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Sleepless in Makkah City, Saudi Arabia: Prevalence and Risk Factors of Insomnia and the Variations in Sleep Quality among Visitors of Primary Health Care Centers

By

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Master of Public Health

Hubert Department of Global Health

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Roger Rochat, M.D.

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An abstract of

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University

in partial fulfillment of the requirements for the degree of

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in the Hubert Department of Global Health

2013

ABSTRACT

Objective: To study to determine the prevalence of insomnia, sleep quality and related factors among visitors to PHCCs in Makkah, to investigate the extent of sleep problems in relation to the frequency of treatment, and to evaluate a simple screening tool helping PHCC physicians identify people with sleep problems.

Methods: This study is a cross-sectional survey conducted among 463 participants in five primary health care centers in Makkah city, Saudi Arabia. The main tool used to collect data was an interview using a Pittsburgh Sleep Quality Index (PSQI) questionnaire. .

Results: In this study, 61.8% were classified as good sleepers, while 38.2% were classified as bad sleepers. The prevalence of insomnia was 29.4%. Females were about 2 times more likely than males to complain of sleep problems in each category except for widowed males. Insomnia was associated with female gender, chronic diseases and bad sleep habits. Also, 78% of participants with sleep problems were not being treated for them.

Conclusion: Sleep problems and insomnia are common, underestimated, and undertreated in Saudi Arabia. I recommend forming a Saudi Center for Sleep concerned with the medical and epidemiological aspects of sleep. Efforts should focus on understanding insomnia and other sleep problems, especially in females. PHCC doctors need to be trained to evaluate insomnia and other sleep problems with simple screening tool and to prescribe the appropriate management.

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Chapter 1: Introduction

1.1 Overview

Insomnia is defined as difficulty in falling asleep, difficulty in staying asleep or nonrestorative sleep, which is awakening feeling unrefreshed (Schaira, 2007). It is the most common sleep disorder (Schaira, 2007). Insomnia can be a symptom of disease or a standalone illness. Insomnia-related disorders are regarded as a single category among the eight categories of sleep disorders. Insomnia is classified in various ways, such as primary and secondary, according to the etiology, or as transient, short-term, or chronic, based on the duration of symptoms(American Academy of Sleep Medicine, 2005).

1.2 Study Setting

The Kingdom of Saudi Arabia (KSA), with a population of 26,534,504 (July 2012 est.) and land area of 2,250,000 km², is located in Southwest Asia (see Appendix A for map). It is the largest country in the Arabian Peninsula and home to the two holiest cities of Muslims, Makkah and Madinah. Islam is the official religion. In terms of origin, Saudis are 90% Arab and 10% Afro-Asian.

In the past, the economy of the KSA depended on revenues from pilgrims visiting the holy cities, cattle-raising, and minor agriculture. Now, with oil production, the economy has become more industrialized. These economic changes and modernization have led to lifestyle changes among the Saudi population over the last four decades. Saudi Arabia's population is young. About 50% of the people are under age 24. The population's average age is 22. The literacy rate is 86.6% (2010 est.), and the birth rate is 19.2 births per 1,000 population (2012

est.). Saudi Arabia is highly urbanized (85%) and Saudis have a life expectancy of about 74.35 years. In comparison, four decades ago, 50% of people lived in rural areas with lower life expectancy. The country has also achieved low levels of fertility and infant mortality. The total fertility rate is about 2.3 and the infant mortality rate is about 15.5 (The Central Intelligence Agency, 2013).

Makkah, which is the holy capital of Muslims, is located in the western part of the KSA. Its population is 1,500,000. Its history goes back 4,000 years, when pilgrims first started going to perform Hajj (the pilgrimage to Makkah), which Muslims have been performing since 630 CE. In 2012, about 10,000,000 visitors went to Makkah for religious rituals.

The government offers health care free to Saudi citizens and some foreigners through three levels of health services: primary, secondary, and tertiary. Primary health care centers (PHCC) provide health care services in cities and rural areas. Each neighborhood or group of neighborhoods has a PHCC. Activities like health education, treatment of common and chronic diseases, vaccinations, prenatal care, and screening programs take place in PHCCs. A number of visitors also go only for administrative purposes, such as to register their records or update their files when, for example, they have a new baby or change their address. The 77 PHCCs in the metropolitan area of Makkah are divided into five sections. Three sections are urban and two rural.

1.3 Significance

Despite the modernization that has taken place in the KSA in the last decades, few studies have evaluated the magnitude and the causes of the new public health problems that have emerged. For example, developed countries recognize that insomnia and other sleep problems

are common and are public health issues, but KSA's public health researchers have not yet engaged this issue. Many studies in those countries state that these sleep problems are underdiagnosed, undertreated, and underreported, despite the fact that sleep problems have negative consequences like depression, road and work accidents, and low productivity.

In the KSA and in the Arabian Gulf region generally, very few studies have been conducted about insomnia and other sleep problems. Published studies have focused mainly on the medical manifestations of the problem, without addressing the wider picture (e.g., prevalence, related risk factors). This study sets out to examine whether sleep problems are common or not in an important city in the KSA. This study seeks not only to establish the prevalence of insomnia and sleep problems, but also tries to correlate risk factors related to sleep problems, which are not necessarily similar to those in other countries but might be unique to the KSA. People in the KSA have different cultural, religious, and economic backgrounds, which can interact with different risk factors. Perhaps this study's results can be applied to other countries in the Gulf region which are similar in some ways to the KSA.

1.4 Rationale

During my experience as a family physician working in primary health care centers in the KSA, I noticed a change in lifestyle in general, and in sleep habits in particular. Issues like going to bed late, changes in sleeping cycles, and increases in life stressors grew to be more commonplace. Not only were patients underestimating their sleep problems, some were also being treated improperly with hypnotics, which could cause negative outcomes.

In fact, there are simple, cost-effective measures to treat the majority of insomnia cases in PHCCs. Primary care physicians, as the first health contact, can play a key role in the diagnosis

and treatment of many cases of insomnia and other sleep problems, but they have a long list of patients to see, and a short amount of time to spend with each. Health providers need a simple screening tool to discover whether the patients have sleep problems or not. The distribution and analysis of patient questionnaires in PHCCs could become a reliable screening tool for better serving the patients.

1.5 Objectives

1. To describe general sleep habits of those attending PHCCs.
2. To characterize the prevalence of insomnia among visitors to PHCCs in Makkah.
3. To evaluate the demographic and sleep pattern factors associated with insomnia among visitors to PHCCs in Makkah.
4. To measure the sleep quality among visitors to PHCCs in Makkah based on their Pittsburgh Sleep Quality Index (PSQI) score and to study related risk factors.
5. To investigate the extent of sleep problems in relation to the frequency of treatment and find a simple, useful screening tool for PHCC physicians to manage the cases.

Chapter 2: Literature Review

2.1 Prevalence of Insomnia

Insomnia is the most common sleep disorder (Schaira, 2007). Rates of insomnia reported worldwide range from 11.9% in Finland to 21% in Japan (Mendelson et al., 2004). In the United States, a study by Mellinger showed that 35% of adults aged 18 to 79 experienced difficulty falling asleep or staying asleep (Mellinger, Balter, & Uhlenhuth, 1985). Data from large community and primary care medicine surveys of insomnia in the United States reveal that approximately 10% of adults experience insomnia lasting more than six months (Roth & Roehrs, 2003). Other studies have reported that up to one-third of the adult population in the United States has suffered from insomnia at some time. Altogether, 26% of the population reported one insomnia trait, 13% reported two, and 10% reported three (Schubert et al., 2002).

The prevalence of insomnia increases with age; more than 50% of people above age 65 report regular sleep problems (Ancoli-Israel, 1997). In a National Institute of Aging (NIA) survey of 9,000 people aged 65 years and above, 28% reported that they had difficulty falling asleep and that they awakened too early; 29% reported trouble maintaining sleep; 18% reported awakening too early; and only 12% reported no sleep complaints (Foley et al., 1995). In the KSA, a study conducted by Dr. S.O. Wali indicated that the prevalence of sleep disorders was not known. This study concluded that sleep disorders were common but unrecognized in the country (Wali et al., 1999).

2.2 Consequences of insomnia and other sleep problems

The most consistent impact of insomnia is a high risk of depression (Roth & Roehrs, 2003). In fact, the relationship between insomnia and depression is complex and interlinked.

They can influence each other, but those with insomnia are ten times more likely to develop depression compared to those without it(Taylor, Lichstein, Durrence, Reidel, & Bush, 2005). Insomnia is also associated with the frequent use of medical resources, chronic health problems, perceived poor health, and increased drug use (Sateia & Nowell, 2004). People with insomnia frequently experience a greatly reduced quality of life, even when comorbid conditions have been treated, and the degree of their impairment is directly related to the severity of the sleep disturbance (Sateia, Doghramji, Hauri, & Morin, 2000).

