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Relationship of Work Hours and Sleep Hours with Anthropometric Measures in Pakistani Laborers in Saudi Arabia

Mehreen Mehtab[1], Farooq Ahmad Khan[2], Muhammad Atif Malik3, Seemin Kashif Malik[4]*

[1]MBBS, MPH, Infection Control Officer, Ahmad Hospital, Rahim Yar Khan, Pakistan; [2]MBBS, FCPS, Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia; [3]FCPS, SF- CA, Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia; [4]MBBS, MPhil (Nutrition), Allama Iqbal Open University, Islamabad, Pakistan.

ABSTRACT

Introduction: Obesity is a known risk factor for type2 DM, hypertension, fatty liver, cardiovascular disease and cancer. Long work hours and short sleep duration might lead to obesity in migrant workers.

Objective/Aim: Study was done to show the effects of work hours and sleep hours on the nutritional status of Pakistani laborers working in KSA.

Method: It was a cross-sectional study. Pakistani male, 25-60 years old, unskilled and semi-skilled workers were included. Sociodemographic profile, length of work hours, and sleep hours were recorded. Anthropometric measures included BMI, waist circumference (WC), waist-to-hip ratio (WHR), waist-to-height ratio (WHtR), and conicity index (CI).

Results: About 80% of participants were <40 years old. About half of the participants were working for >48 hours/week, and half of the participants slept for <7 hours/day. BMI, WHtR, and CI were higher than normal in the older group only, but WC and WHR were higher than normal in both groups.WHR and CI were significantly and negatively correlated with sleep hours categories. Binary regression analysis could not show effect of work and sleep hours on any of the anthropometric measures.

Conclusion: Long work hours were not associated with obesity, however, fewer sleep hours were associated with obesity.

Key Words: Sleep, Work hours, BMI, Waist circumference, Binary regression analysis, Obesity

INTRODUCTION

Obesity is a known risk factor for type 2 DM, hypertension, fatty liver, cardiovascular disease, and cancer. Long work hours and short sleep duration might lead to obesity in migrant workers.

Working longer hours can lead to obesity due to various reasons.[1,2] Long work hours have been accused to result in unhealthy eating habits, less sleep, and a sedentary lifestyle.[1] Working equal to or more than 40 hours per week has been found to be associated with an increased risk of obesity.[3,4] According to Conventions and Recommendations of ILO, limitations of working hours were set initially as 8 hours per day and 48 hours per week, and later as 40 hours per week.[5] However, about one-third of the global workforce still works more than 48 hours per week.[6]

Reduced sleep duration has also been recognized as a factor associated with the prevalence of obesity.[7] Lack of sleep results in metabolic changes in the body that are aimed at conserving energy, with increased caloric intake, probably resulting due to sleep restriction and this puts these people at high risk of weight gain and obesity.[4] Night shift workers were found to have fewer sleep hours as compared to day shift workers, and also had more weight, body mass index and abdominal circumference as compared to the latter.[8] Similarly, both short sleep and long working hours were found to be significantly associated with obesity amongst long-distance truck drivers and conductors.[9]

This study was conducted to observe the effects of work hours and sleep hours on the nutritional status of the Pakistani labor class working in the Kingdom of Saudi Arabia (KSA), with help of anthropometric measurements.

Corresponding Author:
Dr. Seemin Kashif, MBBS, MPhil (Nutrition), Allama Iqbal Open University, Islamabad, Pakistan.
Cell: 00966560020731; Email: seeminkashif@hotmail.com

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MATERIALS AND METHODS

The study was a cross-sectional one. Purposive sampling was done. Total 130 Pakistani males, between the age range of 25-60 years, doing unskilled, and semi-skilled jobs, were included in the study. These workers included construction workers, loaders, farmers, and gardeners, drivers, electricians, plumbers, etc, and somewhat educated workers like supervisors, and clerks. Professionally educated workers were not included in the study. The study was conducted in the Pakistan Embassy in Riyadh, Kingdom of Saudi Arabia. Ethical approval of the study was taken from IRB of Allama Iqbal Open University, Islamabad. IRB reference number for this study was AIOU-6-2017-IRB-A-054.

