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Comparison of Physical Activity Patterns among Diabetic and Non Diabetic Adults in Saudi Arabia

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Abstract: Background and objectives: Quantifying the magnitude and risk factors of Diabetes Mellitus in the community is essential for all intervention strategies. The objective of this study is to assess physical activity as a risk factor of diabetes mellitus by comparing physical activity patterns of diabetics and non diabetics. **Methods:** A community-based cross-sectional study using STEPwise approach among adults using a multistage, stratified, cluster random sample. Data was collected using a questionnaire which included patterns and durations of physical activity, sociodemographics, and history of diabetes, biochemical and anthropometric measurements. **Results:** Of the total 4657 subjects, 712(15.3%) were diabetic (369(16%) for males and 343(14.6%) for females). Of all subjects only 12.1, 20.2 and 46.1% were physically active in recreational, work and transport respectively. Diabetes was significantly negatively associated with total level of physical activity. All lower levels of physical activity in leisure, transport and work were significantly associated with increased risk of diabetes .Physical activity at work and walking or cycling for 10 minutes continuously were significant predictors of diabetes. **Conclusions**: Diabetes mellitus among adults in associated with lower levels of all patterns of physical activity. Specifically tailored and culturally sensitive physical activity interventions, is necessary for preventing, controlling diabetes. Females, elderly and retired persons need special attention.

Keywords: Diabetes, physical activity, adult, Saudi Arabia.

INTRODUCTION:

Diabetes mellitus is a multifactorial disease of considerable heterogeneity where both genetic and environmental factors have significant roles [1]. The burden of type 2diabetes is high and it is predicted, worldwide, to be increased about 42% in the year 2025 [2],[3]. Diabetes is not only a major morbidity burden but it is also a major cause of premature mortality. Global excess mortality attributable to diabetes in

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adults was estimated to be 3.8 million deaths.[4]

Type 2 diabetes affects about a fifth of the adult population in Kingdom of Saudi Arabia(KSA) and other Gulf countries.[5-7] The last national survey in KSA showed that the prevalence was significantly higher in males, obese and in urban areas.[5] Despite the readily available access to healthcare facilities in KSA, about 28% of diabetics were unaware of their disease.[8] Physical inactivity was blamed for increase in burden of chronic non communicable diseases such as diabetes and hypertension in KSA.[5,9,10] Efforts to prevent, early detect and control the disease are of prime importance .Risk factors particularly modifiable ones need to be identified to accomplish this task. Sedentary habits and low cardiorespiratory fitness are involved at several points in the progression from normal glucose metabolism to Type 2 diabetes and premature mortality in individuals with diagnosed diabetes.[11-13] Many observational (prospective and retrospective) and interventional studies confirmed the association of physical inactivity with type 2 diabetes mellitus and the beneficial effects of physical activity in prevention and control of the disease.[14-19] Increased urbanization in many communities including KSA has resulted in several environmental factors which may discourage participation in physical activity such as high-density traffic, low air quality, pollution, lack of parks, sidewalks and sports / recreation facilities. Studies in KSA showed that physical inactivity was high indicating the sedentary nature of the Saudi population.[20,21] The overwhelming majority of men and women did not reach the recommended physical activity levels necessary for promoting health and preventing diseases.[21]

This study aims to compare physical activity patterns of diabetic and non diabetic adult subjects and identify the significant physical activity risk factors and predictors of diabetes mellitus. To the best of our knowledge this is the first study of its nature and scope in KSA. The results of this study may be of help in designing programs to prevent, early detect and control the disease.

Subjects and methods:

This is a cross-sectional community-based study covering the whole population of KSA in 2005. The WHO STEP wise approach to Surveillance (STEPS) of Non-Communicable Diseases (NCD) risk factors was the basis for conducting the survey and for collecting the data.[22]

Study population

All Saudi population from all the 20 health regions of the country aged 15 – 64 years.

Sampling

A multistage stratified cluster random sampling technique was used to recruit the study subjects. Stratification was based on age (Five 10-year age groups) and gender (Male/female 2 groups). All health regions of the country (20 regions) were covered. Based upon proposed methodology of the WHO STEPwise approach, a sample size of 196 was calculated for each of these ten strata. A list of all Primary Health Care Centers (PHCCs) in each region was prepared and 10% of these PHCCs were randomly chosen, and allocated regional sample to them proportionate to the size of their catchment population in sampled PHCCs. To identify the households a map of the health center coverage area was used to choose the houses. Each house was assigned a number and a simple random draw was made.

Data collection:

Data was collected using the WHO STEPwise approach which includes a questionnaire, physical measurements plus biochemical measurements covering hypertension and other chronic diseases and risk factors in addition to physical activity pattern, intensity and duration. The questionnaire was translated into Arabic by a team of physicians and was back translated to ensure the accuracy of translation. Arabic instrument was pre-tested and corrected before using on 51 eligible respondents for wording and understanding of the questions, and necessary adjustments were made in the instrument in light of the pre-test.

