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SLEEP QUALITY AND ITS ASSOCIATION WITH BODY WEIGHT AMONG ADULTS: AN EPIDEMIOLOGICAL STUDY

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ABSTRACT

Obesity and sleep disorders are common adverse health problems, related to unhealthy behaviors and the two can co-exist frequently. Majority of studies examining the relation between sleep and obesity have examined mainly the effect of sleep duration on the body weight. However, assessing sleep involves both quantitative and qualitative aspects. Aim of the study was to investigate the relation between sleep quality and body weight. This was a Community based cross sectional study carried out in Minia, Egypt. Sleep quality was assessed in 469 participants using the Pittsburgh Sleep Quality Index (PSQI). Sociodemographic data and anthropometric measures were collected. The study reported that the PSQI score was significantly higher among overweight/obese 6.11±3.05 than that of normal body weight subjects 5.58±2.64. Across the two studied BMI based groups; there was a statistically significant difference in each of duration of night sleep, sleep disturbances and timing of going to bed. The global score is increasing with the increase in BMI presented in each BMI category. Among men of the studied group; PSQI score was 5.00±2.48, 5.22±2.97 and 6.79±3.20 of the healthy body weight, overweight and obese category respectively (p=0.011). Same trend is among women but couldn't reach significance (p=0.27). The global PSQI score has a statistically significant correlation with sleep duration, sleep latency and the BMI. As well, duration of night sleep is significantly correlated with the BMI. The study concluded an association between short sleep duration with an increased likelihood of being overweight/obese in the adult population.

***Keywords**: Overweight, Obesity, Sleep quality, PSQI, Sleep duration.*

INTRODUCTION

Obesity is a high prevalence public health issue in different age groups[1,2], related with diverse negative health consequences[3]. Increased body weight has economic and social consequences besides direct health effects. Studying the potential factors contributing to the high obesity prevalences has a big role on the health of population. The usual explanations of excess body weight have focused on dietary habits including the quality, and quantity of food consumed, availability of low-cost high-calorie foods and physical inactivity. Other causal mechanisms have been suggested, involving poor quality of sleep and chronic partial sleep loss[4].

A line of research suggests that short duration of sleep justifies particular attention[5]. In parallel with the increasing prevalence of obesity, there has been a progressive decrease in sleep duration worldwide[6]. The association between high BMI and short sleep in various communities and age groups has been documented[7,8]. Previous literature demonstrating that sleep quality may be a relevant indicator of obesity severity. A meta-analysis reported that poor sleep quality has a considerable role in overweight and obesity status in children, adolescents, and young adults[9], independent of sleep duration.

Research shows that adequate sleep can have an important role in controlling body weight and decreasing the risk of metabolic disorders as increased insulin resistance and diabetes mellitus[10]. From a public health perspective, modifiable risk factors, such as behavioral and environmental factors, are the most promising in terms of primordial prevention and control of obesity.

However, research into sleep quality of Egyptian adults is insufficient, in which the social patterning of sleep could be divergent, therefore, relatively deficient local data are available. So, studying the relation between sleep and body weight is particularly needed to fill the gap. This would be helpful in developing clinical and public health information.

METHODS

This was an exploratory, community-based cross-sectional study which was carried out in Minia

Governorate during the period from November 2018 to June 2019.

Study population

A simple random sample was done to select one district out of the nine districts of Minia Governorate. Subjects were invited to participate. If a subject does not contain inclusion criteria, another individual was taken until reached the targeted sample size. Inclusion criteria: Both sex, over the age of 18. Exclusion criteria: Self-reported significant change in bodyweight and/or sleep habits during the 6 months prior to the study, Patients with acute illness, Physical or mental disability.

Sample size:

The required sample size was calculated using the statistical software EPI-INFO v5.4.6 considering the prevalence of poor sleep quality as 50%. Since there are limited local data considering the quality of sleep of the general population in Egypt. Poor sleepers were 58.5% in the study conducted by Salama in 2017 in Egypt among medical students[11]. Then we used the expected frequency of 50%, design effect 1 and a maximum acceptable error of 5%. We obtained a sample size of 384 subjects with a 95% confidence interval then added 20% to guard against non-response. The number of participants successfully recruited was 469 with overall response rate of 96%.

Assessment criteria

Sociodemographic: age, sex, residence, employment status, highest educational level, marital status.

