

Characterizing sleeping habits and disturbances among Saudi adults

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ABSTRACT

الأهداف: وصف عادات النوم وتقييم مدى انتشار اضطرابات النوم وتحديد العوامل المرتبطة بها بين البالغين السعوديين.

الطريقة: تم دعوة 1720 شخص بالغ للمشاركة في هذه الدراسة المقطعية بين أكتوبر 2014 و مارس 2015م. استخدمنا استبياناً لوصف خصائص النوم نسبة إلى الأمراض المزمنة، وحالة التدخين، والسمنة، والأداء اليومي والعوامل الديموغرافية.

النتائج: كانت نسبة الاستجابة للمشاركة بالدراسة 79.6% (1369 مشاركاً)، كما أظهرت الدراسة بأن 61.6% قد يكون لديهم اضطرابات في النوم و ادعى 18.6% منهم أما تباطؤ أو توقف التنفس أثناء النوم. وأظهرت الدراسة بأن معدل انتشار اضطرابات النوم أعلى لدى السيدات (65.2%). الشعور بالتعب كان مرتبطاً إلى حد كبير مع اضطراب النوم (49% مقابل 19.7%) من المصابين باضطراب النوم يعتقدون إلى حد كبير أنه قد تتأثر قدرتها على أداء المهام اليومية ($p=0.005$). وعلاوة على ذلك، التدخين والسمنة كانت مرتبطة إلى حد كبير باضطرابات النوم ($p<0.01$). أدلى المشاركون الذين يعانون من الربو، وارتفاع ضغط الدم، وأمراض القلب المزمنة والسكري باضطراب النوم ($p=0.016$ - $p=0.001$).

الخاتمة: اضطرابات النوم شائعة بين البالغين السعوديين. ينبغي النظر في تحسين نوعية النوم كهدف مهم لصحة العامة في المملكة العربية السعودية.

Objectives: To characterize sleeping habits, assess sleep disturbance prevalence, and identify associated factors among Saudi adults.

Methods: A total of 1720 adults were approached for this observational cross-sectional study between October 2014 and March 2015. The study took place in Riyadh, the capital of Saudi Arabia. We used a questionnaire to describe sleeping characteristics in relation to existing chronic diseases, smoking status, obesity, daily performance and sociodemographic variables.

Results: The response rate was 79.6% (1369 participants), 61.6% have or may have sleeping disturbances of which 18.6% claimed either slowed or stopped breathing during sleep. Women reported a higher prevalence of sleep disturbances (65.2%). Feeling tired was significantly associated with sleep disturbance (49% versus 19.7%) ($p<0.001$). Approximately 78.4% of those with sleep disturbance significantly believed that their ability to perform daily tasks is affected ($p=0.005$). Moreover, smoking and obesity were significantly associated with sleep disturbances ($p<0.01$). Participants with asthma, hypertension, chronic heart disease, and diabetes mellitus reported significantly more sleeping disturbance ($p=0.016$ to $p=0.001$).

Conclusions: Sleep disturbances are associated with obesity, smoking, chronic health conditions, and lower performance among Saudi adults.

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Sleep is a vital biological process that has repeatedly been associated with human physiological, neurological, and psychological systems' wellbeing.^{1,2} An established body of research over the years strongly links the significance of restorative sleep to cellular repair, maintained homeostasis, learning, memory, metabolic functions maintenance, and neurobehavioral balance.^{3,4}

Epidemiological and experimental studies points to a possible link between sleep disturbances as a risk factor for serious deleterious consequences on health.^{2,4,5}

Moreover, studies that evaluate the proportion of casualties and injuries as a consequence of human error in industry, transport, and telecommunications vary, nonetheless, are consistent in pointing towards the effect of sleep disturbances on daytime sleepiness and general low vigilance.^{1,4} It can be speculated that motor and cognitive impairment due to sleep disturbances are the main factors behind dropped levels of alertness culminating such human errors.¹

Previous studies highlight that people around the world sleep differently.^{6,7} These sleeping patterns were attributed to probably associated factors of which are ethnicity and culture. Several studies aimed to highlight the unique cultural factors that may be associated with constructing the Saudi population sleeping pattern architecture. This fuels the importance of identifying the sleeping characteristics of the Saudi population.

