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Research Article

Sleep Quality and its Lifestyle Associated Factors among Secondary School Students in an Egyptian City

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Abstract

Introduction: sleep is critically important to human being as it can properly maintain mental and physical health.

Study objectives: to determine the predictors of poor sleep quality among secondary school students in Egyptian city.

Material and Methods: a cross sectional study was conducted among secondary school students in Assiut. students were selected randomly by multistage stratified random sampling technique Data was collected using a self-administered questionnaire that included demographic data, Pittsburgh Sleep Quality Index (PSQI), lifestyle factors associated with poor sleep quality.

Results: The prevalence of poor sleep among participants was 72.5%. poor sleep quality was more prevalent among females, public school students, urban residents and male students who use illicit drugs. Significant Correlates of poor sleep quality by multivariate analysis were urban residence, using illicit drugs, using internet and mobile phones, irregular breakfast and dinner taking, regular eating carbohydrate and snacks, drinking caffeinated drinks and daytime napping.

Conclusion: poor sleep quality was critically important problem among secondary school student with many lifestyle factors as using illicit drugs, using internet and mobile phones for long time, irregular breakfast and. Dinner time, caffeinated drinks after 6pm and day time napping. Increasing the awareness about healthy sleep is an essential priority especially by focusing programs on adolescents with lifestyle risk factors.

Keywords: Sleep quality; Lifestyle correlates; Secondary schools

Abbreviations: PSQI: Pittsburgh Sleep Quality Index

Introduction

Sleep is a critically important to human being as it can properly maintain mental and physical health. Good quality of sleep helps in cognitive restitution, learning, decision making, memory consolidation and processing of an individual [1,2]. Previous studies have found that poor sleep has associated with weight gain, obesity, daytime sleepiness, exhaustion, impaired glucose tolerance and diabetes, depression and anxiety, impaired memory, and higher risk of motor vehicle accidents [3-8].

Adolescents' aged between 10-19 years old suffering poor sleep quality is a major worldwide concern [9]. The recommended sleep duration for adolescents is between eight to ten hours of sleep per night in order they could to function well [10]. The transition from childhood to adolescents mostly happens during their schooling environment. During this transition period several biological, physical and psychological aspects of changes will occur to the adolescent. During this period the adolescents suffer from increasing pressures from family, school, social and even the environmental that indirectly contribute towards the delay in sleep timing together with a biological sleep phase delay causing poor sleep quality [11]. Adolescents experience rigid early school start times, elevated social and academic demands, and increased

exposure to electronic media, all of which contribute to poor sleep quality [12]. Reduction in sleep quality and sleep duration across populations was found to be linked to increased social and work demands, changes in lifestyle, smoking, alcohol, increasing use of technology, current sexual activity, dietary factors, caffeine intake and level of physical activity [13-20]. This study aimed to determine the predictors of poor sleep quality among secondary school students in Assuit, Egypt. The findings from this study will add new knowledge in the respective field and will provide useful information for the government or policymakers in terms of planning an intervention or a campaign targeting the secondary school students by focusing on the significant predictors of poor sleep quality of this study. Hence, it will give a wake-up call for better health and wellbeing for the future generation.

Material and Methods

A cross sectional study was conducted among 829 secondary school students selected in their second year.

Sample size

Sample size was calculated using Epi- Info, version 7 for descriptive study design. according to the student affairs administration in education high authority, the total number of registered students in the second year of secondary school was. 7,686 students. Based on the least prevalence of poor sleep quality in adolescents from other studies. The calculated number was 375 students. In this study, a multistage stratified random sampling technique was used to select the study sample to correct for the difference in design the sample size was multiplied by the design effect (2); the result equaled 750. An increase in the sample by 10% is used to account for incomplete questionnaires and non responders; the final calculated sample was 825 students.

Sample design

The target students were selected randomly by multistage stratified random sampling technique. Firstly, the schools were stratified into public, private, and technical secondary schools, with further stratification into boys' and girls' schools. From every stratum one school was randomly selected, thereby giving a total of four boys' schools and four girls' schools. Out of public schools' strata two schools were selected to include different city regions. Secondly, according to the number of students in the second year in every secondary school, the total sample size was divided proportionately. Lastly, by using simple random sampling the classes were selected. In every class, all students All students were included. Those students who refused to participate were few in number.