Objective: To study the relationship between work hours and sleep hours with anthropometric measurements of Pakistani laborers working in KSA.

Research instruments: A questionnaire was developed to find out the duration of sleep hours per day, work hours per day, and the total number of days the workers used to work in a week. The work hours per day were then multiplied by the number of days of work per week, and hence work hours per week were computed. Keeping in mind the recommendations of ILO[5], a cut-off limit of 48 hours per week was selected to find the relationship between work hours and anthropometric measurements. Equal to, or more than 7 hours of sleep per day is recommended.[10] Hence, a cut-off point of ≥7 hours per day for sleep was selected for statistical analysis.

Our sample was divided into two groups according to age. A cut-off point of 40 years of age was set to divide it because this age is a risk factor for non-communicable diseases.[11] The sample was also divided into two professional categories, according to the education and skill level of their work. One group included drivers, construction workers, and laborers, who did not require any education and special skill, and the second group included electricians, plumbers, carpenters, salespersons, supervisors, etc who were better educated and skillful.

Our sample was also divided into professional categories. Categories were made according to the physical activity involved in the profession. 'Unskilled labor' category included construction laborers, loaders, gardeners, and farmers, and the 'semi-skilled labor' category included drivers, clerks, supervisors, plumbers, electricians etc.

Body weight and height of all participants was measured by using digital weighing scale, and a stadiometer, respectively. BMI (Body mass index) was calculated by dividing weight (in kilogram) by height (in meters squared). In Asian populations, BMI of 23-27.5 kg/m² represents over-weight, and 27.5 kg/m² or higher represents obesity.[12] Subjects were grouped as normal (<23.0 kg/m²), and over-weight (≥23.0 kg/m²) by using these WHO cut-off points.

Waist circumference (WC) and hip circumference (HC) were measured with help of a measuring tape and were done according to NHANES (2007) guidelines. All these measurements were taken in centimeters (cm). Waist-to-hip ratio (WHR), was measured by dividing WC by HC. A cut-off value of ≥ 90 cm for WC, and a cut-off point of ≥ 0.90 was used for waist-to-hip ratio (WHR), as found in South Asian (SA) populations, according to International Diabetes Federation.[13]

Waist-to-height ratio (WHtR) was found to be a good predictor of chronic disease compared to other measures in different population studies.[14] In the Indian population, optimal cut-point for WHtR was found to be 0·56 for males.[15] So, 0.56 was set as a cut-off value in our study. It was measured by dividing WC (cm) with height (cm).

CI (Conicity index) is used to assess abdominal obesity. Its calculation is done by the formula: $CI=WC\ (m)/0.109\sqrt{Wt\ (kg)/Ht\ (m)}$. A person with CI of 1.25 shows has a WC 1.25 times larger than the circumference of a cylinder with a height and a weight of that particular person. A Pakistani study set cut-off point at 1.32 for males.[16]Hence, same cut-off value was chosen for our study.

RESULTS

Out of total 130 participants, 21.5% participants were, unskilled labourers' includingconstruction workers, loaders, gardeners, and farmers, and 78.5 % were 'semi-skilled labourers' like drivers, electricians, plumbers, supervisors, and clerks etc. There were 104 (80%) participants below 40 years age, remaining 26 (20%) participants were older than 40 years (Table1).About 48% of sample participants were working for ≤ 48 hours per week, and 52% participants were working for >48 hours per week. About 48% participants used to sleep for <7 hours, and 52% participants got sleep of 7 hours or more.

Independent sample T-tests were run between both age groups for sleep hours, work hours, and all anthropometric measurements. No significant difference was found between work hours and sleep hours of both groups, but all anthropometric measurements were significantly higher in older age group (Table 1). BMI, waist circumference (WC), and waist-to-hip ratio (WHR) were high in both age categories, but much higher in older age group. Waist-to-height ratio (WHtR) and conicity index (CI) were, however, within normal limits in younger group, but were significantly higher and above cut-off values in older group.

