QATAR UNIVERSITY

COLLEGE OF PHARMACY

SLEEP PATTERNS AMONG UNIVERSITY STUDENTS AND INSOMNIA

MANAGEMENT IN PRIMARY CARE SETTINGS IN QATAR: A TWO-PHASE

INVESTIGATION

BY

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ABSTRACT

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Title: Sleep Patterns among University Students and Insomnia Management in Primary Care Settings in Qatar: a Two-Phase Investigation

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Insomnia is a public health concern that affects approximately a third of adult population worldwide. The aim of this research was to investigate insomnia and its management among university students and primary care centers in Qatar using quantitative and qualitative methods, respectively. The first phase of this research consisted of a cross-sectional quantitative survey to explore the pattern and quality of sleep among Qatar University (QU) students using the Pittsburgh Sleep Quality Index and the Sleep Hygiene Index. In the second phase, qualitative interviews were used to explore the perspectives of healthcare providers (HCPs) working at primary health care centers (PHCCs) regarding insomnia and its management. Approximately 70% of QU students reported scores consistent with poor sleep quality and 79% reported poor sleep hygiene. Students with good sleep hygiene compared to those with poor sleep hygiene were about four times more likely to have good sleep quality (OR= 3.66, 95% CI= 2.8-4.8, p < 0.001). The interviews with 19 HCPs generated five themes, including general perspectives on insomnia, view of primary healthcare as the setting for insomnia management, current practices for insomnia management at PHCCs, HCPs' role perception, and challenges facing insomnia management at PHCCs. The findings from this two-phase investigation revealed that insomnia is common among university students in Qatar and that it is associated with poor sleeping habits. HCPs at PHCCs

expressed awareness of the magnitude of insomnia as a problem of public health

significance but appeared to find its management challenging.

DEDICATION

To my grandmother who always reminds me that even the darkest of nights

ends with a sunrise.

ACKNOWLEDGMENTS

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CHAPTER 1: INTRODUCTION

1.1. The anatomy and physiology of sleep

Sleep is one of the fundamental human needs required to maintain physical and mental health. Adults need around 7 to 9 hours of sleep per night to preserve their health (1). The anatomy of sleep is complex as different parts of the brain are involved in the initiation and maintenance of sleep. One of the most important brain parts involved in sleep is the hypothalamus, which contains a group of nerve cells responsible for maintaining the balance between sleep and arousal (2). The hypothalamus contains the suprachiasmatic nucleus which senses external stimuli such as light and is responsible for regulating different activities in the body, including sleep, based on the circadian rhythm (3). The thalamus also plays an important role in arousal by controlling the activity levels in the cerebral cortex. Moreover, different structures in the brain stem including the medulla oblongata, pons and midbrain represent essential parts of the sleep arousal system. The brain stem also contains neurons which connects it with both the hypothalamus and the cerebral cortex. Overall, the anterior hypothalamus and basal forebrain can be regarded as the sleep center in humans, whereas the posterior hypothalamus represents the wake center (2).

The sleep-wake cycle is mainly regulated by two mechanisms; the reticular activating system and the circadian rhythm (4). The reticular activating system, also known as the ascending arousal system, extends from the upper pons to the hypothalamus and the base of the forebrain and promotes wakefulness by releasing neurotransmitters that activate the thalamus, cerebral cortex and other areas in the forebrain (5). The wakefulness maintaining neurotransmitters released by this pathway includes norepinephrine, dopamine, serotonin, histamine, glutamate, acetylcholine,

peptide neurotransmitter orexin and neuropeptides such as substance P and corticotropin releasing factor which are released from the hypothalamus (5). On the other hand, the sleep promoting neurotransmitters function by releasing chemicals which suppress the activity of the arousal system (5). These neurotransmitters are released by clusters of inhibitory neuronal cells present in the ventrolateral preoptic area (VLPO) (6). The activity of these neurons is continuous during sleep. It has also been suggested that the initiation of sleep could be related to the activation of the VLPO neurons by external triggers, most likely adenosine (6). The other important inhibitory neurotransmitter is γ-aminobutyric acid (GABA), which is produced by cells in the basal forebrain and hypothalamus (2,3). The balance between the arousal and the sleep promoting systems is responsible for regulating the transition between sleep and wakefulness.

The circadian rhythm is a 24-hour long cycle of neuronal activity which is aligned with environmental light-dark stimuli (5). Differences in the circadian period can lead to variations in the diurnal preferences, and individuals sleeping habits could also affect the length of the cycle (3). This sleep-wake cycle is also regulated by melatonin which is a hormone secreted by the pineal gland. The secretion of melatonin is affected by the amount of environmental light, such that it is induced by darkness and inhibited by exposure to ambient light. During night sleep, the core body temperature is at its lowest levels while the melatonin at its highest level (4).

A healthy sleep consists of around 4-6 sleep cycles each night (3). Each cycle consists of two stages which are the non-rapid eye movement (NREM) and the rapid eye movement (REM) stages. The duration of each cycle ranges between 70 and 120 minutes (3). This classification of sleep is based on the recording of the

electrophysiologic parameters using polysomnography (5). A typical sleep cycle starts with NREM and progresses to the REM stage. NREM stage is further divided into 3 stages (N1, N2 and N3). N2 is the longer stage of the sleep cycle, followed by N3, which is known to be the deep sleep stage; in fact, spending enough time at this stage is necessary for the person to feel refreshed during the day. Most of the dreaming occurs during the REM phase with rapid eye movement from side to side behind the eyelid (7). Generally, REM stage comprises 20-25% of the total sleep time, while NREM stage represents around 50-60% (5). The movement from one sleep stage to the other happens in a progressive and gradual manner without complete transition from one stage to the other (8).

Sleeping patterns change throughout the lifecycle of an individual. Healthy adults usually fall asleep within 10 minutes and sleep for around 7-8 hours per night (3,4). Infants and young children require a longer sleep duration. The division of the sleep cycle into REM and NREM stages in humans starts at 3 to 6 months of age (3). Individuals develop the circadian pattern of sleep and wakefulness at approximately 3 years of age. During childhood, N3 sleep stage is more prominent and the duration of this phase decreases as the person moves from puberty to adulthood (5). Other NREM stages become more fragmented in older adults with greater frequency of waking up during the NREM sleep stages in this population. Particularly, a reduction in N3-slow wave sleep is detected in the elderly (5). During the infancy period, REM accounts for 50% of the total sleep time and as the person grows into adulthood the percentage of the REM stage decreases to represent 20-25% of the night sleep duration.

1.2. Insomnia and its classification

Insomnia has been defined as a persistent complaint of difficulty falling or staying asleep and early morning awakenings associated with difficulty returning to sleep despite adequate opportunity (9). These symptoms are often accompanied with significant impairment in daytime performance and activities. According to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) and the International Classification of Disease, 10th edition (ICD-10), the previously mentioned symptoms should occur at least 3 times a week for a minimum duration of 1 month (10,11). In addition, ICD-10 identifies preoccupation with sleepiness and excessive worry about the consequences of insomnia during the day as one of the clinical features for insomnia (11).

Insomnia has historically been classified into either a primary or secondary insomnia. This classification was introduced to differentiate between insomnia as a standalone problem (primary insomnia) as opposed to insomnia that presents as a symptom of an underlying medical or psychiatric condition (secondary insomnia) (12). Disturbances in the neurochemicals controlling the arousal and sleep promoting systems could lead to the development of primary insomnia. Primary insomnia is a hyperarousal state, particularly somatic arousal, which is identified by an increase in muscle tone, sweating and increased heart rate due to peripheral nervous system activation (10). Additionally, misalignment of the endogenous circadian rhythm with the individual's desired sleep-wake schedule could also lead to sleep disturbances (5). Moreover, some personal factors including the sleep environment and racing thoughts, or life stressors could disturb the normal sleep and contribute to the development of insomnia (10).

However, the latest editions of the diagnostic criteria for insomnia namely the DSM-5 and the International Classification of Sleep Disorders 3rd edition (ICSD-3) have moved away from this classification (10,13). In the ICSD-3, insomnia was classified according to the duration of symptoms into either a short-term insomnia or chronic insomnia. In addition, the DSM-5 suggests that insomnia should be viewed as an independent medical problem regardless of the presence of other health problems, whether medical or psychological (10). Yet both guidelines have specifically highlighted the need to take other comorbid conditions into consideration when diagnosing and managing insomnia. The choice of the new classification was mainly done to avoid the inappropriate management of insomnia when classified as a secondary problem and to overcome the difficulties associated with diagnosing comorbid insomnia (14). Moreover, the ICSD-3 has included two additional classification criteria one for individuals who present with isolated insomnia symptoms and the other for short sleepers (<6 hours per night) (13).

Therefore, the classification of insomnia now is largely dependent on the duration of the symptoms and is classified into either acute or chronic. Acute insomnia is diagnosed when the symptoms have been experienced for less than 3 months, usually associated with a known precipitant like stress or pain (12). While chronic insomnia is diagnosed when it persists for longer than 3 months (11). Additionally, requiring 30 minutes or longer to either fall asleep or return to sleep after waking up at night is considered an abnormal parameter.

1.3. Epidemiology of insomnia

Insomnia is the most common sleep complaint in the general population (15–17). The prevalence of insomnia has been extensively investigated in the last 40 years (12). Overall, studies in the general population suggest that around 30% of adults present with at least one of the insomnia symptoms, while 10-13% are estimated to suffer from chronic insomnia (16,18). Additionally, only 1-2% of the general population are reported to have chronic insomnia without an underlying cause (16). Studies from general populations in Western countries have reported an insomnia prevalence ranging from 19-37.6% (19–24). Similarly, epidemiological studies from Asian countries such as China, Japan and Korea have found a similar prevalence rate (13.5-39.4%) in adults (25–29). Limited information is available in the literature on the prevalence of insomnia in Arab countries including the Middle East and North Africa. The findings of a population study from the Kingdom of Saudi Arabia (KSA) have shown higher prevalence rates of insomnia as compared to reports from Western and Asian countries. In this study around 78% of the sample reported poor sleep quality and more than one-third had insufficient sleep (<7 hours) (30).

In Qatar, results from a study among professional male soccer players indicated that 69% suffered from poor sleep quality, but only 27% fit the criteria for insomnia (31). An unpublished population-based study that was recently conducted by the Social and Economic Research Institute at Qatar University (QU) reported a prevalence of 5.5% among adults, which is much lower than the prevalence found in the Western and Asian studies reported above (32). However, it is noteworthy to mention that this study used a relatively strict definition of insomnia by applying the DSM-5 criteria. A review conducted by Ohayon in 2002 suggested that the prevalence of insomnia identified in

epidemiological studies is influenced by the definition used and found that highest prevalence (30%) was often identified in studies that used insomnia symptoms as the defining criteria, while the lowest prevalence was associated with the use of the DSM-diagnostic based criteria (6%) (33) .

Accumulating evidence from research suggests that some sectors of the population are more vulnerable to sleep disturbances than others. These at-risk groups include university students, the elderly and individuals with chronic conditions or mental illness. Insomnia is a common problem among university students, with a reported mean prevalence of 18.5% (34). University students have irregular sleeping patterns with sleep duration of less than 8 hours per night (35). Studies have also reported the occurrence of excessive daytime sleepiness in 50% of college students as compared to 36% of non-student adults (36). In fact, university students are considered a population at higher risk for insomnia due to the stress related to the academic workload and assessments to which they are exposed, coupled with their unhealthy lifestyles.

Several epidemiological studies have also consistently shown that insomnia prevalence increases with age (18,20,27,29). A study done among older adults ($\geq$50 years) from 8 different countries across Asia and Africa reported that 16.6% of the sample experienced sleep disturbances. In this study, the probability of developing insomnia increased with increasing age and was more common in females (37). One study reported that insomnia was the second most common problem in this population with a prevalence of 28% (38). In another study, around one-third of the elderly sample reported having insomnia symptoms (39). It has been suggested that changes in sleep pattern among older adults which manifests as a decrease in deep sleep and frequent

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nocturnal awakenings are responsible for the occurrence of frequent sleep disturbances accompanied with daytime sleepiness (33,40). This observation could be related to the increase in chronic disease burden, polypharmacy and lack of engagement in physical and social activities in this age group (39,41). It is estimated that four out of every five elderly individuals have at least one chronic medical condition (41). Heart diseases, chronic pain, memory problems and depression were found to be commonly associated with insomnia in this population (41).

Insomnia is also a common complaint in individuals with chronic ailments both physical and mental (42). It is well known that insomnia and disrupted sleep patterns are some of the early symptoms of several mental disorders (43). Studies are now suggesting a bidirectional relationship between insomnia and other psychiatric illnesses, whereby chronic insomnia is considered as an independent risk factor for developing mental illnesses even in healthy individuals (43,44). Specifically, it was suggested that insomnia increases the risk of depression by two folds in healthy individuals (44).

Several studies have also shown that long-standing insomnia increases the probability of developing chronic medical conditions including hypertension, cardiovascular diseases and type 2 diabetes (45,46). In addition, sleep deprivation has been identified as a risk factor for premature mortality (40). A previous study has also explored its association with early symptoms of cancer (47).

1.4. Insomnia in primary care settings

Insomnia is the second most common complaint in primary healthcare settings after pain (12). Primary healthcare centers (PHCCs) are usually the first point of contact of patients with the healthcare system due to their accessibility and affordability. In fact, studies from different countries have reported that between 22.4-76.5% of patients treated at PHCCs present with at least one of the insomnia symptoms (48–57). Therefore, healthcare professionals at PHCCs play an important role in the detection and management of insomnia as it is common in community dwelling adults, especially among individuals with chronic conditions. Indeed, observations from practice have confirmed that general practitioners at PHCCs are the first healthcare professionals to whom patients convey their sleeping problems (15).

Chronic insomnia associated with daytime dysfunction is also common among insomniacs presenting at PHCCs. A study conducted in Malaysia reported that around 59% of those with sleep problems had chronic insomnia and that 28.6% of them were also complaining of impaired daytime performance (51). It has also been documented that insomnia often worsens functional impairment and disability associated with other medical conditions (58). A second study done in Italian PHCCs found that more than 50% of patients reporting insomnia also complained of associated daytime dysfunction (49). The most common daytime complications of insomnia were mood disturbances and tiredness during the day. In another study, patients with insomnia were twice more likely to have days of restricted activity due to illness and tended to spend more days in bed as compared to individuals without insomnia (58). Therefore, insomniacs in this study were more likely to have occupational disability as a result of taking more sick days leaves.

1.5. Guidelines recommendations on insomnia management

Treatment options available for insomnia include psychological and pharmacological therapies which are given to improve sleep and alleviate disease-related dysfunction. Insomnia guidelines recommend that patients receive psychological therapies either alone or in combination with pharmacological therapies as needed. Table 1 provides a summary of insomnia management recommendations as per the most up-to-date international guidelines (59–62). All these guidelines concur that cognitive behavioral therapy specifically designed for insomnia (referred to as CBT-I) should be the first line treatment. CBT-I consists of a combination of behavioral, cognitive and educational interventions including stimulus control, sleep restriction, relaxation techniques and sleep hygiene (63). A meta-analysis that assessed the benefits and harms associated with non-pharmacological interventions for insomnia reported the superiority of CBT-I in improving all sleep related outcomes including sleep quality, efficiency and onset latency in comparison to the control (63). Additionally, the improvement in sleep was maintained for up to 6 months after treatment.

As part of CBT-I, the European guidelines for insomnia recommends the provision of patient education on healthy sleep habits known as sleep hygiene. Sleep hygiene consists of a combination of behavioral practices and environmental conditions which improve sleep (9). It is known that unhealthy sleep related habits, such as taking daytime naps and consuming stimulants (including caffeine) close to bedtime, are common among insomniacs; therefore, sleep hygiene education is considered an important element in the management of insomnia (64). A meta-analysis which assessed the efficacy of sleep hygiene education in insomnia treatment found a

significant improvement in sleep onset latency, sleep fragmentation, total sleep duration and insomnia scores indicative of improved sleep when using validated questionnaires such as the Pittsburg Sleep Quality Index (PSQI) (65). However, sleep hygiene education was significantly less effective than CBT-I. Despite that, the evidence on sleep hygiene's effectiveness remains controversial as the components of sleep hygiene recommended are widely variable across studies which makes the generalization of the findings more challenging (66).

The use of hypnotics for insomnia management is recommended if CBT-I alone was not effective or if it was not available for patients (59–62). However, these medications are recommended to be used for a maximum of 4-5 weeks with close patient monitoring (59,60). Long term use of hypnotics is generally discouraged but if needed hypnotics could be used for longer than 5 weeks.

Additionally, some guidelines recommend the use of sedative antidepressants for insomnia (60–62). However, the British Association for Psychopharmacology (BAP) guidelines for insomnia recommends their use to be reserved for patients with a comorbid mood disorder. The use of antipsychotics is not recommended due to their side effects and lack of evidence on efficacy for insomnia management (60,61).

The European, the BAP and the American Academy of Sleep Medicine (AASM) guidelines for insomnia do not recommend the use of antihistamines or melatonin for insomnia management due to limited efficacy evidence. The AASM recommends the use of suvorexant (an orexin agonist) and ramelteon (a melatonin agonist) for sleep maintenance and sleep onset insomnia, respectively (61).

