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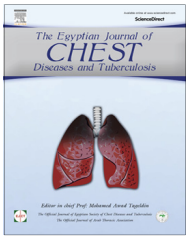

ORIGINAL ARTICLE

Evaluation of sleep related breathing problems and sleep disturbances among health related employees at Fayoum University Hospitals

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KEYWORDS

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Abstract Sleep plays a role in normal metabolism and immunity. Short sleep duration and circadian misalignment are hypothesized to causally contribute to health problems including obesity, diabetes, metabolic syndrome, heart disease, mood disorders, cognitive impairment and excess health care use. Sleep and breathing are tightly linked. Sleep related breathing disorders (SBD) are quite common in the general population. Snoring and obstructive sleep apnea (OSA) are the main SBD for which children and adults are now-a days referred to sleep disorder centers. Accurate screening for sleep problems is essential. Economic estimates demonstrate that sleep disorders are associated with large financial and non-financial costs. The greatest financial costs appear to be non-medical costs related to loss of productivity and accident risk.

The aim of this study: The aim of this study was to screen and determine the prevalence of sleep breathing problems and sleep disturbances among health related employees and workers at Fayoum University hospitals.

Methods: Data were collected from 159 subjects who were employed as a health care worker at Fayoum University hospitals. All patients completed self-administered screening and Berlin questionnaires.

Results: The prevalence of sleep disturbance was 18 (11.3%). Daytime sleep problems were 16.3 ± 5.02 and nocturnal sleep problems were 12.5 ± 4.92. Insomnia was reported in 34%. Snoring was reported in 12.6%. Sleep dissatisfaction was reported in 32.1%.

Abbreviations: OSA, obstructive sleep apnea; SDB, sleep disordered breathing; PSG, polysomnography; CPAP, continuous positive airway pressure; DSM, diagnostic and statistical manual of mental disorders.

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Conclusion: Our findings indicate that the daytime somnolence is common among health care workers followed by nocturnal sleep problems. Urbanization and large scale of industrialization can explain the incidence of sleep problems among rural living.

Introduction

Sleep duration and quality participate in normal metabolism, function of immune system, mood, and cognitive functioning [1]. Short duration of sleep and circadian misalignment are hypothesized to contribute to many problems of health including overweight, diabetes, metabolic syndrome, cardiac disease, mood disorders, cognitive dysfunction, and accidents. Sleep troubles is a common and often underdiagnosed complaint in general medical practice, which can remain over years and has been shown to lead to health problems, greater functional impairment, loss of productivity, and excess use of health care [2]. Recently, it has been identified that the regulation of glucose homeostasis and control of appetite are related to sleep [3]. Sleep and breathing are closely linked. Sleep in humans is produced and regulated by specialized central networks of neurons. Central and peripheral chemo- and mechanoreceptors control normal breathing that are responsible for the reduction in the slope of the ventilator responses to hypoxia and hypercapnia during sleep as compared to wakefulness. Sleep-related breathing disorders (SBD) are common in the general population. Nowadays snoring and obstructive sleep apnea (OSA) are the main SBD for which children and adults are referred to sleep disorder centers [4]. OSA is characterized by the occurrence during sleep of repeated episodes of partial or complete obstruction of the upper airways causing intermittent oxygen desaturations and arousals during sleep as regards the pathophysiological point of view [5]. As a part of OSA chronic exposure to intermittent hypoxia induced impaired glucose tolerance and intermittent hypoxia-induced sympathetic nervous system initiation, production of reactive oxygen species and the production of a whole-body pro-inflammatory state [3].

Obstructive sleep apnea (OSA) is a common disorder that affects at least 2–4% of the adult population [6].

Diagnosis of OSA is done by polysomnography (PSG) [7], however OSA can be effectively treated but it is not easy largely due to accessibility problems. Accurate sleep problem screening is essential which involves multiple screening questionnaires that are based on clinical characteristics that are easy to apply in patients suspected of having sleep disorders [8,9]. Therefore, a screening tool is important to classify patients according to their clinical symptoms, physical examinations, and risk factors to observe high risk patients and their need for PSG and/or further treatment and low risk patients who may not need PSG [10]. Economic estimates show that sleep disorders are associated with large financial and non-financial costs. Given that the greatest financial costs seem to be non-medical costs related to loss of productivity and accident risk [11].