Independent sample T-tests were run between both profession categories for sleep hours, work hours, and all anthropometric measurements. No differences were found between work hours, sleep hours, and all anthropometric measures

(Table 1). BMI of both groups was higher than normal, but this parameter was even higher in 'semi-skilled' workers. Similarly, WC was also higher than normal in both groups, but this parameter was also even higher in the 'semi-skilled' group. WHR was higher than normal in 'semi-skilled' laborers, however, it was normal in 'unskilled' laborers. WHtR was normal in both 'unskilled' and 'semi-skilled' workers. Similarly, the conicity index was normal in both 'semi-skilled' and 'unskilled' groups (Table 1).

When Chi-square tests were run between age group categories and all anthropometric measurements, BMI, WC, and WHR were found to be significantly higher in age ≥40 years. Similarly, WHtR and CI were found to be higher in age ≥40 years. When Chi-square test was run between work-hours per week and anthropometric measurements, no relationship was found. Anthropometric measurements were also compared with sleep hours per day categories. Statistically significant differences were found in WHR and conicity index (Fig 1). A weak negative correlation was found between these variables.

Binary regression analysis was carried out to see if work hours and sleep hours could significantly predict the anthropometric measures. BMI was strongly predicted by older age, after adjusting with sleep hours, and work hours, but WC, WHtR, and CI were strongly predicted by older age, after adjusting with sleep hours, work hours, and profession as well (Table 2). However, WHR was strongly predicted by both older age and fewer sleep hours, after adjusting with work hours, and profession (Table 2).

DISCUSSION

Our results showed similar work hours in both age groups, as well as in both profession categories (Table 1). In our sample, work hours were found to be much more than the recommendations of ILO (International Labor Organization). ILO recommended a maximum 48 hours per week, irrespective of the profession.[5] Long work hours were found to be associated with higher risk of higher BMI, waist circumference and waist-to-hip ratio in literature.[2] Studies also showed that long working hours could lead to chronic illnesses due to overweight and obesity. It was also recommended that measures were supposed to be taken to control this weight gain to improve health and save health insurance money.[17] Behavioral risk factors are associated with long working hours.[2]Smoking, alcohol intake, and reduced physical activity are the risk factors which can lead to overweight and obesity. Contrary to these findings, many studies have been unable to provide evidence against work long hours. Although along with long work hours in our sample, almost all anthropometric measures were falling in categories of overweight and central obesity, long work hours could not prove themselves to contribute to obesity. Hence regarding weight gain related to long work hours, our study showed results contradictory to the literature. However, not all studies have been able to show positive associations of general or central obesity with long work hours.[2]

