

Original Research Article

Assessment of the influence of family history of type 2 diabetes or hypertension on the physical activity pattern among young Saudi population aged 15-25 years

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ABSTRACT

Background: With a high prevalence of non communicable diseases and its risk factors among the Saudi Arabian population, the present study was conducted to determine the levels and pattern of physical activity behavior of the youth with reference to their parents' diabetes/hypertension status.

Methods: A cross sectional study was performed in higher secondary schools and university. Multistage cluster random sampling technique was used to obtain a sample of 450 subjects aged 15-25 years. All types of physical activity performed in daily routine were recorded using a validated questionnaire. Data was reported as mean or median physical activity hours for normal and skewed data and corresponding test of significance was applied.

Results: There was a high prevalence of sedentary behavior among the overall population (76.5 median hours per week). Female gender ($p<0.002$) and transition to university ($p<0.000$) showed increased sedentarism. Subjects whose both parents were affected with diabetes showed least sedentary behavior [70 (19) mean hours per week] and higher levels of moderate (2.25 median hours per week; $p<0.025$) and strenuous physical activity (1.25 median hours per week; $p<0.034$). Maternal diabetes also showed significant influence in improving the physical activity of the subjects. Presence of maternal history of hypertension or both parents affected by hypertension did not make any significant impact on the physical activity pattern of their offsprings.

Conclusions: Increased physical activity was observed only among those who had family history of diabetes. Otherwise the normal population showed a typical sedentary lifestyle reflecting on the questionable effectiveness of national programs on physical activity.

Keywords: Parental diabetes, Physical activity, Saudi Arabia, Young adults

INTRODUCTION

Increased physical activity is considered the linchpin in prevention and control of not only diabetes and hypertension but several other diseases and disorders like obesity, hyperlipidemia, cancer and other related co morbid conditions. Staying physically active is associated with emotional wellbeing and good musculoskeletal

health. Diabetes and cardiovascular diseases have complex multiple etiology and physical inactivity is one of the major risk factor.¹ Global report on diabetes by World Health Organization (WHO) estimates 422 million people living with diabetes in 2014 with higher prevalence rates in low and middle income countries.¹ Hypertension is equally important public health issue with global prevalence estimates as 1.5 billion affected

individuals.² Evidence suggests that the global economic cost burden was estimated at a whopping US \$ 1.3trillion.³ Prevalence of diabetes is reaching to epidemic proportions globally, affecting the developed and developing nations alike making it a combination of genetic and environmental etiology. Despite the multiple etiology of the disease, lifestyle modification like diet, physical activity and weight reduction have been found to be protective at all levels of prevention.⁴ Cohort studies have shown inverse relationships between rigorous physical activity and HbA_{1c} irrespective of changes in body weight.^{5,6} The American Heart Association (AHA) recommends 150 minutes of moderate exercise per week or 75 minutes of vigorous exercise per week for overall cardiovascular health.⁷ Canadian guidelines suggest minimum of 60 minutes of moderate to vigorous activity for children per day.⁸

A systematic review on behavior modification intervention trials of overweight children concluded that a significant reduction in fasting plasma glucose levels is obtained by enhancing lifestyle modification.⁹ The findings and recommendations of the classical and highly successful study, Diabetes Prevention Program (DPP) on the beneficial effects of lifestyle intervention in primary prevention of type 2 diabetes are being launched nationwide by United States Centre for Disease prevention and Control (CDC).^{10,11}

The Kingdom of Saudi Arabia has been witnessing an increase in prevalence of non-communicable diseases (NCD) and its risk factors. The 2004-05 STEPS surveillance showed physical inactivity as the most highly prevalent NCD risk factor while International Diabetes Federation (IDF) reported Saudi Arabia in the Middle East and North Africa region (MENA), to have highest prevalence of 17.6% diabetes among adults while a regional study reported 34.1% and 27.6% prevalence rates among male and female gender respectively.¹²⁻¹⁴ Al Hazzaa et al reported a very high prevalence of sedentary behavior among school children with 84 % boys and 91 % girls exceeding the recommended daily TV watching time of 2 hours and about 75% of the girls failed to meet the recommended physical activity guidelines.¹⁵ The offsprings of patients with history of diabetes or hypertension fall into the high risk category and generally lifestyle intervention programs are highly recommended for prevention of diabetes. This necessitates imparting education and awareness concerning health promotion and primary prevention strategies in the form of improving physical activity among the children.

