


## Physical activity levels and related sociodemographic factors among Iranian adults: Results from a population-based national STEPS survey

Ali-Asghar Kolahi<sup>\*1</sup>, Alireza Moghisi<sup>2</sup>, Ahmad Kousha<sup>3</sup>, Yalda Soleiman-Ekhtiari<sup>1</sup>

Received: 14 Aug 2019

Published: 19 Dec 2020

### Abstract

**Background:** Physical inactivity (PA) is one of the leading modifiable risk factors for noncommunicable diseases (NCDs) worldwide. This study aimed to determine PA levels and related sociodemographic factors as risk factors for NCDs among Iranian adults.

**Methods:** In this cross sectional study, data were collected from the sixth nationwide STEPS survey in 31 provinces of Iran. A total of 6100 individuals aged 18-64 years were selected by a multistage cluster sampling method, and their PA levels were assessed using the Global Physical Activity Questionnaire (GPAQ). Data were analyzed using descriptive methods and analytical tests, including chi-square, ANOVA, and independent t tests in SPSS version 21 software.

**Results:** The prevalence of vigorous, moderate, and low levels of PA was 36.3% (95%CI:35.1-37.5), 29.2% (95%CI:28-30.3), and 34.5% (95%CI:33.3-35.7) in participants, respectively. The mean  $\pm$  SD of total MET-min/week was 1842.3 $\pm$ 2619.3. Total mean  $\pm$  SD duration of PA was 98.2  $\pm$  115 min/week (125.8 $\pm$ 142.6 and 77.2 $\pm$ 84.5 min/week in men and women, respectively). Transport-related PA and severe PA at work had large and small contributions to overall PA, respectively. Urbanization, sex, age, family size, and occupation status were identified as factors associated with PA levels ( $p < 0.001$ ).

**Conclusion:** This study revealed a significant prevalence of low PA among the target population and some sociodemographic characteristics identified as factors associated with PA. Identification of these factors can develop more effective interventions to promote PA.

**Keywords:** Physical activity, Noncommunicable diseases, Population surveillance, STEPs Survey

**Conflicts of Interest:** None declared

**Funding:** This study has been funded and supported by Shahid Beheshti University of Medical Sciences (Project No: 21405).

**\*This work has been published under CC BY-NC-SA 1.0 license.**

Copyright© Iran University of Medical Sciences

**Cite this article as:** Kolahi AA, Moghisi A, Kousha A, Soleiman-Ekhtiari Y. Physical activity levels and related sociodemographic factors among Iranian adults: Results from a population-based national STEPS survey. *Med J Islam Repub Iran.* 2020(19 Dec);34:172. <https://doi.org/10.34171/mjiri.34.172>

### Introduction

Insufficient physical activity (PA) is an established modifiable risk factor for noncommunicable diseases (NCDs), such as cardiovascular diseases (CVDs), some cancers, and type 2 diabetes mellitus (1-3). Regular PA

plays an important role in prevention of these diseases via effect on body mass index (BMI), body fat mass, blood pressure, blood glucose, insulin sensitivity, lipid profile, low-density lipoprotein cholesterol, etc., and generally it

**Corresponding author:** Dr Ali-Asghar Kolahi, [a.kolahi@sbmu.ac.ir](mailto:a.kolahi@sbmu.ac.ir)

<sup>1</sup> Social Determinants of Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup> Ministry of Health and Medical Education, Tehran, Iran

<sup>3</sup> Department of Health Education and Promotion, Faculty of Health, Tabriz University of Medical Sciences, Tabriz, Iran

#### ↑What is “already known” in this topic:

Insufficient physical activity (PA) is a modifiable determinant for noncommunicable diseases, and regular PA plays an important role in its prevention. Most studies reported that Iranian adults do not meet the global recommendations of PA. The association between sociodemographic characteristics and level/intensity of PA has been established in previous studies.

#### →What this article adds:

This study revealed the prevalence of vigorous, moderate, and low-level PA among Iranian adult population. In addition, this study can help to describe sociodemographic factors for insufficient PA. Highlighting these characteristics will provide evidence for public health efforts to improve PA levels in the Iranian population.

has been associated with reducing medical care costs and improving health-related variables (2, 4-6). However, unfortunately, according to the World Health Organization (WHO) report, worldwide, 1 in 4 adults is not physically active enough (1). In the Middle East region, high prevalence rates of physical inactivity has been reported (7). Most studies also reported that Iranian adults do not meet the global recommendations of PA (8). Results of studies have shown that the levels of PA among adults has declined in recent decades and an increase in the prevalence of insufficient PA was seen (9,10).

