Leisure Time Physical Activity and Its Determinants among Adults in Tehran: Tehran Lipid and Glucose Study

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ABSTRACT

Objectives: The aim of this study was to assess leisure time physical activity and its determinants among adults in Tehran.

Methods: This cross-sectional study comprised adults (n = 7285), aged 20 years and older. The subjects were participants of the Tehran Lipid and Glucose Study between 2002 and 2004. Information on the number of days spent on different activities during a week and the time devoted to each activity on a typical day was recorded. In addition, each activity, weighted by its relative intensity, was referred to as a metabolic equivalent.

Results: The prevalence of inactivity was 69.8% (95% CI: 68.7-70.8) in the whole population and 30.2% (95% CI: 27.2-33.1%) of men and 30.3% (95% CI: 27.7-32.8%) of women were considered as active. Leisure time physical activity less than 30 min/week was scored in 1590 (50.6%) men and 1803 (43.5%) women. The most frequent leisure time physical activity performed by men (96.1%) and women (95.2%) was walking. A negative association was observed in men between leisure time physical activity and increased work hours, older age, more cigarette smoking and higher body mass index (69.8% were overweight and 75.3% were obese; $P < 0.05$). Leisure time physical activity was more likely to be associated with high educational levels in men. In addition, there was a statistically significant relationship between physical inactivity and occupation in both men and women.

Conclusions: The prevalence of physical inactivity among adults in Tehran was high. Leisure time physical inactivity was more likely to be associated with older age, more cigarette smoking, more working hours, and higher body mass index. Public health efforts are needed to improve people's participation in physical activities in Iran.

Keywords: Physical inactivity, Adults, Tehran, Leisure time.

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Original Article

INTRODUCTION

Urbanization and new technologies worldwide have affected the lifestyles of communities and made them physically inactive. Today, physical inactivity is considered as a critical public health issue because of increasing physical inactivity in adults around the world. On the other hand, physical inactivity is an important preventable risk factor for non-communicable diseases (NCDs).[1] According to an assessment by the World Health Organization (WHO), over 60% of adults are not active enough to benefit their health.[2] Sedentary lifestyle has become a significant serious public health problem in Iran, with 70-80% being physically inactive.[3] Low levels of physical activity represent an independent risk factor for several chronic degenerative diseases including diabetes mellitus and obesity.[4]

Various studies have identified factors associated with participation in physical activity among adults. Demographic and health variables known to be associated with level of physi-

cal activity include sex, age, smoking status, level of educational attainment, income, weight and body mass index (BMI).[4-5] Recognizing the demographic, environmental and social determinants of physical activity in adults is important in designing effective intervention strategies to promote physical activity in this population. According to several studies, some determinates such as age, higher level of education and higher income are well-documented factors associated with increased participation in physical activity in some groups. Despite this body of knowledge and constant efforts to promote physical activity participation, the prevalence of physical activity in most developed countries remains low, with women consistently having poorer rates of participation compared to men.[6] Indeed, type, frequency, duration and intensity of physical activity are major determinants of public health.[7]

Approximately, 80% of the NCD burden is found in developing countries. Iran is an example of countries in the Eastern Mediterranean region undergoing a nutritional transition.[3] In order to determine the prevalence trends of NCDs and their risk factors, Tehran Lipid and Glucose Study (TLGS), a large-scale population-based study, was designed in 1998 and started in 1999. Based on the results of the first phase of TLGS, only one-third of the study population had adequate physical activity.[8] There have been no prior studies on physical activity and the factors associated with inactivity in adult population of Tehran. The present study aimed to assess leisure time physical activity (LTPA) levels and its determinants among the adult population of TLGS during 2002-2004.

