RESEARCH COMMUNICATION

Leisure Time Physical Activity in Saudi Arabia: Prevalence, Pattern and Determining Factors

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Abstract

Background: Identification of reliable predictors of leisure time physical activity (LTPA) will enable healthcare providers to intervene and change the patterns of LTPA in the population to improve community health. Objectives: The objectives of this study were to determine prevalence and pattern of LTPA among adult Saudis aged 18-65 years, and to define the socio-demographic determinants that correlate with LTPA in Al-Hassa, Saudi Arabia. Subjects and Methods: A cross-sectional study of 2176 adult Saudis attending urban and rural primary health care centers were selected using a multistage proportionate sampling method. Participants were personally interviewed to gather information regarding socio-demographics, physical activity pattern using the Global Physical Activity Questionnaire (GPAQ). Physical activity (PA) in each domain was expressed in metabolic equivalents (METs). Results: The median total METs minutes/week for LTPA for both genders was 256, higher for men (636 METs minutes/week) compared to women (249METs minutes/week). Overall, only 19.8% of the total PA was derived from LTPA. Of the sampled population 50.0% reported doing no leisure activity. Using the cut off of 600 METs-minutes/day or 150 minutes of moderate intensity over 5 or more days/week, only 21.0% of the included sample were considered as being sufficiently active and 10.4% were in the high active category with beneficial health effects. Multivariate regression analysis showed that male, younger age (<35 years), absence of chronic disease conditions and moderate level of total PA were significant predictors for being active in the LTPA domain. Conclusion: The prevalence and intensity of LTPA among the included sample demonstrated low levels. Nearly 80% of the included sample population did not achieve the recommended LTPA level with beneficial health effects. Female gender, urban residence and associated chronic diseases correlated with a low LTPA.

Keywords: Physical activity - epidemiology - leisure time - adult Saudis - determinants - Saudi Arabia

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Introduction

Prevention of non-communicable diseases depends on controlling the predisposing risk factors including physical inactivity (PinA). PinA is an independent risk factor for coronary heart disease (CHD), diabetes mellitus (DM), hypertension (HTN), obesity and osteoporosis (United States Department of Health and Human services, 1996). According to estimates of the World Health Organization (World Health Organization, 2002), PinA (a behavior in which individuals do not engage in any leisure time physical activity 'LTPA') accounts for almost 2 million deaths globally. Physically inactive persons have a 20% to 30% increased risk of all-cause mortality as compared to those adhere to 30 minutes of moderate intensity physical activity on most days of the week (Vuori, 2004). Furthermore, PinA may responsible for 21.5% of cases of ischemic heart disease, 11% of ischemic stroke, 14% of diabetes and for 10 to 16% and breast and colorectal cancer respectively (Bull et al 2004). In spite of the well-recognized benefits of PA, the prevalence of PInA is growing (Centers for Diseases Control and Prevention, 2002). In spite of the well-recognized benefits of PA, the prevalence of PInA is growing (Centers for Diseases Control and Prevention 2002). Population studies carried out in transitional countries have reported a prevalence of general PinA (including all domains of PA: leisure time, work-related, transportation, and exercise) that ranged form 29.6% (Lopez et al., 2010) to 31.8% (Smith et al., 2008). LTPA refers to exercise, sports or recreation that is not related to regular work, housework, or transport activities (U.S. Department of Health and Human Services, 1996). LTPA was shown to be positively associated with the likelihood of being in the normal body mass index and lower body fat range (King et al., 2001). On the other hand, sedentarism or leisure-time physical

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inactivity is associated with arterial hypertension and diabetes (Pitanga & Lessa, 2005), and an increase in the number of hospital admissions (Pitanga & Lessa, 2008). LTPA in the context of other PA domains has been studied by epidemiological surveys in developed countries like the U. S. (U.S Department of Health and Human Services, 1996) and in some developing countries like Mexico (Hernandez et al., 2003), Chile (Salinas & Vio, 2003) and Brazil (Monteiro et al 2003). However, in many studies conducted in developing countries, PinA is overestimated because other types of PA have not been evaluated (Florindo et al., 2009). Zanchetta et al. (2010) reported that the prevalence of PinA increases when only considering the leisure-time domain. Saudi Arabia has witnessed enormous economic advancement in the recent decades. This transition has promoted the adoption of westernized dietary habits and a sedentary lifestyle which in turn has had a considerable negative impact on community health. These changes are thought to be important contributors for a recent epidemic of non-communicable diseases and their complications (Alwan 1997; Al-Nozha et al 2004).

A community-based study in KSA has shown that the overall prevalence of coronary heart disease (CHD) and diabetes mellitus (DM) to be 5.5% and 23.7% respectively (Al-Nozha 2004). Moreover, the expected increase in CHD mortality in the Middle East year 2020 compared to 1990 is estimated to be the largest worldwide – a 146% increase in women and 174% increase in men (Murray et al 1996). Moreover, according to the National Cancer Registry Report breast cancer represented 12.9% of all cancers among Saudi population, with age specific incidence rate of 11.8/100,000 among adult Saudi females (National Cancer Registry Report 2001). Breast cancer incidence is predicted to continue rising in response to the changes in lifestyle of Saudi population specially lack of PA (Lee et al 2004). Also, colorectal cancer (CRC) is now the first and third most common cancer among males and females in Saudi Arabia. CRC has a progressive rise in age standardized rate over last few decades (Al-Shamsi et al 2003). This rise is attributed to increase in predisposing factors including PinA (Rozen et al 2005).

