate facilities, and poor self-rated health) were significantly associated with physical inactivity among hypertension patients. Regarding older age, this study revealed that older age participants were 10.289 times more likely to be inactive than younger hypertension patients. The possible reason for this might be participants of this age group in this study are mostly retired people and may be associated with a sedentary lifestyle after retirement. Furthermore, older people are reluctant to do physical activity due to their perception that HTN weakened their body and causing them to have some demotivation effect to perform regular physical activity and feeling tiredness. This finding is in line with another cross-sectional study carried out in Malaysia, South Africa, and Nigeria. This similarity might be due to the similar methodology and measuring tool used. But our study is not agreed with a previous similar study conducted in the USA, which revealed that those >65 years of age did adequate physical activity compared

to young hypertension patients. This difference might be due to different methodology and measuring tools used 6. The other difference between these two studies might be reflective of adults staying in the workforce longer, which may cause stress or time constraints that hinder incorporating PA into their lifestyle in the USA so those that retired at age 65 may have had more time to focus on structured activities or to be more physically active. But this finding studied in the USA is contrary to the trend of declining PA level with increasing age.

This study revealed that environmental factors like social support and was not associated with the level of physical activity but this study is not agreed with a similar study conducted in the USA and Nigeria, which revealed that those hypertension patients who have no social support performed inadequate physical activity. This difference might be due to the different methodology and measuring tools used. Regarding the psychological attributes, this study agreed with studies done in China, South Africa, Nigeria, and Rwanda which revealed that most of the hypertensive patients presented with low levels of physical activity have poor self-efficacy. Poor self-efficacy (having no time for PA, one component of self-efficacy, in particular), was a major barrier to physical activity among adult hypertension patients. In this regard, in our study, participants who had low efficacy towards physical activity were 10.339 times more likely to be physically inactive compared with that of good self-efficacy. The reason for similarity might be due to similar participants. Concerning the environmental factors, our study revealed that lack of adequate facilities was statistically positive significant with insufficient physical activity on HTN patients. Participants who have lack adequate facilities were 4. Times more likely to be physically inactive compared with those who have adequate facilities. This study was supported by studies conducted in Netherland on Ghanaian hypertension patients and Rwanda. This could be due to both countries may not have adequate facilities for doing PA for hypertension patients or another reason for the similarity of these two African studies may be the study may have been conducted in an area of inadequate facilities, due to comparable sample size and sampling technique. Unlike other studies conducted from so far, socio-demographic factors like sex, place of residence, marital status, employment status, level of education, socioeconomic status were not associated in our study. The possible reason for this might be due to a diverse participant's socioeconomic circumstances, different study participants, cultural background or living environment or may differ in many sociodemographic respects including the way of lifestyle, sociocultural backgrounds and geographical origin, different data types, and different validated instrument. For example, in this study, the residence was divided into two (urban and rural). But in another study; Residence was divided into 3 categories (rural, urban, and city). This category makes a difference in its research.

Thirdly, the relationships among gender, socio-economic position, and physical activity may be different in rural contexts than in urban; women residing in rural zones and those with low socio-economic status may engage in sports less frequently, but likely have more active occupations.

Unlike other studies conducted from Finland, Rwanda behavioral factors such as smoking cigarettes, alcohol consumption, and anthropometric measurements like general obesity (BMI) were not significantly associated in our study. The possible reason for this might be due to low prevalence in smoking and alcohol users in our study and different study design and sample size. For example, a study conducted in Rwanda has a sample size of 252 hypertensive patients which is small compared to this study (n=423). As well as those who were overweight, obese individuals being motivated to engage in physical activity to have weight loss.

Regarding self-rated health, this study found out that poor self-rated health was significantly associated with physical inactivity among hypertensive patients. This study revealed that hypertensive patients with poor self-rated health were 6 times more likely to be physically inactive than good self-rated health patients, (AOR: 5.905, 95% CI (1.725-20.128)). This finding was supported by previous similar studies reported from China and Rwanda.This similarity might be due to study participants sensing unpleasant experiences gathered by patients throughout the course of their illness.

## Conclusion

This study revealed that a low prevalence of inadequate physical activity among adult hypertensive patients in the study areas. Among patients with HTN participants older age (>64 years old), low self-efficacy, poor self-rated health, and lack of adequate facilities were significantly associated with inadequate (insufficient) physical activity among adult hypertensive patients in this study.

## Ethical Consideration

The proposal was reviewed, approved and ethical clearance was obtained from the research and ethical review committee and Institutional Review Board (IRB) of university of Gondar, college of medicine and health science. Respondents were fully informed about the purpose of the study and gave verbal consent. Confidentiality of the information was assured from all data collectors and principal investigators as well as participant's privacy was respected during physical measurements such as height and weight. The study participants were informed about the study. Participants were allowed to withdraw from the study at any time of the data collection with no need to justify their reason. Privacy and confidentiality of information given by each respondent were kept.

## Availability of Data and Material

Since this is a funded work, the data sets used and/or analyzed during the current study are available from the corresponding author on reasonable formal request.

## Competing Interests

The authors declare that they have no conflicts of interest.

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