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ORIGINAL PAPER

Correlates and Levels of Physical Activity and Body Mass Index Among Saudi Men Working in Office-Based Jobs

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Abstract

Obesity and overweight are global public health concerns with major consequences. Physical inactivity has been repeatedly linked with a high Body Mass Index (BMI) and the increasing prevalence of non-communicable diseases. In Saudi Arabia, approximately 60% of the entire population is considered physically inactive. The aim of this study was to investigate the correlates and burden of physical inactivity and high BMI among male office workers. A cross-sectional study was conducted among 395 adult Saudi males between the ages of 18 and 60 years working in governmental offices in AL Madinah. The self-administered instrument collected information regarding demographic characteristics and lifestyle practices. BMI was calculated from measured height and weight. Descriptive statistics were calculated and the probabilities of being overweight/obese and physically inactive were estimated using logistic regression. Approximately two-thirds of the participating men were overweight or obese and in the low category of physical activity. Being 35 years old or above, having a least one morbidity, and not eating a healthy diet, were all factors independently associated with low level of physical activity and high BMI. Being married was also associated with High BMI in this population. This study identified Saudi males working in office-based jobs as a high-risk group for being overweight, obese, and physically inactive. The detected risk factors are modifiable and require interventions addressing the intrapersonal and the environmental factors most likely to mitigate or ameliorate the consequences of this destructive lifestyle.

Keywords Office jobs · Physical activity · Overweight · Obesity · BMI · Men · Saudi Arabia

Abbreviations

95% CI	95% confidence interval
OR	Odds ratio
SD	Standard deviation
WHO	World Health Organization
IPAQ	International Physical Activity Questionnaire
GPAQ	Global Physical Activity Questionnaire
NCDs	Non Communicable Diseases
SR	Saudi Riyal
USD	United States Dollars
BMI	Body Mass Index

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Introduction

Physical inactivity is a global health challenge, among the leading risk factors for mortality, and accounts for around 6% of "all-cause mortality" rate worldwide [1, 2]. It is a shared concern among the oil-producing countries of the Arabian Peninsula and is being perpetuated by elevated levels of sedentary behavior [3] and as being a contributing cause for NCDs (non-communicable diseases) such as 27% of diabetes, 30% of ischemic heart disease, and approximately 21–25% of the breast and colon cancer burden [4]. It is estimated that currently, of every ten deaths, six are attributable to non-communicable conditions [4]. The estimated gain in life expectancy by eliminating physical inactivity is 1.51 years [5]. In Saudi Arabia, approximately 60% of the entire population is considered physically inactive, with 90% sitting consecutively for over two hours daily [1]. According to the WHO's (World Health Organization) country profile for the year 2016, 58.5% of the adult Saudi population were found to be physically inactive (52.1% of men and 67.7% of women) [6]. Modern-day workplaces are environments

where employees sit for an extended period without being required to move. Desk-based employees, including office workers, spend more than two-thirds of their working day in a seated position [7, 8]. Lengthy sitting time in the workplace may exceed the time spent sitting during leisure-time [9]. Most previous researchers have mainly concentrated on leisure-time behavior and have given limited attention to office-based jobs, even though it is evident that innovations in production processes and technology have gradually rendered most tasks to be less strenuous, which is believed to have simultaneously led to more sedentary lifestyles and increases in body mass [10]. According to the last report from the General Authority of Statistics in Saudi Arabia, the number of male employees in the whole country is 4,185,853 [11]. This segment of the population is considered to be one of the most neglected, vulnerable groups due to the nature of their primarily office-based work. The aim of this study was, therefore, to assess the levels and correlates of physical activity and Body Mass Index (BMI) among Saudi males working in office jobs.

Methods

A cross-sectional study was conducted on 395 adult Saudi males working office -based jobs in governmental offices in Al Madinah, Saudi Arabia. The three selected work sites were part of the Ministry of Education, the Ministry of Health, and the Ministry of Justice; they were purposefully selected as being governmental gender-segregated work areas (a common practice in Saudi Arabia). Eligible participants had to be Saudi male nationals between the ages of 18 and 60 years working in one of the selected study sites. All employees that met the inclusion criteria were consecutively recruited to participate in the study after being informed about its purpose. Of the 480 employees in the work sites that were eligible to be enrolled in the study, 395 agreed to participate, which is a response rate of 82.29%. The study obtained ethical approval from the Institutional Review Board (IRB) at King Saud bin Abdulaziz University for Health Sciences (KSAU-HS) located at King Abdullah International Medical Research Center (KAIMRC). Consent was obtained from all participants.