People with chronic insomnia had up to 16 days of lost work time, compared to only 1.6 days among those without insomnia (Zammit, Weiner, Damato, Sillup, & McMillan, 1999). A study conducted by Walsh indicated that chronic insomnia was correlated with impaired mood, impaired functioning and a decreased quality of life. It was also related in some cases with increased daytime sleepiness and accident risk. Those reporting insomnia have higher rates of absenteeism and health care utilization. The direct costs of insomnia have been estimated to be $13.9 billion annually (Walsh, 2004). A study in Italy showed that insomnia occurred frequently in that country's primary care population. It was also associated with being at high risk for co-morbid conditions, and resulted in the increased use of health care resources (Terzano et al., 2004). One study conducted in U.S.A and Italy showed a moderate-to-strong linear relationship between sleep hygiene and reported sleep quality in both samples (LeBourgeois, Giannotti, Cortesi, Wolfson, & Harsh, 2005). The authors concluded that going to bed late caused 77.3% of the participants to sleep 7 hours or less a night. The National Sleep Foundation recommends that adults get 7–9 hours of sleep per night (National Sleep Foundation, 2011).

Another study showed that those who have an average sleep duration of 6 hours or less had a higher tendency to fall asleep while driving than those who slept 7-9 hours a night.

("Drowsy driving - 19 states and the District of Columbia, 2009-2010," 2013). Furthermore, self-reported insufficient sleep has been linked to unhealthy behaviors like smoking, physical inactivity, and obesity (Strine & Chapman, 2005).

2.3 High-Risk Patients

Risk factors for insomnia include getting older, being female, underlying medical and psychiatric conditions, and doing shift work (Roth & Roehrs, 2003). Another study conducted by Sateia et al. showed that there were higher rates of insomnia in women, the unemployed, those with less education, those who were separated or divorced, the medically ill, and those with depression, anxiety, or substance abuse problems (Sateia et al., 2000). In fact, women are 1.4–2 times more likely than men to report insomnia (Lee-Chiong, 2009). A study conducted in 2003 showed that the sleep problems common in older adults were often secondary to other medical conditions and not attributable to aging itself.

2.4 Attitudes of Patients and Doctors Toward Insomnia

In a French study, the researchers concluded that many individuals hesitate to consult their doctor about insomnia. In addition, physicians rarely ask their patients about possible sleep problems and tend to underestimate the severity of insomnia and its consequences. When patients reported insomnia, physicians frequently recommended lifestyle changes and sleep hygiene measures. Hypnotic agents were the most frequently prescribed class of medication. Patient satisfaction with treatment was relatively high (Allaert & Urbinelli, 2004). One study conducted in 2003 showed that only 5% of all adults with insomnia in the U.S. were properly diagnosed (Cochran, 2003).

In one U.S. survey of primary care physicians (PCPs), the results showed 94% of the respondents were board certified, with 76% certified in more than one area. None of them rated his or her level of knowledge of sleep problems as excellent, while 10% rated their knowledge as good, 60% as fair, and 30% as poor (Papp, Penrod, & Strohl, 2002). The elements that ranked highest in influencing current practices regarding sleep and sleep disorders were journals articles, continuing medical education courses, and physician discussions with specialists. While most doctors agreed that prevention counseling should be a part of patient care, in actuality, the majority spent more time counseling patients on the benefits diet or exercise than the benefits of sleep (Papp et al., 2002). Dr. Ba-Hammam of the KSA concluded that Primary Health Care physicians in Riyadh, the capital, do not completely recognize the importance and impact of sleep disorders (BaHammam, 2000).

2.5 Questionnaire

The Pittsburgh Sleep Quality Index (PSQI), a validated questionnaire (Fictenberg, Putnam, Mann, Zafonte, & Millard, 2001), was developed by a team at the University of Pittsburgh Sleep Medicine Institute to measure sleep quality (Buysse, 1989). The method for scoring the questionnaire is fully illustrated in the questionnaire itself (see Appendix B for full questionnaire).

Chapter 3: Methods

This section presents the methods employed to achieve the research objectives.

3.1 Study Design

This study is a cross-sectional analytic study. The main tool used to collect data was an interview using a Pittsburgh Sleep Quality Index (PSQI) questionnaire. I conducted this study in five primary health care centers in the city of Makkah, KSA, in the first three weeks of July 2012. I selected the PHCCs based on their varied geographical locations in the metropolitan area of Makkah in order to include urban and rural representation of different economic, cultural, and ethnic backgrounds. For cultural reasons, I enlisted the assistance of five female physicians to interview the female patients. I trained these physicians to conduct interviews using the questionnaire. A pilot study of 20 individuals was conducted to refine the questionnaire and study protocol.

The criteria for inclusion was adults eighteen years and older, both male and female. The study excluded visitors to PHCCs who were under 18 years old or who did not understand Arabic.

Issues of consent and confidentiality were taken into consideration, and these were fully explained in the proposal, which was approved by the IRB.

The Emory IRB determined that this study was exempt from the approval process because it did not involve any invasive human research. Administrative acceptance was obtained from the Ministry of Health in the KSA, which has authority over these PHCCs.

3.2 Study Setting

The 77 PHCCs in the metropolitan area of Makkah are divided into five sections. Three sections are urban and two rural. In order to represent areas with different economic and cultural backgrounds, a total of five PHCCs were randomly selected from the urban and rural parts. Alazizia Algharbia, Alrusaifa, and Jarwal PHCCs represented the urban side, while Jura'na and Abu'urwa PHCCs represented the rural side (see Appendix C for map of the participating PHCCs).

3.3 Study Population and Sample Size

This study used data that I obtained at Primary Health Care Centers (PHCCs) in the city of Makkah, KSA, in the first three weeks of July 2012. The primary population sample, numbering 463, was recruited from visitors to the five selected primary health care centers during the period of the study.

I calculated an appropriate sample size in the following manner. First, I found the total number of visits to these health centers in the corresponding weeks of the previous year, July 2011. The records of the five primary health care centers that participated in the study indicated about 1,800 visits. I used this information to find the appropriate sample size with the Raosoft sample size calculator, with a margin error of four and confidence level of 95%, which resulted in a sample size of 451. By dividing 451 over 1800, I received a result of 0.25. So, I decided that we would interview every fourth patient visiting the PHCC for the study duration. The response rate was 98%. After three weeks of study, we had interviewed 463 participants.

3.4 Questionnaire

We used an Arabic version of the PSQI questionnaire validated in Egypt (see Appendix 2 for Arabic version)(Asaad T, 2001; Asaad, Okasha, & Okasha, 2002) (see Appendix D for the Arabic version of PSQI).

3.5 Variables

3.5.1 Dependent variables

We have two dependent variables. The first is the objective sleep quality tabulated from the questionnaire score. The score indicates two possible outcomes, "bad sleeper," a patient with a score of more than 5, and "good sleeper," a patient with a score of 5 and less.

The second dependent variable is insomnia. Participants with insomnia have either initial insomnia, maintenance insomnia, or both. Initial insomnia is taking more than 30 minutes to fall asleep (Schutte-Rodin, Broch, Buysse, Dorsey, & Sateia, 2008). Maintenance insomnia is waking up in the middle of night or early morning three or more times per week.

3.5.2 Independent Variables

3.5.2.1 Demographics and Lifestyle Variables. Demographic variables include subject's gender, age, nationality, marital status, number of children (if any), education level, job, chronic disease (if any), smoking status, location, and financial status.

Age is a continuous variable. I recoded individual ages according to age groups: "early young" (18-24); "young" (25-44); "middle age" (45-60); and "senior" (61 and above).

Gender is a categorical variable and was entered as male and female. Likewise, nationality is categorical and was entered as Saudi and non-Saudi. Marital status was collected

and entered as: single, married, divorced, and widow/ed. In regression, for statistical reasons, I recode marital status to married and others (single, divorced, and widowed) number of children, a continuous variable, was recoded to groups: 0 children; 1 - 2 children; 3 - 4 children; 5 - 6 children; and more than 6 children.

Education level was collected and categorized as illiterate, elementary school completed, intermediate school completed, high School completed, and graduate or post-graduate school completed. I recoded the education levels to four categories for statistical reasons: illiterate, elementary or intermediate school, high school, and graduate or post-graduate school.

The job descriptions were government, private, retired, business owner, military, temporary worker, female homemaker, college student, and laborer. I recoded the job descriptions to three categories for statistical reasons: government, female homemaker, and other.

The participants indicated their chronic disease status as follows: none, diabetes, hypertension, both diabetes and hypertension, heart disease, osteoarthritis, psychiatric disorder, asthma, hypothyroidism, anemia, and hypertension plus osteoarthritis. I recoded this data to “no chronic disease” or “chronic disease.” Smoking status was entered as smoker or non-smoker. We had three urban PHCCs and two rural PHCCs. Their locations were entered as urban and rural. Financial status, which was determined by the participants themselves, was entered as below average, average, and above average.

3.5.3 PSQI Questionnaire Variables. All questions in the PSQI questionnaire were entered and coded as they are printed. Two variables in the questionnaire were open response: “time to go to bed” and “time to wake up.” The variable time to go to bed was categorized and

coded in the time groups of 9 p.m. – 11 p.m., 11 p.m. – 1 a.m., and after 1 a.m. The variable time to wake up was categorized as 3 a.m. – 7 a.m., 7 a.m. – 9 a.m., and after 9 a.m.