Table 1. Guidelines' recommendations for insomnia management

Guidelines	First line	Second line	Treatments not recommended
American College of Physicians guidelines (2016)	CBT-I[*] is recommended as the initial treatment for all adults with chronic insomnia disorder. *(Grade: strong recommendation, moderate-quality evidence)*	Short term use of medications in combination with CBT-I when CBT-I alone is unsuccessful. *(Grade: weak recommendation, low-quality evidence)*	None
European Guidelines for Diagnosis and Treatment of Insomnia (2017)	CBT-I[*] is recommended as first-line treatment for chronic insomnia in adults of any age. *(Strong recommendation, high-quality evidence)*	• Benzodiazepines (BZ) and Benzodiazepine receptor agonists (BZRA,) (<4 weeks). (High quality evidence) • Sedative antidepressants for short term use. (Moderate-high quality evidence*)*	• Long term use of BZs/BZRAs. • Long term use of sedating antidepressants[**] • Antipsychotics[**] • Antihistamines[**] • Melatonin *(low quality evidence)*. • Phototherapies (e.g. valerian). • Alternative and complementary therapies (e.g. aromatherapy).
British Association for Psychopharmacology (2010)	- CBT-I[*] package is the first line of therapy for insomnia. *(High quality evidence)* - CBT-I[*] recommended when tapering hypnotics	• Hypnotics might be used after considering the safety, efficacy and onset for action of the medication. *(High quality evidence)* • Long term use of hypnotics is allowed as needed. Withdrawal is recommended. • Antidepressants: recommended at the existence of a comorbid psychiatric disorder. • Antipsychotics: not a first line treatment for insomnia (side effects).	• Antihistamines
American Academy of Sleep Medicine (2017)	• Suvorexant is recommended for sleep maintenance in individuals with chronic primary insomnia. *(Weak)* • Ramelteon for sleep onset insomnia • BDZs and Z-drugs *(Benefits outweighs the risks). (Weak)* • Doxepin *(Benefits outweighs the risks)*		• Diphenhydramine[**] • Melatonin[**] • Tryptophan • Valerian • Trazodone[**] • Tiagabine[***]

*CBT-I: Cognitive behavioral therapy for insomnia
**Lack of evidence on efficacy
***Harm outweigh the benefits

1.6. Study rationale and significance

Insomnia is a public health problem that affects around one third of adults in the general population which is particularly common among university students and individuals accessing primary health care services. Insomnia is a public health concern and a burden to society as it affects the overall performance of individuals and impairs their physical and mental health. Sleeping problems are also associated with serious consequence, such as increased rates of motor accidents, lower productivity and work absenteeism (28,40). Therefore, identifying the extent of insomnia distribution and factors contributing to its development in these populations are necessary before designing interventions to address the problem more effectively.

It was recently reported that around 5.5% of the adult population in Qatar has insomnia (32). Daytime sleepiness was found to be common among patients at PHCCs in Qatar and around one third of PHCCs' attendants were reported to have depression or anxiety (67,68). Likewise, depression is common among teenagers in Qatar as it was previously shown that around one third of Qatari adolescents at secondary schools have clinical depression (69). Considering the established link between depression and sleep problems it is possible that adolescents may also be at higher risk of experiencing insomnia. Moreover, if depression and related sleep problems are not resolved early, these may be carried on during their study at university.

Qatar University (QU) is the largest national university in the country to which thousands of students are enrolled every year; the majority of which are Qatari high school graduates. The estimated number of students at QU as of Fall 2019 was 20,000 (70). Students are distributed across ten different colleges, including: Arts and Sciences, Business and Economics, Engineering, Education, Law, Medicine, Pharmacy, Health

Sciences, Sharia and Islamic Studies and Dental Medicine. The university also offers a Foundation Program, designed for new students who do not acquire the mandatory requirements for enrollment in specific colleges. The number of students and the variability in both student populations and academic specialties offered makes QU an appropriate site for evaluation of sleep problems among university students in Qatar.

The healthcare system in Qatar comprises public, private and semi-private entities. The leading healthcare provider in the country is Hamad Medical Corporation (HMC) which currently consists of 13 hospitals, including the Mental Health hospital (71). Primary Healthcare Corporation - which is a public institution - is the main provider of primary care services in Qatar, through its twenty seven healthcare centers distributed in different regions across the country (72,73). PHCCs are easily accessible to all the population in Qatar and therefore, for individuals suffering from insomnia, it is expected to be the first point of contact with the healthcare system. The healthcare utilization seems to be more common among insomniacs as it was previously shown that individuals who visited a doctor two times or more in a one month period were 50% more likely to have a sleep problem (41). The Ministry of Public Health (MoPH) is the primary authority in the country which regulates both the public and the private healthcare sectors (74).

Mental health services are mostly reserved to secondary healthcare institutions, more specifically to HMC's psychiatric hospital. However, in recent years the role of primary care in the management of mental illnesses has been expanded to PHCCs, in line with the main goals of Qatar's National Mental Health Strategy (73). This strategy aims for primary health care to become the foundation for delivering mental health services, including early identification and treatment of mental disorders. To achieve

this goal, around sixty one physicians at PHCCs in Qatar received advanced mental health training (74). Mental healthcare services have been integrated into PHCCs as of February 2019 which includes support clinics run by psychologists and a once weekly mental health clinic run by a psychiatrist (75). Although it is unclear if general practitioners at PHCCs received specialized training on sleep medicine, it is likely that they acquired basic skills needed to identify and manage insomnia through their mental health training program. This will not only improve the early identification of insomnia but will also facilitate the introduction of early interventions to decrease the burden of insomnia and the consequences associated with delayed treatment.

Currently, many of the medications used for insomnia treatment are not available on the PHCCs' formulary and are only available at specialized hospitals or through psychiatrists at mental health clinics. Medications are affordable at public hospitals and PHCCs in Qatar as the cost of medications and other healthcare services are subsidized by the government (76). At PHCCs, physicians are involved in the diagnosis and the treatment of various disease conditions including mental illnesses while pharmacists' role remains largely limited to the traditional medication dispensing and to a lesser extent education and counseling on medications. Therefore, it is important to explore how health care providers (HCPs) at PHCCs treat patients presenting with insomnia complaints considering the above realities in relation to insomnia management.

Additionally, considering that most individuals with chronic conditions such as diabetes, hypertension and cardiovascular diseases, who are also at higher risk for insomnia, are treated at PHCCs, it is important to understand the viewpoints of HCPs who treat these patients. Furthermore, exploring the influence of the different

educational and cultural backgrounds from which HCPs' come from on insomnia management is indeed important.

Overall, there is a paucity of research information in the published literature about sleep problems in Qatar. No previous studies in Qatar have focused on the sleeping patterns and habits among university students. Additionally, insomnia management in primary care has not been sufficiently explored, neither in Qatar nor in other Arab countries. Thus, this investigation will contribute towards the goal of Qatar's mental health strategy to shift the management of mental health conditions to PHCCs.

1.7. Study objectives

The main aim of this study is to explore the prevalence of insomnia among university students and to describe the approaches followed by healthcare providers for insomnia management at PHCCs. To achieve this aim, the following are the objectives of the study:

1.7.1. Objectives for phase 1 of the study

The specific objectives of this phase of the study were to explore:

  i. Sleeping patterns and the prevalence of sleep problems, particularly insomnia among university students in Qatar.

  ii. Common sleep hygiene behaviors and practices among QU students.

  iii. Factors that contribute to the development of insomnia in university students.

1.7.2. Objectives for phase 2 of the study

The objectives of this phase of the study were to explore:

i.   The overall perspectives of general practitioners and pharmacists on insomnia as a health concern.

ii.   The assessment, diagnosis and management of insomnia at PHCCs

iii.   HCPs' perceptions of their role in the management of sleep problem at PHCCs. of insomnia.

iv.   Barriers for the optimal care of patients with insomnia presenting at PHCCs.

CHAPTER 2: LITERATURE REVIEW

This chapter provides an overview of the current literature findings in relation to insomnia starting with reviewing the prevalence of insomnia briefly in the general population and more extensively in university students. Next, a systematic review of the available instruments for assessing insomnia symptoms or sleep hygiene will be presented. Lastly, this chapter will explore the literature related to HCPs' perspectives and experiences with insomnia management in primary healthcare centers.

2.1. Insomnia in university students

2.1.1. Sleeping patterns and prevalence of insomnia among university students

2.1.1.1. Insomnia prevalence

According to a systematic review of seven studies published in the period between 2000 and 2014, the mean prevalence of insomnia among university students was identified as 18.5% (95% CI =11.2-28.8%) (34). However, the prevalence reported in the literature is variable both within and beyond the range reported in this study.

Poor sleep quality and insomnia were found to be common among university students from Asian countries. A study which was conducted among 400 full-time students from a university in Hong Kong showed that around 58% of the participants had poor sleep quality (77). While the prevalence of sleep problems among Indian university students was found to be 43.1% (78). Higher prevalence rates were reported among university students in Pakistan, with 60.5% of them having poor sleep quality (79). On the other hand, only around 15% of Japanese graduate students were found to have insomnia with 4% complaining of excessive daytime sleepiness (80). Furthermore, the prevalence of sleep problems among Iranian university students was

highly variable as it ranged between 21.5 and 62% in two studies (81,82).

Large number of studies reporting prevalence rates of insomnia in university students come from the United State (US). A Study reported that around that 12-14% of the university students had clinical insomnia, while 40-45% were reported to have subclinical insomnia (83). Prevalence rates, ranging from 9.4-16% have been reported in other studies with large (1845 students) and small samples (191 students) (84–88). Interestingly, in one of these studies, 26.9% of the students met the insomnia criteria despite not reporting insomnia while another 6.5% complained of insomnia but failed to meet the defined criteria (87). Fewer studies have reported higher prevalence of insomnia among university students (89,90). In one of these, around one third of university students had poor sleep quality (89). The other was a large study which included more than 7000 students from 6 different universities in the US, in which 62% of the participants were identified as poor sleepers (90).

Similarly, studies from European countries have confirmed that a significant number of university students from European countries have insomnia. In the United Kingdom (UK), 46% of university students perceived their sleep as bad or fairly bad (91). Similarly, the prevalence of insomnia among Lithuanian and Norwegian students were reported to be 59% and 30.5%, respectively (92,93). On the other hand, only 7.7% of German university students were found to have insomnia in a study with a sample of 2196 participants (94). However, one third of the students in this study reported having intermittent sleep for at least 3 days a week in the previous month.

In addition, a study from New Zealand indicated that 39.4% of the students had persistent sleep problems (>1 month) (95). However, only 8.8% of them were found to have primary insomnia. Moreover, studies from Brazil have shown that sleep problems

were very common among university students and around 60-95.3% of the students had poor sleep quality (96,97). Despite that, around two thirds of the study sample reported a short sleep latency of 15 minutes and a sleep duration not less than 6 hours (97).

Several studies have assessed the prevalence of insomnia in some African countries. Studies from Ethiopia have consistently shown that more than 50% of university students had poor sleep quality (55.8-61.6%) (98,99). Likewise, around 50% of Nigerian university students were shown to have poor sleep quality in a study that included 505 students (100).

A limited number of studies have assessed the prevalence of insomnia among university students in Arab countries and the findings are summarized in Table 2. Sleep problems were frequently reported in this population and most students' complaints were related to difficulty initiating or maintaining sleep and having an interrupted sleep pattern (101–103). Sleep insufficiency was a common problem among university students and sleep durations of 5.71 and 6.48 hours were reported from KSA and Jordan, respectively (104,105). Poor sleep quality and insomnia were also prevalent among Arab university students with the reported prevalence ranging between 8 and 85% (104–111).

2.1.1.2. Sleep duration

Many studies in literature have suggested that university students are sleep deprived as many of them do not get the recommended 7-9 hours of sleep which are necessary for replenishing the body's energy (1). A meta-analysis of 57 studies which included university students from China reported that around 44% of the students slept for less than 7 hours while around 26% of them required more than 30 minutes to fall asleep (112). Additionally, around 28% of university students in India were found to

be sleep deprived, while 72% of Pakistani students slept for less than 7 hours and 33% needed longer than 30 minutes to fall asleep (78,79). Several studies from the US and European countries have collectively shown that at least one third of university students sleep less than 7 hours per night (89,91,99,100). Similarly, insufficient sleep was common among Arab university students, as around 50% of Iraqi students and 12% of Lebanese students were reported to sleep < 7 hours per night (106,113). Additionally, a significant proportion of university students (15-43%) reported facing difficulties in falling asleep within 30 minutes of going to bed, while others complained of frequent awakenings (78,92,94,107,109,112).

Table 2. Prevalence of insomnia and sleep complaints among Arab university students

Country	Study population	Prevalence of insomnia	References
Lebanon	University students	Insomnia: 37-59%. Clinical insomnia: 10.6% Subclinical insomnia: 61.5%	(106–108)
Jordan	Nursing students	Poor sleep quality: 85% Insomnia: 75.9%	(105,111)
	Medical Sciences' students	Clinical insomnia: 26% Subclinical insomnia: 49.9%	
Palestine	University students	Poor sleep quality: 9.8%	(109)
Kuwait	University students	Complaints of insomnia symptoms: 4.1-32.2%	(101)
Kingdom of Saudi Arabia	Female university students	Moderate clinical insomnia: 8%. Subclinical insomnia: 42%	(104,114–117)
	Medical students	Poor sleep quality:25-67% Insomnia symptoms: 33%	
United Arab Emirates	University students	Poor sleep quality: 67.2%	(110)
Bahrain	University students	Poor sleep quality: 14% Interrupted sleep: 41%	(102)
Egypt	University students and employees	Insomnia: 7-69% Poor sleep quality: 53%	(103,118–120)
	Medical students		

An international study that included 19,417 university students from 26 different countries in Asia, Africa and the Americas reported a mean sleep duration of 7.07 hours (121). According to this study, students from Southeast Asia and sub-Saharan Africa had the shortest sleep duration (6.82 and 6.97 respectively). Likewise, a study from the US has shown that 62% of the students reported sleeping for 7-9 hours per night , yet around 43% of the students required more than 30 minutes to fall asleep (90). Sleep duration was significantly correlated with insomnia severity, as it was found that students who slept less were more likely to have worse insomnia symptoms (93,111). Additionally, individuals with short sleep duration, intermittent sleep and those who wake up late were at least three times more likely to develop insomnia (94).

2.1.1.3. Junior versus senior students

Young students who graduate from school and enter university are often subjected to psychological stress which is associated with the change in their lifestyle and the new responsibilities (79). Several studies have shown that students were more likely to have worse insomnia during their early years in the university (91,119). The stress in university students is often caused by different factors including academic burden, pressure to succeed and worries about the unknown future, and this increases their risk of developing sleeping problems (79).

A study that assessed the prevalence of insomnia among newly enrolled students to a university in Taiwan found that around 55% of the students had poor sleep (122). Likewise, it was reported that first year university students from the UK were 1.4 times more likely to have poor sleep quality compared to their senior colleagues (91). Moreover, a study that included Egyptian university students reported worse

stress in early years of education which is often associated with poor sleep (119).

2.1.1.4. Factors associated with insomnia among university students

Accumulating evidence in the literature has shown that female students tend to have worse sleep quality and are more likely to have insomnia (78,84,85,87,90,122). Yet other studies failed to find an association between gender and sleep quality (99,100,111). Surprisingly, some studies are suggesting that males might be at higher risk for poor sleep quality than females (82,107).

A correlation between insomnia and mental disorders in this population has been consistently reported in the literature and a recent study found that students with mental disorders are three times more likely to have insomnia compared to their healthy colleagues (87,88,98). Additionally, anxiety and depression were the most commonly linked conditions with insomnia (90,91,96,100). Mental disorders were also associated with increased use of medications and worse daytime dysfunction. Furthermore, a significant association was found between the perceived stress and poor sleep quality among university students (100,116,123). Similarly, a study conducted among Egyptian medical students found that stress, anxiety and depression were significantly associated with insomnia (119). Additionally, more severe insomnia was found in students affected by stress, anxiety and depression. Likewise, a study conducted among Ethiopian university students found that the level of perceived stress is associated with increasing scores of poor sleep quality (99). It was reported that around 59% of Ethiopian university students were subjected to stress related to their academic performance and examinations (98). This finding supports the notion that stress is associated with sleeping problems and mental disorders. Additionally, receiving less

social support and being at risk for psychiatric morbidity were predictive of poor sleep quality (122).

A number of studies in the literature have suggested that medical students are at higher risk for sleep problems as compared to students in other study disciplines. The findings of a meta-analysis has shown that medical students were more likely to have short sleep duration as compared to non-medical students (112). A review of the literature found that the prevalence of insomnia in medical students ranged between 17 and 40.6% (124). Excessive daytime sleepiness was also common among this group of students and ranged between 30.6% and 90% in the included studies.

Similar findings were reported by students from different universities in Arab countries. Results from several studies conducted among medical students from Egypt have found that 53% of students had poor sleep quality, while insomnia prevalence ranged between 28 and 69% (118–120). Additionally, around half of the sample (48.7%) reported bad daytime dysfunction and 29% experienced excessive daytime sleepiness (118,120). One third of medical Saudi students were shown to have insomnia symptoms in one study, while another study showed that 63.4% of the students had a sleep disorder (116,117). Also, 40.2% of medical students in Bahrain reported going to university without sleep at least once a week (125). Moreover, the prevalence of excessive daytime sleepiness in this population was reported to range between 36.6% and 56.9% (116,117,126). Similarly, most Iranian medical students (71%) were reported to have poor sleep quality (127). On the contrary, only 25% of Saudi female medical students reported poor sleep quality (115).

2.1.2. *Sleep hygiene patterns among university students*

Unhealthy sleep habits are common among university students. It was reported that university students have worse sleep hygiene than the general healthy population (83). Interestingly, a significant association was found between sleep quality and sleep hygiene practices; indicating that students with poor sleep hygiene are more likely to have poor sleep quality (77).

University students often have irregular sleep schedules with sleep durations that differ significantly between weekdays and weekends (84,85,98,112). Most university students usually get more sleep during weekends as compared to weekdays. Going to bed late was one of the most common sleep habits among Saudi university students, of whom 43% reported doing that most days of the week (115). It was also suggested that students might sometimes go to university after staying awake all night, as in one study around 28% of Bahraini university students reported going to campus without sleep at least once a week (102). Several factors including skipping breakfast, drinking tea and internet use significantly predict poor sleep quality in university students (122).

Studies from different countries have consistently shown that taking daytime naps is a common habit among university students. A meta-analysis has shown that around 86% of Chinese university students usually have an afternoon nap (112). Similarly, around 58% of students at a Palestinian university reported having daytime naps at least once a week (109). While, between 49% and 60% of Saudi medical students reported taking daytime naps after school, and 23% of them indicated that this was a daily habit (116,117). Studies have also shown that daytime naps tend to decrease nocturnal sleep duration to less than 7 hours per night (79).

The consumption of stimulant drinks especially caffeine containing products is a common practice among university students in Arab countries. A study from Lebanon has shown that 97% of the students consumed caffeinated beverages (128). Daily consumption of caffeine was reported by around 85 and 65% of Egyptian and Saudi university students, respectively (116,118). Drinking caffeinated beverages late at night was also frequently described by university students from Arab countries (115,128). In addition, around one third (33.4%) of Saudi medical students reported consuming energy drinks regularly in the previous 2 months (129).

Students often use energy drinks to compensate for their lack of sleep and many students indicated that they often use these drinks to stay awake for longer periods and to boost their energy for studying (129). The frequency of consumption was found to increase with age and one study have shown that around 47% of students older than 24 years consumed caffeinated beverages more than 3 times a day (128). This study also reported an increase in the use of caffeinated drinks in response to increased academic pressure and workload. The consumption of energy drinks 4 times or more per week was also associated with worse sleep quality as around one third of regular energy drinks' users were found to develop insomnia (29.5%) (79,129).