The rationale behind conducting this current study is to describe the sleeping characteristics and disturbances among Saudi adults due to distinctiveness in their environmental and cultural issues catalyzed by a swift modernization. A key unique factor is that Saudi society is virtually all Muslims;⁸ hence, sleep values in Islam such as breaking sleep to pray 'Fajr' (Dawn) which was speculated to cause a higher prevalence of morning typology in one study participants.⁹ Also, lifestyle changes of late night, shopping hours may be well contributing towards bedtime delay.¹⁰ Similar studies from Egypt and Lebanon reported high prevalence of sleeping disturbances among university student and elderly.¹¹⁻¹⁴ There is a rationale to carry out sleep characterization studies in the Saudi population given their context-specific societies. This will probably have an impact on the profile of conditions associated with sleep disturbances. Saudi Arabia is undergoing an epidemiological transition with an increasing prevalence of non-communicable diseases such as obesity, diabetes, thyroid disorders, and coronary heart disease. This is expected to impact the profile of sleeping patterns as well as its relationship with other diseases.^{10,15,16} The aim of this survey was to describe sleeping characteristics and sleeping disturbances among Saudi adults. Moreover, to assess factors that might be associated with sleeping disorders.

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Methods. A cross-sectional study of 1720 Saudi adults aged 18 and above was conducted in Riyadh, the capital of Saudi Arabia with approximately 5 million habitants, between October 2014 and March 2015. Data was collected from all 5 regions of Riyadh. Adults aged 18 and above who have completed the questionnaire were included in the study; there were no exclusion criteria. The survey was carried out upon ethical approval from the Institutional Review Board, King Fahd Medical City, Riyadh, Saudi Arabia.

Sample size calculation. The average prevalence of sleep disturbance across age and gender in context to the study is 22%.¹⁷ We adjusted for finite population across all age groups and gender, and considered the design effect (2.5) and non-response rate of 20%; thus, sample size for the study is 1685.31 (1686) by using the following formula:

Cochran's formula for calculating sample size:

$$n = Z^2 pq / e^2$$

Formula with finite population correction:

$$n = \{N * Z^2 p(1-p)\} / \{d^2(N-1) + Z^2 p(1-p)\}$$

Data collection was accomplished using a self-administered questionnaire based on information obtained from the literature to assess the prevalence and characterize the sleeping habits and disturbances among the Saudi adult population. PubMed search was used to retrieve related literature from 2011 until current date. The questionnaire was divided into 5 sections. Section 1 includes participants' demographics including age, gender, body mass index (BMI), marital status, level of education, occupation and smoking status. Section 2 explored the existence of chronic diseases (hypertension, chronic heart disease, diabetes mellitus, stroke/angina, asthma) by using "Yes" and "No" responses. Section 3 includes questions to assess participants' sleeping habits. Participants were asked about the average sleeping hours per weekday and weekend; response choices were designed to cover average sleeping hours (A - <6 hours, B - 6-7 hours, C - 7-8 hours, D - ≥8 hours). Participants were asked whether they take naps; responses were measured by "Yes" and "No". Moreover, participants were also asked when they do feel most active, whether during the "morning" or the "evening". Section 4, we used 8 questions to explore participants' sleeping disturbances; participants were asked the following questions: whether their physician discussed with them the sleep habits, and if they have ever been diagnosed with sleep disturbance, the presence of difficulty in sleep/frequently awakening. In addition to if they

cannot go back to sleep if they wake up very early, the presence of snoring, breathing difficulties during sleep, the presence of restless leg syndrome also asked whether they take any sleeping medications (physician's prescription/over the counter/herbal). Responses were measured by using "Yes", "No", and "I don't know" choices. Section 5 assessed the effect of present sleeping habits and/or disturbances on social and professional aspects; 5 questions were used in this section including; frequency of feeling tired upon awakening, sleeping during driving, feeling not fresh when they wake up, their believes whether sleep disturbance affects their daily task and absence from work due to sleep disturbance. The association of short sleep duration with participants' characteristics, comorbidities and social and professional aspects was measured using the cut-off reference ≤ 7 hours per night as a definition for short sleep.¹⁸

A pilot study was conducted on 20 Saudi adults, selected from each area of Riyadh proportionally to the population density, to evaluate that the questions were properly phrased and had no ambiguity ensuring the validity of the questionnaire.