Data collection tool and technique

A self-administered questionnaire was used in data collection. The data included the following: (a) demographic data of the students; (b) sleep quality, using the Pittsburgh Sleep Quality Index (PSQI); (c) lifestyle factors associated with poor sleep quality.

The demographic variables were categorized as follows: sex (male and female), residence (rural and urban), type of education (public, private, and technical), smoking (nonsmoker, currently smoker, and ex-smoker) and addiction (using illicit drugs and no). The PSQI is a questionnaire that is used to evaluate sleep quality over the last month; it is a validated questionnaire that has been used to evaluate sleep quality of adolescents and young adults. It consists of 19 self-rated questions that are grouped into seven component scores, all of which have equal weight on a 0–3 scale. These components are sleep latency, sleep duration, subjective sleep quality, habitual sleep efficiency, daytime dysfunction, sleep disturbances and use of sleep medication. The seven component scores are summed to give a global PSQI score from 0 to 21; a higher score indicates worse sleep quality. A score more than 5 differentiates between good and bad sleep quality, with a sensitivity of 89.6% and specificity of 86.5%.The internal consistency of the index (Cronbach's $\alpha = 0.83$). The index needs 5 to 10 min to complete [21]. Suleiman et al. (2010) [22] translated the questionnaire into Arabic.

Lifestyle factors associated with poor sleep quality were categorized as follows: watching TV and using internet (not regularly, less than one hour per day, one hour per day, two hours per day, 3-4 hours per day and 5 hours or more per day), using mobile phones (calls/text messages) (zero, less than one hour per day, one to > 2 hours per day and ≥2 hours per day), sleeping with lights on, daytime napping and using bed for activities other than sleep (always, usually, sometimes and never), eating breakfast, lunch, dinner, snacks, vegetables and fruits, milk, carbohydrates and caffeinated drinks after 6 pm (regular and irregular). Data collection was done away from the exam times at the middle of the first semester of academic year. The questionnaire was filled in by the students during class. It was explained page by page. In every class, the class teacher and two well-trained data collectors assisted in watching the students and keeping understanding and completeness of data during questionnaire filling in.

Data management and statistical analysis

The study hypothesis was "poor sleep quality would be associated with many demographic, lifestyle factors and special habits that could be risk factors for poor sleep quality".

Descriptive statistics were used in the form of frequencies, means, and standard deviations [SDs] also tests of significance such as the chi-square test and Fisher's Exact test for qualitative variables and Student's t test for quantitative variables. For prediction of factors that could be associated with poor sleep quality binary logistic regression analysis was used. All significant factors that were found to be likely associated with poor sleep quality by using bivariate analysis were used to construct regression models. Only significant variables included in the final equation. P-value was considered significant when it was equal to or less than 0.05.

Ethical considerations

Before starting data collection, the proposal was approved by the Faculty Ethical Review Committee in Assiut university. Also, an approval was received from the Central Agency of Public Mobilization and Statistics and administration of secondary education and directors of every school. After explanation of the aim and methods of the study, an informed consent was taken from every student. As the questionnaire items did not include sensitive issues, parents' consent was not sought, and it was not requested

from the higher authorities. It was explained at the class that the collected data will be used for scientific research only and are confidential.

Results

The mean age of the students was 16.66 ± 0.72 SD. About one half (54.9%) were boys, 56.2% attended technical schools, 66.7% were from urban areas, 14.7% of males were currently smokers, 7.7% of males reported using illicit drugs as hashish or bango. The prevalence of poor sleep among participants was 72.5%, using the cut off of PSQI >5. The mean PSQI score was 7.35 (SD = 2.94). Poor sleepers were statistically significantly higher among females (77.0%) than males (68.8%). Urban residents (76.8%) evidenced poorer sleep compared to rural residents (63.6%). The percent of poor sleepers was higher among public school students (81.4%) than private school students (76.9%). The percent of poor sleepers was statistically significantly higher among male students who use illicit drugs (91.4%) than non-users (67.4%) of illicit drugs (Table 1).