Caffeine consumption significantly predicted poor sleep quality among students (116,118). It has also been reported that among university students, the consumption of more than 6 cups of coffee per day was associated with increased stress levels (119). Furthermore, frequent consumption of simulants in most days of the week was found to delay the sleep onset by more than 30 minutes (79). Several studies have also linked smoking with worse sleep quality among university students (79,81,91,106).

Electronic devices are one of the life necessities nowadays, especially among younger generations. The use of electronic devices is common among university students. In one study it was found that around 70 and 90% of university students use laptops and smart phones, respectively, for longer than 3 hours a day (130). The use of electronic devices has been associated with insomnia development in this population (130). Increased use of mobile phone, television, DVD and music player were also linked with the incidence of poor sleep quality among university students (79,114). Addiction to cell-phone was reported to be associated with increasing the likelihood of poor sleep quality by 4.5 folds in one study (82). It was also reported that students who used smart phones for longer than 6 hours daily were more likely to have insomnia (130). It seems that the use of electronic devices before sleep is a common habit among university students (114) However, the use of these devices for 1 hour before sleep most days of the week (4 days or more) was significantly associated with a delayed sleep onset by more than 1 hour (79). Furthermore, listening to music at night was significantly related to poor sleep quality (127).

2.1.3. Consequences of insomnia among university students

Students deprived of sleep during the night often experience excessive daytime sleepiness as a compensation for their lack of night-time sleep. The reported prevalence of excessive daytime sleepiness among university students ranged between 4 and 90% (80,91,116,117,120,124,126). Insomnia in this population have also other detrimental consequences as several studies have documented a negative impact on students' day-time performance and quality of life (87). Sleep deprivation affects students' cognitive

functioning and attention during classes and examinations (120,131). Lack of sleep affects and compromises the individual's memory, learning ability and performance of complex mental tasks. As a result, insomniac students are usually sleepy during class, can easily get distracted while studying and are less likely to actively participate in class (110,120). It was also reported that students with worse insomnia are more likely to have study related headache (120).

Other complications of sleep problems include fatigue, university absenteeism and accidents (80). One study found that students with worse sleep quality were more likely to miss one class or more in comparison to students with good sleep quality (110). In another study, around 75% of the students reported daytime consequences of sleep insufficiency including fatigue in the morning and excessive daytime sleepiness with lower concentration (113). Similarly, in another study around 55% of the students reported tiredness, and 72% had daytime sleepiness during lectures at least once a week (109).

Some studies have also linked insomnia to lower academic performance, findings indicate that college students who sleep for longer duration or those with better sleep quality were more likely to have higher grade point average (GPA) (84,116,132). Likewise, another study suggested that excessive daytime sleepiness was associated with worse academic performance (126). However, the effects of insomnia on academic performance remains controversial as other studies were not able to find a significant association (79,87,98,105,109). Although the link between insomnia and academic performance is not yet clearly established, examinations and assessments were reported to be the main factors that affect university students sleep (102). In a similar context, it was shown that students perceived sleep quality was lower during examination period

as compared to the non-examination periods (28% and 55.2%, respectively) (115).

The use of sleep aids was found to be more common among university students with insomnia (87,100). It has also been suggested that increased use of sleeping pills negatively affects the academic performance by resulting in worse GPA scores (115).

Poor sleep has also negative effects on the students' quality of life. This finding was shown through several studies which suggested that individuals with worse sleep quality often perceive their quality of life to be poor and are usually pessimistic about their achievement in university and other aspects of their lives (92). This was supported by the findings of another study done among Lebanese university students which concluded that higher insomnia scores were often associated with poor quality of life (133).

2.2. Exploration of instruments assessing insomnia symptoms and sleep hygiene practices among adults

Polysomnography is considered the gold standard method for the assessment of sleep problems. However, the routine use of polysomnography for the diagnosis of insomnia in clinical practice is impractical since it is expensive, requires special equipment and facilities with qualified staff (134). Instead, a variety of self-reported sleep instruments have been developed to assess insomnia symptoms (134,135). However, a wide range of sleep instruments are available, and it is important to determine which are the most appropriate and robust to be used in the context of clinical practice or in sleep research. A previous systematic literature review identified 22 instruments which assess different sleep-related domains in the adult population (136).

In other similar reviews, authors evaluated studies which developed instruments assessing multiple sleep disorders or those measuring sleep disturbances in specialized populations such as adolescents (137,138). Yet, none of these reviews focused on instruments that assess only insomnia. In these reviews, there was also insufficient evaluation of the psychometric properties of the instruments that were identified, and none of them included instruments which assess sleep hygiene practices in adult population. Therefore, as part of this research, a systematic review of the literature on subjective instruments assessing different aspects of sleep and sleep hygiene in the adult population was conducted. This review also aimed to identify sleep instruments available in Arabic language.

A comprehensive systematic search of five databases was undertaken, including PubMed (1966- April 2018), EMBASE (1980- April 2018), ProQuest Central (1947-2018), SCOPUS (1966-April 2018), and Google Scholar (till April 2018) (detailed search for PubMed and EMBASE are displayed in Appendix A). Grey literature was also searched by reviewing conference proceedings and abstracts of the Canadian Sleep Society and the AASM published in the period between January 2014 and December 2017. Additionally, a hand search of the bibliographies of the articles identified through the electronic database search was undertaken. Search terms used in the databases were classified into three categories related to: sleep dysfunction (Category A), the instrument for assessment (Category B), and validation and psychometric properties (Category C). Terms from Category C were not used in databases such as PubMed which offered "validation studies" as one of the limits or filters. Publication language was limited to English and no limits were imposed on the publication year. In addition to the English search, two separate searches were

conducted to identify sleep instruments developed in or translated into Arabic language. The first used the same search terms as those in the original search, in addition to the word "Arabic". The second was conducted in Arabic language in the following databases: PubMed, Google Scholar and Dar Al-mandumah using the same search terms as those used in the original search.

The inclusion criteria for this systematic review of the literature was limited to studies reporting the psychometric properties of instruments and questionnaires assessing characteristics of sleep (quality, quantity, nocturnal awakenings), daytime consequences of poor sleep, or sleep hygiene in the adult population and which were completed by self-report. Studies evaluating instruments designed to measure sleep disorders other than insomnia (e.g. obstructive sleep apnea, restless leg syndrome, etc.) and those using sleep items as subdomains of an instrument assessing a condition other than insomnia were excluded from analysis. Additionally, studies which focused on pediatric/geriatric populations, describing instruments designed to be completed by clinicians or caregivers, using instruments developed in languages other than English or Arabic, or describing instruments not psychometrically validated were also excluded.

After obtaining article citations from the different databases, duplicates were removed. Titles and abstracts of the articles were initially screened for relevance. Full text of eligible articles was obtained and screened against the inclusion and exclusion criteria. Articles which successfully passed full-text screening phase were included in the final analysis. Data were extracted from these studies in accordance with eight key attributes established by the Scientific Advisory Committee of the Medical Outcomes Trust (SAC-MOT) (139). The extraction tool acquired from the SAC-MOT attributes

included the following components: instrument's name, authors, conceptual framework (domains and purpose), psychometric properties, validation population, general description of the instrument (number of items, scale, scoring, response format, burden), in addition to cultural and linguistic adaptation. The psychometric properties were extracted from studies describing the validation of the original (English or Arabic) version of the instruments. The psychometric properties extracted from the validation studies included validity, reliability, responsiveness, and interpretability. Validity is a measure of an instrument's accuracy in assessing the constructs it was developed to measure, whereas reliability evaluates an instrument's consistency in determining these constructs (140). In addition, responsiveness provides useful information regarding the instrument's ability to detect clinically meaningful changes in sleep parameters, whereas interpretability reflects the degree to which an instrument's score could be translated into a clinically meaningful classification. As part of this study, instruments' attributes related to the validation sample were also extracted. Data extraction was done by the MSc student (RA) and reviewed by the primary supervisor (MZ).

The quality of the instruments obtained was assessed according to the SAC-MOT criteria described previously and the quality criteria developed by Terwee et al. (139,141). However, the criteria for the floor and ceiling effects and the agreement component of the reproducibility which are included in the Terwee et al. quality criteria were not considered in the evaluation of instruments' quality because these components were rarely reported in the validation studies. In addition, for the criteria regarding test-retest reliability, criterion and construct validity, the Pearson's correlation coefficient was extracted from the included studies to describe the extent of correlation between the instrument in question and the reference instruments for the validity measures and

between the two responses in case of reliability.

After removal of duplicates, 4,453 citations were retrieved from the search as shown in Figure 1. One hundred and seven articles were deemed suitable for inclusion in the review. These articles included 31 distinct sleep instruments. Of the 107 articles included, 47 discussed the validation process of the instruments in English, while the remaining 60 articles reviewed the translation and cultural adaptation of these instruments into a variety of languages and populations. The two additional searches done to find sleep instruments in the Arabic language did not identify any additional results other than those derived from the original search. Table 3 summarizes the results of the validation studies (n=47) related to the 31 sleep and sleep hygiene instruments included in this review. The table also describes the psychometric properties of the instruments and the characteristics of the populations in which they were validated. Furthermore, Table 4 provides a detailed description of the characteristics of the 31 instruments.
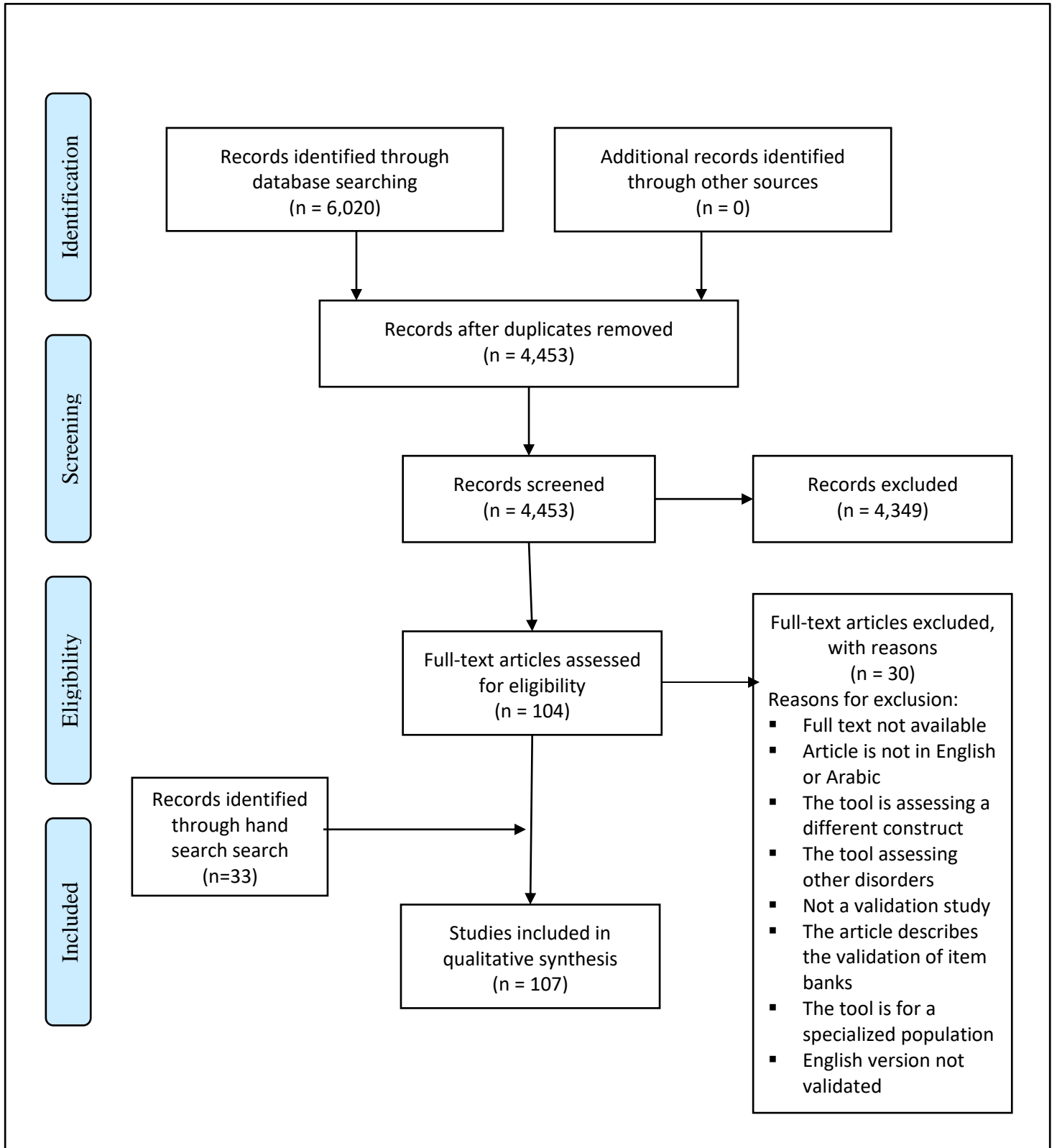
Figure 1. Flow chart of the systematic review

Table 3. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Pallesen et al., 2008	The Bergen insomnia scale (BIS)	University students Community sample Patient sample	*Convergent and discriminant:* BIS significantly associated with Athens Insomnia scale (r=0.79) and the Pittsburgh sleep quality index (r=0.73). BIS had lower correlation with Beck depression and anxiety inventories (r=0.55 and 0.32 respectively).	*Internal consistency:* Students (n=320): α= 0.79 Community (n=5,000): α= 0.87 Patient sample (n=225): α= 0.80 *-Test retest* (after 2 weeks) Students (n=200): r = 0.77	NR
Yeh et al., 2012	The Insomnia Screening Scale (ISS)	Study 1: (n=162) Adults Participants with primary insomnia and healthy participants Study 2: (n=262) Community sample (paediatrics, adults and elderly)	*Concurrent/criterion validity:* - ISS (Insomnia symptoms subscale) significantly correlated with Insomnia severity index (ISI) and Pittsburgh sleep quality index (PSQI): (r =0.87 and r =0.85 respectively). - ISS (daytime functioning) significantly correlated with ISI and PSQI (r =0.63 and 0.68 respectively) - Sleep environment domain negatively correlated with PSQI and ISI: (r = - 0.31 and - 0.25 respectively). - Sleep opportunity negatively correlated with ISI and PSQI was expressed as: (r = – 0.37 and r = – 0.41, respectively). **-** *External validity:* community sample, 13.36% (inadequate sleep opportunity and sleep environment), and 37.02% met the criteria of insomnia and daytime function.	*Internal consistency:* -Insomnia symptoms: α =0.98 -Daytime function: α=0.94 -Sleep environment: α = 0.90 -Sleep opportunity: α=0.87	*Interpretability:* ISS demonstrated sensitivity and specificity of 0.89 and 0.59 respectively Cut-off scores: -Sum of sleep environment and opportunity subscales scores= 27 -Sum of insomnia symptoms and daytime functioning subscale scores=42
Kato T., 2013	Sleep Quality Questionnaire (SQQ)	Full-time employees and college students.	*Content validity:* confirmed by two Japanese experts in stress research. *Convergent validity:* (n=370) SQQ subscales (Sleep difficulty and daytime sleepiness) with MOS sleep scale[1] (*r*s = 0.37 and 0.43, p< 0.001). The Daytime Sleepiness score with Epworth Sleepiness Scale (ESS) score (r = 0.47, p < 0.001). *Incremental validity: (n=346)* SQQ subscales with the GHQ-12[2], CES-D Scale[3], FSS[4], and SWLS[5] scores significant ΔR^2 scores (0.403, 0.313, 0.408 and 0.054 respectively) with p< 0.001.	*Internal consistency:* For Daytime sleepiness in student (α= 0.83) and in employee sample (α=0.84). For Sleep Difficulty subscale were (0.74) for the student sample and (0.77) for the employee sample. *Test-retest* (over 8 weeks) Daytime Sleepiness subscale (r=0.76) Sleep Difficulty subscale (r=0.79)	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Levine et al., 2003 (study a) **Levine et al., 2003 (study b)**	Women's Health Initiative Insomnia Rating Scale (WHIIRS)	Postmenopausal women	*Content analysis:* The WHIIRS items corresponded to most of insomnia characteristics noted in the nosologies (e.g. International Classification of Sleep Disorders) and the literature. *Construct validity:* The correlation between the CES-D[3] and the WHIIRS was small r =0.29 -The WHIIRS mean in the largest CES-D[3] category (*M* =10.3 for Category 12) was 1.8 times that in the smallest depression category (i.e., *M* =5.7 for Category 0) -The SF-36[30] subscales were also linearly related to the WHIIRS Cohen's f value was 0.273, (p < 0.0001). -For night sweats and hot flushes with WHIIRS, the values of Cohen's f were, respectively, 0.205 and 0.157.	*Internal consistency:* α = 0.786. -89.3% of the samples had reliability coefficients ≥ 0.75 *Test-retest:* Same day administration (r =0.96) Tests after >1 year (r =0.66)	NR
Drake et al., 2014	Restorative sleep questionnaire (RSQ)	Community based sample Patients with primary insomnia Non-refreshed sleepers (NRS)	*Content validity:* -Key concepts developed through patient focus groups and patient interviews. Concepts reviewed by two expert panels. *Convergent/divergent:* -RSQ-Daily (RSQ-D) with Leeds Sleep Evaluation Questionnaire scores: Positive and significant correlation with all domains (r ≥0.40, p ≤0.006) except for Getting to Sleep scores (r = 0.27; p= 0.079) -RSQ-D with Subjective Sleep questionnaire: Sleep quality (r = 0.59; p < 0.001); TST[31] (r = 0.32; p= 0.036) -RSQ-D with vitality questionnaire: (r = 0.61; p< 0.001). -RSQ with PSG: Latency to persistent sleep (r ≥0.20), TST[32] and sleep efficiency (r ≥0.26), WASO[32] (r ≤0.020) and total wake time (r ≤0.26) significant P-value.	*Internal consistency*: RSQ-D: α= 0.91 RSQ-W: α= 0.90 *Test-retest* (responses on consecutive days measures) RSQ-D and RSQ-W: r >0.80	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric Properties		
			Validity	Reliability	Responsiveness and Interpretability
Buysse et al., 1989 **Grandner et al., 2006** **Backhaus et al., 2002**	Pittsburgh sleep quality index (PSQI)	- Group I: healthy control subjects (n=52) - Group 2: patients with major depressive disorder (n=34). - Group 3: Clinical sample physician-referred outpatients at the Sleep Evaluation Center (n = 45) -Non-clinical sample (younger and older adults) -Primary insomniacs - Healthy controls	*Discriminating between patients and controls:* -Global PSQI scores differed significantly between groups and a significant difference was found between all patient groups and individuals in the healthy control group. -Patients with DIMS[6] had significantly higher scores than patients with Disorders of Excessive Somnolence DOES[7] patients. A significant difference in PSQI components' scores were found between the control group and both DIMS[6] and depressed groups. PSQI scores also differed on 3 components (sleep disturbances, daytime dysfunction, and sleep quality) with DOES[7] patients. - A significant difference in all PSQI component scores except sleep disturbance were identified between DOES[7] and DIMS[6] patients. While DOES[7] and depressed patients differed on all components' scores except sleep disturbance and daytime dysfunction. *Diagnostic validity:* (Buysse et al., 1989) A cutoff score of 5 in the global PSQI scores correctly determined the sleep quality for 88.5 participants (kappa = 0.75, p < 0.001) reporting a sensitivity of 89.6% and a specificity of 86.5%. (Backhaus et al., 2002) - PSQI global score > 5 resulted in a sensitivity of 98.7 and specificity of 84.4 *Criterion/concurrent validity:* (Buysse et al., 1989) **PSQI scores and PSG:** **-** Significant positive correlation between PSG and PSQI only for sleep latency (r =0.33, p < 0.001)	*Internal consistency:* Overall: $\alpha = 0.83$ (Buysse et al., 1989) Overall: $\alpha = 0.85$ (Backhaus et al., 2002) *Test-retest:* (Buysse et al., 1989) -Test retest (around 28 days from the first time) the global PSQI scores was r = 0.85 (p< 0.001). - Component scores: r = 0.84 - 0.65 (p< 0.001 for each component score). *Test retest:* (Backhaus et al., 2002) Overall: (r =0.87, p= 0.000) -Short interval (2 days): r =0.90, p=0.00 -Longer interval (45.6 ± 18 days): r =0.86, p= 0.000	*Interpretability:* Can distinguish between "good" and "poor" sleepers. The cut-off point is 5.

