

Sleep hygiene, sleep-related problems, and their relations with quality of life in a primary-care population in southwest Saudi Arabia

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ABSTRACT

Background: Little is recognized about factors affecting poor sleep hygiene and relations of sleep problems with the quality of life among adults. **Aims:** To evaluate sleep hygiene, explore its associated factors, assess the prevalence of excessive daytime sleepiness (EDS) and insomnia, and their relations with sleep hygiene. Besides, correlate sleep problems with life quality. **Methods:** A representative sample of primary healthcare population was surveyed using questionnaires comprising sociodemographic characters, personal lifestyles, validated Arabic versions of Epworth sleepiness scales, Athens insomnia scale, short-form health survey questionnaire (SF-12), and developed Arabic sleep hygiene index (SHI). **Results:** A total of 401 adults participated in the study. The average SHI score was 17.25 ± 7.33 . Poorer sleep hygiene was significantly detected in younger age, unmarried, unemployed, smokers, and energy drinks consumers ($P < 0.05$). Positive significant correlations were correlated with cellphone and video-gaming duration. About 56.61% and 39.90% of participants suffered insomnia symptoms and EDS, respectively. Significant poorer SHI was detected among insomnia and EDS sufferers. Negative significant correlations were observed between scores of both components of SF-12 and EDS, insomnia, and SHI. **Conclusion:** Significant negative associations were detected between SHI, EDS, insomnia, and both components of life quality. The role of sleep hygiene education programs in the promotion of sleep and quality of life need to be considered.

Keywords: Adults, daytime sleepiness, insomnia, quality of life, sleep hygiene

Introduction

Sleep hygiene could be defined as personal behaviors and environmental routines that support sleep and avoid activities that disturb or delay sleep.^[1] Poor sleep hygiene is thought to be one of the contributing factors for sleep-related problems including insomnia and excessive daytime sleepiness (EDS).^[2-5] Therefore,

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sleep hygiene programs might help amend sleep quality and reduce the burden of sleep-related problems.^[6-8] It is suggested that interventions for adjusting sleep hygiene behaviors may help in reducing the risk of sleep-related problems.^[9,10]

Poor sleep, insomnia, and daytime sleepiness are considered serious public health problems due to their increasing prevalence and dangerous consequences. These consequences include physical and mental health impairments, diminished productivity, accident proneness, increased medical utilization, and elevated risk of psychiatric disorders.^[4,7,8,11]

Today's life technology and modern lifestyle provide many potential factors that could implicate sleep hygiene. These factors include easy 24 h per day access to the internet; online media interaction; computer, smartphone, and television viewing; and video game addiction.^[12] Besides, stressful life conditions, smoking, caffeine, energy drinks, and unhealthy dietary habits may have a disruptive effect on sleep and may exaggerate sleep-related problems.^[13,14]

There are few studies evaluating sleep hygiene, its associated factors, and its functional outcomes. Therefore, the objectives of this study were to evaluate sleep hygiene behaviors and explore the factors associated with it; to assess the prevalence of EDS and insomnia symptoms, and their relationship with sleep hygiene; and to correlate sleep hygiene behaviors, insomnia, and EDS with health-related quality of life (HRQOL).

Methods

Study design and setting

A cross-sectional survey was conducted in the primary healthcare centers (PHCCs) in Abha city, Aseer region, southwestern Saudi Arabia. Abha city incorporates 11 PHCCs delivering primary care services for around 421,921 persons.

Study population

The study targeted all adult subjects who attended the studied PHCCs for any purpose throughout the study time. The study extended from June till August 2018. The exclusion criteria were people below 18 years old, noncooperative, pregnant women, and severely ill subjects.

Sample size and sampling method

Using Epi info program version 7.2 with a conservative anticipated prevalence of sleep-related problems of 50%, margin of error 5%, and confidence level of 95%, the minimal calculated sample size necessary for the study was estimated to be 385 subjects. To manage potential nonresponse, a sample of 418 persons was planned. From every PHCC, 38 subjects were selected by systematic random technique.