Few population-based studies (Al-Refaee & Al-Hazzaa, 2001; Al-Hazzaa, 2004; 2007; Al Nozha et al., 2007) were carried out to determine the prevalence of LTPA in Saudi Arabia; however these studies were unable to display the PA pattern along its different domains. Furthermore, these studies failed to demonstrate the relationship between LTPA and the other domains of PA and/or the possible socio-demographic correlates of LTPA. Published reports on PA profile of Saudi adults indicated that the majority of Saudi people are not physically active enough to achieve health benefits from PA. Knowledge about the prevalence of LTPA and its determinants may serve as the basis for the establishment of interventions that encourage leisure-time physical activities in different populations, thus generating useful data for the development of public policies designed to prevent physical and mental comorbidities (Rocha et al., 2011).

The objectives of this study were to determine prevalence and pattern of LTPA among adult Saudis, and to define the socio-demographic determinants that correlate with being sufficiently active LTPA in Al-Hassa, Saudi Arabia (KSA).

Materials and Methods

Setting and design

A cross-sectional descriptive study was carried out in Al-Hassa Governorate located in the eastern province of KSA, with a total population of around one and half million. Al-Hassa is comprised of three regions; urban, populated by about 60% of the total population, rural consisting of 23 villages (35% of the population) and "Hegar" Bedouin scattered communities making up the remaining 5%. The Ministry of Health provides primary care through 54 PHCs in Al Hassa.

Subjects and Methods

Sample size: Assuming a level of PA among Saudi adults of 50% (Al-Hazzaa 2007), with a precision of ± 10%, employing a 95% confidence and 80% power, the total sample size would be 1820 adults. Adding a 20% increment to compensate for a potential non-response, the final total sample size estimated to be 2184 adult Saudis. After preparing an updated list of PHCs; a multistage proportionate sampling technique was employed. In the first stage, ten PHCs were randomly selected from an updated list (6 urban and 4 rural, proportionately, those in "Hegar" areas were excluded for logistical reasons). In the second stage, considering a female to male ratio of attendees of 1.5:1 (Taha & Bella 1998), an appropriate sampling fraction was used to estimate the required sample according to gender and urban /rural distribution. Systematic random sampling method was employed within each PHC to select subjects. Every 10th and 8th subject was selected from urban and rural PHCs respectively. On an average, 35 to 50 subjects were selected per PHC per month.

Inclusion criteria

Age ranging from ≥18 to ≤ 64 years of both genders, Saudi Nationals, with no apparent physical disability or handicapping conditions.

Exclusion criteria

Those with physiological "e.g. pregnancy" or pathological conditions "e.g. wounds" deterring them from their routine LTPA in the last week.

Personal approach was used to invite possible participants; 2546 subjects were approached, 2316 agreed to participate with a response rate of 91%. Total females approached were 1272, but only 967 consented for inclusion (response rate of 76%), they represented 44.4% of total included in the final analysis (N=2176) due to high refusal of females especially in urban centers. Those who refused to participate were not significantly different from the rest of the sample.

Participants were invited to a personal interview to gather information on the following:

1- Socio-demographics: Age in years, current residence, years of education, occupational status and the

presence of any chronic disease conditions.

2- The Global Physical Activity Questionnaire (GPAQ) version 2.0 was used for data collection and accompanied with the GPAQ; a show card derived from World Health Organization STEP wise approach to Chronic Disease Risk Factor Surveillance instrument version 2.0 (WHO STEPs http://www.who.int/chp/steps/GPAQ/en/index.htm)which provides examples of types and intensity of PA was used with the introduction of some modifications to suit the Saudi community (Global Physical Activity Questionnaire http://www.who.int/chp/steps/GPAQ/en/index.htm). It assesses the frequency (days) and time (minutes/hours) spent in doing moderate-and-vigorous-intensity PA during a typical week in three domains: a) Work-related (paid and unpaid, including household chores). b) Transportation (walking and cycling) and c) Leisure–time PA.

GPAQ is derived from International Physical Activity Questionnaire (IPAQ) (www.ipaq.ki.se). It is validated and widely employed to assess PA pattern. Previous studies have shown that GPAQ has good test-retest repeatability and relative validity (Bull et al 2009; Trinh et al 2009). Translation of the original content of GPAQ into Arabic, followed by back translation into English to ensure reliability of the questionnaire was carried out. No changes were made to the original contents and wording of the questionnaire. LTPA covered the following activities: walking (light and intense), running, biking (light and intense), swimming (light and intense), tennis, football, basketball, handball, martial arts, aerobics-gym, weightlifting, workout with apparatus, and others. From each PHC two nurses; one male and one female were recruited for data collection; they received training on: a) Conducting an interview. b) How to use the show card. c) Checking for quality of the collected data under supervision of investigators.

Pilot testing was carried out through interviewing a sample of 97 subjects attending a primary care center, to train the data collectors, and to test the reliability of data collection instrument (inter-rater reliability coefficient =.86).