Physical inactivity coupled with family history of diabetes escalates the risk of development of diabetes. Hence it is essential to focus attention on the children of parents with diabetes for a targeted intervention. It is important to analyze if the family history of diabetes or hypertension has had any effects on their physical activity levels. There is lack of evidence on this vital issue from the region of Saudi Arabia and the present study was

done with an objective to fill the gap. We thus aim to determine the effect of parental diabetes or hypertension on the physical activity behavior of adolescents.

METHODS

A cross sectional study was conducted to obtain the study sample comprising of boys and girls in the age group of 15 to 25 years. One university and four schools (two boys and two girls school) were chosen by random sampling technique and multi stage cluster random sampling technique was used to recruit the study subjects from different age groups during the study period from December 2016 to March 2017. Assuming 25% prevalence of physical inactivity among the children, with 95% confidence interval and precision of 4, the sample size was estimated at 450, which was further increased to 495 with 10% nonresponse rate. Ethical clearance and approval was obtained by the Department's ethical committee.

The survey instrument used was a validated physical activity questionnaire developed for the Saudi population.¹⁶ The questionnaire was interviewer administered by well-trained students. It contained two sections, the first which included the primary demographic information and the second section consisted of all details of physical activity recorded in minutes per session per week.

Levels of physical activity were categorized into sedentary, moderate and vigorous activity levels. Sedentary activity included the items involving sleeping and watching TV. Moderate activity included walking, activity related to home and light exercises while strenuous activity like stair climbing, jogging, swimming, weight lifting and sports were categorized as intensive activity. Scores were given for all questions on physical activity by multiplying the time spent doing the activity in each session with the number of times the activity was performed in a week.

Data was analyzed by SPSS ver 21.0. Mean and standard deviation was used to summarize normally distributed data while median and range was used to in case of skewed data. The scores for physical activity were computed and assessment of variation was done across different groups. Classification of the study sample was based on gender, study level, and family history of diabetes mellitus or hypertension. Chi square test was used to assess the difference of proportions between study groups. For normally distributed data, student t test was used for comparison of means of two groups and ANOVA test was used for the difference across more than two groups. For skewed data Mann Whitney U test was used to compare medians of two groups and Kruskal Wallis test was used to compare between more than two study groups. A test with a p value of <0.05 was considered statistically significant.

RESULTS

The study included 497 subjects with a well-balanced male:female ratio (49:51). The mean age of the study population was 20 years ranging from 15 to 25 years. The

proportion of subjects from high school and university was similar (48%:52%). The physical activity and parental details of diabetes or hypertension are shown in Table 1.

Table 1: Demographic characteristics of the study population (n=497).

Variables	Total N (%)
Mean age in years (minimum-maximum)	20 (15–25)
Gender	Males
	243 (49)
Gender	Females
	255 (51)
Education level	High school
	238 (48)
Education level	University
	259 (52)
Subjects with family history of diabetes	Paternal
	113 (23)
	Maternal
	50 (10)
Subjects with family history of hypertension	Both affected
	35 (7)
	Neither affected
	299 (60)
Subjects with family history of hypertension	Paternal
	99 (20)
	Maternal
	63 (13)
Average physical activity of study population: Median hours per week: (minimum-maximum)	Both affected
	52 (10)
	Neither affected
	284 (57)
Average physical activity of study population: Median hours per week: (minimum-maximum)	Sedentary
	76.5 (28-119)
	Moderate
	1.66 (0–20.3)
Average physical activity of study population: Median hours per week: (minimum-maximum)	Intense
	0.97 (0–42.6)

Table 2: Description of different activities of study population according to gender.