Study tools and data collection

A specially designed Arabic anonymous paper-based survey was built by the researchers. It comprised the following

sections: a) sociodemographic characteristics, namely, age, gender, marital status, education, job, and family income; b) personal lifestyles as smoking, caffeine drinking, cellphone use, and video gaming; c) validated Arabic version of Epworth sleepiness scale (ESS); d) Arabic Athens Insomnia Scale (AIS); e) Arabic version of sleep hygiene index (SHI); and f) Arabic version of Short Form Health Survey questionnaire (SF-12). Participants voluntarily got involved in the study. Data were collected by self-report at the PHCCs. For illiterate participants and elders (2.51% and 1.24% of participants, respectively), researchers assisted them in completing the questionnaire through personal interviews using simple and understandable words. Informed oral approval was attained from each contributor and an anonymous questionnaire was used to confirm the confidentiality of data. The estimated time for questionnaire completion was 10–15 min.

Validation of the Arabic tools

- **Arabic version of the Epworth sleepiness scale (ESS)**

English version of ESS^[15] is validated across different countries and cultures. It was translated into Arabic language, modified to adapt culture in Arabic populations, and validated.^[16] The total ESS score is the aggregate of the 8-item grades. The total score scale from 0 to 24 points. The presence of EDS was considered when the total ESS score has an estimate of more than 10, with higher scores indicating worse daily sleepiness. Its reliability was assessed and was found to be substantially high (overtime intra-class correlation coefficient = 0.86).^[16]

- **Arabic version of Athens Insomnia scale (AIS)**

Similarly, AIS is a validated survey to explore insomnia among adults.^[17] It was translated and examined in a previous Arabic study.^[18] It consists of 8 items related to insomnia symptoms. Each item score extended from 0 to 4 according to the degree of symptoms. The total score varied from 0 to 32 with greater scores point towards more insomnia symptoms. Subjects with a total estimate of 6 points or higher were considered suffering from insomnia.^[19] The reliability of the Arabic version was examined in a previous study and found acceptable (Cronbach's alpha = 0.77).^[20]

- **Arabic version of the sleep hygiene index (SHI)**

SHI is a validated instrument that has been established to evaluate sleep hygiene conduct. It included 13 self-reported questions. Subjects were requested to show how regularly they engage in certain performances (always, frequently, sometimes, rarely, never). The total SHI score is the summation of the 13-item marks. The total score scale lies between 0 and 52. Greater scores are suggestive of poorer sleep hygiene.^[1] The English version of SHI was translated to Arabic independently by two bilingual translators (the first two authors). The two versions were revised and combined and then back-translated. The Arabic version and back-translation were compared and refined to ensure that both

versions became conceptually and linguistically compatible. The validity of the final Arabic version was examined by a panel of experts from the Department of Family and Community Medicine, Faculty of Medicine, King Khalid University, and approval was obtained. Content validity for the items and total score ranged from 0.85–0.97.

• Short-form Health Survey questionnaire (SF-12)

SF-12 is a valid measure to examine HRQOL among general and specific populations. It contains 12 items that assess the different functional aspects of health. The scoring of the SF-12 questionnaire was based on the method described by Ware and colleagues. Physical (PCS) and mental (MCS) components scores were measured for each participant as a proxy of physical and mental HRQOL.^[21] The used Arabic version of SF-12 was developed and validated by a previous study.^[22] According to the previous study, the Cronbach's alpha was equal to a value of 0.84, which indicates acceptable reliability. SF-12 scores are extending from 1 to 100, with greater scores signifying the good quality of physical or mental health conditions.

Data analysis

The obtained data were reviewed and refined. The analysis was done by SPSS program, version 22 software package (IBM, North Castle, NY, USA). Scores of SHI, EDS, AIS, and mental and physical components of HRQOL were inspected for normality distribution using the Kolmogorov-Smirnov normality test and found non-normally distributed (P values < 0.05). Mann-Whitney U test and Kruskal-Wallis H test were operated to compare the average ranks of two or more groups, respectively. Spearman's correlation coefficient was applied to assess the strength and direction of the relation between two continuous variables. Multiple stepwise linear regression model was done to explore the independent explanatory factors for SHI. All sociodemographic factors, personal habits, insomnia, and EDS were included in the model. The individual effect of the predictors was assessed by the regression coefficient which indicates the amount of change in the sleep hygiene per unity change in each predictor. A hierarchical linear regression model was used to examine the age, sex-adjusted relation between SHI, insomnia, and EDS and participants' physical and mental health composites of HRQOL. P value of less than 0.05 was considered statistically significant.