Data analysis

Data collection and processing followed the GPAQ version 2.0 analysis protocol.

Definitions and analysis procedures

Energy expenditure was estimated based on duration, intensity and frequency of PA performed in a typical week. The unit of measurement for energy expenditure was the Metabolic Equivalent (MET) derived form activity variables of the GPAQ. MET is the ratio of specific PA metabolic rates to the resting metabolic rate. One MET is equal to the energy cost of sitting quietly (1 Kcal/kg body weight/hour) and oxygen uptake in ml/Kg/minute with one MET is equal to the oxygen cost of sitting quietly (about 3.5 ml/Kg/minute). MET values and formulas for computation were based on the intensity of specific PA:
a- A moderate-intensity activity during work, transportation and leisure assigned a value of 4 METs. b- Vigorous-intensity activities assigned 8 METs. c- Total PA score are the sum of all METs/minutes/week derived from moderate-to-vigorous-intensity PA performed in work, transportation and recreation. According to the GPAQ analysis framework, PA is classified into the following levels:

i- High: includes (a) vigorous-intensity activity on at least 3 days with a total of at least 1500 METs-minutes/week OR (b) ≥ 7 of any combination of walking, moderate-or-vigorous-intensity activities with a total of at least 3000 METs-minutes/week.

ii- Moderate: includes (a) ≥ 3 days of vigorous-intensity activity of at least 20 minutes/day OR (b) ≥ 5 days of moderate-intensity and /or walking of at least 30 minutes/day OR (c) ≥ 5 days of any combination of walking, moderate-or-vigorous-intensity activities with a total of at least 600 METs-minutes/week.

iii- Low: No activity is reported or reported activities did not comply with the previous criteria.

The previous three levels were re-categorized into

A) Highly active: Vigorous activities ≥ 3 days and accumulating ≥ 1500 METs-min per week OR ≥ 7 days of any combination of moderate or vigorous activities accumulating of ≥ 3000 METs-min per week.

B) Sufficiently active: Participants who met the PA recommendations "being in moderate or high intensity categories" OR meeting the minimum recommendations of 30 minutes of moderate-intensity LTPA for 5 or more days per week "or MET minutes/week of ≥ 600 in classification of LTPA (International Physical Activity Questionnaire. www.ipaq.ki.se).

C) Insufficiently active: In the low category.

- In GPAQ, no physical activity during work, transportation and leisure were determined based on yes/no questions for each domain.

Data analysis

Data entry and analysis were carried out using SPSS 13.0 (SPSS Inc. Chicago, ILL.) and Epi-Info version 6.04 (Centers for Disease Control and Prevention, Atlanta Ga.). Data cleaning and analysis were performed according to GPAQ protocol. Elimination of the records was done in response to: a) Missing information on one or more domains of PA (112 records). b) Over-reporting of total minutes spent in PA /day "> 1440 minutes/day" (28 records).

Statistical methods

Shapiro-Wilk test for normality revealed the following statistics: .614 for METs-work related, .726 for METs-transport, .648 for METs-leisure and .788 for the total METs, with a (P=0.001). The previous figures reject data normality, and hence we employed the median (50th percentiles), the 95% confidence intervals for the median using the method proposed by Bonett and Price (Bonett & Price 2002) and interquartile range (IQR =25th – 75th quintiles) to report prevalence of physical activity in METs-minutes. Non-parametric tests of significance namely Kruskal Wallis (one way) and Mann Whitney tests were used for comparison of continuous variables. Categorical variables were reported as proportions with

95% confidence intervals (CI); Chi-square test for trend was used when appropriate. Prevalence ratios (PR) were calculated. Wald tests for heterogeneity and trend were also used to determine significance various independent variables in relation to LTPA. Multivariate logistic regression analysis with adjustment was generated to explore the relationship between the dependent variables (being sufficiently active in LTPA) against independent socio-demographic variables. P value of < 0.05 was considered significant.

Ethical considerations

Permissions were obtained from the local Health Authorities as well as our institution after approval of the proposal and data collection tools. Participants were provided with full explanation with the emphasis on the right of the subject not to participate. Informed consent forms were obtained from those agreed to participate.

Results

Table 1 demonstrates socio-demographic characteristics of participants. Age ranged from 18 to 64 years with a mean of 32.7±9.8 years. Urban population constituted 61.7% and 33.3% of the included women were working. Chronic diseases and conditions were reported in 10.8% (149 men and 84 women), of which DM, HTN, DM with HTN and CHD represented 65.7%. Men showed longer years of education compared to women.

METs in different physical activity domains

Table 2 depicts the physical activity of the participants in METs hours /week distributed by age groups along the three domains of PA (work-commuting and leisure-related). The total METs minutes /week for all age groups showed a median of 2304 (38.4 METs hours/week). The total METs minutes/week for LTPA for both genders was (median=256, Confidence intervals, CI=348-666), higher for men (a median of 636 METs minutes/week) compared to women (median=249 METs minutes/week). Overall, 76.6% of the total PA was derived form the work-related domain, 19.8% from leisure-related and 3.6% from transport related activity. In work-related domain, those < 25 and ≥ 55 years demonstrated the lowest METs hours /week. Age group of 18-< 25 years showed highest METs hours /week in transport-related domain. Leisure-related METs hours/week was higher among those of 18 - < 25 years of age with significant downward trend in relation to age (P=0.001).