		Males (n=243) N (%)	Females (n=254) N (%)	P value
Most frequently reported exercise: Walking	No	89 (36.6)	105 (41.3)	0.5 ^a
	≤3 hours/week	108 (44.4)	102 (40.1)	
	>3 hours/week	46 (18.8)	47 (18.6)	
Preference of using elevator or stairs	Elevator	107 (44)	116 (45.7)	0.7 ^a
	Stairs	136 (56)	138 (54.3)	
Prefer to walk short distance instead of car	Yes	87 (35.8)	85 (33.5)	0.24 ^a
	Sometimes	110 (45.3)	105 (41.3)	
	No	46 (18.9)	64 (25.2)	
TV watching/computer use	≤3 hours/week	118 (48.6)	93 (36.6)	0.0004 ^a
	>3 hours/week	125 (51.4)	161 (63.4)	
Performing house work Median hours (minimum-maximum)	Number of hours per week	0 (0–7)	0.6 (0–14)	0.000 ^b

^aChi-square test ; ^b Mann-Whitney U test.

The study population seems to be largely sedentary with very low levels of moderate and intense activity per week. Almost 40% of the students had a parental history of either diabetes or hypertension where higher number of adolescents reported paternal history compared to those who reported maternal history.

Considering the most common forms of light and strenuous intentional exercises like walking and swimming, the study found a meager 19 % of the overall study population were regular walkers while only 6.4% were involved in swimming activity for more than three times per week. The study showed 39% of the subjects to

have never tried walking as a voluntary exercise and 68% reported to have never gone for swimming. The other details of common physical activity performed by the study population are shown in Table 2.

Significant differences were found in sedentary behavior where females had high levels of TV watching (p=0.004) and males showed significantly lower contribution in median hours of household activity (p<0.000).

Pattern of physical activity was analyzed to determine the influence of demographic factors and family history of diabetes or hypertension on the levels of physical activity of study subjects (Table 3).

Table 3: Influence of demographic factors and family history of diabetes or hypertension on levels of physical activity of the study population.

	Average number of hours spent performing sedentary activities per week Mean (SD) [p value]	Average number of hours spent performing moderate activities per week Median (minimum-maximum) [p value]	Average number of hours spent performing vigorous activities per week Median (minimum-maximum) [p value]
Demographic factors			
Gender			
Male	72 (15)	1.3 (0 - 20)	1.97 (0–42.6)
Female	77 (16)	1.7 (0 – 22.3)	0.50 (0–19.8)
	[0.002] ^a	[0.321] ^b	[0.000] ^b
Education level			
High school	75.4 (17.3)	2.25 (0–20.3)	1.35 (0–42.6)
University	74.5 (14.5)	1.0 (0–15.2)	0.50 (0–18.3)
	[0.507] ^a	[0.000] ^b	[0.000] ^b
Family history of diabetes			
Paternal diabetes	76.8 (14.5)	1.32 (0–16.5)	0.5 (0–16.3)
Maternal diabetes	73.6 (18.3)	1.74 (0–12.6)	1.77 (0–42.6)
Both parents affected	70.7 (19)	2.25 (0–17.9)	1.42 (0–33.5)
Neither parents affected	75 (15.5)	1.50 (0–20.3)	0.97 (0–42.6)
	[0.22] ^c	[0.025] ^d	[0.034] ^d
Family history of hypertension			
Paternal hypertension	74.2 (15.4)	1.3 (0–17)	0.81 (0–33.5)
Maternal hypertension	78.2 (18.0)	1.8 (0–20)	1.42 (0–42.6)
Both parents affected	73.0 (18.2)	1.9 (0–20.03)	1.3 (0–20.5)
Neither parents affected	74.8 (15.0)	1.6 (0–14.6)	0.97 (0–42.60)
	[0.293] ^c	[0.822] ^d	[0.261] ^d

^aStudent t test; ^b Mann Whitney U test; ^c ANOVA test; ^d Kruskal Wallis test.