Study Instrument

A self-administered questionnaire was used to collect information from the male office workers regarding their demographic characteristics and lifestyle practices. The questions adapted for this study were retrieved from the Arabic version of Steps instrument. The Arabic version of the Steps instrument is a valid and reliable tool in based on the English-language version of the instrument developed by the World Health Organization [12]. This tool was used to collect data and measure NCDs risk factors. The Steps instrument consists of three levels or "steps" of risk factors assessment: step 1 (questionnaire), step 2 (physical measurements), and step 3 (biochemical measurements) [13]. In step 1, information on demographics(age, gender, education, and income) and behavioral risk factors were assessed (dietary patterns such as vegetable and fruits intake, physical activity, as well as the history of non-communicable diseases and related conditions). In step 2, physical measurements for height and weight to calculate the BMI were carried out. Step 3 measures were not collected for the purpose of this study. Participants were asked to report their sociodemographic characteristics, dietary behavior, levels of physical activity, and their chronic conditions. We used the standards applied by the Global Physical Activity Questionnaire (GPAQ) [14] to classify participants into three groups of physical activity: (1) low, (2) moderate, or (3) intensive. Also, diet was classified as healthy or not healthy based on the recommendations of the American Heart Association [15].

Anthropometric Measurements

Measurements of height and weight to determine the participants' BMI were taken using a Seca 813 digital floor scale and a Seca 213 portable measuring rod (Seca, Germany). A BMI score (kg/m^2) was calculated and subjects were categorized as underweight, normal weight, overweight, or obese, according to the international classification used by the WHO [16].

Data Analysis

Analysis of data was conducted using the STATA software program, version 13 (College Station, TX). Continuous data were presented as a mean (± SD) and categorical data were presented as frequencies. BMI and physical activity levels were collapsed into binomial categories (overweight/obese versus normal weight and low level of physical activity versus moderate/intense level of physical activity; respectively. Significant differences across categories of study variables and levels of physical activity or categories of BMI were tested using the Chi square test of analysis. The predicted probabilities of being in the low level of physical activity category versus the higher levels of physical activity or with high BMI versus low BMI was calculated using logistic regression. Multivariate logistic regression was performed and odds ratios (OR) and 95% confidence intervals were obtained for all independent variables. All variables that showed significance in bivariate analysis were entered into the model simultaneously to adjust for potential confounders and stepwise backward elimination technique was applied. The significance level was set at $p \leq 0.05$ for all analyses.

Results

Characteristics of Study Participants

The demographic characteristics of this sample are displayed in Tables 1 and 2. A total of 395 men agreed to participate in the study, yielding a response rate of 82.29%. Most respondents (67.34%) were 35 years of age or above and 80.98% of them were married. Many of the participants (71.39%) held at least a college degree. Almost half of the sample (48.35%) earned a salary of 9000 Saudi Riyals or more (≈2400 USD). Approximately two-thirds (65.31%) of the participating men were classified as overweight or obese (45.82% for overweight and 19.49% for obesity) and 36.46% of them reported having at least one morbidity. The vast majority (65.05%) of this sample had low levels of physical activity, and only 20.00% reported consuming a healthy diet.

Factors Associated with Overweight or Obesity

Bivariate analysis showed that level of BMI varied significantly by age ($p < 0.001$), marital status ($p < 0{,}001$), morbidity status ($p = 0.015$), level of physical activity ($p < 0.001$), and dietary behavior ($p < 0.001$). Education and income were not found to be significantly associated with being overweight or obese in this sample ($p = 0.177$ and $p = 0.701$; respectively). Approximately half of the surveyed men were overweight/obese and over the age of 35, with low level of physical activity, and consumers of a non-healthy diet. More than half of them were overweight/obese and married. Results for this section are displayed in Table 1.

Results of multivariate logistic regression analysis showed that being married compared to being single (OR 2.55; 95% CI 1.46–4.47), having at least one morbidity compared to having no morbidity (OR 1.68; 95% CI 1.02–2.77), consuming a non-healthy diet compared to consuming a healthy diet (OR 2.43; 95% CI 1.26–4.70), and being in the lower category of physical activity compared to higher categories (1.83; 95% CI 1.10–2.95) were all factors independently associated with overweight/obesity in this sample of male office workers (Table 2).