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric Properties		
			Validity	Reliability	Responsiveness and Interpretability
	Pittsburgh sleep quality index (PSQI) Continued.		PSQI global score and PSG: - Objective sleep latency (r = 0.20, p< 0.01), weak correlation - The global PSQI score correlated only with REM% in controls (r = 0.34, p< 0.006) and number of arousals in depressives (r = 0.47, p< 0.002). (Backhaus et al., 2002) - PSQI was highly correlated with sleep log data (r =0.81, p= 0.000 for sleep duration and r =0.71, p< 0.001 for sleep onset latency. -The correlations between PSQI and polysomnographic data was significant and lower ranging between r = -0.32 to -0.33). *Construct validity:* PSQI with actigraphic measures of sleep: lack of significant association (r ≤0.13). *PSQI with sleep diary: (significant correlation)* -Sleep efficiency (r = -0.562, p< 0.01), TST[31] (r = -0.307, p< 0.01), WASO[32]: (r = 0.262, p< 0.01), -Sleep latency: r = 0.480, p< 0.01 -CESD[3]: r = 0.305, p< 0.01		
Bastien et al., 2001 **Morin et al., 2011**	Insomnia severity index (ISI)	*Study 1:* Patients with a chief complaint of insomnia (n=145). *Study 2:* (n=78) Insomnia patient involved in a study assessing the	*Criterion/concurrent validity:* ISI items with sleep diary variables: -Sleep onset latency (r = 0.38), WASO[32] (r = 0.35) and Early morning awakening (r =0.35). -Total ISI score and the sleep efficiency variable (r = -0.19) -ISI and sleep diary components r = 0.32- 0.55 at baseline and r = 0.50 to 0.91 post-therapy (all p values < 0.05).	*Study 1:* Internal consistency: α = 0.74. *Study 2:* *Internal consistency:* The internal reliability coefficients did not change significantly from baseline to follow up (0.76 to 0.78, respectively).	*Responsiveness:* A significant reduction in ISI score was detected post-treatment in patients' (8.9 vs. 15.4) and clinician's versions (7.7 vs. 17.7).

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric Properties		
			Validity	Reliability	Responsiveness and Interpretability
	Insomnia severity index (ISI) Continued.	efficacy of cognitive behavioral therapy. Morin et al., 2011 - Community sample (n= 959) - Clinical sample (n=183)	- ISI variables with PSG variable: Correlation ranged between $r = 0.07$ to 0.45 at pretreatment, and $r = 0.23$ to 0.45 at post-treatment. Only the correlation for SOL[8] variable was significant at pretreatment, whereas all correlations, except one were significant at post-treatment ($p< 0.05$). -The correlations between the patient's and the clinician's versions of the ISI at the two assessment periods were all significant (p values < 0.01). Furthermore, the correlations between the patient's and the significant other versions of the ISI were also significant at the two assessment periods (p values < 0.01). *-Predictive validity:* The clinician's ratings predicted best the patient's ISI total score at baseline, while post-treatment, both clinicians' rating and the sleep diary data were equally predicted the patient's total ISI score. $R^2= 0.37$ (p< 0.05) at *pretreatment,* clinician: ($\beta= 0.52$) $R^2= 0.61$ (p< 0.05) at *post-treatment*, clinician: ($\beta= - 0.52$) Sleep diary: ($\beta= - 0.34$) *Content validity:* A principal component analysis, using varimax rotation, explored the ISI content validity, (i.e. relation of the items to the concept) and the extent to which its components corresponded to diagnostic criteria of insomnia.	Morin et al., 2011 Community: (Cronbach $\alpha = 0.90$) Clinical samples: (Cronbach $\alpha = 0.91$).	*ISI sensitivity to detect clinical improvement* (n=146) Moderate improvement in insomnia was identified as a reduction in ISI score by > 7 points (60% sensitivity, 70% specificity). Marked/ higher improvement in sleep was identified as a decrease in ISI score by > 8 points (64% sensitivity, 80% specificity). *Interpretability:* The scores of the ISI represent the following: 0–7: lack of insomnia, 8–14: Subthreshold insomnia 15–21: Moderate insomnia 22–28: Severe insomnia.

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric Properties		
			Validity	**Reliability**	**Responsiveness and Interpretability**
	Insomnia severity index (ISI) Continued.		Morin et al., 2011 *Diagnostic validity:* *- Subthreshold insomnia:* A cutoff score of 8: Sensitivity of 95.8% and 99.4% in the Community and Clinical samples respectively, and with specificity of 78.3% and 91.8%. *- Moderate to severe insomnia:* -A cutoff score of 15 Specificity of 98.3% and 100% in the Community and Clinical samples, respectively, with a sensitivity of 47.7% and 78.1% respectively. - Community sample: cut point of 10 (86.1% sensitivity and 87.7% specificity). - Clinical sample, cut point of 11 was associated with 97.2% sensitivity and a perfect 100% specificity. *Construct validity (convergent):* - Insomnia severity on the ISI was positively correlated with the corresponding diary variable. -The ISI total score and the PSQI total score: $r = 0.80$, p< 0.05. (positive, significant correlation) - Significant relationships were found with measures of anxiety and depression, different dimensions of fatigue. Significant correlations were also discovered with the SF-12[9], with a stronger association identified with the Mental components of the measure than with the Physical Health component.		Morin et al. (2011) suggested clinically significant insomnia could be identified by ISI scores >10 in community samples and scores >11 in clinical settings.

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric Properties		
			Validity	Reliability	Responsiveness and Interpretability
Jenkins et al., 1988 **Nassermoaddeli et al., 2005** **Jerlock et al., 2006**	The Jenkins Sleep Scale (JSS)	-Air traffic controllers (n=250 men; 25- 49 years old) -Patients recovering after from cardiac surgery (500 patients).	*Construct validity:* Spielberger's state anxiety: r=0.37 POMS[10]-Depression: r =0.35 POMS[10]- Hostility: r =0.29 POMS[10]-Vigor: r = -0.24 POMS[10]-Fatigue: r =0.46 Positive well-being: r = - 0.22	*Internal consistency:* α= 0.79 Test-retest reliability: r=0.59 Jerlock et al., 2006 *Internal consistency:* α= 0.80 Nassermoaddeli et al., 2005 *Internal consistency:* α= 0.77	NR
Soldatos et al., 2000 **Soldatos et al., 2001**	Athens Insomnia Scale (AIS)	299 subjects Consisting of: 1-Primary insomniacs 2- Psychiatric patients (both inpatients and outpatients) 3-Healthy subjects	*External validity:* Sleep problems scale with: AIS-8: r = 0.90, p<0.001 AIS-5: r = 0.85, p<0.001 Soldatos et al., 2001 *Diagnostic validity:* - AIS in general population, for a Cut-off score of 6 only 1% of those responders with insomnia are misdiagnosed (i.e. NPV[11]= 99%), whereas 41%(PPV[12]=41%) of those who score 6 or higher will be meeting the diagnostic criteria for insomnia - For psychiatric population: 8% (NPV[11]=92%) and (PPV[12]=86%). -A total score of 6 or higher in the AIS was shown to correctly identify 90% of the study subjects as suffering or not from ''nonorganic insomnia'' according to ICD-10, with a sensitivity of 93% and specificity of 85%.	*Internal consistency:* AIS-8: α= 0.89, AIS-5: α=0.87 *Test retest* (n=194): AIS administered two times, one week apart. AIS-8: r = 0.89, p<0.001 AIS-5: r = 0.88, p<0.001	*Interpretability:* Cut-off score of 6 General population (NPV[11]= 99%, PPV[12]=41%) Psychiatric population (NPV[11]=92%, PPV[12]=86%) with sensitivity (93%) and specificity (85%). -A total score of 6 or higher in the AIS was shown to correctly identify 90%

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Broman et al., 2008 Westergren et al., 2015	Minimal Insomnia Symptom Scale (MISS)	1379 randomly selected subjects (20-64) were included in the study (Sweden).	*Criterion validity:* The correlation between BNSQ[13] question about sleep quality and MISS total score high with r =0.76. Westergren et al., 2015 A lower difference in score was observed between adult and elderly groups with the use of the cut-off score ≥6.	*Internal consistency:* Total: α=0.73 *Test retest reliability*: (6 months apart) High correlation was found with an ICC[14] of 0.79.	*Responsiveness:* *Sensitivity to change* Paired t tests revealed that there was a strong trend for an increase score (m=+0.80; t=2.0; p=0.053) in subjects who deteriorated while there was a significant decrease (m =-1.06; t =2.9; p<0.01) in subjects who improved. *Interpretability:* A cut-off score of ≥6 on the MISS identify insomniacs in the general adult population (sensitivity 0.82; specificity 0.86), PPV[12] 0.44; NPV[11] 0.97
Espie et al., 2000 Edinger et al., 2001 Chung et al., 2016	Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS)	Chronic insomniacs Normal subjects Insomniac Individuals with insomnia derived for a randomized controlled trail of self-help CBT-I[16].	DBAS 10 with DBAS-30: good correlation (r =0.826). -Total score: DBAS-10 and SDQ (r = 0.28) Edinger et al., 2001 *Construct/ convergent validity:* -DBAS with DBAS-10: Normal sleepers: r =0.84, Insomniacs: r ≥0.80 *Discriminative validity:* Insomnia sufferers (mean DBAS 35.5, SD[15] 10.5) had significantly higher (F (1, 136) = 28.2, p< 0:0001), or more pathological scores on the full DBAS than did our normal sleepers (mean DBAS 26.4, SD 9.7). - DBAS-10 scores of our insomnia sufferers (mean DBAS-10 43.3, SD 15.0) were significantly (F (1,136) = 15.9, p< 0:0001) higher than those shown by our normal sleepers (mean DBAS-10= 33.5, SD 14.0).	DBAS 30: *Internal consistency:* -Overall: α = 0.72 -Only two subscales achieved significance: 1) "misattributions or amplifications of the consequences of insomnia"; α= 0.77 2)Subscale 4: "diminished perceptions of control and predictability of sleep;" α= 0.41. DBAS-10:	*Responsiveness:* -Changes in DBAS score following treatment were statistically comparable (F (2,68) = 2.33, p< 0.10) for all three treatment groups CBT, relaxation training (RT) or placebo control (PC). - DBAS-10 changes did differ statistically across the three treatment groups (F (2, 68) = 4.69, p< 0.025). -Post hoc comparisons, showed that the CBT-treated insomniacs showed significantly greater decreases on the DBAS-10.

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
	Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) Continued.		Chung et al., 2016 *Criterion/ concurrent validity:* - DBAS total was significantly correlated with several subscale scores of ISI and PSQI total scores, HADS-anxiety[17] and HADS-depression[17] subscale scores. - The DBAS-10 "immediate consequences" subscale had significant correlation with ISI and HADS-anxiety subscale but was not related to HADS-depression subscale. - The DBAS-30 and DBAS-16 "sleep expectation" subscales were only significantly correlated with ISI total score.	*-Internal consistency:* $\alpha = 0.69$ *-Internal consistency* for factors I and II were 0.73 and 0.60. Edinger et al., 2001 *Internal consistency:* DBAS 30: Normal subjects: $\alpha = 0.81$ Insomniacs; $\alpha \geq 0.71$ DBAS-10: Normal subjects: $\alpha = 0.70$, Insomniacs: $\alpha \geq 0.53$ Chung et al., 2016 *Internal consistency:* DBAS-30, DBAS-16, and DBAS-10 with Cronbach α of 0.81, 0.80, and 0.73, respectively.	Significant changes from pre-to post treatment were found only for Factor 2 (F (2; 68) = 5.05, p <0.05). - Significantly greater reduction in DBAS scores was found in participants allocated to CBT-I[16], except the DBAS-30 "attributions" subscale and DBAS-16 "medication" -Participants who had improved in ISI scores by ≥ 8 points had significantly greater changes in DBAS total scores and on DBAS-30 and DBAS-10 subscale scores compared to those who had not improved scores.
Espie et al., 2014	Sleep Condition Indicator (SCI)	Samples from 5 validation studies: - The Great British Sleep Survey (GBSS): adults > 18 -The GBSS+[18] -TV sample -Glasgow Science Centre data (n=256)	*Content validation:* - The DSM-5 was used to develop the questionnaire, consultations were conducted, and a draft was published on the American psychiatric association website. *Concurrent/criterion validity:* - SCI was negatively associated with the score of sleep quality questionnaires including PSQI (r = −0.734) and the ISI (r = −0.793).	*Internal consistency:* - Cronbach's α = 0.857 (the GBSS[18]) (range of α-if-item-deleted 0.822–0.860).	*Interpretability:* A cut-off ≤ 16, was able to identify 89% of patients who had insomnia (ISI scores of ≥ 15). However, an SCI score of >16 was able to exclude 82% of individuals without insomnia.