Modern society, identified by extensive use of electricity, demand for high performance at work, shift work, prolonged commute times and activities of multiple leisure time, has much changed human sleep patterns [3].

Purpose

The aim of this study was to screen and determine the prevalence of sleep related breathing problems and sleep disturbances among health related employees and workers at Fayoum University hospitals.

Methods

Study design

The study was a descriptive cross-sectional, conducted at Fayoum University hospitals. This study was reviewed and approved by the ethics committee of the faculty of medicine, Fayoum University. A verbal consent was obtained from all participants before filling the questionnaire.

Subjects

Data were collected from adult subjects who were employed as health care employees and workers at Fayoum University hospitals for the evaluation of suspected sleep related breathing problems and sleep disturbances between January 2013 and February 2014. Criteria for inclusion were as follows: age over 18 years and completion of the sleep disorder screening questionnaires. Patients were excluded if they had received treatment for OSA or if they had an active psychiatric disease.

Screening questionnaires

All patients completed the self-administered screening questionnaire and Berlin clinical questionnaire. Self-administered screening questionnaire was designed to assess the sleep quality of subjects according to DSM IV classification (diagnostic and statistical manual of mental disorders, 4th Edition) of sleep disorders [12]. A self-administered questionnaire was used to assess the presence of snoring, sleep apnea, sleep complaints (satisfaction, quantity, and insomnia). It includes 29 questions organized into three categories. This questionnaire was adapted from Hammad et al. [13]. The first category includes five items on general sleep, the second category includes ten items on daytime sleepiness, and the third category includes 12 items on nocturnal sleep disorders.

Subjects can be classified into 5 levels: (1) less than moderate < 52 (no sleep problems), (2) moderate 52–60 (sleep problems within normal range), (3) more than moderate 61–75 (sleep problems more than moderate), (4) acute 76–90 (acute sleep problems) and (5) severe and chronic sleep 91–104 (severe

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and chronic sleep problems); based on their responses to the individual items and their overall scores. Demographic descriptions like name, age, gender, height, weight, education level, residence and occupations were also collected. Anthropometric measures (height and weight) [BMI of > 30 kg/m^2] were obtained on the day of enrollment.

The Berlin questionnaire has 11 questions grouped in 3 categories. The first category contains 5 questions concerning snoring, witnessed apneas, and the frequency of events. The second category comprises 4 questions addressing daytime sleepiness, with a sub-question about drowsy driving. The third category comprises 2 questions concerning history of high blood pressure (>140/90 mmHg) and BMI of > 30 kg/m^2. Category 1 and 2 were considered positive if there was P2 positive responses to each category, while category 3 was considered positive with a self-report of high blood pressure and/or a BMI of > 30 kg/m^2. Patients were scored as being at "high risk" of having OSA if scores were positive for two or more of the three categories. Those patients who scored positively on less than two categories were identified as being at "low risk" of having OSA [14].

Statistical analysis

Data were analyzed using Statistical Package for Social Science version 16.0 software, SPSS, Inc., Chicago, IL Data were summarized using mean, SD, and range for quantitative variables, number and percentage for qualitative variables. Comparison between groups was done using Chi square test for qualitative variables and Independent *t* test and ANOVA test for quantitative variables. *p* value $\leqslant 0.05$ was considered statistically significant.

Results

Characteristics of study participants

We enrolled 159 participants, 49.7% males and 50.3% women, with a mean age of 33.74 ± 10.46 years old and mean BMI 28.35 ± 4.38 kg/m^2. Participants' age ranged from 18 to 60 years. The majority were married (71,6%), 23.3% were single and 5% were divorced/widow. Regarding residence; rural residence was represented by 51.6% of participants, only 5% were residing from other governorates. The majority were nurses (57.8%), employees were 29.6%, workers 8.2%, and safeguard represented by 4.4%. The majority were educated, informally educated participants represented by 7.5%. The prevalence of sleep disturbance was 18 (11.3%) with a mean age 33.56 ± 10.62 years old. Men were 10 while remaining 8 were females. Patients with sleep disturbance had a higher percent of widow/divorced state (16.7%) which showed a significant difference in relation to normal participants (3.5%)

Table 1 Descriptive and comparative data of the study participants.