Table 1: Study Variables

Dependent Variable	Description
Insomnia	Evaluated as a dichotomous variable No insomnia Insomnia
Sleep Quality	Good sleepers Bad sleepers
Independent Variable	Description
Demographics	
Gender	Male Female
Age Groups	Early young (18-24) Young (25-44) Middle age (45-60) Senior (61 and above)
Nationality	Saudi Non-Saudi
Marital status	Single Married Divorced

	Widowed
number of children	0 children 1 - 2 children, 3 - 4 children 5 - 6 children More than 6 children
Education level	Illiterate Elementary school completed, intermediate School completed High school completed Graduate degree and post-graduate degree
Job	Government Female homemakers Others
Chronic diseases	No chronic disease Chronic disease
Smoking status	Non-Smoker Smoker
Location	Urban Rural
Financial Status	Below average Average Above average

Bold is base category for independent variables for logistic regression

3.6 Data Analysis

SAS 9.3 (SAS Institute Inc. Cary, NC) was used for database construction, manipulation, and statistical analyses. Descriptive statistics were reported via mean ± SD or counts and percentages. Univariate analysis was performed using one-way ANOVA, Chi-square test, and Odds ratio (OR) plus its 95% confidence interval (95% CI). P-values <0.1 were considered statistically significant. Exploratory analysis revealed gender modified the effect of several variables , including marital status and education on sleep quality, the regression , therefore stratified analysis was undertaken. The simultaneous association of independent variables on probable sleep quality based on PSQI score was assessed through multiple logistic regressions (equation 1) .

Equation 1: Specified Logistic Regression Model

$$\Pr(OUTCOME) = \frac{1}{1 + e^{-z}}$$

$$z = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_i X_i + \varepsilon.$$

Chapter 4: Results

4.1 Sample Size

The total number of participants in this study was 463. The response rate was 98%.

4.2 Age and Gender

In this study, the gender distribution was 233 males (50.3%) and 230 females (49.7%). The age of the study sample population ranged from 18 to 80 years. The mean age for the sample population was 42.6 years; males' mean age was 44 years while females' mean age was 41.2 years (p = 0.034). The young age group was the most common age group (206 persons) (44.5%).

4.3 Other Demographic Data

Other demographic data like nationality, marital status, and level of education, job status, questionnaire scores and chronic disease frequencies are illustrated in the following tables (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12).

Table 2: Gender Distribution

	Number	*Percent*
Male	*233*	*50.3*
Female	*230*	*49.7*
Total	*463*	*100*

Table 3: Age Distribution

	Number	*Percent*
Early Young	50	10.8
Young	206	44.5
Middle Aged	154	33.3

Senior	53	11.5

Table 4: Nationality Distribution

	Number	*Percent*
Saudi	397	85.8
Non-Saudi	66	14.2
Total	463	100

Table 5: Marital Status Distribution

	Number	*Percent*
Single	62	13.4
Married	348	75.2
Divorced	20	4.3
Widow/er	33	7.1
Total	463	100

Table 6: Number of Children Distribution

0 children	101	21.8
1 - 2 children	95	20.5
3 - 4 children	109	23.5
5 - 6 children	82	17.7
More than 6 Children	76	16.4
Total	*463*	*100*

Table 7: Financial Status

Below Average	70	15.1
Average	325	70.1

Above Average	68	14.7
Total	*463*	*100*

Table 8: Location

Urban	332	71.7
Rural	131	28.3
Total	463	100

Table 9: Education Level Distribution

	Number	*Percent*
Illiterate	98	21.2
Elementary or intermediate school	130	28.1
High school	128	27.7
Graduate or post-graduate school	107	23.1
Total	*463*	*100*

Table 10: Job Distribution

	Number	*Percent*
Governmental employee	131	28.3
Female homemaker	155	33.5
Combined Groups	177	39.4
Total	*463*	*100*

Table 11: Chronic Disease Distribution

	Number	*Percent*
No chronic disease	*230*	*49.9*
Chronic disease	*233*	*50.1*
Total	*463*	*100*

Table 12: Smoking Distribution

	Number	*Percent*
Smokers	83	17.9
Non-Smokers	380	82.1
Total	463	100

4.4 General Sleep Habits

4.4.1 Going to Bed

The study showed that 230 persons (49%) went to bed between 11 p.m. and 1 a.m., which represent almost half of the study population. Interestingly, 139 persons went to bed after 1a.m. They are divided into 88 females, representing 38.3% of them, and only 51 males, which represented 21.9% of them. Among those 88 females, 65.9% were homemakers.

Among urban participants, 164 (49.4%) went to bed between 11 p.m. and 1 a.m., and it was almost the same figure among rural participants (66) (50.4%).

Those in the early young age group were more likely to go to bed after 1 a.m. (38%). Other age groups tended to go to bed between 11 p.m. and 1 a.m. The highest percentages of people within these age groups went to bed at that time: young (47.1%), the middle aged

(60.4%), and senior (43.4%). Interestingly, while most seniors went to bed between 11 p.m. and 1 a.m., the second highest percentage of them went to bed between 9 p.m. and 11 p.m. (37.7%), unlike the second highest percentage in middle aged and young, who tended to go to bed after 1 a.m.

Notably, among the 36 people who self-reported bad sleep quality, 50% of them went to bed after 1 a.m. On the other hand, among the 156 persons who self-reported very good sleep quality, 57.7% went to bed between 9- 11 p.m. Further, among those who were classified by the questionnaire as "bad sleepers," 39.6% tended to go to bed after 1 a.m., while only 24.1% of "good sleepers" went to bed after 1 a.m. A small number of participants, mostly women, reported going to bed even later; 16 people (13 females and 3 males) tended to go to bed between 3 a.m. and 7 a.m. Ten out of these 13 females were homemakers.

4.4.2 Falling Asleep

On average, it took the study participants 29.4 minutes to fall asleep. Males took an average of 21minutes to fall asleep, while the mean time for females was 38 minutes (p <.001). Female homemakers took longer than the female average to fall asleep (40.6 minutes). Female governmental workers took even longer to fall asleep (41.1 minutes). Male governmental workers took 24.2 minutes to fall asleep, which is longer than the average time of males.

Rural people took 34.3 minutes, while urban people took only 27.5 minutes to fall asleep (p = 0.018). As expected on the basis of prior studies, People with chronic illness took longer to fall asleep (32.3 minutes) compared to those with no chronic illness (26.5 minutes) (p = 0.025). Contrary to expectations based on smoking-related problems, smokers took a shorter time to fall asleep (24.8 min) compared to non-smokers (30.4 min) (p = 0.098).

The early young age group took on average the shortest time to fall asleep (19 minutes). Young, middle aged, and seniors took an average of 30.3 minutes, 30.9 minutes, and 31.4 minutes respectively ($p = 0.049$) .

In the category of marital status, widowed participants took the longest time to fall asleep (47.1 minutes) followed by married (29.1 minutes) then single (23.9 minutes), and finally divorced participants (23.5 minutes) ($p <.001$).

Those who were illiterate took the longest time to fall asleep (34.5 min) followed by those who had completed Elementary and Intermediate School (30.6 min). Those who completed more education than intermediate school took less time to fall asleep. Those who completed High School took an average of 25.3 min, while those who had Graduate or Post-Graduate degrees took an average of 28.3 min to fall asleep ($p= 0.091$).

People who considered themselves above or below average financially took 33 minutes to fall asleep on average, while the mean time for those with average financial status was 28 minutes ($p = 0.162$).

All of those who took 2 hours or more to fall asleep were female, 17 in total, and only 7 of them were taking medication to treat this problem.

4.4.3 Length of Sleep

The mean duration of sleep per night was 6.3 hours for the study population. The mean sleep hours for males was 6.3, while the mean sleep hours for females was 6.3 ($p = 0.592$). The bulk of the participants (45.4%) slept between five and seven hours a night. They are divided into 126 males and 84 females. Also the study showed that 81 females and 67 males, which

represents 32% of the study population, slept 5 hours or less. On the lowest end, 10 persons (2.7%) slept three hours or less a night.

Among the study participants, as people aged, they had fewer sleep hours. The early young age group had 7.1 hours of sleep on average; the young had 6.3 hours; the middle aged had 6.1 hours; and the seniors had 6 hours (p <.001).

Although the majority of urban and rural participants went to bed at roughly the same time, rural had more sleep hours (6.5) than urban people (6.2) (p= 0.132). People with chronic illness not only took longer to fall asleep, but also slept less. They had 6 sleep hours, while people with no chronic illness had 6.6 sleep hours (p <.001). Smokers had 6.4 sleep hours, while non-smokers had 6.3 hours (p= 0.477). People's self-assessment of their sleep quality was a good indicator of their sleep hours. The mean sleep hours for self-reported sleep quality had a trend. Those self-reporting their sleep quality as bad had 4.9 hours of sleep. As their self-assessment improved, their sleep hours increased: 5.9 hours for average, 6.3 hours for good and 6.9 hours for very good. These results are statistically highly significant (p <.001).

Those who considered their status below average financially had fewer hours of sleep than those in the average and above-average categories. Those of below-average financial status slept 6.1 hours, those of average status slept 6.3hours, and those who were of above-average status slept 6.4 hours (p= 0.441). Government workers had fewer sleep hours than the average of study population; they had 5.8 hours, while the study average was 6.3 hours (p <.001). When we stratify government workers by gender, male government workers had 6 sleep hours, while female government workers had 5.7 sleep hours. Most of male government workers (59. 6 %) had sleep hours of 5-7 hours, while the majority of female government workers (54.8%) had

sleep hours of five hours or less. The highest percentage of female homemakers (37.4%) had sleep hours of 5-7; only 31% had sleep hours of 5 or less.