Metabolic equivalents (METs) are used to calculate intensity of total PA, which is defined as the ratio of a person's working metabolic rate during exercise to the metabolic rate at rest (2,11,12). One MET is defined as the energy cost of sitting quietly and is equivalent to a caloric consumption of 1 kcal/kg/hour. MET is used for the analysis of global physical activity questionnaire (GPAQ) data. According to the GPAQ scoring protocol, if total PA MET minutes per week is < 600, it does not meet WHO recommendations on PA for health (13).

The WHO STEPwise approach to surveillance (STEPS) is an effective method for collecting and analyzing data. The conceptual framework of this approach includes three steps of risk factor data assessment: (1) ecological and behavioral risk factors measurement, (2) physical measurement, and (3) biochemical measurement. Use of this approach allows monitoring risk factors for NCDs and uptaking prevention and control activities (14,15).

Social determinants, including sociodemographic variables, are associated with the prevalence of NCDs, and in this context, the association between sociodemographic characteristics and the level and intensity of PA was established in previous studies (6,16). Therefore, a nationwide population-based survey can be helpful in determining the distribution of sociodemographic determinants of these diseases (17). Considering the increase in the incidence and prevalence of NCDs worldwide and, consequently in Iran, conducting such studies can be useful in identifying some social determinants of these diseases and their risk factors. Conducting surveillance studies and identifying these characteristics can provide valuable nationwide information for planning effective public health policies and intervention and monitoring efforts to promote PA among high-risk population groups according to the such social pattern (3,18,19). Therefore, this study was conducted to determine PA levels and related sociodemographic factors among Iranian adults.

## Methods

### Design and population

In this cross sectional study, data were analyzed from the sixth-round nationwide survey on NCDs risk factors using STEPS approach in Iran. In the main survey, all Iranian people aged 6 to 70 years living in 31 provinces of Iran were considered as the target population. In this study, data about adults aged 18-64 years were analyzed, according to global recommendations on PA (20). A total of 12 000 Iranian people were selected via multistage cluster random sampling and participated in this survey.

At first, every big city or several small cities were considered as primary sampling units (PSUs). Then, a systemic random sample was selected from the PSU list and urban/rural was considered as the secondary sampling unit (SSU); thus, 12 SSU were selected from each PSU using systematic random method. Next, executive clusters, consisting of 20 households in each SSU, were determined and 20 samples were placed in each executive cluster. Households were randomly selected based on postal code. Then, the qualified person was randomly selected from each selected household by KISH method.

In KISH method, first, a list of eligible people per household was provided. At each age group, men and women were sorted in order of age. In KISH table, we looked up the column for the digit on the right side of the household code, and the row for the total number of eligible people of households from that age group. The number in the cell where the column and row meet was the person to interview.

### Implementation and data collection

In the main survey, data were collected based on 3 phases of STEPS approach: (1) demographic information, (2) behavioral risk factors measurements, and (3) physical and biochemical measurements. In this study, only the first step of data collection was discussed.

Prior to the implementation of the survey, all interviewers and executive teams were trained in the field of all stages of survey, including the 3 steps measurements. During the survey, these measurements were controlled and monitored periodically by city and province observers; then, they were reported to higher level officials. At first, all trained interviewers explained the goals of the survey and obtained verbal informed consents from eligible participants. Interviewers completed a standard questionnaire via a face-to-face interview. Finally, they measured physical and biochemical factors.

### Questionnaire

In this study, PA levels were assessed using GPAQ. This questionnaire has been developed by WHO and has been used in most population-based studies using STEPS approach (21). The questionnaire included 16 questions about the frequency and duration of PA (min/day) and 3 different domains, including PA at work, PA at travel to and from places, and recreational activities in a normal active week for the participants. The frequency and duration of PA (min/day) of participation in these domains over a typical week are recorded. According to GPAQ protocol, low-level PA is assigned a score below 600 METminutes/week, moderate level PA a score of 600-1500 MET-minutes/week, and vigorous level PA a score more than 1500 MET-minutes/week (13,22). To analyze GPAQ data, 4 METs are assigned to the time spent in moderate activities and 8 METs to the time spent in vigorous activities. To calculate a categorical indicator, the total time spent in PA during a typical week and the intensity of the PA are taken into account. Total PA MET-minutes/week is the sum of the total MET/minutes/week of activity computed for each setting (13).