Data collectors

Data was collected by 54 males and 54 female collectors who work in teams. Each field team was made up of four persons: a male data collector, a female data collector, a driver and a female assistant. Data collection teams were supervised by a hierarchy of local supervisor, regional coordinators and national coordinator.

Training of data collectors

All individuals involved in data collection attended a comprehensive training workshop that included interview techniques, data collection tools, practical applications and field guidelines.

Blood glucose measurement

Analysis of blood glucose using one touch strips portable machines which give immediate results with drop of blood using disposable strips.

Definition of Diabetes Mellitus

A subject is labeled diabetic if he/she is a known diabetic as diagnosed by a health professional or his fasting blood sugar was 7.1 mol/ liter or more on three separate occasions.

Physical activity measure

The physical activity measure used was the Global Physical Activity Questionnaire (GPAQ) which comprised 19 questions about physical activity performed in a typical or usual week. It has been validated and widely used to assess physical activity pattern.[23] The GPAQ measure asked about the frequency (days) and time (minutes/hours) spent doing moderate- and vigorous-intensity physical activity in three domains:

1- work-related physical activity (paid and unpaid including household chores),

2- Active commuting (walking and cycling)

3- Discretionary leisure-time (recreation) physical activity.

Data management:

Questionnaires collected from the field were reviewed by team leaders assigned to each team before submitting them to the headquarters for data entry. Double entry of the questionnaires was performed using EPI-INFO 2000 software and EpiData software developed by the Menzes centre for validation. After data entry, data cleaning was conducted. New variables were defined by adopting the standard Steps variables (STEPS Data Management Manual, Draft version v1.5, October 2003).

Statistical Analysis:

Descriptive statistics, t-test, Mann Whitney test and ANOVA or Kruskal Wallis tests were used as appropriate after checking for normality. Level of significance was set to be < 0.05 throughout the study. The data were processed in SPSS version 17.

Ethical clearance and confidentiality:

The protocol and the instrument of the surveillance were approved by the Ministry of Health, Center of Biomedical Ethics and the concerned authorities in KSA. Informed consent of all subjects was obtained. Confidentiality of data was assured and that data will be used only for the stated purpose of the survey. The survey was conducted in the year 2005.

RESULTS

Of the total 4657 subjects who participated in the study 2345 (50.4%) were females and 2312 (49.6%) were males. Diabetics were 712 (15.3%) of the sampled population (369(16%) for males and 343 (14.6%) for females). Of all subjects only 12.1, 20.2 and 46.1% were physically active in recreational, work and transport respectively. Physical inactivity in general was significantly associated with females, elderly, retired and persons living in the central region. Pearson correlation coefficient was calculated for blood glucose level and total duration of physical activities in minutes per day for all subjects (diabetics and non diabetics). There was a significant negative correlation indicating that as total duration of physical activity increases, blood glucose level decreases ($r=-0.67$, $P<0.001$). Diabetes was significantly negative associated with total level of physical activity as shown in table 1. Table 2 compares physical activity patterns in diabetic and non diabetic subjects with odds ratios and 95% confidence interval. As can be seen all lower levels of physical activity in leisure, transport and work are significantly associated with increased risk of diabetes. Table 3 compares mean durations of different patterns of physical activity of diabetics and non diabetics. Diabetics have significantly shorter durations for all patterns of physical activity. Table 4 shows multiple logistic regression analysis for significant predictors of diabetes. All significant risk factors were included in the logistic regression model. Only physical activity at work and walking or cycling for 10 minutes continuously were significant predictors of hypertension ($p = 0.031$ and 0.023 respectively).

DISCUSSION

The evidence of the importance of physical activity for health status in general is wellknown.[24] Rapid socioeconomic development in the countries of the Gulf Cooperation Council (GCC) including KSA has resulted in demographic and epidemiological transitions, with obesity, diabetes and other chronic diseases becoming the leading causes of morbidity and mortality. This emerging disease pattern is often attributed to physically inactive lifestyles.[20,21,25] The overwhelming majority of men and women in KSA did not reach the recommended physical activity levels necessary for promoting health and preventing diseases.[21] Students in KSA have poor knowledge about the role of physical activity in the prevention of diabetes.[26] The present study found that physical inactivity was significantly negatively correlated with blood glucose levels. Significant risk factors for diabetes as revealed by the present study included low levels of physical activity for all patterns of activities (leisure, work, transport and recreational activities.). Low levels of work involving moderate physical activity for 10 minutes and walk/cycle for 10 minutes continuously were the significant predictors of diabetes. These findings are in agreement with findings of many studies worldwide. Studies reported that both physical fitness and activity were inversely associated with the development of diabetes. Walking during leisure or to work in many communities was associated with decreased diabetes prevalence.[27] Studies reported that intensive lifestyle modification (healthy diet and moderate physical activity of 30 minutes a day for 5 days a week) reduced the incidence of type 2 diabetes by 50% as compared with placebo.[28] The risk of type 2 diabetes was increased among women and men who spent an appreciable amount of time watching television, and this increase was apparent at every level of physical activity.[29,30] A sedentary lifestyle appears to be an important modifiable risk factor for type 2 diabetes in the general population and a risk factor for complications for known type2 diabetics.[31-34] The identification of strategies for facilitating sustained exercise at a level sufficient to result in measurable improvements to public health should be a top priority. In our largely sedentary society, the challenge to clinicians and policymakers is determining how best to promote appropriate levels of regular physical activity to their patients and the general public, respectively. The overall disease burden in a given population generally undergoes a more dramatic reduction when a large segment of the population adopts small improvements in health behaviors than when a small segment of the population adopts large improvements.[35]