4.4.4 Wake Up Time

According to the study data, 241 persons (52%) woke up between 7 a.m. and 9 a.m. Divided by gender, it breaks down as follows: 137 males (58.8%) woke up during this time period, and 101 females (43.9%) did.

Females tended to wake up later than males. The study showed that 96 females, which represent 41.7% of them, woke up after 9 a.m., while only 54 males, which represent 23.2% of them, woke up after 9 a.m. Out of 32 persons who woke up between 11 a.m. and 3 p.m., which is considered late in KSA, 26 were female, and 88% of them were home makers.

4.4.5 Insomnia

Among 136 participants with insomnia (29.4%), 73 had only initial insomnia, 31 had maintenance insomnia, and 32 had both initial insomnia and maintenance insomnia. Initial insomnia is defined as taking more than 30 minutes to fall asleep. Maintenance insomnia is waking up in the middle of night or early morning three or more times per week. Among all of those with insomnia, those with initial insomnia totaled 105 (22.7% of all participants), and those with maintenance insomnia totaled 73 (15.8% of all participants). Among the 136 patients with insomnia, 45 (33%) were males, while 91 (66.9%) were females. Overall, 19.3% of males were insomniacs, while 39.6% of females were insomniacs (p <.001). Despite these figures, 75.8% of the insomniacs (103) were not prescribed any medication to promote their sleep (p <.001).

The mean age of people with no insomnia was 42.1 years, while the mean age of people with insomnia was 44 years, and the p value for these results is insignificant (p =0.190).

The mean PSQI score for non-insomniacs was 3.7, while the mean score for insomniacs was 7.2 (p <.001). About 50% of both insomniacs and non-insomniacs tended to go to bed between 11 p.m. and 1 a.m. However, more insomniacs tended to go to bed after 1 a.m. (36.8%) in comparison to non-insomniacs (27.2%). These results are significant (p = 0.051).

The mean time it took for people with no insomnia to fall asleep was 17.54 minutes, while the mean time for people with insomnia to fall asleep was 57.98 minutes, and these results are highly significant (p <.001).

The mean sleep hours for people with no insomnia was 6.5hours, while the mean sleep hours for people with insomnia was 5.9 hours, and these results are highly significant (p <.001).

The mean number of children that non-insomniacs had was 3.3, while the mean number of children that insomniacs had was 3.9, and these results are significant (p = 0.087). Among parents, 42.1% of those with more than six children were insomniacs, the group with the highest percentage (p= 0.023).

The relation between insomnia and chronic illness is statistically significant (p = 0.031). Among those with no chronic illness, 24.8% were insomniacs, while the percentage of insomniacs among those with chronic illness was 33.9%.

The relation between insomnia and marital status is statistically significant (p= 0.009). Among singles, 19.4% were bad sleepers/insomniacs, and among married people, divorced and widowed, the percentages were 29.6%, 20%, 51.5% were bad sleepers respectively.

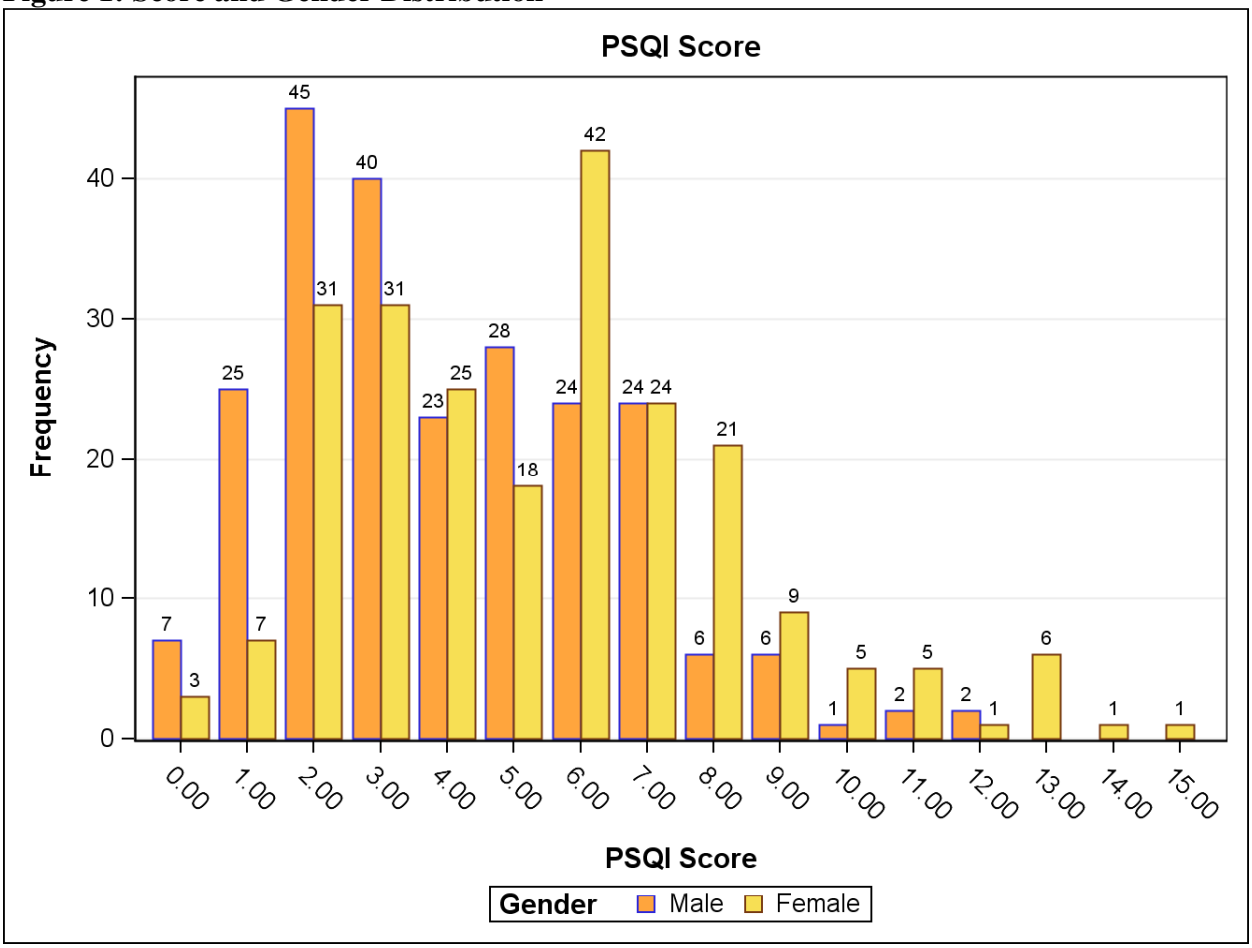
The relation between insomnia and education level is statistically significant ($p = 0.056$). The higher the education level, the less likely a participant was to be an insomniac. Among illiterate participants, 39.8% were insomniacs, while among those who had completed elementary or intermediate school, 29.2% were insomniacs. Among those who had completed an education level of high school or higher, 25.1% were classified as insomniacs, the lowest percentage of the groups.

The relation between insomnia and financial status, location, time to wake up is statistically insignificant.

4.4.6 PSQI Classification of Good and Bad Sleepers

As mentioned earlier, a questionnaire score of more than 5 classified the participant as a bad sleeper, while a questionnaire score of 5 or less classified the participant as a good sleeper. Figure 1 shows score and gender distribution.

Figure 1: Score and Gender Distribution



In total, 286 people (61.8%) were classified as good sleepers, while 177 people (38.2%) were classified as bad sleepers. The mean PSQI score for good sleepers was 3, while the mean score for bad sleepers was 7.6 (p <.001). The mean age of good sleepers was 41.8 years, while the mean age of bad sleepers was 43.9 years, and these results are statistically insignificant (p=0.132). Among the 177 bad sleepers, 62 (35%) were male and 115 (65%) were female, and this result is highly significant. Among all participants, 26.6% of males were bad sleepers, while 50% of females were bad sleepers (p <.001). The mean PSQI score for males was 4, while the mean score for females was 5.4 (p <.001). The PSQI score in every category was higher for females than males except widowed males who scored 8.2, while widowed females scored 5.4.

The highest score in the study was 15 out of 21. Another patient scored 14 out of 21, and six patients scored 13 out of 21. All eight of the highest-scoring participants were female.

The mean PSQI score for early young age group was the lowest at 3.7, while the mean scores for young, middle-aged, and seniors were 4.8, 4.8, and 4.9 respectively.

The mean number of children that good sleepers had was 3.1, while the mean number of children that bad sleepers had was 4.1, and these results are significant (p <.001).

Among those with more than six children, 59.2% were bad sleepers, the group with the highest percentage (p <.001). The mean PSQI score for those with more than six children was 5.6, while the combined mean for the other groups was 4.5 (p <.001).

Participants did report the consequences of poor sleep quality. About half of bad sleepers (48.59%) Complained of next- day sleepiness compared to 17.1% of good sleepers, and these results were statistically significant (p <.001).