### Statistical analysis

Collected data were analyzed in SPSS version 21 (IBM Corp., Chicago, IL, USA). For data analysis, descriptive methods such as the mean  $\pm$  SD and frequency (%) and analytical tests, including chi-square, ANOVA, and independent t tests, were used.

### Ethical consideration

The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki, and it was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences. Moreover, consent of the participants, confidentiality of personal data, and free measurements were considered.

### Results

The data of 6100 people aged 18-64 years (43.1% men and 56.9% women) were analyzed. Of the participants, 24.6% were 25-34 years old, and the majority (69.7%) of the participants lived in urban areas. Family size of 66.3% of the participants was 2-4. Also, 48.6% of the participants had Fars ethnicity. In terms of education level and occupation status, 36.2% of the participants did not finish high school and 43.6% were housewives.

The prevalence of vigorous level PA in participants was

36.3% (95%CI:35.1-37.5). Further, 29.2% (95%CI:28-30.3) of the participants had moderate level PA and 34.5% (95%CI:33.3-35.7) low level PA. Also, 37.6% of the participants aged 25-34 years had low level PA (Table 1). Moreover, 40.1% of the participants aged 55-64 years and 38.5% of those aged 18-24 years had vigorous PA. The highest rate of vigorous level PA was found among rural residents (40.1%). Lor ethnicity had the highest rate of vigorous level PA (53.3%), while 44.3% of people with Baloch ethnicity had low-level PA. In terms of family size, 40.7% of single or divorced people had low-level PA, whereas 40.5% of the participants with 5 and above family size had vigorous low-level PA. In terms of occupation status, 41.6% of homemakers had the highest low-level PA.

In this study, the mean  $\pm$  SD of the total MET-min/week was  $1842.3 \pm 2619.3$ . Total mean  $\pm$  SD duration of PA was  $98.2 \pm 115$  min/week. The highest mean  $\pm$  SD duration of PA was related to transport-related PA ( $56.3 \pm 62.9$  min/week), which was higher in men than in women ( $66.7 \pm 77.4$  vs  $48.4 \pm 47.6$ ) min/week,  $t=10.6$ ,  $p<0.001$ , 95% CI: 14.9-21.6 (Tables 2 and 3). The lowest mean  $\pm$  SD duration of PA was related to severe PA at work, which was also higher in men than in women ( $4.7 \pm 34.5$  vs  $1.3 \pm 18.8$  min/week,  $t=4.5$ ,  $p<0.001$ , 95% CI: 1.9-4.8). Accordingly, the highest mean  $\pm$  SD of MET-min/week belonged to transport related PA ( $1116.1 \pm 1475.5$ ) and the

Table 1. PA levels according to sociodemographic characteristics in the population study