The completed questionnaires were entered into SPSS Statistics version 20.0 (IBM Corporation, Somers, NY), and descriptive analysis was performed. To enhance our analysis, we combined the group that declared having sleep disturbances with the group who claimed "maybe" having sleep disturbances. Thus, the statistical analysis was conducted between 2 groups; group one consisted of those who claimed to have or might have sleep disturbance and group 2 was comprised of those who denied. Continuous measures were presented as means with corresponding standard deviations. Categorical data was calculated as frequencies and percentages. The odds ratio was performed with variables of interest for correlation.

Results. Out of the 1720 distributed questionnaire, 1369 participants agreed to participate and have completed the self-administered questionnaire with a response rate of 76.1%. Of those participants, 373 (27.3%) claimed they have sleep disturbance, besides, a 470 (34.3%) adult revealed the possibility of having sleep disturbance. Approximately 526 (38.4%) participants denied they have sleep disturbance. Sleep disturbance was higher among females than males, with a statistically significant gender difference ($p < 0.001$). Participants who were unemployed/housewife they claimed sleeping disturbance more than other occupation categories ($p < 0.001$). Smoking history was

significantly associated with sleep disturbance. Table 1 represents the participants' characteristics.

Body mass index (Kg/m^2), gender, level of education, occupation, and smoking history were bearing significant associations with sleep disturbance in the bivariate analysis. Multivariate evaluation as per binary logistic regression analysis for sociodemographic did not predict any significant relationship with sleep disturbance. Therefore, the forward step conditional regression analysis for sociodemographic depicted BMI (Kg/m^2), occupation and smoking history among the 5

Table 1 - Association of sleep disturbance with participants' characteristics: age, body mass index (BMI), gender, marital status, level of education, occupation, and smoking history.

Participants' characteristics	Yes or maybe (n=843)	No (n=526)	P-value
Age (years)	33.3 \pm 11.8	33.8 \pm 12.3	0.458
BMI (kg/m^2)	29.6 \pm 8.1	28.2 \pm 7.4	0.005
Gender			<0.001
Male	323 (39.3)	248 (48.2)	
Female	499 (60.7)	266 (51.8)	
Total	822 (100)	514 (100)	
Marital status			0.203
Married	512 (61.9)	335 (64.3)	
Widowed	15 (1.8)	6 (1.2)	
Divorced/separated	35 (4.2)	12 (2.3)	
Single/never married	265 (32.0)	168 (32.2)	
Total	827 (100)	521 (100)	
Level of education			0.097
Illiterate	40 (4.8)	15 (2.9)	
Primary	36 (4.4)	21 (4.1)	
Preparatory	60 (7.3)	32 (6.2)	
Secondary/high school	212 (25.7)	114 (22.1)	
College	477 (57.8)	335 (64.8)	
Total	825 (100)	517 (100)	
Occupation			<0.001
Unemployed/housewife	285 (36.3)	126 (26.1)	
Laborer	22 (2.8)	12 (2.5)	
Employee	329 (41.9)	209 (43.3)	
Business	23 (2.9)	22 (4.6)	
Professional	127 (16.2)	114 (23.6)	
Total	786 (100)	483 (100)	
Smoking history			0.012
Current smoker	138 (16.9)	56 (11.0)	
Never smoked	634 (77.7)	425 (83.7)	
Ever smoked	44 (5.4)	27 (5.3)	
Total	816 (100)	508 (100)	

that persisted with significant association. Occupation and smoking history of the 3 and lastly occupation of the socio-demographic variables has been predicted bearing most significant association with sleep disturbance.

Binary logistic regression analysis for comorbidity predicted asthma having a significant relationship with sleep disturbance. Therefore, the forward step conditional regression analysis for comorbidity depicted asthma and chronic heart disease among the 4 that persisted with significant association. Asthma has been predicted with most significant relationship with sleep disturbance.

Hypertension ($p=0.047$), chronic heart disease ($p=0.031$), and asthma ($p<0.001$) were significantly associated with sleep disturbance. Participants' comorbidities are represented in **Table 2**.

Binary logistic regression analysis for comorbidity predicted asthma having a significant relationship with sleep disturbance. Therefore, the forward step conditional regression analysis for comorbidity depicted asthma and chronic heart disease among the 4 that persisted with significant association. Asthma has been

predicted for having most significant relationship with sleep disturbance.