Ethical approval

All actions done in this research were in agreement with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The research proposal was approved by the Ethics and Research Committee of the College of Medicine of King Khalid University (ERC# 2018-04-07). Official consent was taken from the health sector in Abha City before data collection.

Results

Description surveyed subjects

The survey comprised 401 persons who attended studied PHCCs. Their age extended from 18 to 65 years old with an average age of 31.55 ± 9.02 years. Majority of participants were in the age category of 25–40 years (60.35%), females (54.11%), secondary and above education (83.04%), married (58.35%), unemployed (housewives, retired, and without a permanent job) (48.88%), having sufficient income (67.08%), and currently non-smokers (90.27%) [Table 1].

Univariate analysis for the factors related to SHI

Table 1 shows that the average SHI score was 17.25 ± 7.33 . The higher average score was significantly detected in younger age groups, unmarried subjects, unemployed, smokers, and energy drinks consumers ($P < 0.05$). Besides, it was positively correlated with duration of cellphone use ($r = 0.26$, $P = 0.001$) and video gaming ($r = 0.40$, $P = 0.001$).

Table 1: Sleep hygiene index scores by sociodemographic characteristics and personal habits

Characteristics	n (%)	Sleep hygiene index score Mean \pm SD	P
Overall	401 (100)	17.25 \pm 7.33	-
Age (years)			
<25 ^a	89 (22.19)	20.17 \pm 6.09	
25-40	242 (60.35)	16.92 \pm 7.14 *	0.001
>40	70 (17.46)	14.67 \pm 8.29 *	
Gender			
Male	184 (45.89)	17.42 \pm 7.97	
Female	217 (54.11)	17.10 \pm 6.77	0.657
Education			
< secondary	68 (16.96)	15.85 \pm 6.81	
Secondary and more	333 (83.04)	17.53 \pm 7.42	0.080
Marital status			
Married	234 (58.35)	16.03 \pm 7.32	
Unmarried	167 (41.65)	18.95 \pm 7.03	0.001
Occupation			
Governmental employee	157 (39.15)	17.03 \pm 7.58	
Military	23 (5.74)	13.43 \pm 6.25*	0.010
Free work	25 (6.23)	15.12 \pm 6.71*	
Unemployed ^b	196 (48.88)	18.14 \pm 7.17	
Income			
Sufficient	269 (67.08)	17.85 \pm 7.11	
Insufficient	131 (32.67)	16.55 \pm 7.67	0.080
Smoking status			
Smoker	39 (9.73)	20.41 \pm 7.90	
Non-smoker	362 (90.27)	16.91 \pm 7.20	0.004
Energy drink			
Yes	88 (21.95)	19.77 \pm 7.02	
No	311 (77.56)	16.48 \pm 7.26	0.001
Caffeine intake			
≤ 3 cups	214 (53.37)	17.26 \pm 7.44	
> 3 cups	187 (46.63)	17.22 \pm 7.23	0.966
Cellphone use duration (mean \pm SD h/day)	(7.05 \pm 5.21)	$r=0.26$	0.001
Video games players	108 (26.93)	$r=0.40$	0.001
Duration (mean \pm SD h/day)	(2.83 \pm 3.35)		

^a=Reference group in post-Hoc test, * = Significant post hoc test ($P < 0.05$)

Further analysis revealed that most of the participants (84.30%) in the age group <25 years were unemployed and their average cellphone use (9.18 ± 6.08 h/day) was significantly greater ($P < 0.05$) contrasted to other age groups.

Relation of sleep hygiene with sleep-related problems

As shown in Table 2, the rates of insomnia symptoms and EDS were 56.61% and 39.90%, respectively. The average SHI score was significantly ($P < 0.05$) higher among participants suffering from insomnia (19.22 ± 7.27) and EDS (18.82 ± 7.40) compared to others.

Multiple linear regression model for predictors of sleep hygiene

Table 3 demonstrates the results of the linear regression model of all sociodemographic factors, personal habits, and sleep-related problems included in the univariate analysis. Age, smoking, video gaming, and insomnia were found statistically significantly associated with SHI scores. Increasing age was associated with decreasing SHI scores (better sleep hygiene). On the other hand, smoking was positively associated with higher SHI scores compared to nonsmokers (poor sleep hygiene). Similarly, increasing in video gaming duration was associated with increases in SHI scores. Besides, participants with insomnia had a higher SHI score.