METHODS

Study population

TLGS randomly selected more than 15,000 residents aged over 3 years from district 13 of Tehran during 1999-2001. The rationale and design of the study have been described elsewhere.[9] The study design consisted of two major stages: phase I, a cross-sectional prevalence study of cardiovascular disease and associated risk factors which began in 1999 and ended in 2001, and phases II, prospective follow-ups for 10 years. We selected 7285 participants of TLGS (men and women over the age of 20 years), who had completed physical activity questionnaire during 2002-2004. After confirmation of this study by the Research Ethics Committee of the Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, a written consent was obtained from each participant. This project was conducted in accordance with the principles of the Declaration of Helsinki.

Measurements

Body weight of participants was measured with shoes removed and light clothing using a digital electronic weighing scale (Seca 707; range 0.1-150 kg, Hanover, MD) with an accuracy of up to 1 kg. Standing height was measured barefoot to the nearest 0.1 cm. Body mass index (BMI) was calculated by dividing body weight by height squared (kg/m^2). A BMI of less than 25 kg/m^2 was classified as normal, between 25 and 30 kg/m^2 as overweight, and more than 30 kg/m^2 as obese.[10] Educational status was recorded as primary, secondary and high school and university.

Different categories of cigarette smoking status were defined according to the WHO guidelines, i.e. daily smoker was defined as one who smoked cigarettes at least once a day; occasional smoker was the one who smoked cigarettes but not every day; and never smoker was defined as an individual who never smoked before or had smoked too little in the past.[11]

Occupations were assessed by the International Standard Classification of Occupations (ISCO-88)[12] and classified into the following categories for men: 1) unemployed and students; 2) managers and professionals; 3) technicians; 4) clerks; 5) service workers; 6) skilled workers; 7) industrial workers; 8) machine operators; 9) laborers. However, women were categorized into three groups: 1) unemployed and students; 2) housewives; 3) employed.

The employed persons were asked to indicate how many hours a week they usually worked. Based on the responses, work hours per day were grouped into four categories in men: less than 6 hours, 6-8 hours, 8-10 hours, and 10 and more. These groups included less than 2.5 hours, 2.5-4 hours, 4-5 hours, and 5 and more in women.

Information on physical activity was collected using the Modifiable Activity Questionnaire (MAQ). The reliability and convergent validity of the Persian version of the MAQ had been investigated.[13] Intraclass correlation coefficients between the two pretest and post-test MAQs for past-year leisure time, occupational and total (leisure and occupational combined) physical activity were 0.94, 0.98, and 0.97, re-

spectively. All the respondents were asked if they had participated in moderate exercise (causing a moderate increase in heart rate or breathing) and vigorous exercise (causing perspiration and/or resulting in a large increase in heart rate or breathing) in their leisure time during the 12 months prior to the interview. Information on the number of days a week spent on different activities and the time devoted to each activity on a typical day were also recorded. We defined "leisure time physical activity" as performing three or more days of vigorous-intensity activity of at least 20 minutes, or five or more days of moderate-intensity activity or walking of at least 30 minutes, or five or more days of any combination of walking, moderate or vigorous-intensity activities achieving a minimum of at least 600 MET (metabolic equivalent task)-minutes per week.[14] Those out of this definition were considered as physically inactive. MET-min/wk was calculated as MET value multiplied by the duration of activity in minutes multiplied by the frequency of activity per week. Each activity was weighted by its relative intensity, referred to as a MET. One MET represents the energy expenditure for an individual at rest (1 MET = 3.5 ml/kg.min of oxygen consumption).[15] Energy expenditure was calculated based on the metabolic equivalent, duration of the activity, and body weight. Total weekly leisure time energy expenditure was obtained by summing the values for the individual activities.

Statistical analysis

Data were reported as means and standard deviations or as percentages and 95% confidence intervals (CI) for quantitative and qualitative data, respectively. Data for men and women were analyzed separately. Comparisons were made between active and inactive groups according to demographic characteristics and categories of BMI relative to physical activity levels based on MET-minutes per week cut off scores, using chi-square test. The multivariate relationships between physical activity levels and BMI, smoking, educational level, occupation and hours worked were examined using stepwise logistic regression, and the results are presented as odds ratios and 95% CI. Statistical significance was taken as p value less than 0.05. Statistical analysis was performed by the Statistical Package for the Social Science (SPSS) software, version 15 (SPSS Inc, Chicago, IL).