Anthropometric measures; Height (in centimeters) and Body weight (in kilograms) were measured according to standardized procedures recommended by WHO. BMI was calculated by division of the body weight over squared height (kg/m^2). Individuals were categorized into: normal body weight (with BMI between 18 and 25), overweight (with BMI between 25 and 30) and obese (with BMI over 30).

Sleep quality is assessed based on the Arabic version of the Pittsburgh Sleep Quality Index (PSQI)12, which evaluates the quality of sleep over the past month. It is a self-report questionnaire assessing sleep quality over a one-month time interval. It consists of 7 components that produce one global score[13].

The seven components are: sleep duration, sleep latency (i.e., how long it takes to fall asleep), subjective sleep quality, habitual sleep efficiency (i.e., the percentage of time in bed that one is asleep), use of sleeping medications, daytime dysfunction over the last month and sleep disturbances. Each item is weighted on a 0–3 interval scale. The global PSQI score is then calculated. The maximum score is 21 points, determined by the sum of the seven components. A total score greater than 5 differentiates between people with good and bad sleep quality, with a sensitivity of 89.6% and specificity of 86.5%. The internal consistency of the index (Cronbach's $\alpha = 0.83$)[13,14].

Covariates: We also collected information on potential confounders such as, smoking habits and physical activity of participants which was collected using the International Physical Activity Questionnaire-Short Form-A (IPAQ-SF-A).

Ethical Approval:

The Ethical Committee of the Minia University-Faculty of Medicine approved our study. The studied group was informed about the nature and the purpose of the study and an informed written consent was obtained as part of the research questionnaire from all participants with their assurance regarding the confidentiality of the obtained information

Statistical analysis

Data were entered into a computer database, doublechecked, and analysed with SPSS 25[15]. The quantitative variables were described as means and standard deviations for and the qualitative variables as number and percent. Means were compared by ANOVA, Student's t-tests and Mann–Whitney U-test for parametric and nonparametric data. The qualitative variables were compared by Chi square test. Spearman' correlation was used to examine the correlation coefficient between sleep parameters and the main variables.

To assess the effect of sleep on body weight, we used multiple logistic regression analysis. We calculated odds ratios (ORs) with 95% confidence intervals (95% CIs). ORs greater than 1 indicate increased risk. First, we examined the relationship between increased BMI (> 25) and PSQI sleep quality, usual timing of going to bed and the different components of the PSQI as predictor variables simultaneously in Model 1. Then, in model 2, we examined this association with additional adjustment for gender, age,

residence, marital status, smoking and physical activity as potential confounders. A P value less than0.05 was considered as statistically significant, and it was two sided (2-sided).

RESULTS

Sleep parameters of the studied

Table 1: Sleep quality assessed using PSQI among the studied sample of healthy adults (n = 469)

Characteristics		Total (total 469)	
PSQI total score	**range**	0-17	
	mean±SD	5.86±2.88	
	median	6	
Sleep Quality		Number	%
	Good Sleepers	231	49.3
	Poor Sleepers*	238	50.7

*PSQI; Pittsburgh Sleep Quality Index, value between 0 (no difficulty) and 21 (severe difficulty). * Poor sleepers i.e. had PSQI total score greater than 5.* significant p < 0.05

Table 2: ***Distribution of Sociodemographic characteristics compared by BMI status, and sleep quality (n = 469)***