Table 1: Relationship between demographic factors & special habits and sleep quality among secondary school students in Assiut city, 2015.

Variables	Good sleepers N= 228	Poor sleepers N= 601	P-Value
Age *M* ± *SD* (*n* = 829)[a]	16.71 ± 0.68	16.64 ± 0.73	0.221
Range	15 – 19 years		
Sex (*n* = 829)[b]			0.008
Male	142 (31.2%)	313 (68.8%)	
Female	86 (23.0%)	288 (77.0%)	
Residence (*n* = 827)[b]			<0.001
Rural	100 (36.4%)	175 (63.6%)	
Urban	128 (23.2%)	424 (76.8%)	
Type of education (*n* = 829)[b]			<0.001
Public	53 (18.6%)	232 (81.4%)	
Private	18 (23.1%)	60 (76.9%)	
Technical	157 (33.7%)	309 (66.3%)	
Smoking			
Males: (n = 452)c			0.24
Currently smoker	15 (22.4%)	52 (77.6%)	
Non smoker	119 (32.8%)	244 (67.2%)	
Ex-smoker	8 (32.0%)	17 (68.0%)	
Females: (*n* = 374)[b]			------
Currently smoker	0	0	
Non smoker	86 (23.0%)	288 (77.0%)	
Ex-smoker	0	0	
Addiction			
Males: (n = 452)[c]			0.003
Using illicit drugs	3 (8.6%)	32 (91.4%)	
No	136 (32.6%)	281 (67.4%)	
Females: (n = 373)[c]			1.00
Using illicit drugs	0	1 (100%)	
No	85 (22.8%)	287 (72.2%)	

[a]Student's t test was used. [b]Chi-square test was used. [c] Fisher's Exact test was used.

The percent of poor sleepers was the highest among students who were usually taking sleep naps (79.8%), and the lowest among students who were never taking sleep naps (53.5%). In addition, the percent of poor sleepers was highest among students who were always using bed for activities other than sleep (79.3%), and the lowest among students who were never using bed for activities other than sleep (60.0%). The percent of poor sleepers was the highest among students who reported using internet 5 hours

or more per day (82.9%), and the lowest among students who reported using internet one hour per day (66.7%), the association was statistically significant (p=0.001). Also, the percent of poor sleepers was the highest among students who reported using mobile phones 2 hours or more per day (80.7%), and the lowest among students who reported no using mobile phones (62.6%), the association was statistically significant (p=0.003). On the other hand, there was no statistical significant association between sleep quality and watching TV, using computer or video games.

Regarding the percent of poor sleepers was higher among students who eat breakfast, lunch and dinner irregularly (less than 5 days per week) 76.4%, 79.1% and 81.6% respectively compared to 67.4%, 70.6% and 66.1% among students who eat breakfast, lunch and dinner regularly, the associations were significant (p<0.05). Also, the percent of poor sleepers was higher among students who eat snacks and carbohydrates regularly (less than once every day) 80.9% and 75.0% respectively compared to 68.7% and 68.3% among students who eat snacks and carbohydrates irregularly, the associations were significant (p<0.05). The percent of poor sleepers was higher among students who reported always drinking caffeinated drinks after 6 pm (77.1%) compared to (65.1%) among students who reported never drinking caffeine containing drinks after 6 pm (p < 0.05; Table 2)

Table 2: Relationship between lifestyle factors and sleep quality among secondary school students in Assiut city, 2015.