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	**Reliability**	**Responsiveness and Interpretability**
	Sleep Condition Indicator (SCI) Continued.	- A randomized controlled trial (RCT) sample (n=164) placebo-controlled evaluation of CBT[16] for insomnia.	- Sleep condition was significantly associated with physical and mental health (r =0.222 and r =0.335 respectively). - Using the HADS[17] scale, SCI was negatively correlated with symptoms of depression (r =−0.426) and anxiety (r =−0.400). But was higher than the associated detected in the RCT sample study (depression (r = −0.267), anxiety (r =−0.236) and stress (r = −0.263)). *Concurrent and diagnostic validity:* A cut-off score ≤16 was diagnostic for 89% of individuals who were identified as insomniacs on the ISI scale (scores of ≥15), with a capacity of correctly classifying 82% of non-insomniacs. These findings support the concurrent validity for the SCI and confirming that a score of ≤16 on the SCI could identify insomniac patients.	- GBSS+ sample[18] (α=0.865). The mean corrected item-total correlation was moderate (r =0.620).	
Lee, 1992 **Lee, 2007**	General Sleep Disturbance Scale (GSDS)	Female nurses in different shifts (permanent day shift, permanent night shift and rotating shifts) N=760 Parents of infants hospitalized in the intensive care unit (n=44).	Lee, 2007 Content validity: Evaluated by multidisciplinary reviewers Criterion/concurrent validity: Sleep diary: For both the Chinese and English versions, higher GSDS scores were correlated with lower subjective sleep quality in sleep diaries (r = 0.41), higher morning fatigue levels (Chinese version: r = 0.42, p= 0.05; English version: r = 0.56, p = 0.006). 2-Wrist actigraphy: less sleep efficiency (Chinese version: r = - 0.26; English version: r = - 0.42). Criterion/ predictive validity: The participants' GSDS mean scores were positively correlated with their morning fatigue levels (Chinese version, r = 0.42, p = 0.05; English version, r = 0.56, p = 0.006), supporting the predictive validity of the GSDS.	Lee, 1992 *Internal consistency:* -Overall: α = 0.88 -Subscales of quality of sleep, daytime sleepiness, and use of sleep aids were 0.62, 0.79, and 0.82, respectively. Lee, 2007 *Internal consistencies:* Overall: Chinese version (α= 0.81) English version (α= 0.85)	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Fung et al., 2014	Daily Cognitive Communication and Sleep Profile (DCCASP)	University students' university of Toronto (n=59).	*Criterion validity:* Sleep quality domain of DCCASP with sleep quality domain PSQI: -Adequate criterion validity for the Sleep Quality domain Of the DCCASP was established by the Sleep Quality domain of the PSQI, with rs = 0.398 (p< 0.001). -Positive correlation between sleep quality and each of the DCCASP domains: rs (0.38-0.55) (p< 0.0001).	*-Internal consistency:* Cronbach's α = 0.864 to 0.938 for the seven domains of the questionnaire. *-Test-retest* (2 weeks apart) Concordance Correlation Coefficient (CCC) of each domain of the DCCASP range between (r = 0.548 to 0.742).	NR
Abdel-khalek, 2008	The Arabic Scale of insomnia (AIS)	Students and employees	*Content validity:* PhD holding faculty members and master students assessed the validity of the instruments. *Construct:* Convergent validity: AIS was significantly correlated with Arabic sleep disorders scale and Jenkins sleep scale with a correlation range of (r= 0.56-0.94, p<0.001).	*Internal consistency:* Range: 0.84-0.87 *Test-retest reliability* (1 week apart): 0.70- 0.83	NR
Morrone et al., 2017	Maugeri Sleep Quality and Distress Inventory (MaSQuDI-17)	Outpatients evaluated for sleep disorders in Sleep Centers of Northern Italy	*Convergent validity and discriminant :*(p< 0.001 for all) r2 = 0.5 with the PSQI r2 = 0.15 with ESS r2 = 0.39 with anxiety as measured by A-D[19] schedule r2 = 0.52 with depression as measured by A-D[19] schedule *-Discriminating capacity:* - Mean score for healthy and patient groups were 9.31 and 14.15 respectively; and difference between the two achieved statistical significance (p< 0.001). - Differences corresponded significantly with the underlying disease condition (normal subject vs. OSAS[20] or INS[21] or BSD[22] group of subjects p < 0.001).	*Internal consistency*: α= 0.896	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Johns M., 1991 **Johns M., 1992** **Johns M., 1994**	Epworth Sleepiness scale (ESS)	-Control (n=30) -Individuals with sleep disorders (n=150) Third year medical students (n=104) OSA [23] patients treated with CPAP [24] Patients who had MSLT [25] (n=44) Spouses of participants who completed ESS (n=50)	*Discriminating capacity:* -Significant differences in ESS scores between the seven diagnostic groups were detected *(F*= 50.00; df= 6,173; p< 0.0001). -Sleepiness scores were higher in patients with OSA [23], narcolepsy and idiopathic hypersomnia than controls (p< 0.001) and primary snorers (p< 0.001) (statistically significant findings). *-Criterion validity:* ESS (total score) with MSLT [14]: -Mean Sleep latency (SL): (rho = -0.42, (p< 0.01). [Significant negative correlation] -When the correlation between mean SL with ESS individual item scores was assessed only 3 items were significantly correlated (p<0.05) which were: The likelihood of dosing off "when sitting, inactive in a public place" (rho= -0.44), when "sitting quietly after lunch without alcohol" (rho= -0.34) and when "in a car, stopped for a few minutes in the traffic" (rho= -0.41). *Predictive validity:* -All eight item scores as predictors of the mean SL in the MSLT [14] was statistically significant *(r* = 0.639, p = 0.01). - Items 3 (r= -0.44, p<0.01) and 8 (r= -0.41, p= 0.01) were significant independent predictors.	*Internal consistency:* α = 0.88 (patients) α = 0.73 (students) *Test-retest reliability:* (5 months apart) -For 87 students: r = 0.822 (p< 0.001). -Patient-Spouse paired item correlation: (mean rho = 0.57, p< 0.001). - The paired (patient-Spouse) total ESS scores correlation (high) (rho = 0.74, n = 50, p< 0.001)	**Responsiveness**: After 3 months of treatment with CPAP [24]: Treatment with nasal CPAP [24] in 54 individuals with OSAS [20] was associated with a change in ESS scores by 7.0 ± 5.2 (SD) following therapy, which was statistically significant *(t* =-9.59, df = 53, p< 0.001).
Akerstedt et al., 1990 **Reyner, et al., 1998**	Karolinska sleepiness scale (KSS)	8 male subjects	*Criterion validity*: KSS with VAS [26]: -Minimum and maximum sleepiness: the scale values were 8.6 (0.3) vs 3.1 (0.6) and 89 (7) vs 34 (6) for the KSS and VAS [26], respectively. The highest score on the KSS was relevant to the verbal anchor "extremely sleepy, fighting sleep" levels while the lowest value corresponded with "alert". - The association between subjective sleepiness and the EEG [27]/ EOG [28] variables (r =0.29-0.65, p<0.05).	NR	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
	Karolinska sleepiness scale (KSS) Continued.		-Significant differences in various levels of subjective sleepiness were identified for all variables, except theta activity- during the test conducted under ambulatory conditions. A significant difference between maximum and minimum sleepiness was detected (Wilcoxon, z > 2.20, p<0.05). -No changes were identified in the EEG[27]/EOG[28] before level 7 was reached on the KSS scale. For the test session with closed eyes, a significant variation was identified only with slow rolling eye movement (x2 = 13.6, p<0.01). - Increasing KSS levels were highly significantly correlated with an increased likelihood of falling asleep (Pearson's r = 0.78; df = 1043; p= 0.001).		
Weaver et al., 1997 **Weaver et al., 2009**	Functional outcomes of sleep questionnaire (FOSQ)	**FOSQ-30:** Sample 1 (n = 153) Healthy individuals presenting with sleep complaint Samples 2 (n = 24) and 3 (n = 51): Patients with OSA[29] **FOSQ-10:** Sample 1: (n=155) Participants with moderate to severe OSA[29] on CPAP[24] Sample 2: (n = 51) CPAP[24]-treated OSA[29] patients Normal subjects	**FOSQ-30:** *Face validity:* Seven judges with expertise in the areas of functional status instrument development and sleep problems rated the clinical relevance of each item and the instrument to DOES[7]. *Content validity:* Determined by the proportion of items receiving a rating of at least three or four across all judges. *Construct validity:* -Subscale-to-subscale correlations range: r = 0.52-0.86 -Subscale-to-global FOSQ score intercorrelations ranged from r = 0.78-0.86. *Concurrent/criterion validity:* -FOSQ-30 global score with SIP[29] total score (n=24): (r = -0.50, p≤0.05) -FOSQ-30 global with SF-36[30] sub-scales (n=51): No significant correlation	**FOSQ-30:** *Internal consistency*(n=153): -Total: α = 0.95 -Subscales (α = 0.86 to α = 0.91) - Item to total correlation range: 0.35-0.73 *Test retest reliability* (n=32): (Within 1 week) - Global score: r = 0.90 - Individual subscales ranged from r = 0.81 to r = 0.90 **FOSQ-10:** *Internal consistency:* α = 0.87	*Responsiveness:* Clinically significant changes in total scores for FOSQ-30 and FOSQ-10 measures were detected after CPAP[24] treatment, (p<0.0001).

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
	Functional outcomes of sleep questionnaire (FOSQ) Continued.		-FOSQ-30 global score with SF-36[30] role emotional functioning sub scale (r=0.46, p≤.01) -FOSQ activity level sub scale significantly correlated with SF-36[30] physical functioning subscale. - The FOSQ social outcome subscale was significantly correlated with the SF-36[30] social function sub scale (r =0.36, p≤ 0.05) and SF36 mental health subscale (r =0.38, p≤0.01). *-Discriminant validity:* -Mean of FOSQ global score discriminated between normal sleepers and those with sleeping problems: (68.05 ± 21.24 and 89.59 ± 8.64 respectively with p= 0.0004) (T157 = -5.88, p= 0.0001). **FOSQ-10:** *Criterion validity:* Global scores comparison: -A significant association was identified between the global score of FOSQ-10 and FOSQ-30 both before and after treatment with CPAP[24] (r = 0.96, p< 0.0001) and (r =0.97, p< 0.0001) respectively. *Known group validity:* -A significant difference in total FOSQI-10 score was identified between OSA group[23] and normal patients (*t* = 8.65, p< 0.0001).		
David, 2008	Occupational impact of sleep questionnaire (OISQ)	Community sample: Age:25-50 years. Primary insomniacs according to the DSM IV (n=43) criteria and 43 controls	*Criterion validity:* - Positive, significant correlation was shown between OISQ and PSQI scores (mean r = 0.59, p<0.001) - Sleep diary variable: Work assessment scores negatively correlated with mean TST[31] (r = -0.47, p<0.001) and mean SE (r = -0.56, p<0.001), and significantly and positively with mean WASO[32] (r =0.66, p<0.001). -Significant negative correlation with SF-36[30] subscales ranging from r =- 0.21 to -0.62, p< 0.001.	*Internal consistency:* α = 0.93 *Stability:* A mean difference of 10.82 between groups across 2 time points was found resulting in a significant main group effect (F = 12.52, p< 0.001). A consistent decrement of 10% is seen in insomniacs compared to control.	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Bell et al., 2011	The Sleep Functional Impact Scale (SFIS)	Primary insomniacs Healthy volunteers	*Content validity:* Face to face interviews with patients. *Convergent/divergent validity:* (p< 0.0001) -SFIS with ISI composite score: (r =0.82), SFIS with PSQI composite: (r =0.78), SFIS with FOSQ composite: (r = -0.69), SFIS with ESS total: (r =0.46), SFIS with MOS[1]-sleep problems indices (I and II): (r ≥0.74), SFIS with MOS[1] breathing and Snoring subscales: (r =0.26 and 0.27 respectively). -WPAI–GH[33] Subscales (r ≥0.31). *Known group validity* (n=430)**:** -Higher SFIS score in the insomnia group compared to control (t=19.36, p<0.0001), effect size=2.05 -Lower SFIS scores for those reporting good sleep compared not reporting good sleep. t = -12.18, p< 0.001 (effect size = -1.04) -Higher SFIS score for participants with reporting worse sleep on PSQI, t =17.06, p< 0.0001 (effect size = 2.33).	*Internal consistency:* All the sample: α= 0.97 Insomniacs= α= 0.95	NR
Espie et al., 2000	Sleep Disturbance Questionnaire (SDQ)	Chronic insomniacs	The factors score of SDQ correlated with the SDQ total (0.31 to 0.88).	*Internal consistency:* α= 0.67	NR
Regestein et al., 1993 **Pavlova et al., 2001**	Hyperarousal Scale (H-scale)	-Primary insomnia patients -Hypersomnia -Delayed sleep syndrome -Normal subjects -Patients with refractory insomnia	*Criterion validity:* -H-Scale with neuroticism scale and extroversion-introversion scale: no significant correlation -Higher EEG[27] activity in insomniacs compared to normal subjects (p<0.05). -Significant correlation between hyperarousal score with alpha and non-alpha EEG[27] activity: (r ≥0.38, p≤ 0.03). *Discriminating capacity: (*Pavlovaa et al., 2001) - The insomnia group had a mean Hyperarousal total score significantly higher than the normal group (F = 20.7; p< 0.0001).	NR	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric Properties		
			Validity	Reliability	Responsiveness and Interpretability
Kallestad et al., 2010	Insomnia daytime worry scale (IDWS)	Undergraduate students and senior high school students (Norway)	*Predictive validity:* The IDWS predicted insomnia severity over and above the other variables, accounting for an additional 12% of the variance. -In IDWS factor 1 (lack of energy) and IDWS factor 2 (danger) were entered simultaneously in Step 7 of a new hierarchical regression analysis, both factors predicted insomnia severity.	*The internal consistency:* Cronbach's alpha coefficients were calculated: total scale α =0.93, lack of energy α = 0.94 danger α =0.75.	NR
Tang & Harvey, 2004 **Jansson-Fröjmark et al., 2011**	Anxiety and Preoccupation about Sleep Questionnaire (APSQ)	110 university students (41 of them have insomnia as determined by PSQI score). Community dwelling sample from two counties in Sweden. -Classified according to sleep patterns into: 1) Insomniacs 2) Poor sleepers Normal sleeper	*Criterion/concurrent validity:* The correlation with PSQI ($r = 0.44$, $p< 0.0001$) The correlation with BAI[34] ($r = 0.37$, $p< 0.0001$) This indicates that higher scorers on the APSQ were associated with higher scores on PSQI (poorer sleep quality) and BAI[34] (worse anxiety). Jansson-Fröjmark et al., 2011 *Discriminant validity:* The 10 APSQ items, the total scale score and the two factors of the scale significantly discriminated between the three groups ($F = 97.67 –245.12$, $p<0.001$ in all instances), the total scale ($F = 296.99$, $p<0.001$). Higher scores were reported from the insomnia group as compared to other groups. Those with worse sleep status scored higher on the APSQ. The between group effect sizes for the 10 items ranged from 0.18 and 0.35, for the total scale 0.39, and for the two factors 0.33 and 0.41. *Convergent validity:* The APSQ and its two factors were significantly correlated with: - Pre-Sleep Arousal Scale-Cognitive: $r =0.45 –0.52$ - DBAS-10: $r = 0.50 – 0.61$ - HADS[17] Scale –Anxiety at fair level: $r = 0.38 –0.49$ - HADS[17] –Depression at a fair level: $r = 0.34 –0.40$	*Internal consistency:* Tang & Harvey, 2004 Cronbach's alpha for total scale= 0.92 Jansson-Fröjmark et al., 2011 Cronbach's alpha coefficients were: For total APSQ scale =0.93 For first factor= 0.91 For the second factor = 0.86	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	**Reliability**	**Responsiveness and Interpretability**
	Anxiety and Preoccupation about Sleep Questionnaire (APSQ) Continued.		ASPQ with daytime parameters: APSQ and its two subscales were moderately associated with: - Sleep-onset latency: r =0.28 –0.34 - WASO[32]: r =0.32 –0.37, TST[31]: r = 0.26 – 0.31 - Early morning awakening: r = 0.27 –0.30 - The APSQ and the two subscales were correlated with sleep quality (r = 0.40 –0.48). ASPQ with daytime impairment: -APSQ and its two factors were significantly correlated with daytime impairment (r = 0.41 –0.56) -Correlations after removal of daytime impairment from the composite score: APSQ, r = 0.53; first subscale, r = 0.53; second subscale, r = 0.38.		
Ellis et al., 2007	Sleep preoccupation scale (SPS)	Validity study: University students and community sample	*Criterion/ concurrent validity:* - SPS with the Sleep Associated Monitoring Index (SAMI): - Good correlation between total scores of SPS and SAMI; Poor (r= 0.67, p< 0.001), average (r =0.58, p< 0.001) and good (r =0.62, p< 0.001) sleepers. *Construct/convergent validity:* SPS subscales with Global PSQI-score: p< 0.001 CBC[35] subscale: r =0.37 AC subscale[36]: r =0.55 *Discriminant validity:* *[F (2, 721) =57.27, p<0.001],* poor sleeper reported higher levels of preoccupation scores than average and good sleepers. The tool significantly differentiated between Poor sleepers and good sleepers (as identified through the PSQI questionnaire); as poor sleepers reported more preoccupation than normal sleepers. [t (454) =8.78, p<0.001]	*Internal consistency:* α= 0.91 (overall) For subscales: CBC[35]=0.93 and AC[36]=0.89	NR

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Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Tan et al., 2016	Catastrophic thoughts about insomnia scale (CTIS)	University students	*Content validity:* Expert panel reviewed the scale. *Face validity* (n=523): The tool was given to participants to complete. *Criterion validity:* 1) Catastrophic thoughts about insomnia (CTIS scores) was significantly associated with sleep quality (PSQI scores), $r(137) = 0.643$, $p< 0.001$ 2) Catastrophic thoughts about insomnia (CTIS score) was significantly associated with insomnia severity (ISI scores), $r(137) = 0.703$, $p< 0.001$ *Predictive validity:* - CTIS along with DBAS16, IDWS, nBFI[37], and CESD-10[3], age, gender, and length of education predicted only 51% of the variance in PSQI score $F(8, 128) = 17.07$, $p< 0.001$, $R^2 = 0.51$. CTIS, CESD-10[3], and gender significantly predicted changes in the PSQ scores. - CTIS, DBAS-16, IDWS, nBFI[37], and CESD-10[3] and age, gender, and level of education predicted around two-thirds of the changes seen in ISIS scores $F(8, 128) = 32.07$, $p< 0.001$, $R^2 =0.67$. Each of the three instruments CTIS, the CESD-10[3], and the IDWS independently predicted the changes in ISI scores. *Construct/convergent validity:* CTIS scores were significantly associated with DBAS-16 scores, $r(137) = 0.722$, $p< 0.001$, and IDWS scores, $r(137) = 0.753$, $p< 0.001$.	*Internal consistent:* (a = 0.94) *Subscales:* Helplessness: a = 0.84 Rumination: a = 0.88	NR

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Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Blake & Gomez, 1998	Sleep Hygiene Self-test. (SHS)	Male war-zone veterans	*Criterion validity:* Sleep Hygiene self-test was significantly correlated with Combat exposure scale and Mississippi scale (r =0.20 and 0.10 respectively).	*Internal consistency:* Overall: 0.54	Responsiveness: After 5 sessions of education on sleep disturbance management (1 hour/ week), a significant change of 7.6 points scores was detected
Mastin et al., 2006	Sleep Hygiene Index (SHI)	Psychology students (in the United States)	*Criterion:* The SHI was positively correlated (p< 0.01) with the inadequate sleep hygiene criteria identified by the American Sleep Disorders Association, 1990. (r values = 0.371 to 0.458). *Construct:* A positive association was identified between SHI score and both ESS and PSQI scores r (599) = 0.244 and r (269) = 0.481 respectively with p< 0.01 The SHI scores were significantly correlated with PSQI components scores (p≤ 0.05).	Internal consistency: $\alpha = 0.66$ Test–retest reliability (repeated over 4-5 weeks) r (139) = 0.71, p< 0.01	NR
Brown et al., 2002	Sleep Hygiene Awareness and Practice Scale (SHAPS)	University students in united states (n=124)	*Construct:* Correlation with sleep quality (as rated by the PSQI): - Sleep hygiene awareness with PSQI rating; (r =0.21) - Sleep hygiene practice with PSQI rating: (r =0.49, p< 0.012) - Sleep hygiene practice with sleep hygiene awareness (r =0.30, p< 0.012). - Variable sleep length, noise disturbance, going to bed thirsty, and worrying about the ability to fall asleep at bedtime were identified as significant predictors of sleep quality predictors ($R^2 = 0.24$, adjusted $R^2 = 0.22$, F (1, 118) = 5.30, p= 0.023).	Internal consistency: Cronbach's a = 0.78 The caffeine knowledge and sleep-hygiene practice subscales: Cronbach's a = 0.55 and a = 0.47, respectively. Test retest (4 weeks apart): The sleep-hygiene awareness activities and sleep-hygiene practice: (r = 0.76, p< 0.001 and r = 0.74, p< 0.001, respectively). The caffeine knowledge subsection had poor test-retest reliability (r = 0.50, p< 0.001).	NR

Table 3. Cont. Studies testing the psychometric properties of extracted instruments