Correlations between scores of HRQOL composites, SHI, and sleep-related problems

As demonstrated in Table 4, negative significant correlations were found between scores of both physical and mental health composites of SF-12 and EDS score ($r = -0.20$, $P = 0.001$ and $r = -0.10$, $P = 0.05$, respectively), insomnia score ($r = -0.29$, $P = 0.001$ and $r = -0.37$, $P = 0.001$, respectively), and SHI score ($r = -0.10$, $P = 0.04$ and $r = -0.38$, $P = 0.001$, respectively).

Age and sex-adjusted multiple linear regression for a predictor of HRQOL

Table 5 shows the age and sex-adjusted linear regression model for predictors of physical and mental composites of HRQOL. EDS, SHI, and insomnia showed negative significant relationships with the physical composite of HRQOL ($P < 0.05$). On the other hand, insomnia and SHI were the only significant factors associated with decreased mental health composite ($P < 0.05$).

Discussion

The present survey examined sleep hygiene, evaluated prevalence rates of insomnia symptoms and EDS, and assessed their relations with HRQOL among adults visiting PHCCs in southwest Saudi Arabia. SHI refers to the average scores of behaviors that impact sleep quality and sleep quantity.^[1] In the present study, the average SHI score was 17.25 (SD = 7.33) This indicates that sleep hygiene items-scores ranged between “never”

Table 2: Relationship between sleep hygiene index and sleep-related problems

Sleep-related problems	n (%401)	Sleep hygiene index Mean±SD	P
Insomnia			
No	174 (43.39)	14.67±6.60	0.001
Yes	227 (56.61)	19.22±7.27	
Excessive daytime sleepiness			
No	241 (60.1)	16.19±7.11	0.001
Yes	160 (39.9)	18.82±7.40	

Table 3: Multiple stepwise linear regression model for predictors of sleep hygiene

Independent factors	B	SE	P
(Constant)	30.17	5.03	0.001
Age in years	-0.24	0.11	0.032
Smoking	3.75	1.83	0.043
Video-gaming duration	0.38	0.12	0.039
Insomnia	0.24	0.10	0.044

B=Regression coefficient, SE=Standard error

Table 4: Correlation between scores of quality of life composites and sleep hygiene index, and sleep-related problems

Sleep-related problems	Quality of life			
	Physical Health Composite score		Mental Health Composite score	
	r	P	r	P
Daytime sleepiness score	-0.20	0.001	-0.10	0.050
Insomnia score	-0.29	0.001	-0.37	0.001
Sleep hygiene score	-0.10	0.040	-0.38	0.001

Table 5: Multiple hierarchical linear regression model for age and sex adjusted sleep hygiene index, and sleep-related problems as predictor factors of quality of life composites

Factors [#]	Quality of life			
	Physical Health Composite score		Mental Health Composite score	
	B	P	B	P
Daily sleepiness score	-0.31	0.004	0.04	0.732
Insomnia score	-0.55	0.001	-0.69	0.001
Sleep hygiene	-0.03	0.671	-0.46	0.001

[#]=Adjusted for age and sex, B=regression coefficient.

and “rarely.” Therefore, in current study sleep, hygiene behaviors seemed to be acceptable.^[1,3,23]

Poorer sleep hygiene was significantly detected in younger subjects. The same result was in prior studies using the same SHI among different populations.^[5,24] This could be explained according to our results by the fact that most of the younger participants were unemployed and hence they may lack the responsibility for an early wake-up. In addition, they were more engaged in social media, video gaming, and cellphone use which may negatively impact their sleep hygiene.^[14,25]

In the present study, unmarried individuals had poorer sleep hygiene versus married. A significant relationship between marriage and sounder sleep behaviors has been described by previous studies.^[26,27] The possible explanations could be that married persons tend to reside in a more clean and quiet environment^[28] and have more emotional support, social integration, and security.^[29]