RESULTS

The participants included 7285 subjects consisting of 3138 (43.1%) men and 4147 (56.9%) women. The mean ± SD values of age, weight, height, BMI, years of education and marital status as well as the median of MET-min/wk and total weekly energy expenditure in leisure time for men and women are shown in Table 1. The mean values of age, height and weight were significantly more in men than in women. The mean educational level of men was higher than women and the median of MET-min/week in leisure time was higher in women than in men.

The frequency of leisure time physical activity (LTPA), according to the duration (min/week), among participants is shown in Figure 1. 1590 men (50.6%) and among 1803 women (43.5%) scored < 30 min/week. Using a cutoff score of 600 MET-min/week, the prevalence of physical inactivity was 69.8% (95% CI: 68.7-70.8) in the whole population and only 30.2% (95% CI: 28.5-31.8%) of men and 30.3% (95% CI: 28.9-31.7) of women were considered active.

Tables 2 and 3 show the prevalence of leisure-time inactivity. In men, there was a statistically significant relationship between physical inactivity and age.

The prevalence of inactivity increased with age growing from 20 to 49 and the highest physical inactivity rate was observed in men of 40 to 49 years of age. The most frequent LTPA performed by men (96.1%) and women (95.2%) was walking. The second most common activity for men was team sports (soccer) (88.7%) while for women was aerobic exercises (78.7%). There was a statistically significant decrease in LTPA with increased work hours and more cigarette smoking. The prevalence of inactivity was inversely correlated with educational levels ($P < 0.05$).

There was no statistically significant difference between the prevalence of physical inactivity and age, smoking, educational levels and hours worked in women. In addition, the findings of this study indicated a statistically significant difference between physical inactivity and occupation in men and women. The prevalence of inactivity increased across BMI categories (69.8% in overweight group and 75.3% in obese group; $P < 0.05$) in men but not in women.

Table 4 presents the results of the logistic regression analyses that examined the association

Table 1. Basic characteristics of the study population by gender

	Men (n = 3138)	Women (n = 4147)	p value[†]
Age (Year)	42.1 ± 14.3[*]	40.6 ± 13.2	< 0.001
Height (cm)	171 ± 6	156 ± 6	< 0.001
Weight (kg)	76.8 ± 13.4	68.6 ± 12.7	< 0.001
Body mass index (kg/m^2)	26.2 ± 4.2	27.9 ± 5.1	< 0.001
Years of education	10.4 ± 3.5	9.4 ± 3.4	< 0.001
Marital status (Married %)	78.7	78.5	< 0.001
MET–min/wk (Median)	172.4	238.1	< 0.001
Weekly energy expenditure (Kcal)	208.3	267.9	0.071

[*] Means (± SD) for quantitative variables and percentage for qualitative variables.
[†] Mann-Whitney for quantitative variables and chi-square for qualitative variables.