It was noticeable that, among 177 bad sleepers, 138 (78%) were not prescribed any medication to improve their sleep.

4.4.5.1 Sleep Habits of Good and Bad Sleepers. Among those who were classified by the questionnaire as bad sleepers, 39.6% tended to go to bed after 1 a.m., while only 24.1% of good sleepers went to bed after 1 a.m.

The good sleepers took an average of 17.3 minutes to fall asleep, while the bad sleepers took 49 minutes to fall asleep, and these results are highly significant (p <.001).

Good sleepers actually slept an average of 6.8 hours, while bad sleepers slept 5.5 hours , and these results are statistically significant (p <.001).

4.4.5.2 Associations Between Sleep Quality and Various Factors. The relation between bad or good sleepers and education level is statistically significant ($p = 0.086$). The more education that the participants had, the less likely it was that they were bad sleepers. Among illiterate participants, 47.7% were bad sleepers, while among those who had completed Elementary or Intermediate School, 38.5% were bad sleepers. Among those who had completed an education level of high school or higher, 34% were classified as bad sleepers, the lowest percentage of the groups.

The relation between bad or good sleepers and marital status is statistically significant ($p = 0.016$). The lowest percentages of bad sleepers occurred in the divorced and single groups (30% and 33.9% respectively), while the highest percentages of bad sleepers occurred in the married and widowed groups (37.1%, and 63.6% respectively) . Notably, among widowed group, in contrast to the trend, among widowed males, 80% were bad sleepers, while among widowed females only 60.7% were bad sleepers. Divorced males were the least likely to be bad sleepers (16.7%) among all male marital groups. Notably, divorced females were also the least likely to be bad sleepers (35.7%) among all female marital groups.

The relation between bad or good sleepers and chronic illness is statistically significant ($p <.001$). Among those with no chronic illness, 29.6% were bad sleepers. Among participants with chronic illness, 46.8% were classified as bad sleepers.

The relation between bad or good sleepers and financial status is statistically significant ($p = 0.047$). People in the below average group were more affected by bad sleep quality than those in other groups: 51.4% of them were bad sleepers, while 35.7% of average group and 36.8% of the above average group were bad sleepers.

The relation between bad or good sleepers and insomnia is statistically significant (p <0.001). Among those with insomnia, 16.9% were good sleepers and 83.1% were bad sleepers. Among those with no insomnia, 80.4% were good sleepers and 19.6% were bad sleepers.

The relation between good and bad sleepers and self-reported sleep quality was highly correlated. Among those who reported their sleep quality as very good, 5.8% were bad sleepers; among those who reported their sleep quality as good, 32.9% were bad sleepers; among those who reported their sleep quality as average, 74% were bad sleepers; and among those who reported their sleep quality as bad, 100% were bad sleepers. The author used this data to calculate sensitivity and specificity, positive protective value, and negative protected negative value (see table 13 and 14)

Table 13: Self-Reported Responses and Their Association with Overall PSQI Scores

	# of Bad Sleepers (PSQI score 6-21)	# of Good sleepers (PSQI score 0-5)	
Self-reported bad sleep quality	36	0	36
Other responses (average, good, very good)	141	286	427
Total participants	177	286	463

Table 14: Diagnostic Statistics of Sleep Quality Question

		95% CI
Sensitivity	0.21	0.15 - 0.27
Specificity	1.00	0.98-1
Positive predictive value	0.99	0.86-1
Negative predictive value	0.67	0.62- 0.71

The relation between bad or good sleepers and nationality, location, and smoking status is statistically insignificant.

When participants were asked how they rate their sleep quality, all 36 who answered that it was of bad quality were classified as bad sleepers, i.e., no good sleepers described their sleep as being of bad quality.

4.4.5.3 Comparison of Female and Male Bad Sleepers. Compared to males, females experienced poorer sleep quality in the majority of categories. The female to male risk ratio was 1.1 - 4.3. Very few male groups had poorer sleep quality, one of them was widowed males (see table 15).

Table 15: Percent of Females and Males who were Bad Sleepers, by Selected Characteristics, According to PSQI Scores, Makkah, July, 2012

Categories	Sub- categories	Percentage of bad sleepers among females	Percentage of bad sleepers among males	Female/ Male Ratio
Age Groups	*Early Young*	39.3%	9.1%	4.3
	Young	49.5%	29.9%	1.7
	Middle Aged	54.2%	25.6%	2.1
	Senior and Above	52.4%	31.3%	1.7
Nationality				
	Saudi	49.3%	26.5%	1.9
	Non-Saudi	55.2%	27%	2
Location	*Urban*	50%	30.4%	1.6
	Rural	50%	16.9%	3
Number of Children	*0 Children*	45.5%	23.9%	1.9
	1 - 2 Children	39%	20.4%	1.9
	3 - 4 Children	48.1%	36.4%	1.3
	5 - 6 Children	43.6%	14%	3.1
	More than 6	75.6%	40 %	1.9
Chronic Illness	*No Chronic Illness*	40.2%	18.6%	2.1
	Chronic Illness	60.2%	34.2%	1.8
Marital Status	*Single*	41.9%	25.8%	1.6
	Married	51%	25.7%	2
	Divorced	35.7%	16.7%	2.1
	Widowed	60.7%	80%	0.8
Education Level	*Illiterate*	59.4%	26.5%	2.2
	Elementary or Intermediate School Completed	53.7%	27.6%	1.9
	High School Completed	42.9%	22.2%	1.9
	Graduate or Post-Graduate School Completed	42.9%	31.4%	1.4
Financial Status	*Below Average*	68.8%	36.8%	1.9
	Average	48.1%	23.3%	2.1
	Above Average	41.7%	31.3%	1.3
Smoking	*Non-Smoker*	50.0%	25.9%	1.9

	Smoker	50.0%	28.2%	1.8
Employment	*Government*	58.1%	29.2%	2
	Female Homemakers	49.7%	N/A	N/A
	Other	39.4%	25%	1.6
Time to Go to Bed	*9PM - 11PM*	29.3%	15.1%	1.9
	11PM - 1AM	50.5%	27.9%	1.8
	After 1AM	59.1%	35.3%	1.7
Time to Wake Up	*3AM - 7AM*	48%	28.9%	1.7
	7AM - 9AM	51.9%	27.7%	1.9
	After 9AM	46.9%	29.5%	1.6
Sleep Quality (Self-Report)	*Bad*	100%	100 %	1
	Average	80%	64.1%	1.2
	Good	39.7%	27.0%	1.5
	Very Good	5.2%	6.1%	0.9
Hours of Sleep (Cat.)	*0 - 3 Hours of Sleep*	100%	100%	1
	3 - 5 Hours of Sleep	73 %	46.9%	1.6
	5 - 7 Hours of Sleep	45.2%	20.6%	2.1
	7 - 9 Hours of Sleep	26.3%	8.3%	3.2
	Greater than 9 Hours of Sleep	12.5%	0 %	N/A
Insomnia	*No Insomnia*	25.9%	14.9%	1.7
	Insomnia	97.5%	75.6%	1.3
Sleep Rx Usage	*No Drugs*	46.3%	21.6%	2.1
	Less than Once a Week	77.8%	62%	1.3
Somnolence	*No*	35.6%	21.2%	1.7
	yes	76.5%	44.4%	1.7
Level of Enthusiasm to get things done	*Not a Problem*	19.6%	13.5%	1.5
	Yes, a problem	76.4%	49.4%	1.5

4.4.5.4 Multivariate Logistic Regression. The regression was conducted on stratified data based on gender. Sleep and demographic factors were studied separately for males and females. The variables included in the full model were statistically significant ($p < 0.1$) in chi square association test of demographic and sleep variables on sleep quality stratified by gender. Some important factors are intrinsically related and possess natural trends to other demographic features, which vary by gender like increased chronic illness with age. In consequence, males and females averages and proportions across these variables differ, for example, proportion of good sleepers with below average financial status amongst females (8.7%) and males (14%). Therefore, I could not exclude some important variables from the full regression based on a two variable chi square analysis and I had to adjust the logistic regression to reflect these gender differences. Table 16 and 17 show all demographic and sleep factors respectively (X represents variables that were statistically significant in the full model). Tables 18, 19, 20, and 21 show the results of the final regression.