Table 1. Socio-demographic Characteristics of the Included Participants Distributed by Gender

	Gender: No. (%)		
	Total (N=2176)	Women (N=967)	Men (N=1209)
Socio-demographic variables:			
- Residence:			
Urban	1342(61.7)	558(41.6)	784(58.4)
Rural	834(38.3)	409(49.0)	425(51.0)
- Age in years (mean ± SD):	32.7±9.8	33.4±9.2	32.8±10.1
- Age groups :			
18- < 25 years	420(19.3)	140(33.3)	280(66.7)
25- <35 years	926(42.6)	365(39.4)	561(60.6)
35- <45 years	574(26.4)	358(62.4)	216(37.6)
45- <55 years	171(7.8)	72(42.1)	99(57.9)
55- <65 years	85(3.9)	32(37.6)	53(62.4)
- Chronic diseases and/or conditions * :			
Yes	234(10.8)	85(36.3)	149(63.7)
No	1942(89.2)	882(45.4)	1060(54.6)
- Years of education:			
0 - < 6 years	519(23.9)	276(53.2)	243(46.8)
< 9 years	556(25.6)	221(39.7)	335(60.3)
< 12 years	782(35.9)	339(43.4)	443(56.6)
³ 12 years	319(14.7)	131(41.2)	188(58.9)
- Occupational status:			
Government Employee	716(32.9)	302(42.2)	414(57.8)
Non-government employee	239(11.0)	20(8.4)	219(91.6)
Self employed**	266(12.2)	8(3.0)	258(97.0)
Housewife	446(20.5)	446(100.0)	-
Non-working (retired, student, unemployed)	509(23.4)	191(37.5)	318(62.5)

*Including non-communicable diseases conditions requiring follow up. ** Including trade & business, farmers, salesmen, free lancer technicians and alike

Considering the three domains of PA, a low level of PA was accounted for 48.0% (CI = 45.9–50.1), more among men than women (50.5% vs. 44.8%) with significant downward trend in relation to age and within female gender. Moderate level of PA was found in 35.8% (CI = 33.8–37.8), more among women than men (43.9% vs. 29.3%, P = .001). High level of PA was more among men (20.2% vs. 11.3% for women, P = .001).

No Leisure time activity

Table 3 shows the percentage of participants classified

Table 2. Total Physical Activity in Metabolic Equivalent-Hours Per Week (MET-hours/week) by Participants

Age groups (years)	Physical activity domains: median* (95% CI), IQR			Total physical activity
	Work-related	Transport	Leisure-related	
18- < 25	14.2 (2.7-30.9), 20.8	6.2 (2.8-9.3), 19.8	12.2 (9.1-12.2), 20.8	26.5 (10.6-41.4), 25.8
25- <35	26.1 (18.7-43.1), 27.2	4.9 (2.7-8.1), 8.3	10.8 (7.7-13.9), 19.7	39.7 (10.9-60.7), 44.7
35- <45	30.9 (18.8-51.5), 33.1	3.7 (1.7-5.3), 7.5	5.5 (3.3-7.7), 11.9	44.8 (19.9-55.3), 41.3
45- <55	29.4 (18.1-49.7), 33.0	2.9 (1.1-4.2), 4.0	4.3 (1.9-6.8), 8.0	38.9 (13.5-54.2), 40.5
55- 64	17.3 (4.3-26.7), 18.6	3.7 (2.0-4.7), 7.0	2.0 (0.0-3.1), 6.0	22.1 (6.8-35.7), 34.9
18- 64	29.4 (17.3-53.7), 39.0	3.3 (2.0-5.1), 21.0	7.6 (5.8-8.1), 13.9	38.4 (13.7-69.8), 45.5
P value**	0.03	0.067	0.001	0.013

METs-hours /week calculated according to GPAQ protocol; IQR (inter-quartile range), 75th -25th percentiles; CI, Confidence intervals for median; **Kruskal Wallis test

Table 3. Percentage of Participants Classified as Doing No Work-transport-or Leisure-related Physical Activity.

Age groups	Men (N=1209)			Women (N=967)		
'in years'	Work (N=540) % (95% CI)	Transport (N=614) % (95% CI)	Leisure (N=524) % (95% CI)	Work (N=330) % (95% CI)	Transport (N=554) % (95% CI)	Leisure (N=548) % (95% CI)
18- < 25	15.9(13.9-18.0)	9.1(7.6-10.9)	5.8(4.4-6.9)	9.4(7.7-11.4)	5.7(4.4-7.3)	6.0(4.7-7.7)
25- < 35	14.0(12.1-16.0)	22.8(20.6-25.3)	17.4(15.3-19.6)	14.5(12.4-16.8)	22.6(20.1-25.4)	20.0(12.3-16.7)
35- < 45	7.8(6.4-9.4)	10.9(9.3-12.8)	11.5(9.8-13.4)	7.5(6.0-9.4)	22.3(19.8-25.1)	23.8(21.2-26.2)
45- < 55	4.1(3.2-5.4)	4.8(3.7-6.2)	5.5(4.4-7.0)	1.6(1.1-2.8)	5.0(3.8-6.5)	4.8(3.6-6.3)
55- 64	3.0(2.1-4.0)	3.1(2.3-4.3)	3.1(2.3-4.3)	1.3(0.6-2.0)	1.7(1.0-2.7)	2.2(1.4-3.3)
P value *	0.01	0.0921	0.065	0.109	0.215	0.41
18 – 64	44.7(41.9-47.5)	50.8(48.0-53.6)	43.3(40.6-46.2)	34.1(31.2-37.2)	57.3(54.1-60.4)	56.7(53.5-59.8)