Characteristics	Total (N = 469)		BMI category				P-value	Sleep quality				P-value
			Normal BMI (N =224)		Overweight / Obese (N = 245)			Good Sleepers (N = 231)		Poor Sleepers (N = 238)		
	n.	%	n.	%	n.	%		n.	%	n.	%	
Age group (yrs)												
18-30 y	252	53.7	174	69.0	78	31.0	**<0.001***	130	51.6	122	48.4	0.3
>30 y	217	46.3	50	23.0	167	77.0		101	46.5	116	53.5	
Gender												
Men	187	39.9	96	51.3	91	48.7	0.121	107	57.2	80	42.8	**0.006***
Women	282	60.1	128	45.4	154	54.6		124	44.0	158	56.0	
Residence												
Rural	324	69.1	138	42.6	186	57.4	**0.001***	161	49.7	163	50.3	0.8
Urban	145	30.9	86	59.3	59	40.7		70	48.3	75	51.7	
Marital status												
Single	199	42.4	142	71.4	57	28.6	**<0.001***	98	49.2	101	50.8	**0.027***
Married	253	53.9	78	30.8	175	69.2		130	51.4	123	48.6	
Widow/Divorced	17	3.6	4	23.5	13	76.5		3	17.6	14	82.4	
Smoking												
Non-smoker	376	80.2	182	48.4	194	51.6	0.329	182	48.4	194	51.6	0.488
Current/former	93	19.8	42	45.2	51	54.8		49	52.7	44	47.3	
Job												
Student	166	35.4	124	74.7	42	25.3	**<0.001***	79	47.6	87	52.4	0.120
Professional	22	4.7	6	27.3	16	72.7		10	45.5	12	54.5	
Office work	61	13.0	20	32.8	41	67.2		36	59.0	25	41.0	
Manual work	69	14.7	34	49.3	35	50.6		40	58.0	29	42.0	
Doesn't work	19	4.1	8	42.1	11	57.9		12	63.2	7	36.8	
House wife	117	24.9	32	27.4	85	72.6		47	40.2	70	59.8	
Retired	15	3.2	0	0	15	100		7	46.7	8	53.3	
Education												
Illiterate	45	9.6	14	31.1	31	68.9	**<0.001***	15	33.3	30	66.7	**0.019***
Read and write	56	11.9	16	28.6	40	71.4		22	39.3	34	60.7	
Primary education	59	12.6	24	40.7	35	59.3		32	54.2	27	45.8	
Secondary education	93	19.8	42	45.2	51	54.8		56	60.2	37	39.8	
University	216	46.1	128	59.3	88	40.7		106	49.1	110	50.9	

BMI; Body Mass Index, Healthy body weight: BMI 18.5-25, Overweight: BMI ≥ 25 and Obese: BMI ≥ 30. PSQI; Pittsburgh Sleep Quality Index, Poor sleepers i.e. had PSQI total score greater than 5. Chi-square test,* statistically significant i.e. p < 0.05

Participant characteristics:

This sample included 47.8% participants with normal BMI, while 31.8% were overweight and 20.5% were obese. The age range was between 18 and 79 years, with a mean age of (32.75±13.9) years.

Gender and Sociodemographic variables are shown in table 2. Overweight/obese were significantly more prevalent among the age group above 30 years old (77%), rural subjects (57.4%), married (69.2%)/ widow or divorced (76.5%), housewives/professionals/office work were (72.6%)/(72.7%)/(67.2%) respectively and lower level of education. The comparison of sleep quality groups showed a statistically significant difference in their gender, marital status and level of education. Poor sleepers were more among women (56%) versus (42.8%) among men, widow or divorced (82.4%) compared to 50.8% and 48.6% among single and married respectively, and among low level of education; illiterate (66.7%) and who can read/write (60.7%) compared to 45.8%, 39.9 and 50.9% among primary, secondary and university education respectively

Association between sleep and body weight:

Table 3: Sleep Quality characteristics assessed using PSQI of the studied group compared by BMI status (n = 469)

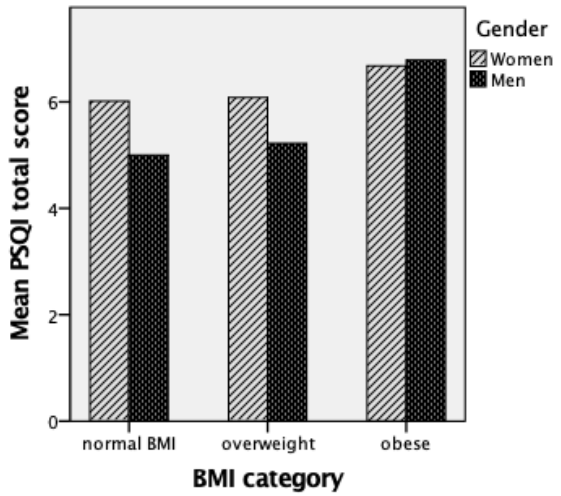
Characteristics	Total		BMI category				p-value
			Normal BMI		Overweight / Obese		
	n.	%	n.	%	n.	%	
1. Subjective quality of sleep							
very good	122	26.0	58	47.5	64	52.5	
fairly good	263	56.1	130	49.4	133	50.6	0.426
fairly bad	59	12.6	28	47.5	31	52.5	
very bad	25	5.3	8	32.0	17	68.0	
2. Sleep latency; time to fall asleep (minute)							
<15	130	27.7	64	49.2	66	50.8	0.740
≥15, <30	147	31.3	74	50.3	73	49.7	
≥30, <60	127	27.1	56	44.1	71	55.9	
≥60	65	13.9	30	46.2	35	53.8	
3. Sleep duration; subjective hours of sleep (hours)							
≥7	311	66.3	160	51.4	151	48.6	**0.016***
≥6, <7	100	21.3	46	46.0	54	54.0	
<6	58	12.4	18	31.0	40	69.0	
4. Sleep efficiency; % time in bed sleeping							
≥85	372	79.3	178	47.8	194	52.2	0.974
≥75, <85	50	10.7	24	48.0	26	52.0	
≥65, <75	24	5.1	12	50.0	12	50.0	
<65	23	4.9	10	43.5	13	56.5	
5. Sleep disturbances							
no	311	66.3	162	52.1	149	47.9	**0.008***
yes	158	33.7	62	39.2	96	60.8	
6. take sleep medications							
not during the past month	420	89.6	204	48.6	216	51.4	
less than once/week	21	4.5	10	47.6	11	52.4	0.521
once or twice/week	8	1.7	2	25.0	6	75.0	
three or more times/week	20	4.3	8	40.0	12	60.0	
7. Day time dysfunction;							
no	309	65.9	142	46.0	167	54.0	0.285
yes	160	34.1	82	51.2	78	48.8	
Timing of going to bed							
before midnight	223	47.5	88	39.5	135	60.5	**<0.0001***
midnight or after	246	52.5	136	55.3	110	44.7	