Sleep hours were less than 7 hours per day in our sample population. Sleep hours were fewer than recommended ones in both age groups, as well as in both professional categories. This number was against the recommendations of the Sleep Medicine and Sleep Research Society.[10] Our study results showed that less sleep was associated with high WHR as well as with conicity index (CI) (Fig 1). These two parameters represent central adiposity. Central obesity is the type of adiposity that actually leads to chronic, non-communicable diseases. Our results were found to be consistent with the literature. Light has been found to be the most important circadian synchronizer for human beings.[18] Exposure to artificial light can lead to a disturbance in the regulation of the circadian rhythm, through a decrease in melatonin secretion. Total inhibition of melatonin secretion might contribute to the development of obesity. Exposure to artificial light at night decreases the duration of sleep, and it disturbs the sleep cycle, and mealtimes.[18,19] Hence, the malfunctioning of the biological clock, also called 'social jet lag', results in metabolic change, and a tendency to increase body weight and fat in the abdomen.[19] Short sleep duration is linked to obesity through various mechanisms, including increased food intake, reduced physical activity, and alterations in levels of hormones related to human appetite, such as leptin and ghrelin. Decreased leptin levels and increased ghrelin result in increased appetite, and hence weight gain.[20,21] Decreased sleep also affects the metabolism of insulin and glucose, growth hormone, cortisol, and thyroid hormones.[20] People, who used to stay awake late at night (also called evening chronotypes) were found to be associated with obesity, specifically.[22] Sleeping less allows more time to eat and stay sedentary, like in children and adolescents, who would stay awake late to interact with social networks whilst snacking.[20] Although obesity was found in people who did not get enough sleep, long sleep duration could also impair energy metabolism through various mechanisms, including poor quality of sleep, sedentary lifestyle, unhealthy diet, and disturbance of synchrony between circadian and behavioral situations.[4] Hence, long sleep duration was also found to be significantly associated with central obesity in literature. Conversely, long sleep duration could also arise due to obesity, and Type 2 DM, which might have impaired sleep quality. However, evidence from various population studies showed that a U-shaped curvilinear association existed between sleep duration and BMI, which suggested that both short and long sleep could result in a gain in weight, and a regular good night sleep of optimal duration was required to maintain a healthy weight.[23] All anthropometric measures had significantly higher values in age group ≥40 years (Table 1). BMI, WC, and WHR were higher than cut-off values in both groups, however, WHtR, and CI were higher than cut-off limits in age ≥40 years only (Table 1). Age was found to be a strong predictor of general and central obesity in our study. These findings were consistent with literature, which showed increased overweight and obesity prevalence amongst adults above 40 years age.[24] A review articles elected data from five most populous countries from African, American, Eastern Mediterranean, European, Western Pacific, and South East Asian regions each, which included Pakistan also. It showed that overweight and obesity increase with 20 years of age onwards, and reaches the peak between 50 to 65 years age.[25]

The profession categories were made while keeping in mind the physical activity level involved in these professions. The construction workers, loaders, farmers, and gardeners were included in the 'unskilled' group because most of these jobs involved tough physical activity levels. The remaining professions were included in the 'semi-skilled' group because these professions were either totally sedentary or they involved very light physical work. No statistically significant differences were found between work hours, sleep hours, and all anthropometric measures in both groups (Table 1). BMI of both groups was higher than normal but was higher in 'semi-skilled' workers. Similarly, WC was also higher than normal in both groups but was higher in the 'semi-skilled' group. WHR was also higher in 'semi-skilled' laborers. This showed that probably low physical activity level was the main reason for such high prevalence of overweight and obesity in this study population. This fact was reflected in the finding that the 'unskilled' group showed a lesser degree of overweight and obesity compared to the 'semi-skilled' group. Although long work hours failed to show their contribution to the change in anthropometric measures in this population, our regression models showed effects of age and sleep hours after adjusting with work hours (Table 2).

CONCLUSION

Our study found that long work hours were not associated with the prevalence of obesity. However, less sleep hours were associated with an increased prevalence of central obesity.

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Table 1: Statistics for all variables, according to groups:

		Age categories:				
Variable:	**Cut-off value:**	**Group:**	**N:**	**Mean:**	**SD:**	**p-value:**
Work-hours/week	48 hours/week	<40 years	104	57.43↑	±22.17	-----
		≥40 years	26	57.96↑	±26.38	
Sleep hours/day	7 hours/day	<40 years	104	6.68↓	±1.08	-----
		≥40 years	26	6.38↓	±1.20	
BMI	23 kg/m²	<40 years	104	25.47↑	±5.17	0.005
		≥40 years	26	28.78↑	±5.00	
WC	90 cm	<40 years	104	93.94↑	±12.69	0.000
		≥40 years	26	103.70↑	±11.01	
WHR	0.9	<40 years	104	0.90↑	±0.06	0.000
		≥40 years	26	0.95↑	±0.05	