*Chi square for trend

Table 4. Total and Leisure Time Physical Activity in Metabolic Equivalents-hours Per Week (METs-hours/ week) and Median Time (minutes/week) of Leisure Time Activity of Moderate and Vigorous Intensity Among Participants in Relation to Age and Gender

	Total PA (METs hours/week) (median* (95% CI), IQR)	Leisure time PA (METs-hours/week) (median* (95% CI), IQR)	Liesure time modérate and vigorous intensity (min/week)	
			Moderate Median (95% CI), IQR	Vigorous Median (95% CI), IQR
Age groups (years) and gender.				
Males (N=1209)			N= 350	N=345
18- < 25	37.8(23.0-42.3), 34.2	16.9(5.4-23.3), 16.7	65.2(41.4-86.9), 82.0	95.5(67.8-133.2), 180.0
25- <35	46.5(19.4-68.9), 41.1	14.0(5.5-21.6), 18.0	52.2(39.1-64.6), 60.0	78.5(48.2-110.9), 176.0
35- <45	49.5(30.4-69.7), 50.0	7.5(4.2-9.9), 8.0	35.2(10.9-57.2), 30.0	41.5(19.7-70.3), 35.0
45- <55	39.5(11.1-55.3), 48.0	5.2(3.4-7.1), 6.5	39.5(22.3-60.4), 30.0	19.0(14.1-23.8), 22.0
55- 64	29.0(19.9-30.6), 37.5	1.4(0.0-5.1), 2.0	34.5(9.9-59.3), 30.0	- -- --
18- 64 years	46.5(9.7-66.1), 42.0	10.6(5.4-16.7), 18.0	45.5(29.2-61.7), 60.0	60.0(26.7-91.8), 65.5
P value**	0.081	0.007	0.172	0.001
Females (N=967)			N=336	N=81
18- < 25	27.6(8.3-41.6), 21.0	7.9(3.4-9.8), 11.5	54.8(38.7-75.1), 90.0	32.5(9.7-60.2), 10.0
25- <35	49.0(17.9-90.3), 42.0	4.5(1.2-7.5), 6.0	45.9(30.1-60.6), 70.0	11.5(5.9-14.2), 10.0
35- <45	46.0(23.1-76.4), 41.0	4.5(2.2-6.7), 4.0	31.5(10.7-49.1), 30.0	10.5(0.0-29.7), 6.0
45- <55	38.4(19.7-61.4), 35.0	3.5(0.8-6.2), 4.0	30.0(13.1-41.5), 45.0	10.0(1.2-21.8), 4.5
55- 64	29.0(15.5-27.6), 12.0	1.2(0.0-6.4), 2.0	20.0(11.9-24.1), 30.0	-- -- --
18- 64 years	43.8(18.9-76.3), 48.0	4.0(2.1-7.1), 4.0	36.0(18.7-55.4), 60.0	11.0(4.1-30.7), 8.0
P value**	0.031	0.01	0.012	0.007

METs-hours /week calculated according to GPAQ protocol; IQR, inter-quartile range 75th -25th percentiles; CI, Confidence intervals for medians; ** Kruskal Wallis test of significance. Moderate intensity = 3-6 METs, Vigorous intensity≥ 6 METs

as doing no work-transport-or LTPA distributed by genders and age groups. Overall, 39.4%, 54.1% and 50.0% of the participants reported doing no work, transport and leisure activity respectively. Among the included men a linear significant association was found with age and no working participants (decrease with increasing age, P=0.010) but this was not the case among women. Men in the age range of 25-<35 years showed the highest percentage of doing no transport and leisure related activity. Women were significantly more in doing no transport (P=0.002) and LTPA (P=0.001) compared to men. Doing no Leisure time was more pronounced among men aged 25 to <35 years of age, while among women a wider age group was shown (25-< 45 years).

LTPA pattern and intensity

Table 4 displays the total and LTPA in METs hours/ week and the median time (minutes/week) of LTPA of moderate and vigorous intensity in relation to gender and age groups. LTPA METs hours /week accounted for 22.8% and 9.1% of the total METs of men and women respectively. Among men the proportion stemmed from LTPA ranged form 44.7% in 18-<25 years to 4.8% for

Table 5. Patterns of Leisure Time Physical Activity Among the Included Participants Distributed by Gender.