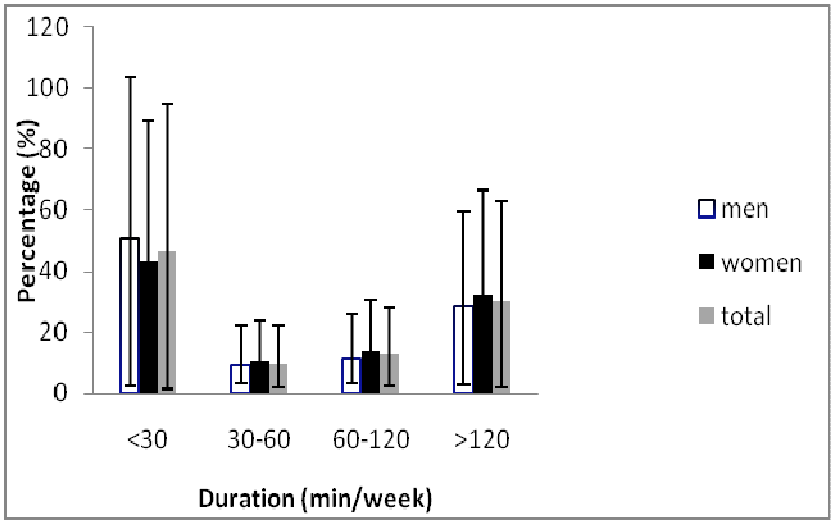

Figure 1. Frequency of leisure time physical activity according to duration (min/week) among adults in Tehran

between LTPA and related factors after adjustment for the covariates. Rates of insufficient activity were significantly higher in men with BMI > 30 kg/m^2 compared with the reference group (BMI < 25 kg/m^2). There was no significant difference between BMI = 25-30 kg/m^2 group and the reference group in men. Insufficient activity among current smokers was 36% higher than in never smokers. Among men, rates of sufficient physical activity were highest for those with high school and university educational levels. The results for the "hours worked" showed that rates of insufficient activity were 52% higher for male employees working 6-8 hours a day compared with the reference group (less than 6 hours per day). Those who worked 8-10 or 10 and more hours per day were more likely to be insufficiently active.

There was no significant difference between BMI, smoking, hours worked and insufficient LTPA in women. Rates of sufficient activity were significantly higher for women with high school educational levels (OR: 0.7; 95% CI: 0.6-0.9) compared with the reference group.

DISCUSSION

This is the first study to assess LTPA and the prevalence of leisure-time physical inactivity and associated factors in a population of adults in Tehran. The prevalence of inactivity among both sexes averaged 69.8%. With increasing age, levels of LTPA decreased and the lowest LTPA levels were observed between in men aging 40-49.

Table 2. The prevalence of leisure-time physical inactivity for each independent variable in men

	Inactive			p value
	(n)	(%)	(95% CI)	
Total	3138	69.8	68.1-71.4	
Age group (year)				
20-29	695	57.3	53.6-60.9	0.001
30-39	799	76.6	73.6-79.5	
40-49	707	78.9	75.8-81.9	
50-59	494	74.7	70.8-78.5	
≥ 60	443	57.3	52.6-61.9	
Occupation*				
Group 1	728	54.8	51.1-58.4	0.001
Group 2	134	79.1	72.2-85.9	
Group 3	282	70.2	64.8-75.5	
Group 4	164	62.2	54.7-69.6	
Group 5	440	71.8	67.6-76.0	
Group 6	705	77.3	74.2-80.3	
Group 7	13	84.6	64.9-104.2	
Group 8	416	74.5	70.3-78.6	
Group 9	256	79.7	74.7-84.6	
Smoking				
Daily	673	74.9	71.6-78.1	0.004
Occasionally	157	70.7	63.5-77.8	
Never	2308	68.3	66.4-70.2	
Educational levels				
Primary	520	75.6	71.7-79.1	0.002
Secondary	543	72.7	68.9-76.4	
High school	1423	67.3	64.8-69.7	
University	652	68.6	65.0-72.1	
Hours worked (h/day)				
< 6	763	58.7	55.2-62.1	0.001
6-8	508	68.1	64.0-72.1	
8-10	798	70.3	67.2-73.4	
≥ 10	1069	78.2	75.7-80.6	

* Group 1) unemployed and students; Group 2) managers and professionals; Group 3) technicians; Group 4) clerks; Group 5) service workers; Group 6) skilled workers; Group 7) industrial workers; Group 8) machine operators; Group 9) laborers.