PSQI; Pittsburgh Sleep Quality Index, Poor sleepers i.e. had PSQI total score greater than 5. BMI; Body Mass Index, normal weight: BMI 18.5-25, Overweight: BMI ≥ 25 and Obese: BMI ≥ 30. Chi-square test. * statistically significant i.e. $p < 0.05$

Sleep quality was assessed across the two studied BMI based groups; there was a statistically significant difference in each of duration of night sleep, sleep disturbances and timing of going to bed. Overweight/Obese individuals tended to sleep significantly less duration than normal-weight individuals ($p = 0.016$); 69% of individuals sleeping less than 6 hours are overweight/obese which is the minimum recommended according to the National Sleep Foundation. There was a

significant relation between BMI and sleep disturbances, overweight/obese individuals presented more sleep disturbances (p = 0.008) (table 3).

Figure 1 The global score of PSQI in each BMI category for men and women of the studied group (n = 469)



PSQI; Pittsburgh Sleep Quality Index, value between 0 (no difficulty) and 21 (severe difficulty).BMI; Body Mass Index=weight/Height², Healthy weight: BMI 18.5-25, Overweight: BMI ≥ 25 and Obese: BMI ≥ 30. using One way ANOVA test to test significance, statistically significant i.e. p < 0.05 *Data presented by mean.*

The global score is increasing with the increase in BMI presented in each BMI category (figure 1). Among men of the studied group; PSQI score was 5.00±2.48, 5.22±2.97 and 6.79±3.20 of the healthy body weight, overweight and obese category respectively (p=0.011*). Same trend is among women, the global PSQI score was generally higher than men and it was 6.02±2.67, 6.08±3.13 and 6.68±2.81 respectively but couldn't reach significance (p=0.27). As illustrated earlier, the more the PSQI score the poorer the quality of sleep.

Logistic regression analysis was performed to examine the relationship between increased BMI (> 25) and PSQI global score, usual timing of going to bed as well as sleep quality category and the different components of the PSQI as predictor variables. Table 4 shows that the logistic regression model was statistically significant (p<0001), of all the possible components entered, timing of going to bed after midnight, and duration of night sleep were significant (p < 0.05) predictors of overweight/obesity (BMI > 25). Then with adjustment of potential confounders as gender, age, residence, marital status, smoking and physical activity, the logistic regression model was statistically significant (p<0001) with duration of night sleep still statistically significant in addition to the gender and the age of the participants.

Table 5 displays the correlation coefficient between sleep parameters and the main variables. The global PSQI score has statistically significant correlation with sleep duration (r=-0.180), sleep latency (r=0.522) and the BMI (r=0.092). As well, duration of night sleep is significantly correlated with the BMI (r=-0.120)

DISCUSSION

This study investigates the association of sleep quality, duration and timing with body weight. Most studies investigating the relationship between sleep and obesity have examined mainly the effect of sleep duration on body weight. However, assessing sleep involves both quantitative and qualitative aspects.

BMI measures Associated with Sleep Quality:

In this study, poor quality of sleep was related to increased likelihood of being overweight/obese. The mean PSQI score was significantly higher among overweight/obese 6.11±3.05 than that of normal body weight subjects 5.58±2.64 which implies worse sleep quality. This is comparable with the findings of the study conducted by Kristicevic[16] among young adults showed that poor quality of sleep was higher in cases with BMI ≥25 kg/m2 (45%) in comparison with cases with BMI <25 kg/m2 (36%).