“What is the time you require to fall asleep? Do you have difficulty in sleep + frequently awakening during one night?” Were significantly associated with sleep disturbance as predicted by binary logistic regression. Further on; “Difficulty in sleep + frequently awakening during one night” has been predicted for having most significant relationship with sleep disturbance. Participants' sleeping habits are represented in **Table 3**; out of 160 participants who claimed going to sleep after 1:00 am during weekdays, 131 (82%) belong to group one and 29 (18%) belong to group 2. However, during weekends these figures changed to 59% in group 1 and 41% in group 2. In group 2, 82% declared with slept 7 good nights per week versus 18% of group one ($p<0.001$). In group 1, 86% claimed taking more than 60 minutes to fall asleep versus 1% of group 2 ($p<0.001$). Over 60% of group one had never been diagnosed with sleep disturbance by a physician. Participants who had sleep disturbance had significantly more difficulties in sleep and more frequent awakening during one night ($p<0.001$). Participants who claimed waking up early

Table 2 - Association between sleep disturbance and co-morbidities: hypertension, chronic heart disease, diabetes mellitus, stroke/angina, asthma.

Variables	Yes or maybe n (%)	No n (%)	P-value
<i>Hypertension</i>			0.047
Yes	112 (13.3)	51 (9.7)	
No	730 (86.7)	474 (90.3)	
Total	842 (100)	525 (100)	
<i>Chronic heart disease</i>			0.031
Yes	59 (7.0)	22 (4.2)	
No	783 (93.0)	504 (95.8)	
Total	842 (100)	526 (100)	
<i>Diabetes mellitus</i>			0.308
Yes	105 (12.5)	56 (10.6)	
No	737 (87.5)	470 (89.4)	
Total	842 (100)	526 (100)	
<i>Stroke/angina</i>			0.276
Yes	20 (2.4)	8 (1.5)	
No	821 (97.6)	518 (98.5)	
Total	841 (100)	526 (100)	
<i>Asthma</i>			<0.001
Yes	144 (17.1)	39 (7.4)	
No	698 (82.9)	487 (92.6)	
Total	842 (100)	526 (100)	

Table 3 - Sleeping habits of 1369 participants agreed to participate in this study.

Sleeping habits	Yes or maybe n (%)	No n (%)	P-value
<i>What is the average hours of sleep you get in week days (during past 2 weeks)</i>			<0.001
<6	382 (46.9)	133 (26.3)	
06-07	246 (30.2)	188 (37.2)	
07-08	113 (13.9)	147 (29.1)	
≥8	74 (9.1)	37 (7.3)	
Total	815 (100)	505 (100)	
<i>What is the average hours of sleep you get in weekends (during past 2 weeks)</i>			<0.001
<6	161 (19.9)	51 (10.0)	
06-Jul	194 (24.0)	123 (24.1)	
07-Aug	229 (28.3)	189 (37.0)	
≥8	226 (27.9)	148 (29.0)	
Total	810 (100)	511 (100)	
<i>When do you feel most active?</i>			<0.001
Morning	502 (61.7)	403 (79.0)	
Evening	311 (38.3)	107 (21.0)	
Total	1849 (100)	1169 (100)	
<i>Do you take naps?</i>			0.002
Yes	380 (46.6)	281 (55.5)	
No	435 (53.4)	225 (44.5)	
Total	2975 (100)	1782 (100)	

and not being able to go back to sleep had significantly more sleep disturbance ($p < 0.001$).

Participants' sleeping disturbances are presented in Table 4. "Do you feel not fresh when you wake up, Do you believe your sleep problems affect your daily tasks and Did you ever been absent from work due to sleep disturbance" as predicted by binary logistic regression, had a significant association with sleep disturbance. "Do you feel not fresh when you wake up, and Do you believe your sleep problems affect your daily tasks" were the most significant causes of sleep disturbance. Effect of present sleeping habits and/or disturbances on social and professional aspects is presented in Table 5.

Table 6 showed that short sleep duration during weekdays was statistically significant with gender and occupation. While during weekend days; the age, BMI, hypertension, chronic heart disease, diabetes mellitus, social status, literacy status, and occupation were found statistically significant with short sleep duration.

Table 7 showed that there is a significant association between short sleep duration during weekdays and absence from work among participants ($p = 0.031$). In addition, a significant association was found between short sleep duration during weekend days and sleeping during driving and daily tasks.

