



## Association between Physical Activity and Some Comorbidity in a Series of Saudi Volunteers

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### ABSTRACT

**Objective:** The purpose of this study was to appraise the association between Physical Activity and T2DM, hypertension, hypercholesterolemia, and other comorbidities in a series of Saudi volunteers. **Methodology:** The present study investigated 304 healthy Saudi volunteers for reported chronic illness and the status of physical activity. **Results:** Out of the 144 individuals, 62/144 (43%) were males and 82/144 (57%) were females. About 64/304 (21%), 75/304 (24.7%), and 21/304 (7%) of the participants practicing physical activity for one hour, 2-5 hours, and  $\geq 6$  hours, in this order. **Conclusion:** PA rates are relatively lower among Saudi people in Northern Saudi Arabia. PA was found to be an effective factor in reducing diverse comorbidities including hypertension, T2DM, hypercholesterolemia, CVDs, asthma, and other comorbidities.

**Keywords:** Physical activity, Comorbidities, Hypertension, T2DM, Hypercholesterolemia, Asthma, Saudi Arabia

### INTRODUCTION

Physical activity (PA) represents one of the most important determinants of a healthy lifestyle for all ages. This is achieved through the maintenance of the body weight and reduction of the health risk of diverse obesity-associated comorbidities [1,2]. Worldwide, >80% of adolescents are inadequately physically active. PA, which denotes any bodily movement resulting in energy expenditure (i.e. work, household chores, etc.) should not be confused with the exercise, which is planned, structured and repetitive form of PA [3].

PA represents the most essential component to conserve a healthy lifestyle. Insufficiently physically active individuals are at elevated risk of developing miscellaneous comorbidities with more rapidly deteriorating in health patterns [4]. PA has a strong impact on the prevention and even treatment of several chronic diseases including type 2 diabetes mellitus (T2DM) [5], cardiovascular diseases [6] including hypertension (HTN) [7], dyslipidemia and other [8].

Obesity/overweight was reported to be ranging from 35-63.6% in different regions in Saudi Arabia [9,10]. A recent report has shown that about 60% of the entire Saudi population is measured as physically inactive [11]. Therefore, the present study aimed to appraise the association between Physical Activity and T2DM, hypertension, hypercholesterolemia, and other comorbidities in a series of Saudi volunteers.

**MATERIALS AND METHODS**

The present study investigated 304 healthy Saudi volunteers for reported chronic illness and the status of physical activity. The study subjects were aged from 10 to 96 years with a mean age of 35 years. A purposeful questionnaire was designed and information was obtained during a personal interview. Except for blood pressure measurement, the inclusion of all other variables depends on the current use of medication to the specific chronic illness.

**Ethical Consent**

Each participant was asked to sign a written ethical consent before the interview.

**Data Analysis**

Obtained variables were analyzed using SPSS software. Chi-square test and odds ratios were identified. A p-value of less than 0.05 was considered statistically significant.

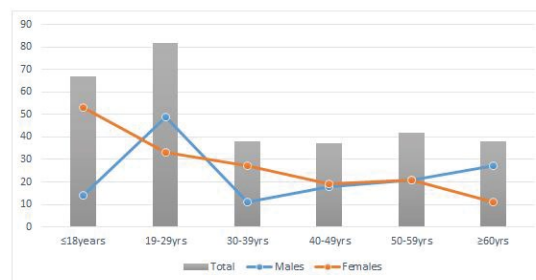
**RESULTS**

Out of the 304 participants, 140/304 (46%) were males and the remaining 164/304 (54%) were females. Most participants were at age range 19-29 years followed by ≤ 18 years, representing 82/304 (27%) and 67/304 (22%), respectively. An elevated number of males observed at age range 19-29 years 49/140 (35%), hence, an elevated number of females seen at age group ≤ 18 years 53/164 (32.3%), as indicated in Table 1 and Figure 1.