Factors Associated with Low Level of Physical Activity

Bivariate analysis also showed that level of physical activity varied significantly by age $p < 0.001$), level of BMI

Table 1 Proportion of respondents with normal versus overweight/obese BMI according to demographic characteristics (N = 395)

Participants' characteristics	BMI category			p value
	Normal	Overweight/obese	Total	
	N (%)	N (%)	N (%)	
Age (μ = 38.7; SD = 9.2)				
< 35	64 (16.20)	65 (16.45)	129 (32.65)	< 0.001
≥ 35	73 (18.48)	193 (48.86)	266 (67.34)	
Marital status (N = 368)				
Married	88 (23.91)	210 (57.07)	298 (80.98)	< 0.001
Single	39 (10.6)	31 (8.42)	70 (19.02)	
Education				
< University	32 (8.10)	81 (20.51)	113 (28.61)	0.177
≥ University	105 (26.58)	177 (44.81)	282 (71.39)	
Income				
< 9000 Saudi Riyal	70 (17.77)	134 (33.92)	204 (51.69)	0.701
≥ 9000 Saudi Riyal	67 (16.96)	124 (31.39)	191 (48.35)	
Morbidities				
No morbidities	100 (25.32)	151 (38.23)	251 (63.55)	0.015
At least one morbidity	37 (9.37)	107 (27.09)	144 (36.46)	
Physical activity				
Low	70 (17.72)	187 (47.34)	257 (65.06)	< 0.001
Moderate/intense	67 (16.96)	71 (17.97)	138 (34.93)	
Healthy diet intake[a]				
Yes	15 (3.8)	64 (16.20)	79 (20.00)	0.001
No	122 (30.89)	194 (49.11)	316 (80.00)	

[a]A healthy diet is high in fruits and vegetables intake, high in seafood intake, and low in dairy and meat intake [19]

($p < 0.001$), marital status ($p = 0.006$), morbidity status ($p = 0{,}001$), and dietary behavior ($p = 0.002$). Almost half of the sample were classified in the lower physical activity category and 35 years old or more (48.86%), overweight or obese (47.34%), married (55.71%), and consumers of a non-healthy diet (49.11%). Results for this section are displayed in Table 3.

Additional analysis revealed that low level of physical activity in this sample is independently associated with being 35 years of age or older compared to younger age groups (OR 2.07; 95% CI 1.30–3.30), having at least one morbidity compared to having no morbidity (OR 2.11;95% CI 1.29–3.45), being overweight or obese compared to normal weight (OR 1.83; 95% CI 1.16–2.91), and consuming a non-healthy diet compared to a healthy diet (OR 2.42; 95% CI 1.30–4.52) (Table 4).

Table 2 Proportion of respondents with low versus moderate/intense physical activity according to demographic characteristics (N = 395)

Participants' characteristics	Physical activity			p value
	Low	Moderate/intense	Total	
	N (%)	N (%)	N (%)	
Age (μ = 38.7; SD = 9.2)				
< 35	64 (16.2)	65 (16.46)	129 (32.66)	< 0.001
≥ 35	193 (48.86)	73 (18.48)	266 (67.34)	
BMI (μ = 26.81; SD = 4.29)				
Normal	70 (17.72)	67 (16.96)	137 (34.68)	< 0.001
Overweight/obese	187 (47.34)	71 (17.97)	258 (65.31)	
Marital status (N = 368)				
Married	205 (55.71)	93 (25.27)	298 (80.98)	0.006
Single	36 (9.78)	34 (9.24)	70 (19.02)	
Morbidity				
No morbidities	146 (36.96)	105 (26.58)	251 (63.54)	0.001
At least one morbidity	111 (28.1)	33 (8.35)	144 (36.45)	
Healthy diet intake[a]				
Yes	63 (15.95)	16 (4.05)	79 (20.00)	0.002
No	194 (49.11)	122 (30.89)	316 (80.00)	

[a]A healthy diet is high in fruits and vegetables intake, high in seafood intake, and low in dairy and meat intake [19]

Table 3 Results of multivariate logistic regression for factors associated with overweight and obesity

Variable	Reference	OR	95% CI	Wald	p value
Non-healthy diet	Healthy diet[a]	2.43	1.26–4.70	2.65	0.008
Having at least one morbidity	No morbidity	1.68	1.02–2.77	2.05	0.04
Being married	Being single	2.55	1.46–4.47	3.3	0.001
Low level of physical activity	Moderate/intense physical activity	1.83	1.10–2.95	2.47	0.013