Variables	Good sleepers N= 228	Poor sleepers N= 601	P-value*
Watching TV (*n* = 829)			
Not regularly	56 (24.6%)	172 (75.4%)	
Less than one hour per day	31 (30.4%)	71 (69.6%)	
One hour per day	32 (25.2%)	95 (74.8%)	
Two hours per day	62 (33.7%)	122 (66.3%)	0.139
3-4 hours per day	27 (21.4%)	99 (78.6%)	
5 hours or more per day	20 (32.3%)	42 (67.7%)	
Using internet (*n* = 821)			
Not regularly	113 (33.2%)	227 (66.8%)	
Less than one hour per day	34 (27.6%)	89 (72.4%)	
One hour per day	26 (33.3%)	52 (66.7%)	
Two hours per day	16 (18.4%)	71 (81.6%)	0.001
3-4 hours per day	15 (18.3%)	67 (81.7%)	
5 or more per day	19 (17.1%)	92 (82.9%)	
Using mobile phones (calls/text messages) (*n* = 828)			
Zero	49 (37.4%)	82 (62.6%)	
Less than One hour per day	102 (29.3%)	246 (70.7%)	
One to > 2hour per day	36 (26.3%)	101 (73.7%)	0.003
≥2 hours per day	41 (19.3%)	171(80.7%)	
Sleeping with lights on (*n* = 827)[b]			
Always	18 (28.6%)	45 (71.4%)	
Usually	18 (21.4%)	66 (78.6%)	0.584
Sometimes	73 (27.3%)	194 (72.7%)	
Never	119 (28.8%)	294 (71.2%)	
Daytime napping (*n* = 827)[b]			
Always	22 (14.0%)	135 (68.0%)	
Usually	40 (20.2%)	158 (79.8%)	<0.001
Sometimes	105 (30.4%)	240 (69.6%)	
Never	59 (46.5%)	68 (53.5%)	
Using bed for activities other than sleep (*n* = 829)[b]			
Always	67 (20.7%)	256 (79.3%)	
Usually	54 (26.5%)	150 (73.5%)	<0.001
Sometimes	83 (34.3%)	159 (65.7%)	
Never	24 (40.0%)	36 (60.0%)	

Breakfast (*n* = 829)			
Regular	121 (32.3%)	254 (67.4%)	0.005
Irregular	107 (23.6%)	347 (76.4%)	
Lunch (*n* = 829)			
Regular	189 (29.4%)	453 (70.6%)	0.021
Irregular	39 (20.9%)	148 (79.1%)	
Dinner (*n* = 829)			
Regular	165 (33.9%)	322 (66.1%)	<0.001
Irregular	63 (18.4%)	279 (81.6%)	
Snacks (*n* = 829)			
Regular	49 (19.1%)	208 (80.9%)	<0.001
Irregular	179 (31.3%)	393 (68.7%)	
Vegetables and fruits (*n* = 823)			
Regular	102 (26.5%)	283 (73.5%)	0.467
Irregular	126 (28.8%)	312 (71.2%)	
Milk (*n* = 825)			
Regular	76 (31.9%)	162 (68.1%)	0.079
Irregular	152 (25.9%)	435 (74.1%)	
Carbohydrates (*n* = 829)			
Regular	127 (25%)	381 (75%)	0.037
Irregular	101 (31.7%)	218 (68.3%)	
Caffeinated drinks after 6 pm (*n* = 827)			
Never	22 (34.9%)	41 (65.1%)	0.481
Sometimes	125 (30.4%)	286 (69.6%)	
Always	81 (22.9%)	272 (77.1%)	

*Chi-square test was used

Table (3) presents multivariate logistic regression, the significant predictors of poor sleep were: the chance of poor sleep increased 1.5 times among urban residents compared to rural residence [odds ratio (OR) 1.5, 95% confidence interval (CI) (1.0 - 2.2) P=0.047]. Using illicit drugs regular or sometimes has shown significant increase in the chance of poor sleep quality 6.6 times compared to not using it [OR 6.6, CI (1.9-23.0) p=0.003]. The chance of poor sleep increased 1.9 times with using internet three hours or more per day compared to using internet less than one hour per day [OR 1.9, CI (1.2-3.2) p=0.009]. Also, using mobile phones two hours or more per day has shown significantly increasing the chance of poor sleep quality two times compared to not using mobile phones [OR 2.0, CI (1.1-3.5) p=0.015]. Also, irregular breakfast taking (less than five days per week) has shown significantly increasing the chance of poor sleep quality 1.6 times compared to regular breakfast taking [OR 1.6, CI (1.1-2.3) p=0.012]. Also, irregular dinner taking (less than five days per week) has shown significant increase in the chance of poor sleep quality 1.7 times compared to regular dinner taking [OR 1.7, CI (1.2-2.5) p=0.006]. Also, regular eating carbohydrate (once or more per day) has shown significant increase in the chance of poor sleep quality 1.5 times compared to irregular eating carbohydrate with [OR 1.5, CI (1.0-2.1) p=0.041]. Also, regular eating snacks (once or more per day) has shown significant increase in the chance of poor sleep quality 1.9 times compared to irregular eating snacks with [OR 1.9, CI (1.3-2.9) p=0.002]. Also, always drinking caffeinated drinks after 6p.m has shown significant increase in the chance of poor sleep quality 1.9 times compared to never drinking caffeine containing drinks after 6p.m [OR 1.9, CI (1.0-3.7) p=0.045]. Also, always daytime napping has shown significant increase in the chance of poor sleep quality 4.8 times compared to never daytime napping [OR 4.8, CI (2.6-9.0) p>0.0001].