Author, year	Instrument	Sample	Psychometric properties		
			Validity	Reliability	Responsiveness and Interpretability
Grandner et al., 2014	Sleep Practices and Attitudes Questionnaire (SPAQ)		*Face validity:* evaluated through group conversations (e.g. focus group) between individuals from the community and research participants. The participants provided their feedback on the content of the instrument and discussed some specific items. *Content validity*: questions derived from theoretical framework were discussed by a group of professionals in sleep medicine and community members to ensure the comprehensiveness and representativeness of items. *Concurrent/criterion validity:* - A significant correlation was identified between PSQI sleep duration and average sleep duration ($r = 0.53$, $p < 0.001$). - Sleepiness with the ESS ($rs = 0.39$, $p < 0.001$). - Coping with acute insomnia correlation with the SHI was moderate ($r = 0.29$, $p < 0.001$). - Activities in bed subscale with the SHI ($r = 0.53$, $p < 0.001$). - Sleep environment with SHI ($r = -0.34$, $p < 0.001$). - Impact of external factors on sleep scores on this subscale significantly differed between good and poor sleepers on the PSQI ($p = 0.004$). - Sleep quality and global PSQI score: ($r = 0.36$, $p < 0.001$) *Construct validity:* SPAQ with DBAS: DBAS was significantly correlated with subscales 2 ($r = 0.18$, $p < 0.05$), 3 ($r = 0.28$, $p < 0.01$), 4 ($r = 0.31$, $p < 0.001$), 8 ($r = 0.23$, $p < 0.05$), 12 ($r = 0.30$, $p < 0.001$), 13 ($r = 0.45$, $p < 0.001$), 15 ($r = 0.30$, $p < 0.001$), and 16 ($r = 0.26$, $p < 0.01$).	*Internal consistency:* Cronbach's alpha range: 0.251- 0.864 (for the different subscales)	NR

Legend: Abbreviations in Table 1:

1. MOS: Medical Outcomes Study
2. GHQ-12: General Health Questionnaire-12,
3. CES-D Scale: Centre for Epidemiologic Studies Depression
4. FSS: Fatigue Severity Scale
5. SWLS: Satisfaction with Life Scale
6. DIMS: Disorders of Initiating and Maintaining Sleep
7. DOES: Disorders of Excessive Somnolence
8. SOL: Sleep Onset Latency
9. SF-12, SF-36: Short Form 12
10. POMS: Profile of Mood States
11. NPV: Negative Predictive Value
12. PPV: Positive Predictive Value
13. BNSQ: Basic Nordic Sleep Questionnaire
14. ICC: Inter-Correlation Coefficient
15. SD: Standard Deviation
16. CBT-I: Cognitive Behavioral Therapy for insomnia
17. HADS: Hospital Anxiety and Depression Scale
18. GBSS+: Great British Sleep Survey extended
19. A-D schedule: this consists of the State-Trait Anxiety Inventory (STAI-X1) and the Depression Questionnaire (DQ)
20. OSAS: Obstructive Sleep Apnea Syndrome
21. INS: Insomnia
22. BSD: Behavioral Sleep Disorders
23. OSA: obstructive sleep apnea
24. CPAP: Continuous Positive Airway Pressure
25. MSLT: Multiple Sleep Latency Test
26. VAS: Visual Analogue Scale
27. EEG: Electroencephalogram
28. EOG: Electro-Oculogram
29. SIP: Sickness Impact Profile
30. SF-36: Short Form 36
31. TST: Total Sleep Time
32. WASO: Wake After Sleep Onset
33. WPAI–GH: Work Productivity and Activity Impairment–General Health Questionnaire
34. BAI: Beck Anxiety Inventory
35. CBC: cognitive/ behavioral consequences
36. AC: Affective Consequences
37. nBFI: Neuroticism Subscale of the Big Five Inventory

Table 4. Characteristics of sleep assessment instruments (n=31)

Instruments	Measurement model				Burden [1]	Response format [2]	Cultural and language adaptation	Population in which the tool was validated
	Number of Qs	Scale	Scoring	Recall period				
The Bergen insomnia scale (BIS)	6	8-points scale representing the frequency (number of days/week) ranging from 0 to 7	Total= 0 to 42	Last month	NR	Self- report	English	NR
The Insomnia Screening Scale (ISS)	26	NR	Insomnia symptoms: 0-50 Daytime function: 0-35 Sleep environment: 0-25 Sleep opportunity 0-20	NR	NR	Self- report	NR	-Community sample: (6-72) years - Primary insomnia
Sleep Quality Questionnaire (SQQ)	10	5-point Likert-type scale (0-4) (0= strongly disagree, 4 = strongly agree).	Total: 0-40	Last month	20 minutes	Self-report	Japanese	Japanese adults
Women's Health Initiative Insomnia Rating Scale (WHIIRS)	5	5-points Likert scale (except 1 question 6 points Likert scale)	Total: 0-20	last month	NR	Self-report	English	Postmenopausal women
Restorative sleep questionnaire (RSQ)	RSQ-daily: 11 items RSQ-weekly: 9 items	Likert scale 1-5, in which 1 corresponds with "not at all" and 5 with "completely".	Total score: The average of the questionnaire items then converted to 0-100 scale. A minimum of 5 items must be completed.	RSQ-D: One day RSQ-W: Past week	NR	Self-report	English	NR
The Jenkins Sleep Scale (JSS)	4 items	6-point Likert scale, reflecting the frequency of having symptoms in the past month: (Not at all = 0; 1–3 days = 1, 4–7 days = 2; 8–14 days = 3; 15–21 days = 4; 22–28 days = 5).	Total: 0-20 (Higher scores reflect worse sleep quality). Score >4: indicative of a sleep problem.	Previous 1 month	NR	Self- report	English Turkish Portuguese	-Post cardiac surgery -Air traffic controllers - Patients with arthritis - Patients with ankylosing spondylitis - Shift workers -Patients with chest pain

Table 4. Cont. Characteristics of sleep assessment instruments (n=31)

Instruments	Measurement model				Burden [1]	Response format [2]	Cultural and language adaptation	Population in which the tool was validated
	Number of Qs	Scale	Scoring	Recall period				
Pittsburgh sleep quality index (PSQI)	19 items (+ 5 questions for bed partner (optional)	First 4 items (open ended), PSQI incorporate varying answer categories including open ending questions (e.g. regular bedtime, wakeup time, sleep duration and sleep latency) as well as forced-choice four-point Likert scale different options relating to the frequency of engaging in these behaviors during the previous month.	Global PSQI score =0- 21 Question score= 0 to 3	Past month	5-10 minutes	Self-report	English French India Japanese Chinese Spanish Hungarian Persian Sebarian Thai Czech Korean Arabic Hebrew Brazilian Portuguese Portuguese Sinhala Italian Malay	-U.S. College students -Pregnant women -Lower back pain -University students -Psychiatric disordered people - Cancer patients -Breast cancer -Fibromyalgia (the Spanish version validated) - Older adults with Generalized anxiety disorders -Community dwelling Ethiopian adults
Insomnia severity index (ISI)	7 items	5-point Likert scale	Total: 0 to 28	Last 2 weeks	<5 minutes	Self-report Clinician Significant others (usually spouse).	German English French Spanish Chinese Italian Turkish Persian Arabic Korean Danish	-Veterans with traumatic brain injury -Lower back pain -Cancer patients -Community-dwelling older people
Athens Insomnia scale (AIS)	AIS-8: 8 items AIS-5: 5 items	Each item is scored on a scale 0-3 with 0 indicating "no problem" and 3 indicating a "very serious problem". An item is rated positive if the described problem's frequency was ≥ 3 times/week	Total score range: AIS-8= 0-24 AIS-5= 0-15	Flexible based on the study purpose (mostly 1 month)	NR	Self-report Administered through an interviewer	English Greek Spanish Japanese (simplified)	-Psychiatric patients -Individuals with primary insomnia -Chronic pain patients

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Table 4. Cont. Characteristics of sleep assessment instruments (n=31)

Instruments	Measurement model				Burden [1]	Response format [2]	Cultural and language adaptation	Population in which the tool was validated
	Number of Qs	Scale	Scoring	Recall period				
Minimal insomnia Symptoms Scale (MISS)	3 items	5-point Likert scale (0= no, 4= very severe problems)	Total= 0-12	NR	NR	Self-report	English	-Elderly
Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS)	-DBAS: 30 or 31 items -DBAS-16: 16 items -DBAS 10: 10 items	Place a mark on a 10 cm long line within poles marking "strongly agree" and "strongly disagree".	DBAS full and DBAS 10: Average score across the items	Not applicable	NR	Self-report	Chinese Taiwanese German (DBAS-16)	NR
Sleep Condition Indicator (SCI)	8 items	5-point scale (0–4)	Total score: 0 to 32 -SCI total score could be converted to 0–10 range if the original total was divided by 3.2, or by using an online version of the instrument with built-in score calculator.	Typical night in the last month	NR	Self-report	English French Swedish	Community dwelling adults (French population)
General Sleep Disturbance Scale (GSDS)	21 items	8-point Likert scale. Items response options range between never (0) to everyday (7); higher scores indicate more severely disturbed sleep.	0-147	Previous week	5 minutes or less	Self-report	English Chinese Korean Italian	-Female nurses -Parents of infants admitted to ICU
Daily Cognitive Communication and Sleep Profile (DCCASP)	7 items	7-point Likert scale (1=worst function and 7=best function)	Total: 7-49	Daily	NR	-Self- report - Therapist -Significant others	English French	NR
Arabic Scale of Insomnia (ASI)	12 items	5-point Likert scale (0= No, 4=very much)	Total: 0-48	Last month	NR	Self-reported	English Arabic	NR
Maugeri Sleep Quality and Distress Inventory (MaSQuDI-17)	17	3-points Likert scale (1=Never, 2= sometimes and 3= frequently)	Total: 17 to 51	NR	NR	Self-report	NR	NR

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Table 4. Cont. Characteristics of sleep assessment instruments (n=31)

Instruments	Measurement model				Burden [1]	Response format [2]	Cultural and language adaptation	Population in which the tool was validated
	Number of Qs	Scale	Scoring	Recall period				
Epworth sleepiness scale (ESS)	8	Measured on 4-point Likert scale (0-3, corresponding to never dose off and high chance of dosing respectively)	Total score (0-24).	Recent times	NR	-Self-report -Completed by roommate	Arabic English Ethiopian German Greek Chinese (Eastern China) Italian Turkish Spanish	-Patients with sleep disorders -Patients with neurological disorders -Patients with psychiatric disorders -Workers (truck drivers) -Obstructive sleep apnea patients -African American population -Truck drivers
Karolinska sleepiness scale (KSS)	1 item	10 points Likert scale 1 (extremely alert) to 9 (extremely sleepy, fighting sleep)	Total score:7–9	5 minutes before answering the question	NR	NR	Japanese	Registered nurses(142)
Functional outcomes of sleep questionnaire (FOSQ)	*FOSQ-30:* 30 items *FOSQ-10:* 10 items	FOSQ-30: Six-point Likert scale (how frequently an activity is performed, 0 = never did it, 5 = three or more times a week) Subscale score calculation: A response score of 0 = a N/A or missing response. Thus, the potential range of scores for any item is 1-4. Calculate the mean of the answered items with responses equal to or greater than 1 for each subscale. This is the weighted mean item total or subscale score.	Global score: *FOSQ-30:* The mean of the subscale scores and multiply that by the number of subscales for which there is a score. - Scores range: 5-20 *FOSQ-10:* Total: the mean of the subscale scores multiplied by 5. Subscale score: 1–3.	Performance on a typical day (or generally how the person feels during the day).	*FOSQ-30:* 15 minutes *FOSQ-10:* NR	Self-administered paper-and-pencil questionnaire at a fifth-grade reading level.	*FOSQ-30:* Thai Norwegian Swedish *FOSQ-10:* Persian Mandarin Chinese Spanish	*FOSQ-30:* -Obstructive sleep apnea patients -Veterans with type 2 diabetes -Women with breast cancer (stages I-III) -Pregnant women *FOSQ-10:* Family members of critically ill infants

Table 4. Cont. Characteristics of sleep assessment instruments (n=31)

Instruments	Measurement model				Burden [1]	Response format [2]	Cultural and language adaptation	Population in which the tool was validated
	Number of Qs	Scale	Scoring	Recall period				
Occupational impact of sleep questionnaire (OISQ)	24 items	5-point Likert scale. Scores on each question range from 0 ("never/not applicable to 4 "all of the time").	Total: 0-96	Last month	NR	NR	Dutch Persian	NR
The Sleep Functional Impact Scale (SFIS)	26 items	5-points Likert scale	Total: 26-130 ≥13 items must be completed	7 days	NR	Self-report	NR	NR
Sleep disturbance questionnaire (SDQ)	12 items	5-point Likert scale Ranging from "never true," "to "very often true").	NR	Typical night with poor sleep	NR	NR	NR	NR
Hyperarousal Scale (H-scale)	26	Measured on a 4-point Likert scale. (Including the following: 0 'not at all,' 1 'a little,' 2 'quite a bit' and 3 'Extremely').	The scale measures the summation score (HSUM); with 3 scores per item.	NR	NR	Self-report	English Swedish	Insomniacs Patients with hypersomnia
Insomnia daytime worry scale (IDWS)	11 items	5-point Likert scale.	NR	Last week	NR	Self-report	NR	NR
Anxiety and Preoccupation about Sleep Questionnaire (APSQ)	10 items	-Original (2004): 10 points Likert scale (1= Not true to 10=very true) -Modified (2011): 5-point Likert scale. (1 = strongly disagree, 5= strongly agree)].	Total: Original:10-100 Modified: 10 to 50	Original: past 3 days Modified: last month	NR	Self-report	NR	NR
Sleep preoccupation scale (SPS)	22 items	7-point Likert scale (0= never to 6= all of the time)	Total: 0-132	NR	NR	Self-report	NR	NR
Catastrophic thoughts about insomnia scale (CTIS)	18 items	7-points Likert scale Ranges from 0=strongly disagree to 6= strongly agree and 3= neutral	Total: 0-108	NR	NR	Self-report	English	NR

Table 4. Cont. Characteristics of sleep assessment instruments (n=31)

Instruments	Measurement model				Burden [1]	Response format [2]	Cultural and language adaptation	Population in which the tool was validated
	Number of Qs	Scale	Scoring	Recall period				
Sleep hygiene-self test (SHS)	30 items	Dichotomous response (yes or No)	Total score (Yes = 1 point and No.=0 point). Every fifth item is scored in the reverse direction	Previous month	NR	Self-report	NR	NR
Sleep hygiene index (SHI)	13-item	5-point scale ranging from 0 (never) to 4 (always).	Total score: 0-52 or 13-65 (higher score indicates worse sleep hygiene)	NR	NR	Self-report	-English -Persian -Turkish -Korean	-Individuals with chronic pain -Elderly -University students
Sleep Hygiene Awareness and Practice Scale (SHAPS)	50 items	-Subsection 1: behavior is rated on a scale from "behavior is very beneficial to sleep" (1) to" behavior is very harmful to sleep" (7). A rating of 4= behavior has no effect (1 point for each correct answer, 2 points for omitted answers and 3 points for wrong answers) (original developers lack et al, 1987). -Subsection 2: Respondents are asked to write y if the substance contains caffeine, n if it does not, and x if they have never heard of it. Score range: 0-7 (brown et al., 2002).	Awareness: Subsection 1: Total: 13 to 39 Subsection 2: Score: 0 to 100. Practice: The total: scores can range from 0 to 133; higher scores suggests behaviors associated with poor sleep hygiene are common).	NR	NR	Self-report	NR	Insomniacs Good sleepers University students
Sleep Practices and Attitudes Questionnaire (SPAQ)	151 items	Sleep duration subscale and sleep debt subscale (measure of the difference between the needed and the actual sleep duration): score < 0 indicate that more than needed sleep is obtained while a score > 0 indicate that the sleep obtained is less than needed. -All other subscales scores range from 0 to 1.	NR	NR	10 minutes	Self-report	English	NR

NR, Not reported

   (1) Administration time

   (2) Individuals who need to complete the questionnaire

As presented in Table 3 and Table 4, most of the sleep assessment instruments identified contain less than 20 items. The longest of these instruments is the Sleep Practices and Attitudes Questionnaire (SPAQ), which contains 151 questions divided into 16 domains (143). On the other hand, the Karolinska Sleepiness Scale (KSS), the Minimal Insomnia Symptoms Scale (MISS), and the Jenkins Sleep Scale (JSS) are the shortest instruments identified, consisting of one, three, and four questions, respectively (144–146). Some of the instruments have multiple versions, each consisting of a different number of questions [e.g., the Functional Outcomes of Sleep Questionnaire (FOSQ)-30 and the FOSQ-10 have 30 and 10 questions, respectively] (147,148). Most of the instruments use Likert-type scales as response options to generate scores. The time needed to complete an instrument was not reported in most of the studies reviewed. However, the response burden, wherever reported, did not exceed 10 minutes. The recall period for the majority of the instruments was one month, except for the Insomnia Severity Index (ISI) and the Sleep Functional Impact Scale (SFIS) which had a recall period of 2 weeks and 1 week, respectively (149–151).

The instruments were classified into four categories based on the outcomes that were assessed in the 107 studies, as follows: (1) instruments screening for insomnia symptoms (n=15); (2) instruments assessing consequences of poor sleep (n=8); (3) instruments assessing preoccupation with sleep (n=4) and; (4) instruments evaluating sleep hygiene (n=4). A detailed description of the psychometric properties for the four categories of instruments is provided in Table 5.