[a]A healthy diet is high in fruits and vegetables intake, high in seafood intake, and low in dairy and meat intake [19]

Table 4 Results of multivariate logistic regression for factors associated with low level of physical activity

Variable	Reference	OR	95% CI	Wald	p value
35 years old or above	Under 35 years old	2.07	1.3–3.30	3.08	0.002
No reported morbidity	At least one morbidity	2.11	1.29–3.45	3	0.003
overweight/obese	Normal weight	1.83	1.16–2.91	2.6	0.009
Non-healthy diet	Healthy diet[a]	2.42	1.30–4.52	2.79	0.005

[a]A healthy diet is high in fruits and vegetables intake, high in seafood intake, and low in dairy and meat intake [19]

Discussion

Approximately two-thirds of the surveyed men who work office jobs in this study were classified as either overweight or obese and in the lower category of physical activity; placing them at risk of developing different chronic diseases and thus lowering their life expectancy. Those with high BMI, in this sample of men, are consumers of an unhealthy diet, have at least one morbidity, are married, and have reported a low level of physical activity. The present study showed that the prevalence of overweight and obese participants in this sample was 45.82% and 19.49%; respectively. This overweight percentage is higher than what has been previously reported for Saudi men by the WHO and the overweight percentage is notably higher [6]. Also, a household survey conducted in 2013 in Saudi Arabia (N = 10,735) reported a greater prevalence of obesity (24.1%) among men than what has been detected in this study sample [17]. The variation in prevalence of overweight and obesity between these previously conducted studies and this current study among office jobs workers may be due to the fact that previous studies were large cross-sectional studies conducted among the general population of various regions in Saudi Arabia which are known to vary in their BMI. It has been repeatedly documented that a high prevalence of overweight and obesity exists in all age groups and in both genders across the entire Eastern Mediterranean Region (EMR) [12]. Similarly to what has been previously reported in Saudi Arabia [17] and globally [18], the prevalence of obesity differed significantly between age groups in the current study; men younger than 35 years of age were less overweight/obese than older men. Also, rates of overweight/obesity in this study varied by marital status. Married men had a significantly higher BMI than single men; placing them at higher risk of acquiring morbidities that are associated with obesity. These results coincide with reports from previous studies conducted locally in Saudi Arabia [17] and elsewhere [19]. It is common knowledge that lacks of physical activity or having less physically active lifestyles are crucial factors that could eventually lead to obesity. In Saudi Arabia, high obesity rates affect all segments of the population due to highly reported rates of physical inactivity and sedentary lifestyles [17]. In fact, the World Health Organization estimates the prevalence of physical inactivity among Saudi adults is as high as 80% [20]. Two-thirds of the sample in this study were in the low physical activity category and, among them, almost half had high BMI. It is worth mentioning that most of the workers employed in the government sectors in Saudi Arabia have tenure; this could be fostering to a more relaxed environment in government workplaces. It is hypothesized that governmental employees in gender-segregated office jobs in Saudi Arabia (a common practice) do not engage directly with clients and hence do not need to look fit compared to workers employed in the private sector. According to the last report from the general authority of statistics in Saudi Arabia, the number of male employees in the country is 4,185,853 [11]. This large segment of the population is considered to be one of the most vulnerable groups due to the nature of their work which is primarily office-based. It is notable that there is insufficient space to maneuver in the workplace, thus, decreasing the employed men daily energy expenditure and placing them at risk for major negative health consequences. A strong association between obesity and lack of physical activity among men has been documented in the literature [17].

Despite the fact that those with at least one morbidity constituted approximately a third of the sample; about three-fourth of them were overweight or obese. Results from a different study indicated that there was no an association between having a chronic disease and being obese [18]. Also, in this study, there was a variation in the level of education among the participants but no significant association was observed between an elevated BMI and education. Similarly, a previously conducted study in Saudi Arabia reported no association between education an obesity [17]. However, a study conducted in the United States regarding obesity, dietary intake, and social inequalities reported that obesity rates were higher among men and women who were less-educated; as education levels increased, obesity levels decreased among women but remained consistent among men [21]. Apparently the association between obesity and education is a global phenomenon that varies between countries and according to their socioeconomic structure.