	Sleeping disturbance N = 18 (%)	Normal N = 141 (%)	Total participants N = 159 (%)	*p* value
Age < 30 y	7 (38.9)	60 (42.6))	67 (42.1)	0.407
30–39 y	7 (38.9)	35 (24.8)	42 (26.4)	
⩾40 y	4 (22.2)	46 (32.6)	50 (31.4)	
Mean ± SD	33.56 ± 10.62	33.76 ± 10.5	33.74 ± 10. 46	
Sex				
M	10 (55.6)	69 (48.9)	79 (49.7)	0.59
F	8 (44.4)	72 (51.1)	80 (50.3)	
Marital status				
Married	12 (66.6)	102 (72.3)	114 (71.6)	0.05
Single	3 (16.7)	34 (24.1)	37 (23.3)	
Divorced/widow	3 (16.7)	5 (3.5)	8 (5.0)	
Residence				
Rural	11 (61.1)	71 (50.4)	82 (51.6)	0.224
Urban	5 (27.8)	64 (45.4)	69 (43.4)	
Other govern ate	2 (11.1)	6 (4.3)	8 (5.0)	
Occupation				
Nurse	10 (55.6)	82 (58.2)	92 (57.8)	0.44
Employee	4 (22.2)	43 (30.5)	47 (29.6)	
Worker	2 (11.1)	11 (7.8)	13 (8.2)	
Safeguard	2 (11.1)	5 (3.5)	7 (4.4)	
Education				
High	6 (33.3)	65 (46.1)	71 (44.6)	0.3
2ry	10 (55.6)	66 (46.8)	76 (47.8)	
Informal education	2 (11.1)	10 (7.1)	12 (7.5)	
BMI				
Normal	2 (11.1)	34 (24.1))	36 (22.6)	
Overweight	7 (38.9)	63 (44.7)	70 (44.0)	0.028
Obese	9 (50.0)	44 (31.2)	53 (33.3)	
Mean ± SD	30.5 ± 5.13	28.06 ± 4.2	28.35 ± 4.38	

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Table 2 Relation between Berlin and self-administered questionnaire.

Berlin questionnaire	Self-administered questionnaire		Total
	Sleep disorder = 18 (11.3%)	No sleeping disorder = 141 (88.6%)	
Low risk of OSA	0	124	124 (78.0%)
High risk of OSA	18	17	35 (22.0%)

Table 3 Descriptive Statistics of sleep scores.

	General	Daytime	Nocturnal	Total
Mean	9.5	16.36	12.57	42.00
SD	3.05	5.02	4.92	10.49
Minimum	2.00	3.00	4.00	18.00
Maximum	19.00	28.00	25.00	70.00

($p = 0.05$). There was a significant difference about BMI of participants with sleep disorders in comparison with normal participants ($p = 0.028$) (Table 1).

Out of the 159 screened patients 22% were classified as being at high risk of OSA by the Berlin questionnaire while 11.3% were having sleep problems by self-administered questionnaire Table 2.

Table 3 shows descriptive statistics of sleep scores which ranged from general and daytime to nocturnal sleep problems. General sleep problems were 9.5 ± 3.05, daytime sleep problems were 16.3 ± 5.02 and nocturnal sleep problems were 12.5 ± 4.92. Nocturnal sleep scores showed a significant difference between participants in relation to BMI ($p = 0.04$) as shown in Table 4. Table 5 shows the relation between the sleep problem scores and marital state which revealed night sleep scores had a significant difference among widow/divorced participants ($p = 0.006$). Single participants had a significant difference about daytime sleep score ($p = 0.000$).

Insomnia symptom was reported in 34% with M:F ratio of 29:25 and mean age 33.05 ± 10.39 years old. Significant association between insomnia and marital state was found as the majority of 87.5% of widow/divorced take a long time to sleep in comparison with 30.7% and 32.4% of married and single participants, respectively ($p = 0.005$) (Tables 6 and 7).