Table 5. Evaluation of the psychometric properties of the instruments (n=31) [*]

Questionnaire	Reliability		Validity			Responsiveness [b]	Interpretability [b]
	Internal Consistency [a]	Test-retest [b]	Content [b]	Construct [b]	Criterion [b]		
Instruments screening for insomnia symptoms							
BIS	+	+	N/A	+	N/A	N/A	N/A
ISS	+	N/A	N/A	N/A	+/-	N/A	+
SQQ	+	+	+	+	N/A	N/A	N/A
WHIIRS	+	+	+	-	N/A	N/A	N/A
RSQ	+	+	+	+	N/A	N/A	N/A
PSQI	+	+	N/A	+	+	N/A	+
ISI	+	N/A	+	+	+	+	+
JSS	+	-	N/A	-	N/A	N/A	N/A
AIS	+	+	N/A	N/A	N/A	N/A	+
MISS	+	+	N/A	N/A	+	+	+
DBAS	+	N/A	N/A	+	?	+	N/A
SCI	+	N/A	+	+	+	N/A	+
GSDS	+	N/A	N/A	N/A	-	N/A	N/A
DCCASP	+	+	N/A	N/A	-	N/A	N/A
ASI	+	+	+	+	?	N/A	N/A
Instruments evaluating consequences of poor sleep							
MaSQuDI-17	+	N/A	N/A	+/-	N/A	N/A	N/A
ESS	+	+	N/A	N/A	+	+	N/A
KSS	N/A	N/A	N/A	N/A	+	N/A	N/A
FOSQ	+	+	+	+	+	+	N/A
OISQ	+	+	N/A	N/A	+	N/A	N/A
SFIS	+	N/A	+	+	N/A	N/A	N/A
SDQ	+	N/A	N/A	N/A	N/A	N/A	N/A
H-scale	N/A	N/A	N/A	N/A	-	N/A	N/A
Instruments evaluating preoccupation about insomnia							
IDWS	+	N/A	N/A	N/A	+	N/A	N/A
APSQ	+	N/A	N/A	-	N/A	N/A	N/A
SPS	+	N/A	N/A	-	-	N/A	N/A
CTIS	+	N/A	+	+	+	N/A	N/A
Instruments measuring sleep hygiene							
SHS	-	N/A	N/A	N/A	-	+	N/A
SHI	-	+	N/A	-	-	N/A	N/A
SHAPS	+	+	N/A	-	N/A	N/A	N/A
SPAQ	-	N/A	+	-	-	N/A	N/A

Legend:
*: Following the Terwee et al. quality criteria
a: Cronbach's alpha: + if 0.7-0.95; - if (< 0.7 or >0.95)
b: Pearson's correlation coefficient (r): + if r≥0.70; - if r<0.70
c: content validity: +; reported
N/A, no information available to establish rating; +/-, conflicting results in studies or inconsistent results across subscales; ?, questionable/not rated

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2.2.1. Instruments screening for insomnia symptoms

From the 15 instruments screening for insomnia symptoms, two [the Women's Health Initiative Insomnia Rating Scale (WHIIRS) and the Restorative Sleep Questionnaire (RSQ)] were dimension-specific and focused on evaluating the sleep quality through assessing problems with initiation and maintenance of sleep (152–154). The remaining 13 instruments were multidimensional, assessing sleep quality and consequences of poor sleep. Some of the identified instruments also measure other specific dimensions such as satisfaction with sleep in the Bergen Insomnia Scale (BIS) and sleep environment in the Insomnia Screening Scale (ISS) (155,156). The Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) explores perceptions regarding insomnia.(157–159). On the other hand, the Daily Cognitive-Communication and Sleep Profile (DCCASP) measures the daily fluctuation in sleep quality and assesses the effects of these fluctuations on the cognitive functioning and communication, while the General Sleep Disturbance Scale (GSDS) assesses sleeping patterns and the use of sleep aids during the past month (160,161).

2.2.2. Instruments assessing consequences of poor sleep

These instruments measure the impact of insomnia on individual's functioning and daytime performance. Two of these instruments [the Epworth Sleepiness Scale (ESS) and the KSS] focus on assessing sleepiness only, whereas the Hyperarousal Scale (H-Scale) also assesses daytime alertness (144,162–164). Three instruments, the FOSQ, Occupational Impact of Sleep Questionnaire (OISQ), and the Sleep Functional Impact Scale (SFIS), evaluate the effects of insomnia on overall functioning (147,148,151,165). Conversely, the Sleep Disturbance Questionnaire (SDQ) evaluates

factors which contribute to poor sleep, while the Maugeri Sleep Quality and Distress Inventory (MaSQuDI-17) measures the emotional burden of insomnia (157,166).

2.2.3. Instruments assessing preoccupation with sleep

Three of these instruments [Insomnia Daytime Worry Scale (IDWS), Anxiety and Preoccupation about Sleep Questionnaire (APSQ), and Sleep Preoccupation Scale (SPS)] evaluate the extent of worry about insomnia symptoms (167–170). Whereas the fourth instrument; the Catastrophic Thoughts about Insomnia Scale (CTIS) assesses exaggerated thinking about insomnia and its consequences (171).

2.2.4. Instruments assessing sleep hygiene

Out of the four instruments included under this category [Sleep Hygiene Index (SHI), Sleep Hygiene Awareness and Practice Scale (SHAPS), Sleep Hygiene Self-test (SHS) and the SPAQ], SPAQ was the only comprehensive instrument which assessed sleep quality, quantity, consequences of poor sleep, and sleep hygiene (143,172–174). The SHS also evaluates the effects of interventions which are expected to improve sleep hygiene and it is the only sleep-hygiene instrument which has been validated for responsiveness. The SHAPS measures knowledge about sleep hygiene in addition to behaviors surrounding sleep.

2.2.5. Other characteristics of the identified instruments

Some of the sleep instruments which were validated in the 107 articles included in this review, such as the BIS, Sleep Condition Indicator (SCI), ISS, Athens Insomnia Scale (AIS) and Sleep Hygiene Index (SHI) were developed in accordance with

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international diagnostic criteria for insomnia such as the International Classification of Sleep Disorders 2nd edition (ICSD-II), International Classification of Diseases 10th edition (ICD-10), and various editions of the Diagnostic and Statistical Manual of Mental Disorders (DSM) (155,172,175–177). Most of these instruments were validated among university students and in primary insomniacs.

Many of the identified sleep instruments have been translated and culturally adapted in a variety of languages, such as the Pittsburgh Sleep Quality Index (PSQI), ISI, and ESS which are available in at least 18, 10, and 6 languages, respectively(178–182). Only four instruments were identified in Arabic, three of which (PSQI, ISI, and ESS) were originally developed in English, but translated and validated in Arabic-speaking populations(183). While the Arabic Scale of Insomnia (ASI) was the only identified instrument which was originally developed in Arabic (184).

2.2.6. Quality assessment

The majority of the instruments used in the 107 studies included in this review did not meet all of the eight criteria set by the SAC-MOT (139). However, the conceptual and measurement models were described for all instruments. Additionally, the reliability of sleep measures was usually reported in the validation studies, particularly the internal consistency was reported for all instruments, except for the H-scale and the KSS. Overall, the reported internal consistency values for the sleep and sleep hygiene instruments across the different studies included in this systematic review ranged between 0.53 and 0.97. This indicates that these instruments were different as some (Cronbach's alpha ≥0.7) were measuring only one construct while those with lower Cronbach's alpha values were probably measuring more than one construct.

As outlined in Table 5, the test-retest reliability was only reported for 15 of the 31 instruments. Validity measures were reported for almost all the instruments identified (29 out of 31), of which criterion validity was the most reported and content validity the least reported validity measure. The generalizability of the psychometric properties was examined for three instruments (ISS, ISI and AIS) in community samples and among primary insomniacs. On the other hand, six instruments (MaSQuDI-17, ESS, FOSQ, DBAS, APSQ, SPS) provided evidence of discriminating capacity between healthy individuals and poor sleepers. As summarized in Table 3, some of the sleep instruments were tested for other validity measures such as incremental validity, diagnostic validity, and external validity (156,175–178,185,186). Additionally, the SHS was the only instrument that was assessed for responsiveness to change in sleep hygiene after interventions (174). With the exception of SHAPS, all of the sleep hygiene instruments had low internal consistency ($\alpha < 0.7$) and only the SHI and the SHAPS were evaluated for their reproducibility (143,172–174).

The improvement in scientists understanding of insomnia pathophysiology hasbeen associated with a parallel increase in the development of instruments that measure different aspects of sleep problems. In fact, around 17 of the 31 instruments identified in this systematic review were developed after 2005, indicating that the development of sleep related subjective measures has been extremely active in the last decade. The instruments available today assess different aspects of sleep dysfunction including the night-time symptoms, daytime consequences in addition to cognitive and behavioral aspects that affect sleep.

In the validation studies reviewed, the sleep instruments identified were mostly tested for their reliability. These studies reported primarily the internal consistency of the questionnaires. Additionally, instruments' precision was mostly assessed through the test-retest reliability method, which compares between the responses to the instrument's questions answered by the same individuals at two different time points (187). However, the time frame in between the two measurements in the validation studies assessing reproducibility was highly variable, ranging between 2 days and 6 months (146,180).

Overall, three main validity measures were reported in the studies included in this review: content, criterion and construct validity. Content validity is often one of the first properties tested when an instrument is developed (140). Criterion validity was the most commonly reported validity measure in the studies included in this review. Of which concurrent validity was evaluated for 18 out of the 31 sleep instruments identified, whereas the predictive validity was assessed only for 5 instruments. However, the choice of the instrument to be used as a comparator or a "gold standard" in the assessment of the criterion validity was rarely justified. In situations where a gold standard measure is not available, construct validity could be tested (188).

On the other hand, the diagnostic validity was reported for only five of the instruments identified in this review (specifically the PSQI, ISI, AIS, MISS and the SCI). In fact, the diagnostic validity is an important measure as it examines the extent to which the instrument can accurately differentiate between healthy individuals and insomniacs at a specific score (189). Additionally, incremental validity which describes

the ability of an instrument to predict sleep parameters beyond what is possible by other existing instruments was only tested for the Sleep Quality Questionnaire (SQQ) (185). Nevertheless, an inconsistency in the way of reporting validity measures was identified in the validation studies reviewed, this particularly introduced a difficulty in distinguishing between criterion and construct validity.

Furthermore, responsiveness and interpretability were the least reported psychometric properties in the studies review. In fact, responsiveness is an important psychometric property which could provide useful information regarding the instrument's ability to detect clinically meaningful changes in sleep parameters (141). Additionally, interpretability which reflects the degree to which the scores of an instrument could be translated into a clinically meaningful classification, could be useful in assessing the effectiveness of treatments or interventions.

The psychometric properties for the four instruments that evaluate preoccupation with sleep were not adequately reported. Although all of these instruments demonstrated good internal consistency, their reproducibility was not assessed, and their validity measures were often associated with low correlation coefficients. Among the sleep hygiene assessing instruments, SHI was the only instrument available in languages other than English. This could be related to the simplicity of this instrument in terms of its language and the number of items included. Additionally, this instrument has good quality as it was developed according to ICSD-II criteria for inadequate sleep hygiene and has been shown to have good psychometric properties(172). The findings of this review have shown that ISI, FOSQ and MISS were the only instruments evaluated for all four psychometric properties (145,147–149,186,190).

This search concluded that only three subjective sleep instruments were translated and culturally adapted in an Arabic context: the PSQI, ESS and ISI. Additionally, through this search the Arabic Scale of Insomnia (ASI), an instrument that was developed in the Arabic language and tested among university students in Kuwait, was identified (184). Notably, none of the instruments assessing preoccupation about insomnia or sleep hygiene identified in this review were available in Arabic.

2.3. Insomnia management in primary healthcare settings

Insomnia is a common problem at primary healthcare settings and studies are suggesting that up to two third of patients could present with at least one of the insomnia symptoms (48–57). However, the prevalence of insomnia might be underestimated because screening for this condition is not part of the routine practice in most primary care centers (191). Patients may also contribute to the under detection of insomnia by not reporting their sleeping problem due to their underestimation of the importance of insomnia in comparison with their other health concerns when presenting to primary care (192). Furthermore, observations from practice suggest that insomnia is not receiving enough medical attention and is still underestimated as a condition and therefore undertreated (193). Results from a Canadian study indicated that 29.9 % of the adults studied complained of at least one of the insomnia symptoms, however, only 13% of those affected consulted a healthcare provider for insomnia management (15). Similarly, in another study only 11.1% of the insomniacs studied visited a doctor at a

PHCC to manage insomnia (193). However, a study that assessed help seeking behavior among adults at PHCCs found that 52% of patients with probable insomnia reported discussing their sleeping problem with a physician (48). Interestingly, in this study, patients who consulted physicians for insomnia were often those with comorbid conditions, and reported poor sleep quality, less total sleep per night, and poor daytime performance due to sleep impairment.

Patients with primary insomnia often avoid seeking medical help as many of them perceive the condition to be benign and trivial and believe that sleeping problems could be self-managed not requiring medical intervention (193). Additionally, in this study some individuals were not even aware of the treatment options available for insomnia. Furthermore, there appears to be stigma associated with insomnia and its possible link to mental disorders, which might discourage some individuals from seeking professional help (193).

Unlike other medical conditions, individuals experiencing insomnia often attempt to treat themselves through using over the counter (OTC) products or non-pharmacological strategies (15). Only after self-treatment shows to be ineffective, patients seek professional help and meet their general practitioners to diagnose their problem and get a more effective therapy (194). A variety of treatment approaches are available for the management of insomnia including behavioral interventions and pharmacological therapies (195). Despite that, insomnia treatments including behavioral therapies such as CBT-I and hypnotics are underutilized in practice (196). A study which assessed the management of insomnia at PHCCs reported that the patterns of benzodiazepine use was lower than the prevalence of insomnia and found that around 46% of the insomniac patients were treated with antidepressants despite not

having a mental disorder (58). However, antidepressants are not indicated for the management of insomnia in the absence of a mood disorder, and there is inconclusive evidence of their effectiveness for this indication (197). Studies also suggest that patients with other chronic diseases and those with greater disability are the ones most likely to be treated for insomnia (58).

Failure to manage insomnia effectively may have serious consequences not only on the patients' health but also on the country's economy and development. Studies have shown that insomnia increases healthcare utilization and resource consumption, as insomniacs at PHCCs are twice more likely to be admitted to a hospital as compared to non-insomniacs (49). Insomnia also increases the need for medical attention represented in general practitioner's visits, laboratory tests and other services. Moreover, patients who suffer from insomnia associated with impaired daytime performance have lower quality of life and they usually complain of excessive daytime sleepiness, loss of concentration at work and memory problems (49,51). These problems put the person at risk of dozing off while driving which in turn increases the risk of road accidents (40). Furthermore, patients with insomnia symptoms were reported to have around 13 clinical consultations per year as compared to 5 consultations per year for other types of patients (49).

Several studies have explored physicians' perspectives on insomnia and their approaches for diagnosis and management of the condition. Studies done at PHCCs have reported that general practitioners often do not prioritize the management of sleeping problems and perceive insomnia as a symptom of an underlying condition (192,198,199). One of the studies which assessed the perceptions of prescribers and patients on insomnia evaluation and treatment showed that physicians focus on the

causes and precipitants of insomnia and provide treatment accordingly, whereas patients were frustrated about the neglect of their insomnia complaints by physicians and often felt the need to convince their general practitioners about the seriousness of their sleeping problem (59). Additionally, patients presenting with insomnia symptoms were confused when a medication for a different indication such as depression or anxiety was given to treat their insomnia complain (195). The cause of this misunderstanding between physicians and patients could be related to the differences in their perspective of insomnia, as physicians viewed it as a symptom of a different problem whereas patients perceived insomnia as their main complaint and focused on its effects on their daily life.

When it comes to treatment approaches, general practitioners at PHCCs described a stepped approach starting with psychological assessment followed by sleep hygiene and lastly medications (198). Although physicians provide sleep hygiene related advice, most physicians expect that patients will not be satisfied with any nonpharmacological therapy (192). On the other hand, some patients perceived physician's advice on sleep hygiene as too simple and questioned its effectiveness (195). Hypnotics are also one of the options for insomnia management, however, physicians at PHCCs use medications as the last resort when other options are shown to be ineffective (192). Additionally, prescribers at PHCCs have demonstrated a good understanding of the health consequences associated with the administration of hypnotic medications and hence these were only prescribed to patients with chronic insomnia and in cases where other therapies were ineffective (198). Moreover, studies have indicated that physicians often view these medications as a quick solution which should be used for short duration.

Disparity has also been found between what is recommended in clinical guidelines and what is prescribed by clinicians in actual practice. For example, although all the recent sleep related guidelines recommend CBT-I as the first line treatment, studies have shown that prescribers at PHCCs do not routinely recommend it for insomniacs (60,61,199,200). In fact, physicians at PHCCs have expressed their doubts about the effectiveness of CBT-I (195). Studies have also shown that patients and most of the pharmacists lacked awareness about CBT as a treatment for insomnia, despite available evidence that the introduction of CBT-I programs at PHCCs is effective for the management of chronic insomnia (198,200). In one study, insomnia symptoms resolved in 88% of chronic insomnia patients who completed 6 sessions of CBT-I (72). Additionally, it was shown in this study that patients who completed the CBT-I had a significant improvement in sleep and mood related measures. Also, the use of sleeping aids in these patients, including both prescribed medicine and over the counter products, was significantly lower after the therapy.

Some general practitioners have related the lack of implementation of guidelines' recommendations in their practice to their working environment and the workload (199). The disparity between guidelines and practice could also be related to the pressure exerted by patients who want a rapid solution for their problem on prescribers. Often these patients want medications to solve their sleeping problems and are not interested in time consuming non-pharmacological therapies (199). In their study Sake and colleagues reported that a lack of a clear treatment guideline for use at PHCCs is one of the barriers to accurate diagnose and manage of insomnia (191). The

authors also suggested that the provision of a simple routine sleep assessment questionnaire would help in identifying patients with sleeping problems. In addition, recent studies have indicated that physicians at PHCCs need training and education on insomnia and its management (198).

The information available about the prevalence of insomnia at PHCCs in the Middle East is limited, but the few studies available suggest a high prevalence. Two recently published studies conducted in KSA found that between 60 and 76% of PHCCs' attendees report insomnia symptoms (50,55). Additionally, around 57% of patients with insomnia also had accompanying daytime dysfunction (50). However, none of the patients with insomnia in these studies discussed their sleeping problem with a physician at PHCC and as a result they were not diagnosed with insomnia nor they received a treatment for it. A study done in Qatar found that sleep disturbances and excessive daytime sleepiness were common among diabetic Arab patients at PHCCs (68). Other than the above, no other published studies have been found in relation to the management approaches of insomnia at PHCC's in Arab countries. In addition, perspectives of HCPs about insomnia and its management at PHCCs is these countries is largely unknown.

CHAPTER 3: METHODOLOGY

The main aim of this study was to explore the prevalence of insomnia among university students and to describe the approaches for its management among HCPs at PHCCs in Qatar. To achieve these primary objectives, two different and yet interconnected study phases were undertaken using quantitative and qualitative methods. Below is a detailed description of the methods utilized in each of the two phases of the study.

3.1. Phase 1: Exploring sleep patterns, behaviors and the use of sleep medicines among university students in Qatar

3.1.1. Study design

This was a quantitative, cross-sectional survey of students enrolled at QU in the fall semester of the 2018 academic year. An online, self-administered questionnaire was utilized in order to provide the respondents with the opportunity to report their sleeping patterns and habits over the past month.

3.1.2. Study population

The number of students at QU, the only government-owned university in Qatar, is the largest in the country. Around 20,000 undergraduate and graduate students were distributed across 9 different colleges when this study was conducted (201).