**Table 1 Distribution of the participants by age and sex**

Variable	Males	Females	Total
<b>Age group</b>			
≤ 18years	14	53	67
19-29	49	33	82
30-39	11	27	38
40-49	18	19	37
50-59	21	21	42
≥ 60	27	11	38
Total	140	164	304
<b>Frequency of Exercise per Week</b>			
None	62	82	144
1 hour	22	42	64
2-5 hours	38	37	75
≥ 6 hours	18	3	21
Total	140	164	304

About the frequency of physical activity per week, the majority of the participants were physically non-active representing 144/304 (47.4%). Out of the 144 individuals, 62/144 (43%) were males and 82/144 (57%) were females. About 64/304 (21%), 75/304 (24.7%), and 21/304 (7%) of the participants practicing physical activity for one hour, 2-5 hours, and ≥ 6 hours, in this order. Physical inactivity was predominantly seen among females. Increased hours of physical activity were observed among males, as indicated in Table 1 and Figure 2. The association between female gender and declining rates of physical activity, the odds ratio (OR) and 95% confidence interval (95% CI)=2.0333 (1.2434 to 3.3250), p=0.0047.



**Figure 1 Description of the study subjects by age and sex**

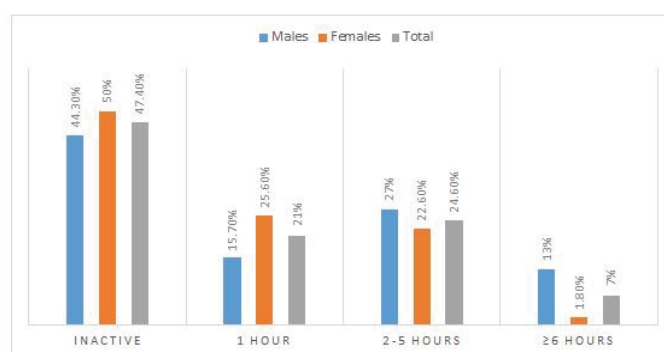


Figure 2 Description of the study subjects by sex and hours of physical activity

Table 2 and Figure 3, summarized the distribution of the participants by sex and chronic diseases. Hypertension was identified in 45/304(14.8%) of the study subjects. Out of 45 hypertensive patients, 37, 15, 16, 3 of the patients were found among inactive, one hour/week, 2-5 hours, and  $\geq 6$  hours, respectively. The risk of hypertension associated with less physical activity, the OR (95% CI)=1.5099 (0.7293 to 3.1259),  $p=0.2670$ .

Diabetes was recognized in 71/304 (23.4%) of the study subjects. Out of 71 diabetic patients, 22, 12, 8, 3 of the patients were found among inactive, one hour/week, 2-5 hours, and  $\geq 6$  hours, respectively. The risk of diabetes associated with less physical activity, the OR (95% CI)=1.3509 (0.7473 to 2.4421),  $p=0.3195$ .

Hypercholesterolemia was recognized in 65/304(21.4%) of the study subjects. Out of 65 diabetic patients, 31, 19, 14, 1 of the patients were found among inactive, one hour/week, 2-5 hours, and  $\geq 6$  hours, respectively. The risk of hypertension associated with less physical activity, the OR (95% CI)=1.7089 (0.9046 to 3.2284),  $p=0.0988$ .

Other chronic diseases were recognized in 64/304 (21%) of the study subjects. Out of 64 diabetic patients, 31, 16, 14, 3 of the patients were found among inactive, one hour/week, 2-5 hours, and  $\geq 6$  hours, respectively. The risk of hypertension associated with less physical activity, the OR (95% CI)=1.3566 (0.7323 to 2.5133),  $p=0.3323$ . Cardiovascular Diseases (CVDs) were indicated in 18 individuals of whom 50% were less physically active. Moreover, Asthma was revealed in 27 persons of whom about 60% were less physically active.

Table 2 Distribution of the participants by the status of physical activity and chronic diseases

Variable	Inactive	One hour/week	2-5 hours	$\geq 6$ hours	Total
<b>Hypertension</b>					
Yes	22	12	8	3	45
No	122	52	67	18	259
Total	144	64	75	21	304
<b>Diabetes</b>					
Yes	37	15	16	3	71
No	107	49	59	18	233
Total	144	64	75	21	304
<b>CVs</b>					
Yes	9	2	6	1	18
No	135	62	69	20	286
<b>Hypercholesterolemia</b>					
Yes	31	19	14	1	65
No	113	45	61	20	239
<b>Asthma</b>					
Yes	14	2	9	2	27
No	130	62	66	19	277
<b>Other Diseases</b>					
Yes	31	16	14	3	64
No	113	48	61	18	240