Snoring was reported in 12.6% with M:F ratio of 13:7 and mean age was 37.26 ± 14.29 years old. There was significant association between snoring and body weight ($p = 0.020$) (Tables 6 and 8). Table 9 shows that there was a significant association between snoring and subtype of occupation as safe guard ($p = 0.023$).

Percent of 32.1 suffered from sleep dissatisfaction, M:F ratio was 24:27 and mean age was 39.35 ± 1.53 years old. Sleep breathing problem was reported in 29.6% with M:F ratio 22:25 and mean age was 35.13 ± 12.70 years old (Table 6).

Discussion

Sleep is a fundamental for biological process that demands to be fulfilled. Inadequate time of sleep can lead to insufficient sleep and disturbance of sleep quality. Insufficient sleep is associated with disturbances in cognitive and psychomotor function including mood, thinking, concentration, learning, memory, and reaction times [15]. Sleep related breathing problems and disorders are often underestimated and misdiagnosed [16]. People with depression were found to be five times more likely to experience sleep-disordered breathing. Treating OSA with continuous positive airway pressure (CPAP) may help depression and create a significant clinical improvement by decreasing both blood pressures [17]. These sleep-related problems cause financial costs on health and non-financial costs on loss of life quality.

The present study evaluated the diagnostic value of screening questionnaire of sleep breathing problems and sleep disorders in health care workers. The risk of sleep disorder was found in 18 (11.3%) subjects, to be increased among male workers in nursing with age of 33.56 ± 10.62. Furthermore risk of sleep disorder was observed to be more in rural living, educated and married health care workers. The mean BMI of sleep disorder population in our study was 30.5 ± 5.13 kg/m^2. There was a significant association between sleep problem with marital status and BMI ($p = 0.05$) ($p = 0.028$), respectively.

Table 4 Correlation between sleep classification scores and BMI.

	Normal and overweight		Obese		p value
	Mean ± SD	Range	Mean ± SD	Range	
General sleep score	9.5 ± 3.2	3–19	9.49 ± 2.89	2–16	0.92
Day time sleep score	16.2 ± 5.04	7–26 ± 5.0	16.7	3–28	0.55
Nocturnal sleep score	12 ± 4.7	4-24	13.7	5–26	0.044

Table 5 Correlation between sleep classification scores and marital state.

	Married		Single		Widow/divorced		p value
	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	Range	
General sleep score	9.3 ± 3.03	2–15	9.8 ± 3.2	3–19	10.9 ± 2.7	8–16	0.298
Day time sleep score	15.6 ± 4.9	3–28	18.6 ± 4.5	8–26	17 ± 4.9	13–27	0.006
Nocturnal score	11.7 ± 4.6	4–25	13.7 ± 4.5	7–24	19.4 ± 5.6	8–25	0.000

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Table 6 Demographic prevalence of selected sleep problem.

	Frequency	Percent	M:F	Age Mean ± SD
Insomnia	54	34.0	29:25	33.05 ± 10.39
Sleep breathing problem	47	29.6	22:25	35.13 ± 12.70
Snoring	20	12.6	13:7	37.26 ± 14.29
Quality of sleep (sleep dissatisfaction)	51	32.1	24:27	39.35 ± 1.53

Table 7 Correlation between marital status and insomnia.

Variables		Married *N* (%)	Single *N* (%)	Widow/divorced *N* (%)	*p* value
Insomnia	No	79 (69.3)	25 (67.6)	1 (12.5)	0.005
	Yes	35 (30.7)	12 (32.4)	7 (87.5)	

Table 9 Correlation between snoring and BMI and occupation.

Variables		Snoring *N* (%)	Non snoring *N* (%)	*p* value
BMI	Normal	2 (10.0)	34 (24.5)	0.023
	Overweight	6 (30.0)	60 (46.0)	
	Obese	12 (60.0)	41 (29.5)	
Occupation	Safeguard	3 (15.0)	4 (2.9)	0.013
	Other jobs	17 (85.0)	135 (87.1)	

This can be explained by the fact that sleep disorders could be more easily predisposed to a weight gain. Obesity and biochemical parameters of metabolic disorders are both closely related to obstructive sleep apnea [18].