Discussion. This study reveals various valuable insights regarding the prevalence, habits, and sleep disturbances of Saudi adults. Most respondents declared or doubted having sleep disturbances. We also found that productivity could be significantly affected by reduced hours of sleep in the Saudi adult population. Our findings are concomitant with a previous study about shift work that contributed to reduced sleep quality and sleep pattern satisfaction¹⁹ that was attributed to social and work dysfunctions and low vigilance and productivity.²⁰ With regards to Saudi population, technology is perceived to have an effect on lifestyle and probably sleep pattern. Previous studies

Table 4 - Participants' sleeping disturbances.

Sleeping disturbance	Yes or maybe n (%)	No n (%)	Total n (%)	P-value
<i>Did your physician discuss with you your sleep habits?</i>				
Yes	93 (71.5)	37 (28.5)	130 (100)	0.027
No	474 (61.4)	298 (38.6)	772 (100)	
<i>Have you ever been diagnosed with sleep disturbance?</i>				
Yes	64 (86.5)	10 (13.5)	74 (100)	<0.001
No	693 (60.4)	455 (39.6)	1148 (100)	
<i>Do you have difficulty in sleep/ frequently awakening?</i>				
Yes	508 (84.2)	95 (15.8)	603 (100)	<0.001
No	274 (41.8)	382 (58.2)	656 (100)	
<i>Do you wake up very early and cannot go back to sleep?</i>				
Yes	489 (72.1)	189 (27.9)	678 (100)	<0.001
No	297 (50.8)	288 (49.2)	585 (100)	
<i>Do you snore?</i>				
Yes	181 (66.3)	92 (33.7)	273 (100)	0.002
No	391 (57.5)	289 (42.5)	680 (100)	
I don't know	202 (68.2)	94 (31.8)	296 (100)	
<i>Do you experience slowing, stopping in your breathing during sleep?</i>				
Yes	115 (81.0)	27 (19.0)	142 (100)	<0.001
No	332 (54.5)	277 (45.5)	609 (100)	
I don't know	318 (65.7)	166 (34.3)	484 (100)	
<i>Do you suffer from uncomfortable feeling in legs during sleep/ evening?</i>				
Yes	285 (75.0)	95 (25.0)	380 (100)	<0.001
No	466 (55.1)	379 (44.9)	845 (100)	
<i>Do you take anything to make you sleep?</i>				
Yes	98 (84.5)	18 (15.5)	116 (100)	<0.001
No	677 (59.2)	466 (40.8)	1143 (100)	

Table 5 - Effect of present sleeping habits or disturbances on social and professional aspects.

Sleeping habits or disturbances	Yes or maybe	No	Total	P-value
<i>How many times you feel tired upon awakening?</i>				
Almost every night	313 (76.5)	96 (23.5)	409 (100)	<0.001
Few nights in a month	149 (71.3)	60 (28.7)	209 (100)	
Few nights in a week	150 (56.0)	118 (44.0)	268 (100)	
Rarely	51 (51.5)	48 (48.5)	99 (100)	
Never stay up late	47 (31.8)	101 (68.2)	148 (100)	
I don't know	75 (54.3)	63 (45.7)	138 (100)	
<i>Do you ever sleep while driving?</i>				
Yes	242 (67.6)	116 (32.4)	358 (100)	0.009
No	367 (58.3)	262 (41.7)	629 (100)	
I don't know	74 (56.9)	56 (43.1)	130 (100)	
<i>Do you feel not fresh when you wake up?</i>				
Almost every day	317 (80.3)	78 (19.7)	395 (100)	<0.001
3 - 4 times a week	146 (69.5)	64 (30.5)	210 (100)	
1 - 2 times a week	169 (60.4)	111 (39.6)	280 (100)	
1 - 2 times a month	48 (46.6)	55 (53.4)	103 (100)	
Never	48 (29.4)	115 (70.6)	163 (100)	
I don't know	48 (48.0)	52 (52.0)	100 (100)	
<i>Do you believe your sleep disturbances affect your daily tasks?</i>				
Strongly agree	213 (78.3)	59 (21.7)	272 (100)	<0.001
Agree	337 (70.6)	140 (29.4)	477 (100)	
Neutral	55 (47.4)	61 (52.6)	116 (100)	
Disagree	128 (54.2)	108 (45.8)	236 (100)	
Strongly disagree	48 (29.8)	113 (70.2)	161 (100)	
<i>Did you ever been absent from work due to sleep disturbance?</i>				
Yes	287 (70.9)	118 (29.1)	405 (100)	<0.001
No	402 (55.1)	327 (44.9)	729 (100)	