Table 16: Demographic Variables Included in multivariate logistic regression for sleep quality

	Categories	Males	Females
Demographic Factors	Number of Children group		
	Nationality		
	Chronic Illness	X	X
	Marital status		

	Financial		X
	Job		
	Health Center Location	X	
	Smoking		
	Age Group	X	
	Education		

Table 17: Sleep Variables Included in Multivariate Logistic Regression for Sleep Quality Among Males and Females

	Categories	Males	Females
Sleep Factors	*Time to go to Bed*		
	Time to fall asleep		
	Sleep Hours	X	X
	Time to Wake up	X	X

Table18: Results of Multivariate Logistic Regression of Sleep Factors for Sleep Quality Among Males

Variable	Category	OR	CI		P value
Presence or Absence of Chronic illness	People with chronic illness	2.2	1.0 -	4.4	0.030
Location	Rural	0.5	0.2	1	0.065
Age Group	Young	3.234	0.8	13.6	0.051

Table 19: Results of Multivariate Logistic Regression of Demographic Factors for Sleep Quality Among Females

Variable	Category	OR	CI	P value
Presence or Absence of Chronic illness	People with chronic illness	2.4	1.4 4.0	0.002
Financial status	Below Average	2.3	1.0 5.2	0.016
Age Group	Above Average	0.7	0.3 1.4	0.040

Table 20: Results of Multivariate Logistic Regression of Sleep Factors for Sleep Quality Among Males

Variable	OR	CI	P value
Time to Fall asleep	1.084	1.055-1.113	<.001
Sleep Hours	0.431	0.285-0.651	<.001

Table 21: Results of Multivariate Logistic Regression of Sleep Factors for Sleep Quality Among Females

Variable	OR	CI	P value
Time to Fall asleep	1.06	1.039-1.082	<.001
Sleep Hours	0.46	0.324-0.653	<.001

In a multivariate regression of demographic factors among males, we noticed that being a patient with chronic disease was significant (p= 0.030) and that the odds of having bad sleep quality were 2.4 times that of participants with no chronic diseases. Being in the young age

group was significant (p = 0.051). Those in the young age group (between the ages of 25 and 44) were 3.2 times more likely to have bad sleep quality than participants in the early young age group (18 to 24). Being a rural resident was significant (p = 0.065) and the odds of having bad sleep quality were 0.5 times that of participants in urban areas. In the multivariate regression of sleep factors for males, we found that for each minute spent waiting to fall asleep, the odds of being a bad sleeper increased by 1.1, while for every hour-long increase in a participant's sleep hours, the odds of being a bad sleeper decreased (OR= 0.4) . Both of these results were highly significant (p <.001).

In a multivariate regression of demographic factors among females, we noticed that being a patient with chronic disease was significant (p = 0.002) and that the odds of having bad sleep quality were 2.4 times that of participants with no chronic diseases. Being in the below average financial group was significant (p = 0.016) as well as being in the above average group (p = 0.040). For those of below average status, the odds of having bad sleep quality were 2.3 times that of participants of average financial status. In contrast, those in the above average group were less likely to have bad sleep quality in comparison to those in average financial group (OR=0.7). In the multivariate regression of sleep factors for females, we found that for each minute spent waiting to fall asleep, the odds of being a bad sleeper increased by 1.1, while for every hour-long increase in a participant's sleep hours, the odds of being a bad sleeper decreased (OR= 0.5). Both of these results were highly significant (p<.001).

For both males and females, the sleep factors "time to go to bed" and "time to wake up" were insignificant in terms of the multivariate regression.

Chapter 5: Discussion

5.1 Sleep Habits among PHCCs Visitors in Makkah

In this study 61.8%, were classified as good sleepers, while 38.2% were classified as bad sleepers. The prevalence of insomnia was 29.4%. Among all of those with insomnia, those with initial insomnia totaled 105, i.e. 22.7% of study population, and those with maintenance insomnia totaled 73 i.e., 15.8% of the study population. The figure for insomnia prevalence is very close to that of the United States (Mellinger, Balter, & Uhlenhuth, 1985). Most of the study population (81.4%) slept fewer than 7 hours per night , which is under the National Sleep Foundation's recommendation (National Sleep Foundation, 2011).

To explain these findings, we have to look at the bigger picture. The economic changes and modernization which have taken place in KSA during the last four decades have led to lifestyle changes among the Saudi population. These lifestyle changes led to the emergence of new public health problems, for example, road traffic accidents ("Road Traffic Accidents in Saudi Arabia," 2012), non-communicable diseases (Al-Nuaim, Al-Rubeaan, & Khoja, 1995), and sleep problems.

In the past, people's sleep hours were guided by prayer times. Muslims are obligated to pray five times a day. The first of them, the Fajr prayer, occurs about an hour before sunrise, and the last prayer, called the Isha'a prayer, occurs about one and half hours after sunset. So, generally speaking, people tended to wake up at the Fajr prayer time and go to bed directly after the Isha'a prayer. In this study, not only did about half of the participants tend to go to bed

between 11 p.m. and 1 a.m., later than people used to traditionally, but about one-third of participants went to bed between 1 a.m. and sunrise. Urban and rural populations had similar habits: half of these populations went to bed between 11 p.m. and 1 a.m. This might be explained by modernization and the availability of electricity in rural areas, and the tendency to watch TV and socialize late at night.

Another factor that can explain the tendency to go to bed later is the hot weather; with the availability of street lighting and air conditioning, shop hours have been extended, with most retailers staying open until 11 p.m. or later. Many people prefer to shop later at night to avoid the heat.

Insomniacs and bad sleepers tended to go to bed even later than the average participant, and this could be part of a cycle in which going to bed too late contributes to insomnia and bad sleep quality or vice versa. We noticed a correlation between going to bed later than 1 a.m. and self- report of bad sleep quality. The most likely explanation is that they do not get enough sleep hours.

Interestingly, the early young age group is the only group whose main bulk went to bed after 1 a.m. As mentioned earlier, their age is between 18 and 24, and this can reflect the effect of modernization on them because they live their lives in the era of modernization and got adapted to this life style. Also we should consider delayed sleep phase disorder as a possibility. Among the age groups, only significant portion of elderly tended to go to bed earlier as 9 p.m. to 11 p.m. We should consider advanced sleep phase disorder, which is very common in elderly.

5.2 Consequences of Changes in Sleep Habits

Documented negative consequences of bad sleep habits include absenteeism, lost hours of productivity, and accidents. But little effort has been made to study the costs of this health issue. KSA has one of the highest road traffic accident rates in the world, which are mainly attributed to speeding. KSA also has one of the highest prevalence rates of D.M. and obesity in the world, mainly attributed to lack of exercise. From this study, we know that there is a high prevalence of bad sleep habits, and from the literature review, there is a documented relationship between poor sleep and road traffic accidents, obesity, and other chronic conditions.

This study is a good start to opening the field to think more broadly about this issue in association with other health problems.

5.3 Gender-Related Sleep Habits

Many findings in this study are in line with the international figures about predominance of insomnia and poorer sleep habits in females. For example, females complained almost twice as much about insomnia and bad sleep habits. They got the highest scores out of bad sleepers. This may be attributed to concerns that the females have about their families and children, and pressure of society and life events. Also there should be studies about the physiology of sleep in females and the relation, for example with hormones to better understand this relation. I assume that part of this is due to the change in sleep habits in the KSA generally, but in females it is more pronounced. In this study, they had the tendency to go to bed late and also to wake up late, especially homemakers. Another striking fact is that, with new trend of females going to work, female governmental workers tended to have lees sleep hours than their male counterparts. This can be explained by the fact that Saudi people are still traditional in the sense that home duties

are part of females' work. This leads female governmental worker to have double duty, i.e., at work and at home.

Only widowed males had higher percentage bad sleepers and higher PSQI score than their female counterparts. This aligns with many studies showing that among widowed people in general, male widowers in particular, are more badly affected in their health outcomes than their married counterparts (Martikainen & Valkonen, 1996). This can be attributed to the loss of social support or the failure to cope with stress. On the other hand, among divorced participants, lower percentage of bad sleepers among both males and females, and also less time to fall asleep, may indicate the relieving factor of divorce on the life of people with difficult marital situations.

5.4 Multivariate Logistic Regression Analysis

An analysis of the multivariate logistic regression showed that demographic factors that aggravated women's sleep quality were chronic illness and having below average financial status, as mentioned in the literature review above. Being a female in above-average financial group was protective for them against being a bad sleeper. These two results related to wealth indicated that females in KSA might have been worried about financial issues, which could have affected them positively or negatively.

For males, having a chronic disease or being young are aggravating factors to be a bad sleeper, while being a rural resident is a protective factor. Being a young male in KSA (25-44) may have stressors like taking care of old parents and small kids, as well as fulfilling duties for other members of the extended family. Also, since men are the only ones who drive, many young men are required to do the shopping and take relatives places in addition to their work. I think

all of these factors combine to make them bad sleepers. However, being a rural resident may mean having less work and less stress, leading to better sleep quality.

An analysis of sleep factors for both males and females showed similar results. The more time it took to fall asleep, the greater the chance of being a bad sleeper. The longer the person slept, the better the chance of being a good sleeper. Interestingly, time to go to bed and time to wake up were insignificant (i.e., were not related to sleep quality). As mentioned, the number of sleep hours has the most effect on sleep quality, so it may not matter when people went to bed or woke up if they had enough sleep hours.

5.5 Other Associated Factors of Insomnia and Bad Sleep Quality

The relation between both insomnia and bad sleep quality is, as expected, highly significant. Also, there is similarity between the findings of this study and other international studies about significant relationship with chronic illnesses, illiteracy, and aging. These factors may be related to each other, despite the fact that bad sleep quality, as many argued, is not part of the aging process per se.

5.6 Lack of Awareness

Bad sleeping habits are underestimated in Saudi society either by patients who lack the awareness of this problem or physicians who not asking patients about their sleep or prescribing medication tor people's needs. Public health professionals and social science experts can play a major role to address and treat these problems from different prospective.