Table 1: ***(Continued)***

Variable:	Cut-off value:	Group:	N:	Mean:	SD:	p-value:
		Age categories:				
WHtR	0.56	<40 years	104	0.54↓	±0.07	0.000
		≥40 years	26	0.61↑	±0.06	
CI	1.32	<40 years	104	1.30↓	±0.08	0.000
		≥40 years	26	1.36↑	±0.05	
Profession categories:						
Work-hours/week	48 hours/week	Semi-skilled labor	102	58.35↑	±24.38	-----
		Unskilled labor	28	54.57↑	±16.86	
Sleep hours/day	7 hours/day	Semi-skilled labor	102	6.62↓	±1.17	-----
		Unskilled labor	28	6.64↓	±0.87	
BMI	23 kg/m^2	Semi-skilled labor	102	26.19↑	±5.17	-----
		Unskilled labor	28	25.90↑	±5.81	
WC	90 cm	Semi-skilled labor	102	96.02↑	±12.31	-----
		Unskilled labor	28	95.43↑	±15.26	
WHR	0.9	Semi-skilled labor	102	0.91↑	±0.06	-----
		Unskilled labor	28	0.89	±0.08	
WHtR	0.56	Semi-skilled labor	102	0.55	±0.07	-----
		Unskilled labor	28	0.54	±0.09	
CI	1.32	Semi-skilled labor	102	1.31	±0.07	-----
		Unskilled labor	28	1.30	±0.10	

N=Number, SD=Standard deviation, WC=waist circumference, WHR=waist-to-hip ratio, WHtR=waist-to-height ratio, CI=Conicity index

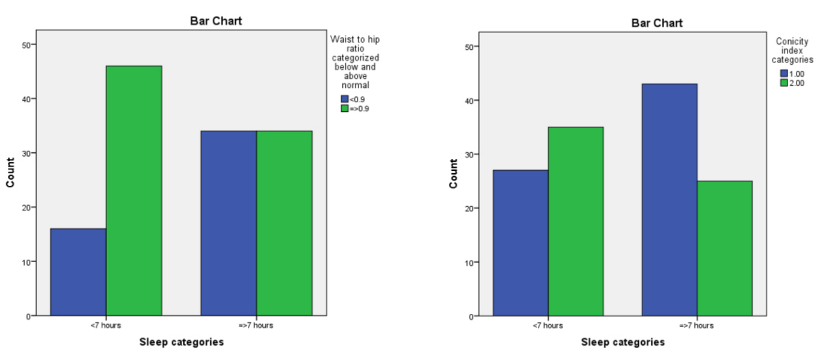

Figure 1: Chi-square of sleep hours with waist circumference and conicity index:

Table 2: Binary logistic regression analysis:

	p-value:	OR[1]:	95% Confidence interval: Lower:	Upper:
Model 1: Dependent variable= BMI[2], p=0.039				
Age (years)	**0.007**	**3.93**	**1.45**	**10.67**
Sleep hours	0.830	--------	--------	--------
Work hours	0.893	--------	--------	--------
Model 2: Dependent variable= WC[3], p=0.002				

Table 2: ***(Continued)***

	p-value:	OR[1]:	95% Confidence interval: Lower:	Upper:
Age (years)	**0.008**	**15.82**	**2.05**	**121.33**
Sleep hours	0.492	--------	--------	--------
Work hours	0.842	--------	--------	--------
Profession	0.385	--------	--------	--------
Model 3: Dependent variable= WHR[4], p=0.001				
Age (years)	**0.006**	**6.08**	**1.68**	**21.94**
Sleep hours	**0.015**	**0.62**	**0.43**	**0.92**
Work hours	0.809	--------	--------	--------
Profession	0.328	--------	--------	--------
Model 4: Dependent variable= WHtR[5], p=0.003				
Age (years)	**0.000**	**6.31**	**2.29**	**16.98**
Sleep hours	0.849	--------	--------	--------
Work hours	0.926	--------	--------	--------
Profession	0.580	--------	--------	--------
Model 5: Dependent variable= CI[6], p=0.000				
Age (years)	**0.000**	**6.98**	**2.39**	**20.41**
Sleep hours	0.180	--------	--------	--------
Work hours	0.211	--------	--------	--------
Profession	0.496	--------	--------	--------

BOLD values= Significant findings, [1]OR=Odds ratio, [2]BMI=Body mass index, [3]WC=Waist circumference, [4]WHR=Waist-to-hip ratio, [5]WHtR=Waist-to-height ratio, [6]CI=Conicity index