Data are presented as number and percentage (%)

showed that frequent use of mobile phone, social medical, and televisions was significantly associated with poor sleeping quality found as a worsening issue in terms of affecting the quality of sleeping.^{21,22} We may collectively infer from these results that chronic non-communicable diseases such as cardiac disorders, diabetes mellitus, and asthma may present a significant association with a sleeping disorder. Previous research linked chronic heart disease to poor blood circulation to the lower limbs which may be linked to restless leg syndrome as a sleep disorder,²³ as well as Asthma, being a possible factor linked to obstructive sleep apnea.²⁴ This prevalence of sleep disturbances highlights a need for sleep medicine health care development; however sleep medicine is still under progressed in KSA, with undervalued importance particularly in areas of clinical service, education, training and research. On the other hand, sleep medicine service is expected to rise significantly in the future. Several challenges to the

progress of sleep medicine in KSA have been identified such as lack of trained technicians, specialists, and funding. A major challenge is expanding the awareness of the high prevalence and serious consequences of sleep disorders.¹⁰

Although the data were utilized from a large sample size from the population, some limitations need to be figured out. First, data analysis was dependent on the report of self-administered questionnaires and this study design is likely to be affected by recall bias that might under or overestimate the truth. Participants possibly might report the duration spent in bed rather than the actual sleeping time. Misleading to inaccurate estimation of the amount or quality of sleep could be contributed to this recall bias. Future studies are recommended to adjust this limitation by adopting different data measurement (laboratory testing or actigraphy) combined with the self-administered survey. Secondly, the causality cannot be drawn from cross-

Table 6 - Association of short sleep duration with participants' characteristics and comorbidities.