According to the WHO report, the global health burden of physical inactivity is increasing.[16] Results of the first survey of non-communicable disease risk factors surveillance system of Iran in 2005 showed that 60.6% of men and 77% of women were inactive.[17] The prevalence of physical inactivity among the urban adult population of Yazd, which is located in the center of Iran, was 65.8%.[18] Although activity energy expenditure and physical activity levels were found to be greatly influenced by genetic factors, environmental determinants of physical activity can play a significant role in promoting an active lifestyle. A recent estimation by the WHO indicated that 60-80% of adults around the world are simply not active enough to achieve health benefits from physical activity.[19] Recent guidelines recommend that all individuals should try to accumulate at least 30 minutes of moderate physical activity per day, 5 or more days a week or 20 minutes of vigorous physical activity at least 3 days per week.[20]

In the United States,[21] Sweden[22] and Australia[23] the prevalence of leisure-time physical inactivity were 68%, 40% and 67%, respectively. In one study 80% of Brazilian citizens were inactive during their leisure time.[24] Results from Pitsavos study showed that 47% of men and 52% of women were classified as physically inactive in Greece.[2] The findings of Kandula study provide

Table 3. The prevalence of leisure-time physical inactivity for each independent variable in women

	Inactive			p value
	(n)	(%)	(95% CI)	
Total	4147	69.7	68.3-71.1	
Age group (year)				
20-29	1012	71.2	68.4-73.9	0.135
30-39	1031	71.7	68.9-74.4	
40-49	1004	69.1	66.2-71.9	
50-59	696	67.0	63.5-70.4	
≥ 60	404	67.1	62.5-71.6	
Occupation *				
Group1	484	64.7	60.4-68.9	0.001
Group2	3140	69.6	67.9-71.2	
Group3	523	75.1	71.3-78.8	
Smoking				
Daily	87	63.2	53.0-73.3	0.062
Occasionally	49	57.1	43.2-70.9	
Never	4011	70.0	68.5-71.4	
Educational levels				
Primary	1098	69.9	67.1-72.6	0.386
Secondary	752	71.9	68.6-75.1	
High school	1756	68.5	66.3-70.6	
University	541	70.1	66.2-73.9	
Hours worked (h/day)				
< 2.5	978	67.0	54.0-79.9	0.201
2.5-4	871	70.7	67.3-74.0	
4-5	785	70.8	67.0-74.5	
≥5	1513	70.3	66.4-74.1	

* Group 1: Unemployed and students; Group 2: Housewives; Group 3: Employed.

evidence that Asian Americans participate in recommended LTPA at much lower rates than US-born non-Asians do and that they are at high risk for physical inactivity.[25] The difference between our findings and those of other studies can be attributed to using different questionnaires, intensity classification, adjustment for confounders, number of participants and definitions for LTPA levels.

There was a significant relationship between low level of LTPA and BMI only in men. The inverse associations of physical inactivity with smoking and hours worked were apparent in men. Also, a statistically significant difference was found between LTPA levels in occupational groups in men and women (12% were employed). In addition, a positive association was observed between LTPA and educational levels in men but there were no significant differences between LTPA levels and age, smoking and educational groups in women.

Results from Motefaker study in Yazd showed that men were more likely to have inadequate physical activity than women (81.6% vs. 54.4%).[18] In other communities like Greece,[2] Australia,[5] Japan,[26] Peru,[27] and Singapore[28] the LTPA levels in women were less than men, suggesting that compared to women, men are more likely to retain their levels of physical activity into older ages. In the present study, there was no difference between men and women in LTPA levels. Moreover, men preferred team sports like soccer, while women preferred activities such as aerobic exercises. However, walking was the most frequent activity in both men and women.

In Swedish adults, the persons who were younger than 55, belonged to the high physical activity category.[29] Our results, like the previous studies,[5,23,30] showed an inverse and negative association between physical activity and age, i.e. increased age results in decreased physical activity levels. However, after 60, the prevalence of LTPA increased, probably because of retirement.