Table 3: Predictors of Poor Sleep Quality Among Secondary School Students in Assiut, 2015 Identified by Multivariate Logistic Regression Analysis

Variable	Odds ratio (95%Confidence interval)	P-value
Age	1.3 (1.0-1.6)	0.074
Sex (female)	1.4 (0.9-2.1)	0.100
Residence (urban)	1.5 (1.0-2.2)	0.047
Using illicit drugs (yes)	6.6(1.9-23.0)	0.003
Using internet		0.034
Less than one hour per day (reference)		
One to two hour per day	1.2 (0.8-2.0)	0.357
3 hours or more per day	1.9 (1.2-3.2)	0.009
Using mobile phones (calls/text messages)		0.090
Zero (reference)		
Less than one hour per day	1.6 (1.0-2.6)	0.051
One to > 2hour per day	1.7 (0.9-3.0)	0.091
≥2 hours	2.0 (1.1-3.5)	0.015
Irregular breakfast taking	1.6 (1.1-2.3)	0.012
Irregular dinner taking	1.7 (1.2-2.5)	0.006
Regular carbohydrate eating	1.5 (1.0-2.1)	0.041
Regular snacks eating	1.9 (1.3-2.9)	0.002
Drinking caffeinated drinks after 6p.m		0.071
Never (reference)		
Sometimes	1.9 (1.0-3.7)	0.045
Always	2.2 (1.1-4.2)	0.022
Daytime napping		<0.001
Always	4.8 (2.6-9.0)	<0.001
Usually	3.6 (2.1-6.3)	<0.001
Sometimes	2.0 (1.3-3.2)	0.004
Never (reference)		

N = 808. Nagelkerke R Square = 0.21. Odds ratio is adjusted for all variables in the table.

Discussion

This study was a cross-sectional study. It was conducted to identify the associated factors which may lead to poor sleep quality. In the current study, age was significant predictor of poor sleep quality [OR 1.4, p=0.014]. This is consistent with the results of meta-analysis of 41 surveys worldwide conducted by Gradisar et al. [23]. Age is important factor affecting sleep pattern in adolescents as it leads to delay of sleep time and restrict school night sleep [23]. The effect of age (especially adolescence) on sleep is attributed to developmental changes in the circadian alerting system, so the preferred times for falling asleep and waking are typically delayed in adolescents [24]. The delayed sleep time during adolescence, early school start time and increased academic and social demands lead to poor sleep.

In the current study, poor sleep quality was associated with female gender. The prevalence of poor sleep quality was higher among females than males with statistical significant difference (p=0.008). This difference may be attributed to that females are more subjected to anxiety, depression and long periods of thinking [25]. This is consistent with the results of many studies. Merdad et al., 2014 in the Saudi study in Jeddah among 947 high school students aged 14–23 years found that females has significantly higher PSQI than males [12]. Similar results were found among 1,629 Hong Kong Chinese adolescents aged 12 to 19 years [9]. In Japanese study among 94,777 adolescents, it was also reported that female adolescents had more short sleep duration than males and more female adolescents rated their sleep quality as poor or very poor [26].