Participants' characteristics	Sleep duration in week days (during past 2 weeks)				Sleep duration in weekends (during past 2 weeks)			
	≤7 hours	>7 hours	Total	P-value	≤7 hours	>7 hours	Total	P-value
Age	33.41±11.1	32.45±13.63		0.343	36.35±12.44	30.89±10.84		<0.001
Body mass index	29.78±8.34	28.79±7.06		0.209	30.91±8.51	28.47±7.64		<0.001
Gender				0.025				0.196
Male	257 (81.3)	59 (18.7)	316 (39.7)		128 (41.2)	183 (58.8)	311 (39.3)	
Female	357 (74.5)	122 (25.5)	479 (60.3)		220 (45.8)	260 (54.2)	480 (60.7)	
Social status				0.574				<0.001
Married	386 (78.5)	106 (21.5)	492 (61.6)		242 (49.9)	243 (50.1)	485 (61.1)	
Widowed	11 (84.6)	2 (15.4)	13 (1.6)		11 (78.6)	3 (21.4)	14 (1.8)	
Divorced/separated	24 (70.6)	10 (29.4)	34 (4.3)		14 (40.0)	21 (60.0)	35 (4.4)	
Single/never married	197 (75.8)	63 (24.2)	260 (32.5)		80 (30.8)	180 (69.2)	260 (32.7)	
Number of family members				0.317				0.896
1	166 (77.2)	49 (22.8)	215 (27.9)		88 (41.3)	125 (58.7)	213 (27.7)	
2	215 (81.7)	48 (18.3)	263 (34.1)		120 (45.8)	142 (54.2)	262 (34.1)	
3	215 (74.9)	72 (25.1)	287 (37.2)		128 (44.6)	159 (55.4)	287 (37.4)	
4	1 (50.0)	1 (50.0)	2 (0.3)		1 (50.0)	1 (50.0)	2 (0.3)	
5	3 (75.0)	1 (25.0)	4 (0.5)		2 (50.0)	2 (50.0)	4 (0.5)	
Literacy status				0.913				<0.001
Illiterate	27 (71.1)	11 (28.9)	38 (4.8)		30 (76.9)	9 (23.1)	39 (4.9)	
Primary	26 (78.8)	7 (21.2)	33 (4.1)		16 (51.6)	15 (48.4)	31 (3.9)	
Preparatory	41 (75.9)	13 (24.1)	54 (6.8)		42 (77.8)	12 (22.2)	54 (6.8)	
Secondary/high school	159 (76.8)	48 (23.2)	207 (25.9)		86 (42.6)	116 (57.4)	202 (25.5)	
College	362 (77.7)	104 (22.3)	466 (58.4)		173 (37.0)	294 (63.0)	467 (58.9)	
Occupation				0.002				<0.001
Unemployed/household	189 (70.3)	80 (29.7)	269 (35.4)		140 (51.9)	130 (48.1)	270 (35.8)	
Laborer	14 (63.6)	8 (36.4)	22 (2.9)		13 (61.9)	8 (38.1)	21 (2.8)	
Employee	267 (83.2)	54 (16.8)	321 (42.2)		131 (41.6)	184 (58.4)	315 (41.7)	
Business	16 (72.7)	6 (27.3)	22 (2.9)		12 (54.5)	10 (45.5)	22 (2.9)	
Professional	99 (78.6)	27 (21.4)	126 (16.6)		34 (26.8)	93 (73.2)	127 (16.8)	
Smoking history				0.689				0.086
Current smoker	109 (80.1)	27 (19.9)	136 (17.2)		47 (35.3)	86 (64.7)	133 (16.9)	
Never smoked	468 (76.7)	142 (23.3)	610 (77.2)		280 (45.8)	331 (54.2)	611 (77.7)	
Ever smoked	34 (77.3)	10 (22.7)	44 (5.6)		18 (42.9)	24 (57.1)	42 (5.3)	
Hypertension				0.64				0.001
Yes	86 (78.9)	23 (21.1)	109 (13.4)		62 (58.5)	44 (41.5)	106 (13.1)	
No	542 (76.9)	163 (23.1)	705 (86.6)		293 (41.7)	410 (58.3)	703 (86.9)	
Chronic heart disease				0.946				<0.001
Yes	43 (76.8)	13 (23.2)	56 (6.9)		38 (69.1)	17 (30.9)	55 (6.8)	
No	585 (77.2)	173 (22.8)	758 (93.1)		317 (42.0)	437 (58.0)	754 (93.2)	
Diabetes mellitus				0.627				<0.001
Yes	76 (75.2)	25 (24.8)	101 (12.4)		60 (61.2)	38 (38.8)	98 (12.1)	
No	552 (77.4)	161 (22.6)	713 (87.6)		295 (41.5)	416 (58.5)	711 (87.9)	
Stroke/angina				0.756				0.055
Yes	16 (80.0)	4 (20.0)	20 (2.5)		13 (65.0)	7 (35.0)	20 (2.5)	
No	611 (77.0)	182 (23.0)	793 (97.5)		342 (43.4)	446 (56.6)	788 (97.5)	
Asthma				0.491				0.075
Yes	108 (79.4)	28 (20.6)	136 (16.7)		70 (50.7)	68 (49.3)	138 (17.1)	
No	520 (76.7)	158 (23.3)	678 (83.3)		285 (42.5)	386 (57.5)	671 (82.9)	

Table 7 - Association of short sleep duration with social and professional aspects.