| Characteristics   |                                     | PA level     |                       |                       | p*     |
|-------------------|-------------------------------------|--------------|-----------------------|-----------------------|--------|
|                   |                                     | Low level PA | Moderate-intensity PA | Vigorous-intensity PA |        |
|                   |                                     | n (%)        | n (%)                 | n (%)                 |        |
| Age groups (year) | 18-24                               | 432(33.4)    | 363(28.1)             | 497(38.5)             | <0.001 |
|                   | 25-34                               | 564(37.6)    | 424(28.3)             | 512(34.1)             |        |
|                   | 34-44                               | 360(37.2)    | 306(31.6)             | 303(31.3)             |        |
|                   | 45-54                               | 336(34.1)    | 287(29.2)             | 361(36.7)             |        |
|                   | 55-64                               | 413(30.5)    | 399(29.4)             | 543(40.1)             |        |
| Residency         | Urban                               | 1454(34.2)   | 1324(31.1)            | 1476(34.7)            | <0.001 |
|                   | Rural                               | 651(35.3)    | 455(24.6)             | 740(40.1)             |        |
| Sex               | Male                                | 688(26.1)    | 726(27.6)             | 1217(46.3)            | <0.001 |
|                   | Female                              | 1417(40.9)   | 1053(30.4)            | 998(28.8)             |        |
| Ethnicity         | Baloch                              | 70(44.3)     | 46(29.1)              | 42(26.6)              | <0.001 |
|                   | Turk                                | 460(33)      | 417(29.9)             | 519(37.2)             |        |
|                   | Turkoman                            | 32(42.1)     | 24(31.6)              | 20(26.3)              |        |
|                   | Sistani                             | 17(36.2)     | 17(36.2)              | 13(27.7)              |        |
|                   | Arab                                | 30(33)       | 21(23.1)              | 40(44)                |        |
|                   | Fars                                | 1096(37.3)   | 869(29.5)             | 977(33.2)             |        |
|                   | Kurd                                | 172(32.3)    | 152(28.6)             | 208(39.1)             |        |
|                   | Gilak                               | 84(31)       | 83(30.6)              | 104(38.4)             |        |
|                   | Lor                                 | 108(21.3)    | 129(25.4)             | 270(53.3)             |        |
|                   | Multiethnic                         | 14(40)       | 10(28.6)              | 11(31.4)              |        |
| Education Level   | Illiterate                          | 439(36.4)    | 324(26.8)             | 444(36.8)             | 0.053  |
|                   | Under Diploma                       | 778(35.3)    | 631(28.6)             | 798(36.2)             |        |
|                   | Diploma                             | 563(34.4)    | 481(29.4)             | 594(36.3)             |        |
|                   | Academically                        | 324(31)      | 342(32.7)             | 379(36.3)             |        |
| Family size       | 1                                   | 66(40.7)     | 52(32.1)              | 44(27.2)              | <0.001 |
|                   | 2-4                                 | 1451(36)     | 1182(29.3)            | 1403(34.8)            |        |
|                   | 5 and above                         | 584(30.9)    | 543(28.7)             | 766(40.5)             |        |
| Occupation Status | Housewife                           | 1098(41.6)   | 785(29.7)             | 758(28.7)             | <0.001 |
|                   | Retired                             | 95(22.9)     | 123(29.7)             | 196(47.3)             |        |
|                   | Unemployed                          | 103(28.5)    | 95(26.2)              | 164(45.3)             |        |
|                   | Worker and employee                 | 266(31.6)    | 251(29.8)             | 325(38.6)             |        |
|                   | Self-employed                       | 321(27.5)    | 330(28.2)             | 518(44.3)             |        |
|                   | Student and soldier and unpaid work | 206(32.6)    | 183(29)               | 243(38.4)             |        |

\*p-values are from chi-square test.

Table 2. Comparison of PA duration by sex in the population study

| PA Duration in minutes   | Male<br>Mean±SD* | Female<br>Mean±SD | Total<br>Mean±SD | p      |
|--------------------------|------------------|-------------------|------------------|--------|
| Severe PA at work        | 4.7±34.5         | 1.3±18.8          | 2.7±26.8         | <0.001 |
| Moderate PA at work      | 9.5±50.5         | 6.9±34.7          | 8±42.2           | 0.020  |
| Transport-related PA     | 66.7±77.4        | 48.4±47.6         | 56.3±62.9        | <0.001 |
| Severe recreational PA   | 15.4±48.8        | 3±19              | 8.4±35.7         | <0.001 |
| Moderate recreational PA | 29.4±55.4        | 17.4±42.1         | 22.6±48.6        | <0.001 |

\* SD: Standard Deviation

Table 3. Comparison of PA pattern by sex in the population study

| PA pattern (MET-Min/week) | Male<br>Mean±SD | Female<br>Mean±SD | Total<br>Mean±SD | p      |
|---------------------------|-----------------|-------------------|------------------|--------|
| Severe PA at work         | 174.9±1456.9    | 35.1±570          | 95.4±1051.3      | <0.001 |
| Moderate PA at work       | 188.3±1112.3    | 136.7±762         | 159±929.8        | 0.040  |
| transport-related PA      | 1396.4±1792.1   | 903±1134          | 1116.1±1475.5    | <0.001 |
| Severe recreational PA    | 317.5±1165.7    | 69.4±572.9        | 176.5±887.7      | <0.001 |
| Moderate recreational PA  | 351.6±767.8     | 252.3±737.1       | 295.3±752.1      | <0.001 |

lowest mean ± SD of MET-min/week to severe PA at work (65.4±1051.3).