In the current study, the prevalence of poor sleep quality was higher among residents of urban area with statistical significant difference (p>0.0001). Using logistic regression, the chance of poor sleep increased two times among urban residents compared to rural residence [OR 2.0, p=0.002]. This finding may be due to calm green environment, early closure of services in rural areas and more access of the adolescents to internet and new technology in urban areas that allows better sleep quality. This result is comparable with the results of study made by Liu et al., 2008 among 1056 high school students in China who found that urban students go to bed later than rural students [27]. This is also consistent with the findings of Haseli-Mashhadi et al., 2009 that rural residents were more likely to report good levels of sleep quality compared to urban residents in middle-aged and elderly Chinese [28].

In the current study, we found that technical school students were less liable to poor sleep than public and private school students with a highly statistical significant difference (p>0.0001). In multiple analysis, the chance of poor sleep increased 1.8 times among public education students compared to technical education students [OR 1.8, p=0.023]. This finding may be related to the lower socioeconomic level of technical school students, less access to new technology, more physical activity and less napping due to more afternoon jobs. All these factors lead to better night sleep. This finding could be explained also by the fact that majority of technical schools students are residents of rural areas.

This study found that the percent of poor sleepers was higher among smoker males than non-smoker males (77.6% versus 67.2% respectively), but the association was not statistically significant. The previous studies showed different results about association between sleep and smoking. Cheng et al., 2012 found no statistical significant difference between good and poor sleepers (PSQI score≥6) as regarding smoking among 4,318 incoming university students in Taiwan [29]. The same results were found among 1,515 African Americans, aged 30-65 years, [30] and 2,803middle aged Chinese [31]. On the other hand, a study among 12,154 high school students in USA [16] and other study among 2,432 Norwegian adolescents, aged 15-17 years [32], revealed that being a current smoker increased the odds of sleeping < 8hours. Additionally smoking was found as a risk factor for sleep problems in Japanese [33] and Hong Kong studies [9]. Although the results of the studies differs between significant and non-significant association between different sleep measures and smoking but being a current smoker a bad habit was related to poor sleep measures in most studies. The effect of smoking on sleep is attributed to nicotine stimulation of nicotinic acetylcholine receptors in the brain that results in release of a variety of neuro-transmitters in the brain, most importantly dopamine. Based on these effects nicotine could interact with sleep regulating mechanisms and may affect sleep quality or Rapid Eye Movement sleep [34].

This study found that the percent of poor sleepers was higher among male students who used illicit drugs regularly or sometimes compared to non-users of illicit drugs with statistical significant difference (p=0.003). By using logistic regression, using illicit drugs regular or sometimes has shown significant increase in the chance of poor sleep quality 6.6 times compared to non users [OR 6.6, p=0.003]. Despite the presence of such significant relation, this point could not be analyzed as only 35 students reported using illicit drugs and many students who use illicit drugs would deny addiction, so this relation would be studied with other study means as e-mail or phone. This result is consistent with other studies in USA (16) and Norway [32].

In this study, it was found that using internet was a significant risky behavior associated with poor sleep quality (p=0.001), by using multiple regression, using internet three hours or more per day was a significant predictor of poor sleep [OR 1.9, p=0.009]. This relation is mostly due to increase the alertness and level of activity of the nervous system. Also exposure to the bright light of the viewing screen before sleep may affect the sleep/wake cycle through suppression of the nocturnal salivary secretion of melatonin. In addition, the content of television programs and computer game playing may be excessively violent and/or stimulating, which may inhibit relaxation and result in anxiety and difficulty in falling asleep [19, 35]. This finding is in agreement with many studies, as that was conducted among 1,956 Turkish high school students aged between 14 and 18 years which found that the students with internet addiction (using Internet Addiction Test) were more likely to have difficulty in falling asleep and night awakenings, problematic internet users and internet addicts were found to sleep significantly less than average internet users [36]. Another Taiwanese study found that poor sleep quality (PSQI score ≥6) was significantly associated with a higher tendency toward internet addition [29]. In a study, among 2,546 Belgium secondary school children, adolescents who spent more time using the internet went to bed significantly later during the week and during the weekend, got up later on weekend days and spent less time in bed during the week [18].