I found three clear examples of lack of awareness among participants and physicians. It was noticeable that, among 177 bad sleepers, 138 (78%) were not prescribed any medication to improve their sleep. Among insomniacs, 103 (75.8%) did not receive any medication to promote

their sleep. Another example of attitude of people is only 7 out of 17 who took 2 hours to fall asleep received medication to promote their sleep habits.

5.7 Screening Tool

Asking patients how they rate their sleep quality overall was a useful screening tool for busy primary health care physicians to assess their patients sleeping habit in a very short time. Self-reported bad sleep quality had specificity of 0.99 and its positive predictive value was *0.99* (see table 22). Further studies could provide evidence supporting the use of this tool.

The author suggests the following algorithm based on the patients' self-reported sleep quality.

Table 22: Algorithm for Screening Patients According to Self-Reported Sleep Quality

Patient's response	Physician's action
Bad	Evaluate the case, encourage patient to follow sleep hygiene measures, and prescribe non-pharmacological or pharmacological measures accordingly.
Average	Apply PSQI Questionnaire on the patient and follow up based on results
Good	Repeat the question on upcoming visits and encourage patient to follow sleep hygiene measures.
Very Good	Do nothing and encourage patient to follow sleep hygiene measures.

5.8 Limitations

I conducted this study in PHCC for practical purposes because both patients and non-patients are come to this place. This may overestimate the prevalence of sleep problems because there chronic pain and sleep problems. All the sleep habits were self -reported and not observed directly (e.g., in a sleep lab), so some people may have misreported their habits.

Chapter 6: Conclusion and Recommendations

Sleep problems and insomnia are common, underestimated, and undertreated in KSA. Their prevalence is comparable to other parts of the world. Modernization and changes in lifestyle have played a major role in this. Primary care physicians are in a key position to deal with this problem. They can ask their patients how they describe their sleep quality and order the appropriate management.

1. The MOH should establish a Saudi Center for Sleep Medicine concerned with medical and epidemiological aspects of sleep, as well as the training of health care providers.
2. Sleep quality should be considered as a public health measure.
3. PHCC doctors need to be trained effectively to evaluate insomnia and other sleep problems in patient encounters and be trained on simple non-pharmacological treatments.
4. Special attention should be paid to insomnia and other sleep problems in females in Saudi society to look for underlying factors.
5. Physicians should ask for patients to report their sleep quality and treat them accordingly, as self-reported sleep quality has been shown to closely reflect actual sleep quality.

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Appendix A: Map of Kingdom of Saudi Arabia

Appendix B: Pittsburgh Sleep Quality Index (PSQI)

Publisher:	N/A
Copyright:	Daniel J. Buysse. MD, Western Psychiatric Insitute and Clinic. 3811 O'Hara St. Pittsburgh. PA 15213
Bibliography:	Buysse DJ, Reynolds CF, Monk TH. Et al. Pittsburgh Sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Res 1989; 28: 193-213
Population:	Patients with possible sleep disorders
Rater:	Patient and bed partner or roommate
Time to Administer:	10 TO 15 minutes

Description: The PSQI, a 24-item scale, was developed to measure sleep quality over the previous month and to help distinguish between "good" and "poor" sleepers. Sleep quality complaints are common in many psychiatric disorders. This test is useful in determining whether a patient has a significant sleep disturbance. The PSQI is a reliable, valid, and standardized measure of sleep quality. It is unclear whether it is effective in monitoring response to treatment.

Patients with sleep disorders were shown to score significantly higher than normal subjects. The PSQI was also able to correctly 84% of patients with difficulty sleeping. 89% of patients with excessive sleep disorders, and 97% of depressed patients (Buysse et al, 1989). Using a cutoff score of 5, the PSQI was found to be very sensitive and specific, Internal consistency (Cornbach's α=.83) and test – retest reliability were acceptable.

The PSQKI covers several dimensions that impact sleep quality: subjective sleep quality. Sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances. Use of sleep medications, and daytime dysfunction. Of the 24 items, 19 are self-rated and 5 are rated by a bed partner or roommate, if available of the 7 domains ranges from 0 (no difficulty) to 3 (severe difficulty) for a range of 0 to 21. A global score > 5 is considered significant.

PITTSBURGH SLEEP QUALITY INDEX (PSQI)

ISTRUCTIONS: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and Nights in the past month. Please answer all questions.

During the past month, when have you usually gone to bed at night?
USUAL BED TIME _____

During the past month, how long (in minutes) has it usually take you to fall asleep each night?
NUMBER OF MINUTES _____

_____

During the past month, when have you usually up in the morning?
USUAL GETTING UP TIME _____

During the past month, how many hours of actual sleep did you get at night? (This may be different than the

Number of hours you spend in bed.)

HOURS OF SLEEP PER NIGHT _____

ISTRUCTIONS: For each of the remaining questions, check the one test response.

Please answer all questions.

	Very good	Fairly good	Fairly bad	very bad
6.During the past month, how would you rate your sleep quality overall?	☐	☐	☐	☐

	Not during the Past month	Less than once a week	Once or twice a week	Three or more times a week
7.During the past month, how often have You taken medicine (prescribed or "over the counter") to help you sleep?	☐	☐	☐	☐
8.During the past month, how often have You had trouble staying awake while driving, Eating meals, or engaging in social activity?	☐	☐	☐	☐

	No problem At all	only a very slight problem	Somewhat of a problem	A very big problem
9.During the past month, how much of a Problem has it been for you to keep up Enough enthusiasm to get things done?	☐	☐	☐	☐

	No bed Partner or Roommate	Partner/ roommate in -.other room	Partner in same room, but not same bed	partner in same bed
10.During the past month, how much of a Problem has it been for you to keep up Enough enthusiasm to get things done?	☐	☐	☐	☐

If you have a roommate or bed partner, ask him/her how often in the past month you have had..

	Not during the Past month	Less than once a week	Once or twice a week	Three or more times a week
(a) …loud snoring	☐	☐	☐	☐
(b) ..long pauses between breaths while asleep	☐	☐	☐	☐
(c) …legs twitching or jerking while you sleep	☐	☐	☐	☐
(d) …episodes of disorientation or confusion During sleep	☐	☐	☐	☐
(c) Other restlessness while you sleep; Please describe	☐	☐	☐	☐

During the past month, how often have you had trouble sleeping because you.

	Not during the Past month	Less than once a week	Once or twice a week	Three or more Times a week
(a)…cannot get to sleep within 30 minutes	☐	☐	☐	☐
(b)… wake up in the middle of the night or Early morning	☐	☐	☐	☐
(c) …have to get up to use the bathroom	☐	☐	☐	☐
(d)…cannot breathe comfortably	☐	☐	☐	☐
(e)…cough or snore loudly	☐	☐	☐	☐
(f)…feel too cold	☐	☐	☐	☐
(g)…feel too hot	☐	☐	☐	☐
(h)…had bad dreams	☐	☐	☐	☐
(I)…have pain	☐	☐	☐	☐
(j) Other reason (s), please describe	☐	☐	☐	☐

How often during the past month have You had trouble sleeping because of this?	☐	☐	☐	☐

SCORING INSTRUCTIONS FOR THE PITTSBURIGH SLEEP QUALITY INDEX:

The Pittsburgh Sleep Quality Index (PSQI) contains 19 self-rated questions and 5 questions rated by the bed partner or roommate (if one is available). Only self-rated questions are included in the scoring.

The 19 self-rated items are combined to form seven "component" scores, each of which has a range of 0-3 points. In all cases, a score of "0" indicates no difficulty, while a score of "3" indicates severe difficulty. The seven component scores are then added to yield one "global" score, with a range of 0-21 points, "0" indicating no difficulty and "21" indicating severe difficulties in all areas.

Scoring proceeds as follows:

Component1: Subjective sleep quality

Examine question #6, and assign scores as follows:

	Component 1
Response	Score
"Very good"	0
"Fairly good"	1
"Fairly bad"	2
"Very bad"	3

Component 1 score: _____

Component 2: Sleep latency

1.Examine question #2. And assign scores as follows:

Response	Score –
≤15 minutes	0
16-30 minutes	1
31-60 minutes	2
>60 minutes	3

Question #2 score: _____

2.Examine question #5a. and assign scores as follows:

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Question #5a score: _____

3.Add #2 score and #5a score

Sum of #2 and #5a: _____

4.Assign component 2 score as follows:

Sum of #2 and #5a	Component 2 score
0	0

1-2	1
3-4	2
5-6	3

Component 3: Sleep duration

Examine question #4, and assign scores as follows:

Component 3

Response	Score
>7 hours	0
6-7 hours	1
5-6 hours	2
<5 hours	3

Component 3 score: _____

Component 4: Habitual sleep efficiency

1.Write the number of hours slept (question #4) here: _____

2.Calculate the number of hours spent in bed:

Getting up time (question #3):_____

Bedtime (question #1):_____

_____

Number of hours spent in bed:_____

3. Calculate habitual sleep efficiency as follows:

(Number of hours slept/Number of hours spent in bed) x100= Habitual sleep efficiency (%)

(_____/_____) x 100 = %

4.Assign component 4 score as follows:

Component 4

Habitual sleep efficiency %	score
>85%	0

75-84%	1
65-74%	2
<65%	3

Component 4 score:_____

Component 5: Step disturbances

Examine questions #5b-5j, and assign scores for each question as follows:

Response	Score
Not during the past month	0
Less than one a week	1
Once or twice a week	2
Three or more times a week	3

5b score: _____

5c score: _____

5d score: _____

5e score: _____

5f score: _____

5g score: _____

5h score: _____

5i score: _____

5j score: _____

Add the scores for questions #5b-5j:

Sum of #5b-5j: _____

Assign component 5 score as follows:

Sum of #5b-5j	component 5 more
0	0
1-9	1
10-18-4	2
19-27	3

Component score: _____

Component 6: Use of sleeping medication

Samine question #7 and assign scores as follows:

Component 6

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Component 5 score: _____

Component 7: Daytime dysfunction

1.Examine question #8, and assign scores as follows:

Response	Score
Never	0
Once or twice	1
Once or twice each week	2
Three or more times each week	3

Question #8 score: _____

2.Examine question #9, and assign scores as follows:

Response	Score
No problem at all	0
Only a very slight problem	1
Somewhat of a problem	2
A very big problem	3

Question #9 score: _____

3.Add the scores for question #8 and #9:

Sum of #8 and #9: _____

4.Assign component 7 score as follows:

Sum of #8 and #9	Component 7 score
0	0
1-2	1
3-4	2
5-6	3

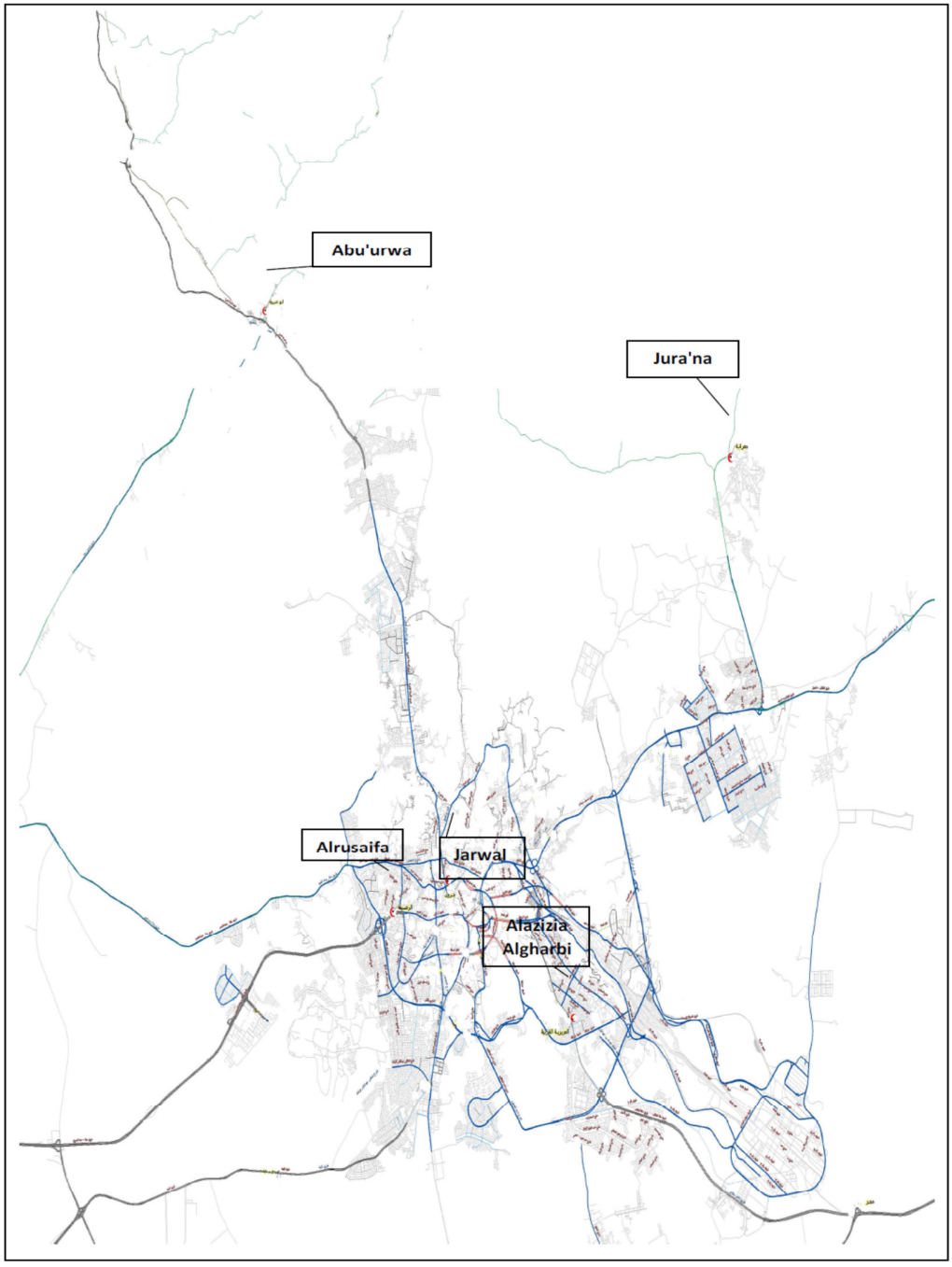
Component 7 score:_____

Global PSQI Score

Add the seven component scores together:

Global PSOI Score: _____

Appendix C: The Participating Primary Health Care Centers in the Study



Appendix D: Arabic Version of Pittsburgh Sleep Quality Index (PSQI)

الإسم		العمر		الجنس	

تم شرح الاستبيان للمراجع	

الجنسية	□ سعودي □ غير سعودي
الحالة الإجتماعية	□ عازب □ متزوج □ مطلق □ أرمل عدد الأطفال إن وجد : .....
المستوى التعليمي	□ غير متعلم □ شهادة إبتدائية □ شهادة متوسطة □ شهادة ثانوية □ شهادة جامعية □ دراسات عليا

الوظيفة	□ موظف حكومي □ عسكري □ موظف أهلي □ أعمال حرة □ متسبب □ متقاعد المسمى الوظيفي :.....
أي أمراض مزمنة	□ سكر □ ضغط □ ربو □ قصور القلب □ خشونة المفاصل □ أمراض نفسية (اكتئاب) □ أخرى . حدد :.....
التدخين	□ مدخنة □ غير مدخنة □ مدخنة سابق □ نوع التدخين □ سجائر □ شيشة □ أخرى حدد :.....

مقياس بتسبرج لنوعية النوم
هذة المجموعة من الأسئلة تتعلق بعادات نومك في الشهر الماضي فقط حاول أن تجيب بأكثر إجابة محتملة وعلى جميع الأسئلة قدر الإمكان
١- في خلال الشهر الماضي في أي وقت عادة كنت تذهب للفراش ؟ الوقت : .....
٢- في خلال الشهر الماضي ماهي المدة التي تأخذها عادة بالفراش حتى تدخل في النوم كل ليلة ؟ المدة بالدقائق : .....
٣- في خلال الشهر الشهر الماضي ماهو موعد استيقاظك المعتاد في الصباح ؟ الوقت : .....
٤- في خلال الشهر الماضي ماهي عدد ساعات نومك الفعلية يالليل (ليس المقصود الوقت الذي تقضيه بالفراش ولكن عدد ساعات النوم) عدد ساعات النوم في الليلة : .....

بالنسبة للأسئلة المتبقية ، المرجو إعطاء إجابة واحدة محتملة وإجابة كل الأسئلة قدر الإمكان :

٥- في خلال الشهر الماضي كم مرة وجدت صعوبة في النوم نتيجة لأحد الأسباب التالية :

		ليس في الشهر الماضي	أقل من مرة في الأسبوع	مرة واحدة في الأسبوع	٣ مرات أو أكثر في الأسبوع
أ	لم أستطيع النوم في خلال ٣٠ دقيقة				
ب	أستيقظ في منتصف الليل ، قرب الصباح				
ج	لم أستطع التنفس بارتياح				
د	أسهل أن أشخر (أغط				

	) بصوت عالي				
هـ	أشعر ببرودة شديدة				
و	أشعر بحرارة شديدة				
ز	لدي أحلام سيئة				
ح	أشعر بألم				
ط	أسباب أخرى				

مامعدل حدوثها أثناء الشهر الماضي

		جيد جداً	جيد	متوسط	سيئ
٦	في خلال الشهر				

	الماضي كيف تصف نومك بصفة مجملة ؟				

		ليس في الشهر الماضي	أقل من مرة في الأسبوع	مرة أو مرتين في الأسبوع	٣ مرات أو أكثر في الأسبوع
٧	في خلال الشهر الماضي كم مرة أخذت أدوية للنوم (أدوية موصوفة أو غير موصوفة طبياً)				
٨	في خلال الشهر الماضي كم مرة				

	كانت لديك مشكلة في البقاء مستيقظاً أثناء القيادة أو أكل للوجبات أو أي نشاط اجتماعي أخر				

		ليست مشكلة على الأطلاق	مشكلة بسيطة	مشكلة ليست بسيطة	مشكلة كبيرة
٩	في خلال الشهر الماضي كيف كانت مشكلة بالنسبة لك أن تحتفظ بحماس ونشاط كافي لإنجاز الأشياء المختلفة ؟				