Gender, level of education and family history of diabetes seemed to have a statistically significant influence on level of physical activities. Gender comparison showed females to have significantly higher sedentary behavior and lower levels of moderate and intense physical activity per week than the males. University education seemed to have significant influence on reducing the physical activity levels in comparison with school students.

There was a significant difference seen among those with family history of diabetes to have marked increase in moderate and vigorous physical activity levels. It can be seen that levels of moderate and vigorous activities are higher in students where both parents were affected with diabetes in comparison to students who reported neither parents were affected. Additionally, it seemed that students who reported maternal history of diabetes were more likely to engage in higher levels of moderate and vigorous activity levels in comparison to those with paternal history of diabetes. This might indicate a higher influence on the adoption of physical activity behavior when the mother is affected than paternal influence. Nonetheless, presence of family history of hypertension did not show any significant difference in all categories of physical activities which might suggest that children

are likely to be influenced by family history of diabetes but not hypertension.

To the questions on preferences of using stairs to elevators and walking short distances instead of using car, which reflects on the attitude of the subjects towards choosing healthy options, 34% and 55% of the study population affirmed to choose to walk and use stairs respectively. The stated reasons behind performing leisure time exercises include maintaining health (53%), losing weight (37%), and to meet friends (7.2%).

DISCUSSION

Understanding the behavioral pattern of youth is important for effective planning and implementation of public health programs. The present study was conducted to provide data on physical activity behavior of young Saudi population and to provide evidence if parental medical history is a vulnerable factor in altering the physical activity behavior of their offsprings. Sedentary behavior was largely obvious among the study population. The group of subjects with parental history of diabetes showed significant improvement in levels of physical activity thereby suggesting that presence of diabetes in the family influences positive behavioral

change. But it is also to be noted that it did bring certain reduction in sedentary behavior like TV watching and computer use which did not reach the level of statistical significance.

Within the precincts of our knowledge this is the first study from the Saudi Arabian region assessing total physical activity behavior measuring all types of activity related to indoor, outdoor, voluntary exercises, intense muscular activity and assessment of activities involving the sedentary ones that are routinely performed during daytime targeting the school and university students with respect to with and without family history of diabetes and hypertension. The important implications of these findings indicate the development of preventive behavior among the offsprings of affected parents as a result of increased awareness created in the prevention of diabetes but with no evidence of influence on the offsprings of healthy parents.

From the findings, it appears that the laid out guidelines and primary prevention strategies targeting obesity and improving physical activity have little effect on health promotion and primary prevention activities among families with no history of medical conditions questioning the effectiveness of such programs.^{17,18} This is an issue of concern and requires further discussion with much needed attention.

The STEPS survey done in 2005 reported alarming levels of low physical activity in the Saudi population, especially among women reaching to as high as 73.7% prevalence of low physical activity. Al Hazzaz has done pioneering work on physical activity behavior in Saudi Arabia and has reported high levels of physical inactivity among all age groups.¹⁹ Such reports have provided evidence about the prevalence of sedentary behavior labeling 'sedentarism' as the major behavioral pattern of the Saudi population. This led to the Ministry of Health to develop a strategic plan involving public-private partnerships and launched a massive program to control diabetes with seven objectives, disseminating awareness on weight reduction with a focus on physical activity as first objective.²⁰ In the past regular household chores and occupational work demanded strenuous physical activity, but with the advent of modernization and technological advancements, a conducive environment is offered promoting sedentary lifestyle and limiting the human maneuvers and physical activity to a great extent. Another major reason for prevalence of high levels of physical inactivity in Saudi Arabia is the presence of cultural and environmental barriers like lack of social support and lack of resources which hinder the prospective benefits of increasing the physical activity.²¹ It is imperative to overcome these barriers in order to improve the physical activity in the Kingdom. The Ministry of Health, with a goal to improve the physical activity in the Kingdom launched a Diet and Physical Activity program Strategy (DPAS) in 2007 which is considered as a cornerstone to prevent a cluster of non