In the current study, there was significant inverse relation between sleep quality and hours of using mobile phones (p=0.003). By multiple analysis, using mobile phones two hours or more per day was significant predictor of poor sleep quality [OR 2.0, p=0.015]. This relation is consistent with a study; done in UK among 738 adolescents aged 11–13 years, that found that frequent use of mobile phones was associated with difficulty in falling asleep, frequent early awakening and inversely associated with weekday sleep duration [37]. Also the study, conducted by Yang et al., 2010 among 11,111 Taiwanese adolescents aged 12-18 years, found that problematic cell phone use was associated with insomnia in adolescents [38]. While the study, conducted by White et al., 2011 among 350 college students with average age 20 years in USA, found that mobile phone use was related to sleep quality, but not sleep length [39].

On the other hand, the current study found that there was no statistical significant association between sleep quality and frequency of watching TV or using computer or video games. These findings are consistent with the study of Lund HG et al., 2010 who found that daily hours of television and video game exposure were not significant predictors of the PSQI score [40]. Also consistent with Chen et al., 2006 study findings that hours of watching TV/ using computer during weekdays and were not significantly correlated with adequate sleep [41]. But other studies in Saudi Arabia, Spain, Norway and USA found that short sleep duration was associated with more TV watching [16,32,42-44].

In this study, it was found that there was no statistical significant association between sleep quality and sleeping with lights on. This finding is consistent with the study of Gellis and Lichstein, 2009 among 220 middle aged adults (mean age 42±12.8 SD) in USA [45].

This study found that there was inverse relation between daytime napping and sleep quality (p>0.0001). Also using logistic regression, always daytime napping was significant predictor of poor sleep quality [OR 4.8, p>0.0001]. This relation could be attributed to that long and late naps interfere with night sleep. This finding is consistent with the study of Gellis and Lichstein, 2009 in USA that found significant differences between good and poor sleepers in relation to daytime napping that poor sleepers were more likely to nap during the day (PSQI >5) [45]. The same result

was obtained by Jefferson et al., 2005 among 516 individuals aged 18 to 65 years in a population based study [46].

In this study, we found association between poor sleep quality and using bed for activities other than sleep (e.g. reading, watching TV, mobile phone using or thinking about important matters), the association was statistically significant (p>0.0001). Several factors may lead to poor sleep in adolescents who used bed for activities other than sleep, including that these activities may replace the time for sleep and it may increase arousal due to the media or book contents or due to alerting features of the screens including brightness and the specific wave-length of the screens [35]. This finding is consistent with the study of Gellis and Lichstein, 2009 in USA that found that bed activities other than sleep especially more likely to worry, plan, or think about important matters at bedtime were greater among poor sleepers (PSQI >5) [45]. In another study conducted by Lemola et al., 2015 among 362 adolescents aged 12–17 years in northwestern Switzerland, found that electronic media use in bed before sleep especially being online (Facebook, Chat etc.) in bed and having the mobile phone switched on at night was related to shorter sleep on weekday nights and only being online in bed before sleep was related with sleep difficulties [35].

The significant association between sleep quality and regularity of meals pattern (breakfast, lunch and dinner) (p= 0.005, 0.021, >0.0001 respectively). Adequate sleep time could be attributed to waking up early and having their breakfast before going to school. Having regular meals pattern may reflect more stable family structures with the parents and children having their meals together, and help adequate sleep [43]. This finding is consistent with the results of many studies as the study of Cheng et al., 2012 who found that students who skipped breakfast were more likely to be poor sleepers (PSQI score ≥6) [29]. Also Al Hazzaa et al., 2014 found that having low intake of breakfast decreased the odd of having adequate sleep duration [43]. On the other hand, irregular breakfast taking (less than five times per week) [OR 1.6, p=0.012] and irregular dinner taking (less than five times per week) [OR 1.7, p=0.006] were significant predictors of poor sleep quality. Also, Stea et al., 2014 found that having an irregular meal pattern were associated with short sleep duration [32], the same result was reported by Chen et al., 2006 that adopting healthy diet (eating breakfast daily, eating three meals a day, drinking at least 1,500cc of water daily, choosing foods with little oil, etc.) was negatively associated with inadequate sleep [41].