Variables	Sleep duration in week days (during past 2 weeks)			P-value	Sleep duration in weekends (during past 2 weeks)			P-value
	≤7 hours	>7 hours	Total		≤7 hours	>7 hours	Total	
<i>How many times you feel tired upon awakening?</i>				0.961				0.582
Almost every night	113 (40.8)	164 (59.2)	277 (36.5)		208 (74.3)	72 (25.7)	280 (36.7)	
Few nights in a month	66 (44.3)	83 (55.7)	149 (19.7)		123 (81.5)	28 (18.5)	151 (19.8)	
Few nights in a week	73 (42.9)	97 (57.1)	170 (22.4)		130 (77.8)	37 (22.2)	167 (21.9)	
Rarely	23 (46.0)	27 (54.0)	50 (6.6)		41 (82.0)	9 (18.0)	50 (6.6)	
Never stay up late	15 (42.9)	20 (57.1)	35 (4.6)		26 (74.3)	9 (25.7)	35 (4.6)	
I don't know	35 (45.5)	42 (54.5)	77 (10.2)		61 (77.2)	18 (22.8)	79 (10.4)	
<i>Do you ever sleep while driving?</i>				0.977				0.019
Yes	98 (42.4)	133 (57.6)	231 (35.0)		188 (80.0)	47 (20.0)	235 (35.4)	
No	151 (42.4)	205 (57.6)	356 (53.9)		277 (77.8)	79 (22.2)	356 (53.6)	
I don't know	30 (41.1)	43 (58.9)	73 (11.1)		47 (64.4)	26 (35.6)	73 (11.0)	
<i>Do you feel not fresh when you wake up?</i>				0.223				0.135
Almost every day	141 (46.5)	162 (53.5)	303 (40.6)		240 (78.4)	66 (21.6)	306 (40.7)	
3 - 4 times a week	56 (39.4)	86 (60.6)	142 (19.0)		106 (74.6)	36 (25.4)	142 (18.9)	
1 - 2 times a week	61 (37.7)	101 (62.3)	162 (21.7)		130 (77.8)	37 (22.2)	167 (22.2)	
1 - 2 times a month	18 (39.1)	28 (60.9)	46 (6.2)		38 (84.4)	7 (15.6)	45 (6.0)	
Never	15 (33.3)	30 (66.7)	45 (6.0)		27 (61.4)	17 (38.6)	44 (5.9)	
I don't know	24 (50.0)	24 (50.0)	48 (6.4)		37 (78.7)	10 (21.3)	47 (6.3)	
<i>Do you believe your sleep problems affect your daily tasks?</i>				0.642				0.016
Severe	93 (45.4)	112 (54.6)	205 (27.3)		149 (73.4)	54 (26.6)	203 (26.9)	
Medium	139 (43.0)	184 (57.0)	323 (43.1)		271 (82.1)	59 (17.9)	330 (43.7)	
Low	49 (39.8)	74 (60.2)	123 (16.4)		96 (77.4)	28 (22.6)	124 (16.4)	
Never	22 (47.8)	24 (52.2)	46 (6.1)		32 (71.1)	13 (28.9)	45 (6.0)	
I don't know	19 (35.8)	34 (64.2)	53 (7.1)		34 (64.2)	19 (35.8)	53 (7.0)	
<i>Did you ever been absent from work due to sleep disturbance?</i>				0.031				0.893
Yes	103 (36.9)	176 (63.1)	279 (41.8)		219 (78.5)	60 (21.5)	279 (41.6)	
No	176 (45.2)	213 (54.8)	389 (58.2)		306 (78.1)	86 (21.9)	392 (58.4)	

sectional studies, a common limitation by surveys. Therefore, the conclusion of this survey will only highlight the associated factors with sleep disturbance among Saudi adults.

Overestimation of the real prevalence of sleep disturbance could be contributed to combine the “maybe” responders with those who reported sleep disturbance. However, previous studies concerned about the risk of answers overlapping in people who might understand the wording in different ways.²⁴ saying that, this might be beneficial for the responders in adding a “don't know” or “maybe” choices for some questions, to provide more options for those who are not decisive to which group they belong.²⁵

Our study provides a significant value to the literature of sleep disturbance in addressing the association of short sleep duration with participants' sociodemographic

characteristics and comorbidities, in addition to the association with the social and professional aspects. In consistence with previous studies,²⁶⁻²⁸ our study revealed that short sleep duration could adversely affect the health and the social and professional life.

Prospective longitudinal studies are recommended to collect data in terms of professional performance, behaviors, sleep characteristics, and health status. Moreover, cohort studies based on sleep disturbance tests will give an in-depth understanding of the association found in our study and to consider the previously mentioned elements.

Transforming our findings into a preliminary public health policy to enhance the awareness of sleep disturbance is recommended. Educating the public about the benefits of sleeping adequacy and quality might be considered in the potential strategies, to improve their sleep health. Modifiable associated factors

like sleeping duration and other sleep problems should be considered into account.

Study limitations. This cross-sectional design does not draw causality relationship. In addition, recall bias of participants cannot be ruled-out, as well as, participants may exaggerate their responses regarding sleep durations.

In conclusion, this study evaluated sleeping habits in a Saudi adult population-representative sample. Sleep disturbances are prevalent among Saudi adults. Improving sleep quality should be considered an emerging and important public health objective in Saudi Arabia.

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