The mean ± SD duration of PA among men and women was 125.8±142.6 and 77.2±84.5 min/week, respectively, and this time was significantly higher among men than in women ( $t=15.5$ ,  $p<0.001$ , 95% CI: 42.4-54.7). Participants aged 18-24 years had the highest total MET-min/week ( $F=3.1$ ,  $p<0.001$ ). Rural residents had higher mean ± SD of total MET-min/week than others ( $t=-4.2$ ,  $p<0.001$ , 95% CI: -485.6-177.3). The mean ± SD of total MET-min/week was significantly higher in men than in women

( $t=14.6$ ,  $p<0.001$ , 95% CI: 893.6-1170). The highest mean ± SD of total MET-min/week was found among Lor ethnicity ( $F=10.9$ ,  $p<0.001$ ). On occupation status, self-employed people had the highest mean ± SD of total MET-min/week ( $F=34$ ,  $p<0.001$ ). Higher family size was also associated with higher mean ± SD of total MET-min/week, so this mean was higher among participants with 5 and above family size ( $F=11.5$ ,  $p<0.001$ ). Table 4 shows total MET-min according to sociodemographic characteristics of the population study.

Table 4. Total MET-min according to sociodemographic characteristics in the population study

| Characteristics   |                                     | Total MET-min<br>Mean±SD | p      |
|-------------------|-------------------------------------|--------------------------|--------|
|                   |                                     |                          | <0.001 |
| Age groups (year) | 18-24                               | 2011.3±2753.7            |        |
|                   | 25-34                               | 1872.5±29.3              |        |
|                   | 34-44                               | 1642.6±2361.3            |        |
|                   | 45-54                               | 1749.1±2336.1            |        |
|                   | 55-64                               | 1858±2516.4              |        |
| Residency         | Urban                               | 1742±2446.1              | <0.001 |
|                   | Rural                               | 2073.5±2968.1            |        |
| Sex               | Male                                | 2429±3187                | <0.001 |
|                   | Female                              | 1396.9±197535            |        |
| Ethnicity         | Baloch                              | 1423±3120.7              | <0.001 |
|                   | Turk                                | 1914.4±2773.4            |        |
|                   | Turkoman                            | 1279.5±1533.1            |        |
|                   | Sistani                             | 1775.7±2670.4            |        |
|                   | Arab                                | 1885.7±2205.7            |        |
|                   | Fars                                | 1653.7±2378.8            |        |
|                   | Kurd                                | 1937.6±2750.7            |        |
|                   | Gilak                               | 2007±2794.7              |        |
|                   | Lor                                 | 2825.3±3120              |        |
|                   | Multiethnic                         | 1420±1721                |        |
| Education Level   | Illiterate                          | 1788±2622.8              | 0.800  |
|                   | Under Diploma                       | 1864.7±2682.9            |        |
|                   | Diploma                             | 1852±2502.6              |        |
|                   | Academically                        | 1824.4±2584.6            |        |
| Family size       | 1                                   | 1412.7±1779.2            | <0.001 |
|                   | 2-4                                 | 1754.1±2543.3            |        |
| Occupation Status | 5 and above                         | 2068.2±2820.8            | <0.001 |
|                   | Housewife                           | 1366.6±1884.9            |        |
|                   | Retried                             | 2025±2619.8              |        |
|                   | Unemployed                          | 2187.8±2546.2            |        |
|                   | Worker and employee                 | 2278.9±3324.1            |        |
|                   | Self-employed                       | 2353.6±3220.6            |        |
|                   | Student and soldier and unpaid work | 2024.1±2720.3            |        |



## Discussion

This study aimed to determine PA levels and related sociodemographic factors among Iranian adults. In this study, the prevalence of vigorous, moderate, and low-level PA was 36.3% (95% CI: 35.1-37.5), 29.2% (95% CI: 28-30.3), and 34.5% (95% CI: 33.3-35.7), respectively. Most previous studies in Iran revealed that PA level among Iranian adults is low and reported a higher prevalence of low-level PA (6, 8, 11, 23, 24). Some studies in other countries also showed a high prevalence of low-level PA (15, 16, 25), whereas in some other studies, most of the studied participants met WHO PA recommendations (18, 26-28).

In this study, transport-related PA and severe PA at work had large and small contributions to overall PA, respectively. However, in some studies, the main contributions to overall PA were from work followed by transport-related PA (25, 26, 29, 30). This difference lies in the nature of the work and style of transportation and traffic in each community, which should be considered in the planning of PA promotion interventions.