communicable diseases.²² Adopting the recommendations of Global Strategy on Diet, Physical Activity and Health, World Health Organization (WHO), the program addressed the nation by highlighting the importance of physical activity through multi-sectoral approaches like enabling favorable environments, school policies, public-private partnerships.²³ It is expected that such programs should have had a positive influence on general public towards the goal of changing the existing physical activity patterns as a method of health promotion and primary prevention. But on the contrary, the results of the present study do not support this view. Gender played an important role in maintaining high levels of physical inactivity which is supported and documented by several other studies from Saudi Arabia.^{21,24} There was a significant reduction in the pattern of moderate and intense physical activity among the university students compared to the school students. This pattern can be partially explained by the social effect imposed when students transfer from school level to university. Students at university are usually required to spend longer period of study time and transportation in comparison to school levels. This is clearly shown in our study to reduce the time and effort dedicated toward physical activity on the entire study population. Our study is consistent with other regional studies in reporting the physical activity pattern of the population in general.^{18,19,21,24,25} But on the other hand the reports from the global studies are in contrast to our findings. Choi et al published a review of systematic reviews in 2017 summarizing the significant factors associated with physical activity behavior among the population. He presented the definitely associated factors and included transition to university as a powerful predictor of physical activity in addition to other personal and environmental factors included in the list. The societal and peer influence in the international universities and facilities provided at the study centers maybe quoted as factors responsible for the increased physical activity behavior of the university students.²⁶

Another interesting finding of the study is the presence of parental history of diabetes as a significant predictor of increased physical activity levels of their offsprings, with mothers showing more influence than fathers. This finding is suggestive of the positive impact of the mother's advice and thus highlights the importance of the role of affected mothers in preventive behavior among their offsprings. There is lack of evidence demonstrating the role of diabetic or hypertensive parents on the physical activity of their otherwise normal and healthy offsprings while there are studies which have reported influence on lifestyle behavior of children of normal parents. For instance, Trost et al evaluated the influential role of the parents on the physical activity of the youth and concluded that parents motivational support is an important correlate of youth behavior.²⁷ A meta analysis of 112 studies investigating the association between parents and children's Physical activity by Yao and Rhodes, yielded a medium size effect suggesting the importance of parents role in determining the children's activity.²⁸ But these studies do not specify and distinguish

the parents with presence or absence of disease conditions. On the other hand, the present study went a step further to evaluate the association between parents and youth activity with a focus on the underlying disease status. Thus presence of parental history of diabetes and specifically the mother being affected with diabetes was found to have the most influential effect on the youth. Parental hypertension did not seem to have any significant effect on the physical activity status of their offsprings.

Another supportive finding of the study is the positive attitude of the younger generation towards the option to increase physical activity instead of using elevators and automobiles. This indicates the intention towards adopting healthier options over ease and comfort. Data from the European region suggests that countries like Finland, Denmark and Sweden show more than half of their population aged 18 years and over to have expressed explicit interest in physical exercise and to have spent exercising minimum of two and half hours per week making them highly active nations.²⁹ Health promotion strategies and advocacy policies by health sector has largely contributed to the success of such physical activity programs in addition to enabling spatial planning making urban environment suitable for exercise.³⁰ Adopting such policies with a population approach to prevention may increase the activity levels of the younger population. And with a high risk approach to prevention, the clinicians and healthcare systems play a vital role in disseminating the health promotion activities to the affected individuals and their families as has been reported by a recent study from Saudi Arabia to be the most powerful factor in enforcing primary preventive behavior.³¹ Counselors and clinicians have a direct effect on their patients who in turn may influence the immediate family members. Thus the need of the hour is an integrated approach from all levels in order to spread the message of awareness since despite the prioritization of improving physical activity in the primary prevention programs, there is no sign of improvement in the voluntary or leisure activity among the population.

The study has certain limitations. Data was collected from a single city and hence the study limits its generalizability. It was restricted to certain age group beyond which no comparisons can be made. Recall bias could have been introduced since the instrument contained closed ended options requiring calculations on time spent for certain activities.

Yet the study has served as a source of vital information providing current statistics on physical activity behavior of youth of Saudi Arabia.

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