	P value *	Gender: No. (%)		Total
		Women (N=419)	Men (N=685)	(N=1104) No. (%)
Leisure time activity				
Football	-	-	181(26.4)	181(16.4)
Light walking	0.001	191(45.6)	101(14.7)	292(26.4)
Intense walking	0.325	43(10.3)	57(8.3)	100(9.1)
Swimming	-	-	67(9.8)	67(6.1)
Volley ball	0.696	20(4.8)	28(4.1)	48(4.3)
Hand ball	0.081	24(5.7)	23(3.3)	47(4.3)
Table tennis	-	-	18(2.6)	18(1.6)
Tennis	-	-	21(3.1)	21(1.9)
Martial arts	-	-	28(4.1)	28(2.5)
Aerobics	0.228	12(2.9)	11(1.6)	23(2.1)
Weight lifting	-	-	27(3.9)	27(2.4)
Apparatus (treadmill)	0.001	80(19.1)	57(8.3)	137(12.4)
More than one type	0.324	49(11.7)	66(9.6)	115(10.4)

*Z test for proportions

Table 6. Levels of Leisure Time Physical Activity and Crude Prevalence Ratio of Leisure Time Physical Activity in Relation to Socio-demographic Variables- Al Hassa, Saudi Arabia.

Socio-demographics	Leisure time-related activity: No. (%)			Prevalence ratio (95% C.I)	P value	Adjusted Odds ratio (95% C.I)	P value
	Inactive (N=1719)	Active (N= 457)					
		Sufficient [a](N=230)	High [b](N=227)				
- Gender:							
Male	871(61.2)	155(12.8)	183(15.0)	2.27(2.08-2.47)	0.001*	2.94 (2.91-3.95)	0.001
Female	848(87.7)	75(7.8)	44(4.5)	1		1	
- Age groups (years):							
18-< 25	284(67.7)	69(16.4)	67(15.9)	1.77(1.17-2.38)	0.001**	1.54(1.09-2.18)	0.003
25-<35	705(76.1)	103(11.2)	118(12.7)	1.26(1.02-1.50)		1.31(1.03-1.26)	0.031
35-<45	511(89.0)	33(5.7)	30(5.3)	0.45(0.38-0.71)		0.97(0.54-1.73)	0.141
45-<55	146(85.4)	13(7.6)	12(7.0)	0.68(0.51-0.92)		0.79(0.27-2.32)	0.421
55- 64	73(85.9)	12(14.1)	- -	1		1	
- Chronic diseases:							
Yes	213(91.0)	13(5.6)	8(3.4)	0.40(0.25-0.68)	0.001*	0.44(0.27-0.73)	0.001
No	1506(77.5)	217(11.2)	219(11.3)	1		1	
- Years of education:							
< 6 years	406(78.2)	63(12.1)	50(9.7)	1.05(0.94-1.11)	0.132**	0.81(0.69-1.09)	0.586
< 9 years	430(77.4)	63(11.3)	63(11.3)	1.11(0.88-1.39)		0.88(0.61-1.25)	0.492
< 12 years	610(78.0)	89(11.4)	83(10.6)	1.12(1.04-1.21)		1.11(0.81-1.52)	0.144
[3] 12 years	273(85.6)	15(4.7)	31(9.7)	1		1	
- Residence:							
Urban	1135(84.6)	119(8.9)	87(6.5)	0.51(0.39-0.67)	0.001*	0.85(0.68-1.07)	0.169
Rural	584(70.0)	111(13.3)	140(16.7)	1		1	
- Occupational status:							
Government	559(78.1)	81(11.3)	76(10.6)	1.07(0.84-1.29)	0.008**	1.18(0.74-1.68)	0.596
Non-government	183(76.7)	29(12.1)	27(11.2)	1.13(0.87-1.41)		1.29(0.76-2.17)	0.321
Self	197(74.1)	38(14.3)	31(11.6)	1.28(1.08-1.47)		1.59(1.11-2.28)	0.018
Housewife	399(89.5)	31(7.0)	16(3.5)	0.45(0.31-0.60)		0.63(0.43-0.94)	0.013
Non-working	381(74.9)	51(10.0)	77(15.1)	1	0.021**	1	
- Level of physical activity:							
High	291(82.4)	40(11.3)	22(6.3)	0.81(0.58-1.17)		0.88(0.61-1.27)	0.449
Moderate	603(77.4)	77(9.9)	99(12.7)	1.45(1.11-1.91)		1.52(1.13-2.05)	0.038
Low	825(79.0)	113(10.8)	106(10.2)	1		1	

[a]Spending 600 METs-minutes or 150 minutes of moderate-intensity physical activity/week. [b]Vigorous activities ≥ 3 days and accumulating ≥ 1500 METs-min per week OR ≥ 7 days of any combination of moderate or vigorous activities accumulating ≥ 3000 METs-min per week; * Wald test for heterogeneity; ** Wald test for trend; *Adjusted for other socio-demographics independent variables. Percent predicted = 78.3%, Chi-Square= 41.36, P=0.001

those aged 55-64 while for women it ranged from 28.6% among those aged 18-<25 years to 4.1% in those aged 55-64 years of age, both genders showed significant downward trend with age. Women were significantly more proportionate in moderate LTPA (34.7% vs. 28.9% among men, P=0.015). Men reported more moderate intensity activity (median of 45.5 minutes/week vs. 36.0 for women). Contrary to men, among women the moderate intensity LTPA showed a significant downward trend in relation to age. Men were significantly higher in doing vigorous intensity LTPA (28.5% vs. 8.4% among women, P=0.001) and for longer duration (median of 60.0 minutes/week vs. 11 minutes /week for women). Among both genders, vigorous LTPA showed significant decline with age. Irrespective of gender, those aged ≥ 55 of years reported zero median minutes/week for vigorous intensity LTPA.