In this study, the mean duration of PA and total MET-min/week were higher in men than in women and homemakers had the highest low-level PA than others. Women are generally more inactive than men. Most studies confirmed a significant association between being a woman and having insufficient PA and established that PA levels are generally lower in women than in men (5, 6, 11, 18, 23, 26, 28, 30-32). Women in most countries such as Iran have lower PA rate due to gender-norm, social and cultural constraints, and maternal responsibilities (33). Therefore, to promote PA level in women, it is essential to consider these limitations and their origin and take the necessary actions to change the social and cultural barriers of promoting PA among women.

Regarding residency, low-level PA was more prevalent among urban residents than the rural and vice versa. Vigorous level PA was more prevalent among rural residents and the total MET-min/week was higher among rural residents. Urbanization had a significant association with low PA in most previous studies in Iran and other countries (15, 34, 35); even in some studies, the levels of PA in rural areas were twice as high as in urban areas (30). Living in urban areas can lead to reduced levels of PA. Several factors, including overcrowding, high-volume traffic, heavy use of motorized transportation, poor air quality, and lack of safe public spaces and recreation/sports facilities make it difficult to participate in PA in urban areas (36).

Remarkable results were found on age. The highest low-level PA was found among participants aged 25-34 years, whereas the highest vigorous level PA was seen among 55-64 year-old participants. On the other hand, total MET-min was higher among participants aged 18-24 years than in others. Age as sex is a determinant factor for PA. In general, PA decreases with age and this finding is confirmed in most studies (3, 5, 6, 10, 11, 32). However, in some studies similar to the present study, some age groups may have less PA level than others even when compared to old people (34). This finding can be justified, as older

people due to retirement and having more free time can spend more time on PA than young and middle-aged people. Meanwhile, old people pay more attention to their health and are more likely to be involved in health behaviors such as PA (34).

## Strengths and limitations of the study

This study was important because it determined the levels of PA in terms of intensity and duration according to demographic characteristics. Such studies can provide national trends in PA to identify successful strategies to promote PA level among target populations. Sociodemographic characteristics of individuals in each community are one of the most important factors influencing the effectiveness of community-based public health programs.

The limitation of the present study was related to the cross sectional nature of the studies used in this article, which could not explore the causes of the trend, associated demographic factors, and logical causality of these associations. Hence, conducting further studies to explore these causalities is highly recommended.

## Conclusion

This study determined PA levels and related sociodemographic factors as risk factors for NCDs among Iranian adults and revealed significant prevalence of low-PA among the target population. Also, urbanization, sex, age, family size, and occupation status were factors associated with PA. Although lack of sufficient PA is recognized as a major modifiable risk factor of NCDs, identifying factors influencing PA behaviors, such as sociodemographic characteristics of community members, can be an introduction to design and implement effective interventions to promote PA levels.

## Acknowledgment

This study was supported by Shahid Beheshti University of Medical Sciences and the ethics committee of this university approved this study (IR.SBMU.RETECH.REC.1398.594).

## Conflict of Interests

The authors declare that they have no competing interests.

## References

1. World Health Organization. Physical activity, Fact sheet, Updated February 2017. WHO, Available from: <http://www.who.int/mediacentre/factsheets/fs385/en/>
2. Bassuk SS, Manson JE. Epidemiological evidence for the role of physical activity in reducing risk of type 2 diabetes and cardiovascular disease. *J Appl Physiol*. 2005 Sep;99(3):1193-204.
3. Bauman A, Bull F, Chey T, Craig CL, Ainsworth BE, Sallis JF, et al. IPS Group. The International Prevalence Study on Physical Activity: results from 20 countries. *Int J Behav Nutr Phys Act*. 2009 Mar 31;6:21.
4. Chung N, Park HY, Park MY, Hwang YY, Lee CH, Han JS, et al. Association of daily physical activity level with health-related factors by gender and age-specific differences among Korean adults based on the sixth (2014-2015) Korea National Health and Nutrition Examination Survey. *J Exerc Nutrition Biochem*. 2017 Jun 30;21(2):30-38.
5. Baldeu SS, Krishnadath IS, Smits CC, Toelsie JR, Vanhees L,

<http://mjiri.iums.ac.ir>

*Med J Islam Repub Iran*. 2020 (19 Dec); 34:172.