The poorer sleep hygiene observed in the current study among unemployed individuals is in accordance with a previous study that reported a significant association between sleep problems, poorer sleep, and unemployment.^[27,30] This may be related to the fact that work rules of on-time attendance for employees help to adjust sleep behaviors.^[14]

The present study identified poorer sleep hygiene among smokers. Studies showed that smoking stimulates alertness, wakefulness, and impairs sleep hygiene.^[4,31]

The findings of the current studies endorse the reported association of energy drinks and impaired sleep hygiene.^[13] The relation between energy drinks and poor sleep hygiene may be bidirectional. The high caffeine content in energy drinks may cause arousal and alertness which consequently impairs sleep and sleep quality. Besides, subjects complaining of sleepiness and/or fatigue due to deficient sleep duration and sleep interruptions are more liable to consume energy drinks.^[32]

According to the present study, all the studied subjects are users of cell phones, and sleep hygiene gets worse with the increased duration of cell phone use. Texting and media interactions mediated by smartphones within the time seeking to fall asleep or operating smartphones in bed have clear implications for sleep and may interfere with the capability to fall asleep causing insomnia.^[12] Likewise, an association has been found between the usage of cellphones after “lights out” and sleep interruptions.^[33]

Furthermore, the present study may suggest a significant negative association between video gaming duration and sleep hygiene. This seems important as about one-quarter of the participants played video games. The previous study reported the behavior of postponing sleep and sacrificing sleep for playing.^[25]

In the present study, about 56% of the participants were suffering from insomnia symptoms. This was lower than reported among adults in Riyadh, Saudi Arabia (77.70%)^[34] in Malaysia (60%)^[35] but higher than that reported in Japan (21%).^[36] Our study results revealed poorer sleep hygiene among participants suffering from insomnia symptoms. However, currently, there is an insufficient and unconfirmed indication for the efficiency of sleep hygiene education as a treatment tool for insomnia.^[4,37] Further clinical trials may be suggested to establish the role of sleep hygiene education programs for the prevention and control of insomnia symptoms.

In the present study, 39.90% of the participants suffered from EDS. The prevalence of EDS varies widely from 2% to 37%

in the general population and may reach to 84% in certain occupations. This variation may be explained by differences in assessment tools, target population, occupation, and underlying comorbidities.^[2,35] The current study reported poorer sleep hygiene among those having EDS. This is consistent with prior studies that found that erratic and unhygienic sleep practices result in sleep deprivation and daytime sleepiness.^[38]

In the present study, results of age and sex multivariable linear regression revealed clear negative associations between sleep hygiene and insomnia and both mental and physical composites of HRQOL. Besides, EDS was negatively predicting the physical health composite of HRQOL. These results confirm the findings of previous studies regarding the outcomes of sleep problems which may include physical and mental function impairments and decreased quality of life.^[4,11]

Certain limitations must be noticed when interpreting the outcomes of the current study. Firstly, being cross-sectional makes it difficult to recognize the direction of a particular relationship and to endorse causality. Secondly, the dependence on subjective measurements of variables, which may enhance the probability of biases. However, the usage of valid instruments may reduce this possibility. Besides, the results may not be representative of the whole adults as we studied only those who visited the PHCCs for any reason (seeking care or accompanying).

Conclusions

The study suggested several factors associated with poor sleep hygiene including younger age, unmarried state, unemployment, smoking, energy drink consumption, and increasing duration of the cellphone. Insomnia and EDS are prevalent problems and significantly associated with poorer sleep hygiene. The significant negative associations detected between sleep hygiene, EDS, insomnia, and quality of life may suggest a possible role for maladaptive sleep hygiene practices. Primary care physicians should screen patients with sleep-related problems for sleep hygiene practices to get a better treatment outcome. It is suggested to implement a sleep hygiene education program for primary care population with sleep-related problems. Prospective cohort and intervention studies are recommended to investigate the possible contributing role of poor sleep hygiene in the development of insomnia and EDS. Besides, the efficacy of sleep hygiene education programs as a component of the comprehensive treatment plan for insomnia and quality of life promotion should be examined thoroughly through appropriate clinical trials.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have

given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Ethical considerations

The study was conducted following the Declaration of Helsinki, and the protocol was approved by the Ethics and Research Committee of the College of Medicine of King Khalid University

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Conflicts of interest

There are no conflicts of interest.

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