Table 5 displays the stated types of LTPA as mentioned by participants. Many LTPA were exclusively prevalent among men including football, swimming, table tennis, tennis, martial arts, and weight lifting. Waking was the major type of LTPA among women both light and intense types. Indoor exercising in the form of using apparatus was significantly higher among women (P=0.001).

Using the cut off of 600 METs-minutes/day or 150 minutes of moderate intensity over 5 or more days/week, only 21.0% (457/2176) of the included sample were considered as being sufficiently active. Men were more active than women in LTPA (338 (28.0%) vs. 119 females (12.3%), P= 0.001) (table 6). Out of those described as being sufficiently active, 227/457 (49.7%) were in the high active category with beneficial health effects (vigorous activities ≥ 3 days and accumulating ≥ 1500 METs-min per week OR ≥ 7 days of any combination of moderate or vigorous activities accumulating ≥ 3000 METs-min per week). Overall, highly active participants represented 10.4% of the total sampled population and significantly more among males (15.0% vs. 4.5% in women), age range of 18-<35 years and self employed or non-working groups and rural residents.

LTPA prevalence and determinants

Table 6 demonstrates the distribution of different levels of LTPA in relation to the included socio-demographics and

the crude prevalence ratios of LTPA among participants. Being sufficiently active in LTPA was determined by being male (prevalence ratio, PR=2.27, P=0.001), in the age group of 18-<35 years (PR=1.77), rural residents (PR= 2.36), not having current chronic disease conditions (PR=2.94), moderate level of PA (PR=1.45). Years of education showed an increasing trend with being sufficiently active in LTPA but without significant trend. Urban residence, being female, housewives and older age (>35 years), with chronic disease condition and with low PA category were all correlated with being physically inactive.

Table 6 also depicts the results of adjusted multivariate regression analysis of the dependent variable (sufficiently active) against the independent socio-demographic variables. Significant positive predictors for being active included male gender, younger age (<35 years), free form chronic disease conditions and with moderate level of total PA. The effect of residence, occupational status and years of education was attenuated in the adjusted final model.

Discussion

The importance of physical activity especially LTPA in the control of non-communicable disease like CHD and metabolic syndrome has been demonstrated in various studies (Behre et al., 2011; Gerber et al., 2011). The identification of reliable predictors of the various components of LTPA will enable healthcare providers to intervene and change the patterns of LTPA in the population to improve community health (Lin et al 2011).

This study endorses that the prevalence of PinA (including all domains) is relatively high (48%) in Saudi Arabia. In a review, Al-Hazzaa (Al-Hazza et al 2007) reported, that PinA ranged from 43.3-99.5% in KSA. It is higher than those reported form many European and North American countries (Park et al., 2003; Zunft et al., 1999).

Life style (and associated cultural contexts) is an important cause of this high prevalence as Tremblay et al. (2006) reported an increase in prevalence of PA after 10 years of immigration among Arabs in Canada. Economical improvement brings changes in lifestyle of a person and community. Change in nature of job and incorporation of technology reduces use of muscle for PA, especially in work related domain. In this study, work related activity is the major contributor, consistent with findings in other studies (Tremblay et al., 2006). Saudi population is generally shifting to a more sedentary lifestyle and people are moving away from more PA related work like agriculture. In Saudi Arabia, at present only 6.7 % of population is involved in agriculture related work (Central Intelligence Agency: World Fact Book, 2009). Another factor which is contributing to the reported high PinA is the subsidized oil price in the country coupled with a poor public transport system. This results in an increased reliance on motorized vehicles for commuting even for short distances. In Saudi Arabia, the numbers of cars per 1000 population has increased from 93 to 336 in last 10 years (Earth Trend, 2010). Therefore, transport related PA is not expected to rise in Saudi Arabia in the near future. In this fashion, a proportionate rise in LTPA is required to meet the PA recommendations for healthy life. This study revealed that only 21.0% of the included sample was considered as being sufficiently active and out of those described as being sufficiently active, 10.4% were in the high activity category with beneficial health effects. Al Nozha et al. (2007) have reported a much lower level of LTPA among the included adult Saudis (6.1% in men and 1.9% in women) this discrepancy may reflect using different methodology and inclusion criteria for their sample (age range of 30-70 years) contrary to this study in which we have included a highly active age group (18-<25 years). This study as well as those previously carried out in Saudi Arabia indicated a low level of LTPA among adult Saudis; much lower as compared to other developing/ transitional or developed countries. PA data for adults in developing countries like Brazil (Florindo et al., 2009) and Albania (Shapo et al., 2004) indicated a prevalence of low levels of LTPA ranging from 53% to 97%. In the developed countries like the U. S. (Crespo et al., 2000), Sweden (Lindstrom et al., 2001), and Germany (Schneider & Becker, 2005), the prevalence of LTPA inactivity was lower, ranging from 21% to 61.5%. On the basis of new scientific evidence, the American Heart Association have recently adapted their recommendations to combine the duration, frequency and intensity of activity and now recommend that "all healthy adults aged 18 to 65 years need moderate-intensity aerobic physical activity for a minimum of 30 minutes on 5 days each week or vigorous-intensity aerobic activity for a minimum of 20 minutes on 3 days each week." (Haskell et al 2007). Applying the previous cutoff, nearly 80.0% of the sampled Saudi adults did not meet these criteria of being sufficiently active.