- Cornelissen V. Self-reported physical activity behavior of a multi-ethnic adult population within the urban and rural setting in Suriname. *BMC Public Health*. 2015 May 12;15:485.
6. Emdadi S, Hazavehei SM, Soltanian A, Bashirian S, Moghadam RH. Physical Activity Status and Related Factors among Middle-Aged Women in West of Iran, Hamadan: A Cross-Sectional Study. *Glob J Health Sci*. 2016 Oct 1;8(10):52166.
  7. Sibai AM, Costanian C, Tohme R, Assaad S, Hwalla N. Physical activity in adults with and without diabetes: from the 'high-risk' approach to the 'population-based' approach of prevention. *BMC Public Health*. 2013 Oct 24;13:1002.
  8. Fakhrzadeh H, Djalalinia S, Mirarefin M, Arefirad T, Asayesh H, Safiri S, et al. Prevalence of physical inactivity in Iran: a systematic review. *J Cardiovasc Thorac Res*. 2016;8(3):92-97.
  9. Koohpayehzadeh J, Etemad K, Abbasi M, Meysamie A, Sheikhbahaei S, Asgari F, et al. Gender-specific changes in physical activity pattern in Iran: national surveillance of risk factors of non-communicable diseases (2007-2011). *Int J Public Health*. 2014 Apr;59(2):231-41.
  10. Turi BC, Codogno JS, Fernandes RA, Lynch KR, Kokubun E, Monteiro HL. Time trends in physical activity of adult users of the Brazilian National Health System: 2010-2014. Longitudinal study. *Sao Paulo Med J*. 2017 Jul-Aug;135(4):369-375.
  11. Esteghamati A, Khalilzadeh O, Rashidi A, Kamgar M, Meysamie A, Abbasi M. Physical activity in Iran: results of the third national surveillance of risk factors of non-communicable diseases (SuRFNCD-2007). *J Phys Act Health*. 2011 Jan;8(1):27-35.
  12. World Health Organization. Global Strategy on Diet, Physical Activity and Health. What is Moderate-intensity and Vigorous-intensity Physical Activity? WHO 2013. Available at: [www.who.int/dietphysicalactivity/physical\\_activity\\_intensity/en/](http://www.who.int/dietphysicalactivity/physical_activity_intensity/en/)
  13. World Health Organization. Global Physical Activity Questionnaire (GPAQ), Analysis Guide. Available from: [www.who.int/chp/steps/resources/GPAQ\\_Analysis\\_Guide.pdf](http://www.who.int/chp/steps/resources/GPAQ_Analysis_Guide.pdf)
  14. Bonita R, Magnusson R, Bovet P, Zhao D, Malta DC, Geneau R, et al. Country actions to meet UN commitments on non-communicable diseases: a stepwise approach. *Lancet*. 2013 Feb 16;381(9866):575-84.
  15. World Health Organization. STEPwise approach to surveillance (STEPS). Available at: <http://www.who.int/ncds/surveillance/steps/en> (accessed Jan. 27, 2017).
  16. Kwaśniewska M, Pikala M, Bielecki W, Dzionkowska-Zaborszczyk E, Rębowska E, Kozakiewicz K, et al. Ten-Year Changes in the Prevalence and Socio-Demographic Determinants of Physical Activity among Polish Adults Aged 20 to 74 Years. Results of the National Multicenter Health Surveys WOBASZ (2003-2005) and WOBASZ II (2013-2014). *PLoS One*. 2016 Jun 7;11(6):e0156766.
  17. McDonald P AJ, Montenegro G JA, Cruz G CE, Moreno de Rivera AL, Cumbre OA. Prevalence, sociodemographic distribution, treatment and control of diabetes mellitus in Panama. *Diabetol Metab Syndr*. 2013 Nov 13;5(1):69.
  18. Moniruzzaman M, Ahmed MS, Zaman MM. Physical activity levels and associated socio-demographic factors in Bangladeshi adults: a cross-sectional study. *BMC Public Health*. 2017 Jan 11;17(1):59.
  19. Serrano-Sanchez JA, Lera-Navarro A, Dorado-García C, González-Henriquez JJ, Sanchis-Moysi J. Contribution of individual and environmental factors to physical activity level among Spanish adults. *PLoS One*. 2012;7(6):e38693.
  20. World Health Organization. Global recommendations on physical activity for health. WHO 2010. Available at: <https://www.who.int/dietphysicalactivity/global-PA-recs-2010.pdf>