Eating a variety of fruits and vegetables every day, consuming daily meals that are low in fat and meat, and eating fish at least twice every week is recommended by the American Heart Association [22]. As expected, it was observed in this study that 49.11% of the obese participants were not eating a healthy diet as specified by these recommendations. A Canadian study, that assessed the relationship between healthy eating and being overweight or obese, reported that participants who met the minimum servings of vegetables and fruits had a lower measured BMI and those who met the minimum number of servings of meat and meat alternatives had a higher measured BMI [15].

The measurement of level of physical activity and the risk factors associated with it is an essential part of the health-promoting efforts to manage physical inactivity. Age, reporting having at least one morbidity, being overweight or obese, and consuming a non-healthy diet were all significantly different factors across levels of physical activity and independently associated with low physical activity in a multivariate logistic regression analysis. This study has

shown that the prevalence of physical activity among men who work in office-jobs is quite low. Almost two-thirds of the sample showed low levels of physical activity, while only 11.65% of participants claimed to have moderate activity. These percentages were greater than what was reported in a study conducted in Saudi Arabia in 2001, which showed that over 53% of participants were physically inactive and 27.5% were irregularly active [23]. Moreover, this proportion is greater than the findings recorded by Hallal et al. [24], who reported on physical activity levels from 122 countries and found that 31% were physically inactive. In 2009, Bauman et al. [25] conducted a comparative international study of population physical activity prevalence across 20 countries and reported that the prevalence of low physical activity in males in Saudi Arabia was 42.8%, which is also less than our findings. These variations in the percentages could be due to the rapid changes in the lifestyle of Saudi citizens in the last two decades. Besides, the populations included in these previous studies are different, since our study is primarily focused on office workers. The present study showed that a significant characteristic related to low physical activity was that participants were of age 35 or above. A previous study conducted in the Kingdom of Saudi Arabia in 2007 reported that the prevalence of physical inactivity increased with increasing age group [26]. Similarly, Hallal et al. found in their study that physical inactivity increased with age [24].

Participants with high BMI are approximately two times more likely to be less physically active. The findings reported in a different study relating to the risk factors of physical inactivity in Saudi Arabia were similar. In fact, it showed that the participants with obesity had a significantly higher proportion of low physical activity [27]. Albawardi et al. [28] had not found a significant difference in their study between a high BMI and the levels of physical activity. The sample used in their study was different since it was conducted among women working in office jobs, while the present study was conducted among men working in office jobs. Moreover, most of the married respondents were classified as less physically active, although a previous study on the influence of marriage on physical activity showed that becoming married did not significantly change physical activity levels compared to individuals who stayed single [29]. However, physical activity levels were significantly lower after having a child [29]. In this study, participants were not asked if they have children and an association cannot be established.

Reported morbidities in this study were also associated with low level of physical activity. A Saudi study by Amin et al. [30], using a survey derived from the International Physical Activity Questionnaire (IPAQ), suggested similar results that being male and free from morbidities were significant predictors of being active in a sample from primary care centers.

This research was subject to some limitations, including the use of a survey as the primary study instrument, which is subject to social desirability effect and recall bias. Therefore, despite using a reliable and valid physical activity questionnaire, it is recommended that future studies may consider the use of more objective instruments such as an accelerometer for the assessment of physical activity in Saudi working men. Another limitation is that the whole sample was gathered from the city of Al Madinah, which affects the generalization of the findings to other regions in Saudi Arabia.

Conclusion

In conclusion, this study identified Saudi men working in office-based jobs as a high-risk group for being overweight, obese, and being physically inactive. Saudi men working in office jobs are more obese and less physically active than the other populations of men. The detected risk factors are modifiable and require planning to modify intrapersonal and environmental factors that are most likely to mitigate or ameliorate the consequences of this destructive lifestyle. It is highly recommended to implement interventions targeting this particular section of males employed in office-based jobs in and outside the workplace in order to minimize the burden of disease and disability. The well-being of this apparently vulnerable segment of the male population in Saudi Arabia is in jeopardy and should be prioritized on the public health agenda.

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Author Contributions HJ conceived the project idea. YA and HJ designed the study and approved the methodology. YA participated in the data collection. YA and HJ managed the study data. HJ conducted the formal data analysis. All authors contributed extensively towards the preparation of this manuscript and approved the version submitted to the journal. All authors read and approved the final manuscript.

Data Availability Please contact the author for data requests.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no competing interests.

Ethics Approval Ethics approval for this study was provided by the institutional review board (IRB) at King Abdullah International Medical Research Center (KAIMRC) in Riyadh (approval number sp18/069). Informed consent was obtained from all participants.

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