Beside economy, age and gender are important factors determining variation in LTPA. In this study, nearly 82.0% of men and 87.7% of women were in the low LTPA level and women were less active than the men which is similar to results reported from previous population-based study carried out in Saudi Arabia (Al Nozha et al., 2007) and also consistent with most of the literature from both developed countries like the United States (Crespo et al., 2000) and developing countries like the Baltic States (Pomerleau et al 2000) and they have shown that women were much less active in LTPA than men. Furthermore, in this study men were more active in leisure time than women, both in terms of meeting the recommendations for being sufficiently active as well as in terms of MET-h/ week total expenditure. These results are consistent with results of studies from some European countries (Martinez-Gonzalez et al., 2001; Pitsavos et al., 2005). Furthermore, the difference between men and women increased with the intensity of PA and was greatest for vigorous activity (Khaw et al., 2006). Strategies to enhance LTPA needs understanding of prevalence and patterns in a society along with measures directed towards barriers towards it. There is considerable variation in perception of barriers for LTPA among study subjects in various countries (Reichert et al., 2007). Amin et al. (2011) reported that the most frequently cited barriers against LTPA among their Saudi participants were related to the weather and traditions (especially for females), unlike lack of time as reported by most of the developed countries (Shores & West, 2010; Oliveira et

al., 2011). Saudi Arabia is known for its hot and rough weather. Outdoor activity is least from afternoon to sunset. Schools and universities remain closed for three months in summer. However, centrally air-conditioned facilities for indoor PA and football stadiums are available in every major city. Cultural environment is another important determinant of LTPA (Oliveira et al., 2011). The strict cultural norms in Saudi society make LTPA difficult especially for females. However these limitations do not apply to simple activities like walking which in itself is a major form of LTPA in many areas of the world (Shores & West, 2010). In this study, all domains of PA, especially leisure time domain showed significant decline with advancing age. Our results are consistent to those reported from previous studies carried out in the United States and Europe, which found that participation in LTPA decreases with age (Martinez-Gonzalez et al 2001; Kaplan et al 2001), and Saudi Arabia (Al Nozha et al 2007; Al Refaee & Hazzaa 2001) but contrasting others conducted in several Asian countries (Juri et al., 2007; Chen et al., 2011). The level of education is considered to be a proxy for income in developing countries. This study revealed that individuals with longer years of education were less active in the LTPA domain. Our results are inconsistent with the previously reported findings from Saudi Arabia (Al Nozha et al., 2007), other transitional country (Florinido et al., 2009; Monteiro et al., 2003) or from the developed countries like U.S. He & Baker (2005) showed that, with increasing schooling level, the occupational physical activity score decreased, while the LTPA score increased. Also, Sternfeld et al. (1999) showed that low educational levels were associated with lower levels of LTPA and with higher levels of PA in occupational and household settings. There is now a consensus in the literature that higher levels of education are associated with higher levels of LTPA. Although the factors underlying the relationship between LTPA and years of education are not well understood, some determinants reported in the literature include psychosocial factors, family size (number of children in the house), material resources, and presence of illness or poor perceived health (Chinn et al., 1999; Droomers et al .,1998). With regard to the relationship between the total PA and LTPA, we found significant association with increased compliance with LTPA recommendations among those with moderate level of PA. Also, there was no significant association between occupational status and LTPA. Some studies have linked decreased leisure time activity with increased energy expenditure at work (Kaleta & Jegier, 2005) or manual labor (Burton & Turrel, 2000).

In a joint study carried out in Estonia, Latvia, and Lithuania, results were discordant between the participating countries (Pomerlou et al., 2003). In Estonia, those in sedentary occupations were also more sedentary during leisure time, whereas in the other two countries the opposite was true. In our study the significant predictors for LTPA inactivity included-female gender, age above 35 years, having current chronic disease conditions and urban residence. While these factors have been reported by other studies (Kaplan et al., 2001; Troped et al., 2003; Chen et al., 2011), some other factors that have been reported to correlate negatively by other authors are – married status, obesity and poor self-perceived health status (Palacios-Cena et al., 2011).

Study limitations, this study was PHCs-based instead of the community-based approach due to constraints entailed in conducting a household survey considering the conservative nature of Saudi society. The results of this study can be generalized while considering that our sample does not include a sizeable population fraction that receives primary care in facilities other than PHCs in Al Hassa. The recall bias cannot be ruled out in this design with over reporting and/or underreporting of physical activity among our participants. GPAQ only considers work related domain without much differentiation between domestic and other form of occupational-related activity.

In conclusion, LTPA prevalence and intensity among the included Saudi adult generally demonstrated low levels. A great part of PA for both men and women was mainly stemmed from work-related activity. Nearly 80% of the sampled population did not achieve the recommended LTPA level for beneficial health effects. Female gender, urban residence and associated chronic diseases correlated with a low LTPA.

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