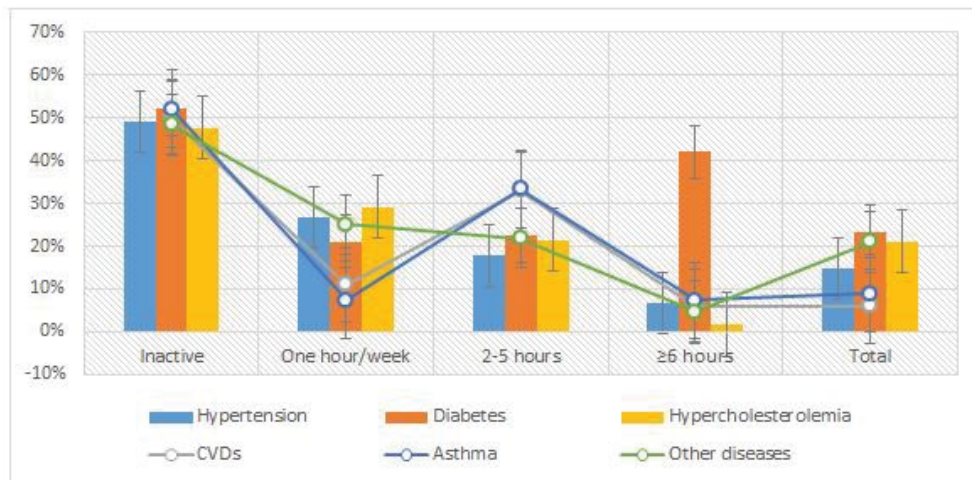


Figure 3 Description of the participants by the status of physical activity and chronic diseases

## DISCUSSION

The recent economic prosperity witnessed by Saudi Arabia has led to adopting a sedentary lifestyle with the least physical activity. This in addition to adopting western dietary habits of excessive fast-food intake. However, this study was investigated the link between Physical Activity and a group of comorbidities including T2DM, hypertension, dyslipidemia, and other conditions in a series of Saudi volunteers.

In this series, about 47.4% of the participants were considered physically inactive of whom 43% were males 57% were females. A recent report from Saudi Arabia has shown that approximately 60% of the entire Saudi population is physically non-active [11]. Many studies from Saudi Arabia indicated the progressive decrease in the levels of physical activity among the Saudi population particularly among females and among younger generations [12-14]. However, several barriers have been documented especially for women [15,16].

The present study showed a slight increase in the risk of hypertension among physically inactive persons compared to active individuals. Worldwide, more than 40% of persons are living with hypertension. Hypertension is a leading cause of myocardial infarction, stroke, heart failure, and other CVDs. Many studies have proved the benefit of physical activity as a complementary treatment in the management of hypertension [17,18]. However, there was a study indicated a reverse association between hypertension and excessive PA duration among young and middle-aged populations [19].

T2DM was also found with a slight increase in a sedentary lifestyle. PA is well documented as a major factor in the prevention and treatment of T2DM [5]. The beneficial effect of PA in reducing obesity has a strong impact on the decreasing of T2DM [20]. However, some results showing an increased number of diabetic patients among physically active individuals. This is attributed to the fact that many people enrolled themselves in PA after the diagnosis of T2DM.

The risk of hypercholesterolemia was relatively increased with decreasing of the rates of PA, the OR (95% CI)=1.7089 (0.9046 to 3.2284),  $p=0.0988$ . The reverse association between physical exercise hypercholesterolemia was reported in many studies [21,22]. Hypercholesterolemia represents a major cause of CVDs, as it is involved in the development of atherosclerotic plaques. PA promotes the release of Proprotein convertase (subtilysin Kexin type 9 (PCSK-9)), which is recognized to be effective in subsiding low-density lipoprotein levels and risk of the evolution of hypercholesterolemia [23].

In the present study, some chronic diseases (including asthma) were seemed to augment with the decreasing of PA. Although there unpredictable evidence for the link between AP and asthma as well as, lung function strengthening [24], Obesity was found to increase the risk of several chronic illnesses including asthma [25]. Though this study provided useful updates about the relationship between PA and comorbidities among the Saudi population in Northern Saudi

Arabia, it has some limitations including its cross-sectional setting and relatively lower sample size, and methodological terms regarding the diagnosis of some comorbid conditions.

### CONCLUSION

PA rates are relatively lower among Saudi people in Northern Saudi Arabia. PA was found to be an effective factor in reducing diverse comorbidities including hypertension, T2DM, hypercholesterolemia, CVDs, asthma, and other comorbidities. More community-based efforts are deemed important to implement a more physically active lifestyle in Northern Saudi Arabia.

### DECLARATIONS

#### Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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