Life in the rural society is very simple which is reflected in the way of living, dressing, habits of food and shelter. Natural resources and organic materials are basics in rural communities. They have small supply and family run work, compared to the big supermarkets in urban areas. Many governments have been trying to urbanize more rural areas and provide extra help in forms of technology, medical and other resources. Urbanization comprises having highly advanced technology and science, rapid lifestyle, much more pollution and large range of industrialization, this can help to understand the increasing incidence of sleep disorders among people living in rural areas.

Little is known about the sleep disturbances experienced by our population. Our findings indicate that daytime somnolence is common among a sample of health care workers living at Fayoum governorate followed by nocturnal sleep problems. Our study participants reported daytime symptoms with mean 16.36 ± 5.02, a known risk factor for impaired work performance. Insufficient sleep is a direct contributor to injury and death from motor vehicle and workplace accidents [19]. Daytime sleepiness was reported by Bradley et al. who reported that insomnia, depression, suicidal ideation, and sleep disordered breathing were associated with excessive daytime sleepiness, long work hours, alcohol dependence, and rotating work shifts further increasing the excessive daytime sleepiness [20].

Insomnia is associated with loss of productivity, greater functional impairment, more days of disability due to health problems, and excess health care utilization. Our study participants had insomnia complaints 54 (34%); mean age 33.05 ± 10.39 and 29 were males and 25 were females. Significant association between insomnia and marital status was found where the majority (87.5%) were widowed/divorced. Our results also are similar to the findings of Arber et al. [21] who found that divorced, separated, or widowed men and women were more likely to report sleep difficulties than their married or single counterparts. These findings show that marital state plays an important role in sleep sufficiency in adult life and divorce is linked with an increased risk of future episodes of depression. Marriage seems to be associated with less depression.

There was no significant association between insomnia and BMI in our study. Difficulty initiating sleep has been the most commonly reported symptom to date [22]. It is likely to be linked with increased prevalence of mental and physical conditions associated. Sleep dissatisfaction was high among our female (27) than male (24) participants which was 32.1% (51).

Obstructive sleep apnea has a focal sign which is snoring. Snoring rates in our study were (20) 12.6%, with 13 men and 7 women reporting snoring with mean age 37.26 ± 14.29. BMI is significantly associated with snoring ($p = 0.020$), and this may be due to the increased frequency of obesity and being overweight can make snoring more likely (particularly in case of having increased neck circumference).

There is a significant association between snoring and nocturnal timed occupation and this can be explained by shift work with shorter sleep duration, overtime work combined with midnight shift work which may be important contributors to metabolic syndrome and also circadian misalignment that

Table 8 Correlation between BMI and sleep questionnaires.

Variables		Obese = 53 *N* (%)	Overweight = 66 *N* (%)	Normal = 30 *N* (%)	*p* value
Insomnia	No	37 (69.8)	42 (63.6)	20 (66.7)	0.377
	Yes	16 (30.2)	24 (36.4)	10 (33.3)	
Sleep breath	Regular	35 (66.0)	48 (72.7)	24 (80.0)	0.38
	Other	18 (34.0)	18 (27.3)	6 (20.0)	
Snoring	No	41 (77.4)	60 (90.9)	29 (96.7)	0.020
	Yes	12 (22.6)	6 (9.1)	1 (3.3)	

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can impair metabolic function and glucose homeostasis which leads to weight gain over time.

Forty-seven (29.6%) of our participants were found to be at high risk for sleep related breathing disorder, 22 were males whereas the remaining 25 were females with mean age 35.13 ± 12.70.

This questionnaire is used as a screen for sleep related breathing problems and sleep problems in patients with no history of sleep disorders. A proper understanding of the problem and an integrated hospital-community to guide the patients with OSA through the proper ways and best diagnostic and therapeutic will be able to prevent, or limit, the complications of this disease. The results of this study could be taken as a guide to apply proper educational actions and to raise level of awareness so that this questionnaire could be used to check the possible effects over time.

Conflict of interest

None.

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