As well, the Global score of PSQI was positively correlated with BMI (r = 0.092*) (table 5). This finding agreed with the previous literature demonstrating that quality of sleep may be a relevant indicator of obesity severity risk. Fatima's meta-analysis study showed that poor sleep quality has a considerable role, in dependent adolescents, and young adults[9].

Hung et al.[8] performed a study on a sample of Chinese community found that the risk of poor sleep was in 40% and 60% higher in overweight and obese populations respectively. Noteworthy, a cross-sectional study[17] from six countries showed that shorter sleep duration was significantly associated with higher BMI and WC measures for both sexes. Poor sleep quality has been reported to change the mechanism of appetite regulation, which could result in poor choices of food and higher intake of calories.

Table 4: Logistic Regression analysis with Overweight/Obese as the outcome variable and the PSQI sleep quality category, and different components of the PSQI as the predictor variables

	Model 1		Model 2	
	OR (95%CI)	P value	OR (95%CI)	P value
Poor Sleep quality (PSQI >5)				
Good	ref.	0.60	ref.	0.59
Poor	1.16 (0.64-2.1)		1.2 (0.61-2.3)	
Timing going to bed				
Before midnight	ref.	**<0.0001***	ref.	0.15
After mid night	0.49 (0.33-0.73)		0.72 (0.46-1.1)	
1. Subjective quality				0.79
fairly good or very good	ref.	0.46	ref.	
fairly bad or very bad	0.82 (0.50-1.36)		0.92 (0.52-1.64)	
2. Latency				0.77
Less than 30 min.	ref.	0.95	ref.	
30 min. or more	0.98 (0.62-1.56)		0.92 (0.55-1.56)	
3. Duration				
≥7 hours	ref.		ref.	
≥6, <7 hours	1.42 (0.86-2.3)	0.169	1.00 (0.55-1.8)	0.99
<6 hours	3.3 (1.67-6.6)	**0.001***	2.3 (1.11-5.1)	**0.02***
4. Efficiency				
HSD ≥75	ref.	0.053	ref.	0.07
HSD < 75	0.49 (0.24- 1.0)		0.48 (0.22-1.06)	
5. Disturbances				
Not have sleep disturbances	ref.	0.06	ref.	0.57
Have sleep disturbances	1.55 (0.97-2.48)		1.16 (0.68-1.97)	
6. Medications				
Not need or <once/week	ref.	0.21	ref.	0.71
Once or more times/week	1.7 (0.73-3.98)		1.19 (0.47-3.02)	
7. Day time dysfunction				
Not have day dysfunction	ref.	0.08	ref.	0.60
Have day dysfunction	0.66 (0.42-1.05)		0.87 (0.51-1.46)	
Gender				
Women			1.67 (1.01-2.76)	**0.04***
Men			ref.	
Age				
18-30 y			0.19 (0.10-35)	**<0.0001****
>30 y			ref.	
Residence				
Rural			1.34 (0.80-2.24)	0.25
Urban			ref.	
Marital status				
Single			0.69 (0.17-2.69)	0.59
Married			1.27 (0.36-4.45)	0.69
Widow/Divorced			ref.	
Physical activity				
Low physical activity			1.39 (0.74-2.62)	0.29
Moderate physical activity			0.85 (0.49-1.47)	0.57
Vigorous physical activity			ref.	
Smoking				
Non-smoker			1.38 (0.75-2.55)	0.29
Current/former smoker			ref.	

PSQI; Pittsburgh Sleep Quality Index, poor quality; PSQI score greater than 5. BMI; Body Mass Index=weight/Height^2, Healthy weight: BMI 18.5-25, Overweight: BMI ≥ 25 and Obese: BMI ≥ 30. OR= Odds Ratio, CI= Confidence Interval * statistically significant i.e. p < 0.05

Table 5 Correlation coefficient between the sleep parameters, BMI and Age

	Global sleep quality	Sleep duration	Sleep latency	Age	BMI
Global sleep quality	1.000	**-0.186****	**0.522****	0.069	**0.092***
		<0.0001	<0.0001*	0.138	0.046
Duration of night sleep		1.000	-0.058	-0.060	**-0.120****
			0.207	0.197	0.009
Sleep latency			1.000	0.050	0.082
				0.283	0.076
Age				1.000	**0.532****
					<0.0001*

PSQI; Pittsburgh Sleep Quality Index, value between 0 (no difficulty) and 21 (severe difficulty). BMI; Body Mass Index=weight/Height^2. Spearman's correlation, * p-value for statistical significance

Also, conclusions on gender differences are mixed. In a number of studies, sleep and obesity in women[18] were associated, some noticed an association only in men[4.] This study reported a significant relation between sleep quality and BMI in both sexes. This is presented graphically in figure 1.