Table 4. Association between educational levels, smoking, BMI, hours worked and insufficient activity for men

	Odds ratio a*b†	(%95 CI)
Educational levels		
Primary	1	
Secondary	0.81	0.60-1.09
High school	0.65	0.50-0.85‡
University	0.72	0.54-0.96§
Smoking		
Never	1	
Occasionally	1.36	1.11-1.66‡
Daily	1.19	0.83-1.70
Body mass index (kg/m^2)		
< 25	1	
25-30	1.13	0.96-1.35
≥ 30	1.44	1.14-1.82¶
Hours worked (h/day)		
< 6	1	
6-8	1.52	1.20-1.93¶
8-10	1.69	1.37-2.09¶
≥ 10	2.46	1.99-3.02¶

a* Odds ratios of insufficient activity in leisure time.
b† Adjusted for age
‡: P < 0.002; §: P < 0.02; ¶: P < 0.001

The association between employment and LTPA, indicating higher prevalence of inactivity among those employed compared to unemployed, can be easily explained by less leisure time among working individuals, which is often reported as a barrier to do physical activity and sports.

The low level of LTPA is related to lifestyle and is an independent risk factor for obesity. Excess body fat is a result of an imbalance between energy intake and energy expenditure. Thus, adequate physical activity is an extremely important part of weight management programs.[31] Many other studies have shown the relationship between obesity and low level of physical activity.[32,33] In Rosengren study, there was an inverse association between the levels of physical activity and BMI[34] which was seen among our male participants, as well. Other studies have shown the same results in other age groups. For example, findings from surveys among high school girls aging 14-18 years in Semnan suggested that physical activity levels in obese and overweight students were significantly less than in normal weight students.[35] The finding of Rahmaninia study showed that there was a significant inverse relationship between the prevalence of obesity and physical activity levels in male students aging 12 to 17 in Rasht, Iran.[36] In another study in Tehran, Iran, Gharakhanlou found a significant association between physical activity and anthropometric indexes in 30-55 year old women, suggesting This that anthropometric indexes may be influenced by physical activity levels and regular physical activity can keep anthropometric indexes within the normal range.[37]

Similar to another study,[2] we also found a negative association between low levels of LTPA and cigarette smoking in men, but we did not find any statistically significant relationship in women. This might have been due to low prevalence of daily cigarette smoking among women in Iran.

In a population based sample from Copenhagen, the investigators observed that subjects with the lowest level of education were most frequently physically inactive.[2] In another community health survey of Adelaide, the investigators reported that low physical activity status was strongly associated with low education.[2] In our study we found the same result in men individuals of our population in Tehran.

Our results suggested a relationship between hours worked and LTPA levels. Employees whose job involved more activity had less physical activity during leisure time compared to those who had more brain activity but were more likely to be sufficiently active for health. It

seems that lack of time and work demands are significant barriers to participation in LTPA. However, hours worked does not only influence the time available for LTPA. Other studies have found that the lower levels of LTPA may be replaced by increased physical activity at work or home.[23] This study showed a possible negative association between LTPA levels and hours worked in men, i.e. the more time participants spent working, the less LTPA they had.

There were some limitations for this study. First, the study did not assess all domains of physical activities including the occupational and household related physical activities. Second, hours worked were categorized into four groups, which may not be enough sensitive. Third, the different sample sizes within each occupational group may have influenced the results, because smaller groups provide less power to detect an association or difference. In addition, this was a cross-sectional study and lacks the ability of prospective studies to find cause and effect relationships.

In conclusion, the present study demonstrates that most of people in Tehran do not meet the current physical activity recommendations necessary for promoting health and preventing diseases. These findings further highlight the importance of environmental factors in physical inactivity of adult population in Tehran. Leisure-time physical inactivity was more likely to be associated with older age, more cigarette smoking, increased work hours and higher BMI. Public health efforts are needed to improve people's participation in physical activities in Iran to prevent the NCDs and other related diseases.

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