  21. Uddin R, Khan A, Burton NW. Prevalence and sociodemographic patterns of physical activity among Bangladeshi young adults. *J Health Popul Nutr*. 2017 Jul 14;36(1):31.
  22. World Health Organization. Pacific physical activity guidelines for adults : framework for accelerating the communication of physical activity guidelines. WHO 2008. Available from: [www.who.int/dietphysicalactivity/publications/pacific\\_pa\\_guidelines.pdf](http://www.who.int/dietphysicalactivity/publications/pacific_pa_guidelines.pdf)
  23. Najafipour H, Moazenzadeh M, Afshari M, Nasri HR, Khaksari M, Forood A, et al. The prevalence of low physical activity in an urban population and its relationship with other cardiovascular risk factors: Findings of a community-based study (KERCADRS) in southeast of Iran. *ARYA Atheroscler*. 2016 Sep;12(5):212-219.
  24. Esteghamati A, Khalilzadeh O, Rashidi A, Kamgar M, Meysamie A, Abbasi M. Physical activity in Iran: results of the third national surveillance of risk factors of non-communicable diseases (SuRFNCD-2007). *J Phys Act Health*. 2011;8(1):27-35.
  25. Vaidya A, Krettek A. Physical activity level and its sociodemographic correlates in a peri-urban Nepalese population: a cross-sectional study from the Jhaukhel-Duwakot health demographic surveillance site. *Int J Behav Nutr Phys Act*. 2014 Mar 14;11(1):39.
  26. Guthold R, Louazani SA, Riley LM, Cowan MJ, Bovet P, Damasceno A, et al. Physical activity in 22 African countries: results from the World Health Organization STEPwise approach to chronic disease risk factor surveillance. *Am J Prev Med*. 2011 Jul;41(1):52-60.
  27. Oyeemi AL, Oyeemi AY, Jidda ZA, Babagana F. Prevalence of physical activity among adults in a metropolitan Nigerian city: a cross-sectional study. *J Epidemiol*. 2013;23(3):169-77.
  28. Poggio R, Serón P, Calandrelli M, Ponzo J, Mores N, Matta MG, et al. Prevalence, Patterns, and Correlates of Physical Activity Among the Adult Population in Latin America: Cross-Sectional Results from the CESCAS I Study. *Glob Heart*. 2016 Mar;11(1):81-88.e1.
  29. Aslesh OP, Mayamol P, Suma RK, Usha K, Sheeba G, Jayasree AK. Level of Physical Activity in Population Aged 16 to 65 Years in Rural Kerala, India. *Asia Pac J Public Health*. 2016 Jan;28(1 Suppl):53S-61S.
  30. Moniruzzaman M, Mostafa Zaman M, Islalm MS, Ahasan HA, Kabir H, Yasmin R. Physical activity levels in Bangladeshi adults: results from STEPS survey 2010. *Public Health*. 2016 Aug;137:131-8.
  31. Dwyer-Lindgren L, Freedman G, Engell RE, Fleming TD, Lim SS, Murray CJ, et al. Prevalence of physical activity and obesity in US counties, 2001-2011: a road map for action. *Popul Health Metr*. 2013 Jul 10;11:7.
  32. Malambo P, Kengne AP, Lambert EV, De Villiers A, Puoane T. Prevalence and socio-demographic correlates of physical activity levels among South African adults in Cape Town and Mount Frere communities in 2008-2009. *Arch Public Health*. 2016 Dec 29;74:54.
  33. Amiri Farahani L, Asadi-Lari M, Mohammadi E, Parvizy S, Haghdoust AA, Taghizadeh Z. Community-based physical activity interventions among women: a systematic review. *BMJ Open*. 2015 Apr 1;5(4):e007210.
  34. Fan M, Su M, Tan Y, Liu Q, Ren Y, Li L, et al. Gender, Age, and Education Level Modify the Association between Body Mass Index and Physical Activity: A Cross-Sectional Study in Hangzhou, China. *PLoS One*. 2015 May 5;10(5):e0125534.
  35. Khorrami Z, Etemad K, Yarahmadi S, Khodakaram S, Kameli M, Hezaveh AM, et al. Urbanization and noncommunicable disease (NCD) risk factors: WHO STEPwise Iranian NCD risk factors surveillance in 2011. *East Mediterr Health J*. 2017 Aug 27;23(7):469-479.
  36. World Health Organization. Bulletin of the World Health Organization. Urbanization and health. April 2010, Volume 88, Number 4, pp:241-320. Available from: <http://www.who.int/bulletin/volumes/88/4/10-010410/en/>