BMI measures and sleep duration

A line of research studies has shown an association between higher BMI and short sleep duration, though there is great variability regarding using subjective or objective measures of sleep duration, population selection and the definition of sleep duration[7,19].

In this study, table 3, Overweight/Obese participants tend to sleep significantly less duration than normal body weight cases (p = 0.016). The regression model examined this association, table 4, duration of night sleep was a significant predictor of overweight/obesity even after adjustment of potential confounders.

The findings are in agreement with the results of other studies from different populations all over the world. Hairston et al. studied three US communities documented that a sleep duration of equal or less than five hours had an association with an increase in BMI[20]. Vorona et al. observed that a rise in BMI was correlated with fewer self-reported sleep hours a day in 900 overweight patients.[18] Patel et al. study followed 68,000 U.S. subjects for 16 years, reported that short night sleeping for 5 to 6 hours is associated significantly with more bodyweight[21].

On the other hand, a research showed that low sleep period was linked to weight reduction[22]. Hayes et al. found that the duration of sleep was not related to weight, activity, or diet variables[23]. This finding may be driven, in part, by lack of variance in age and weight.

It is not easy to suggest a mechanism to link between the low duration of sleep and higher BMI. Many authors say that shorter sleep contributes to higher intakes of calories and lower energy consumption. The modern life style can contribute to fewer sleeping hours, resulting in hunger due to higher ghrelin and less leptin[5]. The higher time of wakefulness gives a higher chance for eating, resulting in higher intake of calories. Sleep deprivation can concurrently influence the metabolism of energy, decreasing day and night energy expenditures. Sleep deprivation may also contribute to higher sympathetic tone, higher levels of cortisol and activating inflammatory pathways, impairment in metabolism of glucose resulting in weight gain[5]. Another hypothesis is that sleep deprivation is a symptom of an unfavorable lifestyle.

In brief, our research showed that short duration of sleep-in adults is linked to a higher BMI.

BMI measures associated with sleep timing

Regarding the timing of going to bed, this study reported that 47.5% of the participants go to bed after midnight, of them 60.5% were overweight/obese. This statistically significant relation suggesting that timing of sleep is also an important factor, that late sleepers are more likely to be of higher body weight (table 3). The regression model examined the associations between timing of sleep and sleep quality with overweight/obesity status, table 4, model 1, the timing of going to bed predicted overweight/obesity (BMI > 25), however, this association was affected by other potential confounders, model 2.

These results were not in agreement with the obtained results of Baron's study, an observational study has documented more calories consumed per day among subjects with delayed sleep timing[24]. That higher consumption of calories in the late evening may link between late sleep and risk of obesity.

CONCLUSION

In summary, the study obviously showed a relationship between short duration of sleep with higher likelihood of overweight/obesity in the adult population, whether a cause or a consequence, and must be considered in the overall prevention and treatment of obesity. In addition, the study reported that more than 50 percent of the Egyptian adults is suffering from poor sleep quality. This finding highlights the urgent need to address sleep behaviors as part of routine health care.

A further interventional study incorporating improved sleep quality and sufficient sleep duration with the weight management plan is one of the suggested prospects for future research.

Study limitations

First, the cross-sectional research design, suggests an association not causality. Although, we did adjust for numerous potential covariates affecting both BMI and sleep such as the physical activity, the estimated associations could still be confounded by unmeasured factors; for example, energy intake and family history of obesity. Secondly, sleep quality was measured subjectively, however, PSQI questionnaire represents a valid and reliable instrument for assessing sleep quality. In addition, other self-reported covariates, such as physical activity may cause systematic measurement error may lead to non-differential exposure and outcome misclassification that eventually bias the results. Finally, the sample size is not as large as some studies as that of Hung[8], Vorona[18] or Patel[21], however, we successfully recruited a larger number than the calculated sample size and the random selection of subjects from different sociodemographic background allows for generalization of the findings.

Despite the limitations, we suppose that this research met the proposed aim for evaluating the association of poor quality of sleep and low duration of sleep with body weight in both sex and different age groups in the adult Egyptian population. Also, it offers data for future research.

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