CONCLUSIONS

The evidence reviewed here provides compelling support for the hypothesis that sedentary habits are a major cause of diabetes. Any strategy to deal the local and global problem of increasing rates of diabetes and its complications must give major attention to physical inactivity and how to reverse it at the population level. Regular physical activity, fitness, and exercise are critically important for the health and well being of people of all ages. This study and others demonstrated that virtually all individuals (diabetics and non diabetics) can benefit from regular health enhancing physical activity. A specifically tailored and culturally sensitive intervention including physical activity that addresses multiple health behaviors is necessary for preventing, controlling diabetes and other chronic morbidities. We should pay special attention to females, elderly and retired persons.

Conflicts of interests:

The authors declare no conflict of interests

Table 1: Level of Physical activity among diabetics and non diabetic Saudi Population

Total level of physical activity	Diabetics n (%)	Non diabetic (n) (%)	Total (n) (%)	P value*
High	84 (11.3)	658 (88.7)	742 (16.4)	0.011
Moderate	114 (15.2)	636 (84.8)	750 (16.6)	
Low	474 (15.7)	2552 (84.3)	3026 (67.0)	

* Using chi- square test

Table 2: Comparison of physical activity patterns of diabetic and non diabetic subjects

Physical activity	Diabetic n (%)	Non diabetic n (%)	Odds Ratio (95% CI)	P- value
Work involving vigorous work for 10 minutes				0.017
Yes	23 (10.0)	206 (90.0)	0.662	
No	663 (15.2)	3696 (84.8)	(0.401-0.965)	
Work involving moderate work for 10 minutes				0.019
Yes	110 (12.7)	759 (83.7)	0.791	
No	576 (15.5)	3143 (84.5)	(0.635-0.984)	
Walk/cycle for 10 minutes continuously				0.003
Yes	288 (13.5)	1843 (86.5)	0.784	
No	413 (16.6)	2072 (83.4)	(0.666-0.923)	
Moderate physical intensity for 10 minutes				
Yes				0.007
No	60 (11.6)	457 (88.4)	0.702	
	645 (15.8)	3448 (84.2)	(0.529-0.930)	
Recreational physical activity				
Yes	113 (12.4)	796 (87.6)	0.770	0.009
No	573 (15.6)	3106 (84.4)	(0.620-0.955)	
Transport l physical activity				
Yes	288 (13.5)	1843 (82.5)	0.784	0.007
No	413 (16.6)	2072 (83.4)	(0.666-0.930)	

Table 3: Patterns and durations of physical activity among diabetic and non diabetic subjects

Pattern of physical activity and duration	Diabetic Mean $\pm$ SD*	Non -Diabetic Mean $\pm$SD*	P value**
Number of days of vigorous activity per week	0.12 $\pm$ 0.74	0.22 $\pm$ 0.96	<0.001
Number of hours for vigorous activity in a typical day	0.12 $\pm$ 0.64	0.14 $\pm$ 0.76	0.023
Number of days for moderate activity in a typical week	0.78 $\pm$ 0.94	0.98 $\pm$ 0.95	<0.001
Number of hours for moderate-intensity activity in a typical day	0.41 $\pm$ 1.20	0.48 $\pm$ 0.90	0.042
Number of days walk or cycle in a typical week for at least 10 minutes	2.03 $\pm$ 2.12	2.81 $\pm$1.77	0.500
Time spent (hours) for walking or bicycling for travel on a typical day	0.37 $\pm$ 0.74	0.47 $\pm$0.88	<0.001

SD* = Standard Deviation
** P value using Mann-Whitney non parametric test

Table 4: Multiple logistics regression analysis for physical activity predictors of diabetes

Physical activity	Beta	Standard Error	P value	Odds Ratio	95 % C.I. for odds ratio
Walk/cycle for 10 minutes	-.183-	.085	.031	.833	(0.705 , 0.983)
Recreation physical activity	-.325-	.143	.023	.722	(0.545, 0.956)
Constant	2.646	.299	.000	14.093	

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