Regular carbohydrate eating (once or more per day) and regular snacks eating (once or more per day) were significant predictor of poor sleep quality [OR 1.5, p=0.041] and [OR 1.9, CI p=0.002] respectively. These findings are consistent with the results of the study of Al-Disi et al., 2010 among 126 Saudi girls aged 14-18 years, who found that subjects sleeping < five hours/day showed a significantly higher percent of carbohydrate intake from their total daily energy intake than those sleeping > seven hours/day [47]. In other study, among eleven healthy volunteers aged 34-49 years completed in random order two 14-day stays in a sleep laboratory with access to palatable food and 5.5-h or 8.5-h bedtimes. Nedeltcheva et al., 2009 found that sleep restriction was accompanied by increased consumption of calories from snacks, with higher carbohydrate content [48]. Proposed mechanisms by which insufficient sleep may increase caloric consumption from carbohydrates and snacks include: more time and opportunities for eating, psychological distress, uninhibited eating (low leptin and high ghrelin secretion), more energy needed to sustain extended wakefulness, and changes in appetite hormones [49].

As found in the study results, there were no statistical significant associations between sleep quality and having milk or its products or eating vegetables and fruits. This is consistent with the results of the study of Al-Hazzaa et al., 2014 among Saudi adolescents who found that the frequency of consumption of vegetables, fruits and milk/dairy products intake per week were not significantly associated with sleep duration [43]. Although milk drinking is thought to promote sleep, this relation was not found in the current study may be due to the sleep promoting effect limited to drinking milk at night. This is contradicted with the results of HELENA study among European adolescents that found that the proportion of adolescents who eat adequate amounts of fruits and vegetables was lower in shorter sleepers than in adolescents who slept ≥ eight hours per day [50]. This difference may be due to different cultural and social habits of eating behaviors between Arab and European adolescents.

The current study shows that there was statistical significant association between drinking caffeinated drinks after 6 pm and poor sleep quality [OR 1.9, p=0.045]. While there were no statistical significant association between sleep quality and regularity of drinking caffeinated drinks per week. These results may be attributed to short term effect of caffeine on sleep and those who drink caffeinated drinks early in the day cannot nap so can have sleep with good quality at night, this is consistent with Lund et al., 2010 who found that the number of caffeinated drinks per day did not significantly differ between PSQI groups [40]. The same result was found by Merdad et al., 2014 that there was no statistical significant difference of PSQI scores between different amounts of caffeine intake per day [12]. While Cheng et al., 2012 found statistical significant association between higher frequency of tea-drinking (≥3 times / week) and poor sleep quality, and non-statistical significant association between frequency of coffee-drinking and sleep quality [29]. While Mindell and his colleges, in their study among 1473 parents/caregivers of children ages newborn to 10 years in America, found that regular caffeine consumption was associated with shorter total sleep time [51]. The same association was detected by Drescher et al., 2011 among 319 American adolescents between 10-17 years [51].

The results of the current study could be generalized because different schools from different regions in Assiut city were included. The current study was limited by being a cross-sectional study; we could not judge the causal relation between the outcome and predictors, that the temporal sequence was not clear. to avoid more elongation of the questionnaire, which could affect the accuracy of data, the study did not include other factors related to sleep as academic performance, sleep habits during exam times, weekends, and holidays. These factors could be studied in other studies.

Conclusion

Poor quality of sleep should be considered a critically important medical problem, especially in adolescents. It's associated with

many life style factors as using illicit drugs, using internet and mobile phones for long time, irregular breakfast and. Dinner time, caffeinated drinks after 6pm and day time napping. A behavioral intervention program should be developed and implemented by the Ministry of Education in secondary schools. Parents should also monitor their sleep timing and behaviors. Mass media should conduct special programs to increase the awareness about sleep needs, healthy sleep patterns, risk factors and consequences of poor sleep to be avoided.

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The authors declare that there was no conflict of interest.

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