Inclusion and exclusion criteria

Participants were included in this study if they were:

- Enrolled as QU students at the time of recruitment

- Residing in Qatar

- Able to read and write in either Arabic or English languages

  Participants who did not meet the inclusion criteria specified above were excluded from the study.

3.1.3. Sample size determination

The sample size required for this phase was calculated using the Cochrane formula as described below (202):

$$n = \frac{Z^2 p(1-p)}{d^2}$$

n = (1.96) ^2 x (0.3) (0.7)/ (0.05^2) =323 persons

n = Sample size

d = sampling error / level of precision

Z^2 = the abscissa of the normal curve that cuts off an area α at the tails ($1 - \alpha$ equals the desired confidence level, e.g., 95%)

P = Probability

Accumulating evidence from literature suggested that the prevalence of insomnia among university students centers around 30% (34,101,108). Therefore, according to the sample size calculation, the minimum sample size required for this study was 325 participants.

Considering a response rate of 15%, the sample size required was 2,167 students which was rounded up to 2, 200 students.

3.1.4. *Sampling technique*

The initial sampling plan was to select the 2,200 students using proportionate, stratified simple random sampling technique, such that students were to be stratified into different clusters according to their college of study. When this method was applied, the minimum sample size specified for this study was not achieved despite sending three reminders over a period of 5 weeks. Therefore, the questionnaires were then sent to all QU students (19,738) with the aim of achieving the minimum sample size required. Whole population sampling method was used in which the questionnaire which was sent to all undergraduate QU students.

3.1.5. *Recruitment and data collection process*

Students were recruited for participation in the study through e-mails. The questionnaire was built in an online platform using SurveyMonkey®. Students were provided with a link to access the online questionnaires. Students were given the option to answer in either English or Arabic as links to questionnaires of both languages were provided. The survey link was opened from the 7th of January to the 7th of March 2019. The survey was completely anonymous and no identifying information were collected. Data were then exported from the online SurveyMonkey® platform to SPSS® statistical software for analysis.

3.1.6. Study instruments

After the extensive literature review of sleep instruments summarized in Chapter 2, section 2.2, two of these instruments were selected to be use in this study: (1) the Pittsburgh Sleep Quality Index and (2) the Sleep Hygiene Index. These instruments investigate factors contributing to poor sleep and the consequences of sleep disturbances from the students' perspective. The questionnaires also measure sleep hygiene practices and the utilization of sleep aids including both pharmacological and non-pharmacological options. Details about the two questionnaires used and their adaptation process are provided below.

Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a validated instrument available in English and Arabic languages (178,181). This instrument explores sleep pattern, daytime consequences of impaired sleep and the use of sleeping aids during the past month. It consists of 19 self-rated questions and additional five questions to be completed by a roommate or a bed partner. Considering that this questionnaire was completed by students who were attending routine classes at the university, the last five questions meant to be filled by a roommate were excluded. Removing these questions will not have bearing on the results because as per the developer guidelines, they are not included in the calculation of the total PSQI score. The 19 questions of the PSQI are categorized into seven different components which are required for the calculation of the PSQI's global score which ranges between 0 and 21. A score of 5 has been reported as the cut-off to distinguish sleep quality; such that a score higher than 5 indicates poor sleep quality (178). This cut-off score is associated with a sensitivity of 89.6% and specificity of 86.5% to detect poor sleepers (178). The PSQI has been previously translated into Arabic and validated

among university students (181). The Arabic version of the PSQI questionnaire has shown a marginally acceptable internal consistency reliability for the global score (Cronbach's alpha = 0.65). In the present study, the PSQI global score was calculated if all the 7 components for calculation were available. Therefore, respondents who missed some questions or provided invalid responses were excluded from the global score computation.

Sleep Hygiene Index (SHI)

SHI is an instrument that assesses the presence of behaviors and environmental conditions which may compromise the individual's sleep hygiene (or healthy sleep practices). The SHI consists of 13 self-rated questions with a response option in a 5-point Likert-type scale, ranging between "Never" and "Always". The SHI scores on the SHI range from 0 to 52, with higher scores indicating poor sleep hygiene (172). A study done among university students identified the cut-off score of 16 with a sensitivity of (77%) and specificity of (47.5%) for identification of sleep quality (203). This indicates that the SHI is a good instrument for detecting individuals with poor sleep hygiene, but it might not be effective in identifying individuals with good sleep hygiene. The SHI is available in English, Persian and Turkish languages (172,204,205). To be consistent with the questionnaire, respondents were asked to provide responses on their sleep hygiene practices in the previous month. At the time when the SHI was selected to use in this study, it had not yet been translated into Arabic or validated in an Arabic-speaking population. Considering that many of the programs at QU are taught in Arabic only and that most of the students speak Arabic language, translating the SHI to Arabic was necessary. Translating the instrument was also important to reach all of the intended sample and to avoid selection bias. Before starting the translation, the

developer of the tool (Dr. David Mastin) was contacted and permission was obtained to conduct the translation. More information about the linguistic validation and cultural adaptation of the SHI is provided in the next section.

3.1.7. *Translation of the sleep hygiene index and validation process*

The SHI was translated to Arabic language following the forward-backward translation method recommended by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) guidelines (206).

3.1.7.1. Forward translation

The SHI was translated from English to Arabic by three independent translators who were native Arabic speakers, one of whom was a professional translator with experience in translating materials from English to Arabic in different specialties. The second was a HCP (clinical pharmacist) with experience in mental health, and the third was an individual with years of experience in translation at the College of Pharmacy, QU.

3.1.7.2. Reconciliation

A fourth individual who is a healthcare professional (pharmacist) reconciled the three translations and produced the first reconciled Arabic translation of the SHI.

3.1.7.3. Backward translation and review

Two individuals with background in healthcare, independently translated the first reconciled SHI from Arabic back to English. A meeting was arranged for the backward translation review, which was attended by the backward translators, research team and the translator who developed the first reconciled Arabic version of the

instrument. In this meeting, the two backward translations were compared to the original English version of the SHI and when any discrepancy was identified, the Arabic version of the instrument was reviewed and edited. At the end of the meeting, the second reconciled Arabic version of the instrument was developed.

3.1.7.4.Cognitive debriefing

The cognitive debriefing was done to assess the clarity and appropriateness of the content of the questionnaire in a sample of Arabic-speaking population living in Qatar. Nine native Arabic language speakers were interviewed for the cognitive debriefing step. The participants selected reflected different age groups, gender, nationalities and occupations. The variability in the participants' demographic background was important to ensure that the items of the questionnaire were understood by Arabic speakers coming from different countries and with different educational backgrounds. This step was done to ensure the comprehension, time burden and acceptability of Arabic version of the SHI. In addition, the Arabic translation of the SHI was also validated for its reliability after administration to QU students.

3.1.8. Data analysis

Quantitative data obtained from surveys were analyzed using SPSS software versions 25 and 26 (IBM SPSS® Statistics for Windows; IBM Corp, Armonk, New York, USA). Questions not answered on either PSQI or SHI were considered as missing values and surveys with missing responses were excluded from the calculation of the total score for each of the instruments. Descriptive statistics including frequencies and percentages were computed for demographic characteristics, sleep patterns and sleep

habits reported by the participants. The total scores for both PSQI and SHI were computed as per developers' guidelines. While the difference in PSQI and SHI scores for different colleges and sociodemographic variables was calculated using Mann-Whitney U and Kruskal-Wallis tests. Additionally, the association between different demographic characteristics and the components of the PSQI with the overall scores of the two instruments were analyzed using Spearman's Rank correlation test. The Pearson's correlation test was also used to explore the association between continuous variables (i.e. PSQI and SHI scores), whereas the Spearman's correlation was used for categorical variables (e.g. college and PSQI score). Binary logistic regression (a.k.a. univariate regression) was also used to assess the cause-effect relationship between different demographic variables and sleep quality or sleep hygiene practices. While multiple logistic regression was conducted to explore the effects of different variables including sleep hygiene on sleep quality. A p-value <0.2 was used as a cut-off point to determine variables which proceeded to the multiple logistic regression. This p-value was selected as recommended in previous studies to enhance the univariate model's ability to identify all truly important variables (207,208).

3.1.9. Ethical considerations

The participants completed consent forms before participating in the study. All responses were anonymous. This study was approved by QU's Institutional Review Board (IRB) and was given reference number of: QU-IRB 977-EA/18.

3.2. Phase 2: Healthcare providers' perspective and experiences on the management of insomnia at primary healthcare centers in Qatar

3.2.1. Study design

This phase utilized a qualitative phenomenological design for enquiry to describe the views and experiences of HCPs at PHCCs regarding insomnia and its management. This study also used the social constructivist framework described by Creswell to interpret the resultant data from the interviews (209). The interviews were conducted at PHCCs in patients' counselling room, physician's office or the pharmacy according to the participant's preference. The interview's duration ranged between 20 and 40 minutes.

3.2.2. Setting and study population

Face-to-face interviews were conducted with HCPs working at several different PHCCs in Qatar. The interviews were conducted within PHCCs in suitable private rooms, such as those used for counselling patients within the pharmacy or at physician's offices. The interview's duration ranged between 20 and 40 minutes.

Inclusion and exclusion criteria

HCPs were eligible for participating in this phase of the study if they were:

- Physicians and pharmacists who have been practicing at PHCCs in Qatar for a minimum of one year.

- HCPs who are involved in providing direct care to patients on daily basis.

HCPs that were not eligible for participating in the study if:

- They were not pharmacists or physicians.

- They were working for less than a year at PHCCs.

- They were in administrative or managerial positions and were not involved in providing direct patient care on daily basis.

3.2.3. Sample size determination

Pharmacists and physicians were interviewed until saturation was achieved (no new themes emerging). In this study saturation was achieved after interviewing 10 physicians and 8 pharmacists from PHCCs. In addition, one psychiatrist who is responsible for one of the mental health clinics was interviewed for his expert opinion.

3.2.4. Sampling

PHCCs to be included in the study were selected from the 26 currently operating healthcare centers. Healthcare centers included in this study were selected from various geographical regions of Qatar including the Northern (N), Central (C) and Western (W) regions. From each region, PHCCs were selected through purposive sampling of different locations and regions to ensure maximum variation of participants' characteristics based on the geographical region, different cultural factors, and nationalities. However, centers which were operating for less than one year were excluded. PHCCs selected for participation in this study included: Madinat Khalifa (N), Al-Khor (N), Lebaib (N), Airport (C), West Bay (C), Al-Rayyan (W), Abu-Baker Siddiq (W), and Mesaimeer (W). HCPs who were approached at each center were also selected purposively. Consent forms were obtained from physicians and pharmacists

who agreed to participate in the study.

3.2.5. *Data collection tools*

Semi-structure topic guides were used during the interviews to explore healthcare professionals' experiences and practice in assessing and managing insomnia. Two topic guides were developed, one to conduct the interviews for physicians (31 items) and another one to conduct the interviews for pharmacists (21 items) (Appendix B). The topic guides were used to direct the interview, however, deviations from the topic guide were allowed as long as it remained within the scope of the study. The interviews were conducted in either Arabic or English based on the participant's preference.

Most of the interviews were tape-recorded. However, if the participants objected to the tape recording, the answers of the participant were documented immediately by the researcher conducting the interview. The recorded interviews were then transcribed, and the transcripts were sent to the participant to ensure the accuracy of the information transcribed. The data collection was continued until saturation was achieved and no new themes were generated.

3.2.6. *Data analysis*

The information transcripts obtained from the interviews were thematically analyzed, following the six steps recommended by Braun and Clarke, to generate themes and codes (210). Initially, the transcripts were read repeatedly to ensure

adequate understanding of the data, followed by the generation of the initial codes. All initial codes and individual quotes were reviewed by two researchers (RA and MZ) and modifications were done as agreed by the researchers. NVivo 12 software was used to aid in the coding process. The codes were then grouped into categories which were further divided into themes. The themes generated and the categories forming them were then thoroughly reviewed with the research team and modifications were made based on the feedback obtained. While reviewing the themes and codes, the research question was kept into consideration to ensure that the generated themes answered the research questions. The deductive approach was followed in generating the final themes.

3.2.7.   *Ethical considerations*

This study received approval from the PHCC's research committee (reference number: PHCC/RC/18/12/004) and QU IRB (reference number: QU-IRB 1097-EA/19). Participants were given an informed consent to read and sign before participating in the study. The personal identifiers of the interviewees (i.e. name) were removed to ensure the anonymity of the responses. The participants were also given the chance to read the transcripts to remove phrases or sentences which they would prefer not to include in the data analysis.

CHAPTER 4: RESULTS

In this chapter, the results of this study will be presented. As in the methodology, the results of the two phases will be presented separately starting with Phase 1 which describes the results obtained from the questionnaires administered to QU students followed by Phase 2 which represents the qualitative findings obtained from the interviews with healthcare professionals in primary care.

4.1. Phase 1: Exploring sleep patterns, behaviors and the use of sleep medicines among university students in Qatar

4.1.1. Sociodemographic characteristics of the study participants

A total of 2,062 students responded to the survey resulting in a response rate of 10.45%. Most of the respondents were females (85%), Qatari nationals (63%) and mostly in their late teens or early twenties (70% in the age category between 18-23) as shown in Table 6. Some of the key demographic variables of the participants in this study are representative of the characteristics of the student population enrolled in QU for 2018 fall semester of which 65.6% were Qatari citizens and 77.3% were female students (201). The demographic profile of the QU students enrolled in the 2018 Fall semester is summarized in Table 7.

The majority of respondents were from the Colleges of Arts and Sciences (33.3%), Business and Economics (19.3%), and Engineering (15.7%).This corresponds with the data reported in the university census as most of the registered students for this semester were in the colleges of Arts and Sciences (32%), Business and Economics (22%) and Engineering (15%) as shown in Table 7.

Table 6. Sociodemographic characteristics of Qatar University students' respondents (N=2062*)

Variable	n (%)
Gender	
Male	303 (14.7)
Female	1753 (85.3)
Nationality	
Qatari	1302 (63.3)
Non-Qatari	756 (36.7)
Age category	
≤ 23 years	1439 (70)
>23 years	616 (30)
Marital status	
Single	1616 (78.6)
Married	439 (21.4)
College	
College of Arts and Sciences	683 (33.3)
College of Business and Economics	397 (19.3)
College of Engineering	322 (15.7)
College of Education	221 (10.8)
College of Law	157 (7.6)
College of sharia and Islamic studies	123 (6)
College of Health Sciences	78 (3.8)
College of Medicine	36 (1.8)
College of Pharmacy	36 (1.8)
Previous use of sleep aids (open time frame)	
Herbal	137 (6.6)
Non-prescription medicine (OTC)	370 (17.6)
Prescription medicine	84 (4.1)
None	1560 (75.7)
Use of multiple medications	
Prescription and herbal	9 (11.4)
Non-prescription and herbal	50 (63.3)
Prescription and non-prescription products	20 (25.3)

*Total number of valid students who responded to the survey questions
**Missing data

Table 7. Characteristics of Qatar University students registered for Fall 2018 (N=19,738)

Variable	n (%)
College[*]	
Arts and Sciences	6,250 (32)
Business and Economics	4,328 (22)
Engineering	2,964 (15)
Education	2,182 (11)
Law	1,642 (8)
Sharia and Islamic studies	1,107 (6)
Health Sciences	579 (3)
Medicine	314 (2)
Pharmacy	237 (1)
Nationality	
Qatari	12,957 (65.6)
Non-Qatari	6,781 (34.4)
Gender	
Male	4461 (22.6)
Female	15,277 (77.4)

*N=19,603; the remaining students are either in the foundation program or not yet specialized

4.1.2. *Sleep quality and sleep hygiene*

The PSQI scores were calculated for 1,549 participants who have provided valid answers for all of the questions required for score calculation. The findings revealed that around 69.7% of the respondents had PSQI scores higher than 5, indicating poor sleep quality (mean ±SD 7.57±3.03) (Table 8).

One third of the students reported having less than 6 hours of sleep at night in the previous month. Additionally, 60% of the respondents indicated that they had trouble falling asleep within 30 minutes of going to bed at least once a week within the previous month, while 63% of them indicated that they woke up in the middle of the

night or early morning (Table 9). Some respondents have also reported that their sleep was interrupted because they needed to use the bathroom, could not breath comfortably or felt it was too hot. The respondents also provided additional reasons outside the list provided in the questionnaire for not being able to sleep well. These responses were thematically analyzed, and the findings are reported later in this section.

Table 8. Pittsburgh sleep quality index scores of responding Qatar University student (N= 1549[*])

Mean± SD	7.57±3.03
Minimum score	0
Maximum score	20
PSQI global score	**n (%)**
Less than or equal to 5 (good sleep quality)	470 (30.3)
More than 5 (worse sleep quality)	1079 (69.7)

*Number of students for whom the PSQI global score was computed

In their response on the PSQI questionnaire, more than two-thirds of the respondents perceived their sleep quality as good (Table 9). Around 64% of the university students experienced excessive daytime sleepiness while doing important tasks such as driving or engaging in social activities. Only a minority of the students indicated that they had a problem with keeping up their enthusiasm for doing their work within the previous month. Around one-quarter of the participating students (25%) have used sleep aids previously, while 15.6% reported using these sleep aids during the past month (Tables 1 and 9). The most commonly used sleep aids among QU students were non-prescription medicines, while prescription medicines were not commonly used.

Table 9. Qatar University students' perceptions of their sleep quality (N=2062[*])

Question	n (%)			
Sleep latency (duration of time required to fall asleep)				
	≤ 15 minutes	16-30 minutes	31-60 Minutes	> 60 minutes
	631 (35.4)	620 (34.8)	313 (17.6)	218 (12.2)
Actual duration of sleep during the past month (as reported by the participants)				
	≥ 7 hours	≥ 6 hours up to < 7 hours	≥ 5 hours up to < 6 hours	< 5 hours
	792 (44.3)	414 (23.2)	330 (18.5)	250 (14.0)
Habitual sleep efficiency as calculated from questions 1 (usual bedtime) and question 3 (Usual wake up time)				
	≥ 85%	75% to < 85%	65% to < 75%	< 65%
	1194 (70.2)	276 (16.2)	145 (8.5)	86 (5.1)
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	387 (21.2)	342 (18.7)	446 (24.4)	650 (35.6)
b) Wake up in the middle of the night or early morning	365 (20)	321 (17.6)	440 (24.1)	697 (38.2)
c) Have to get up to use the bathroom	639 (35.0)	486 (26.6)	405 (22.2)	294 (16.1)
d) Cannot breathe comfortably	1134 (62.4)	307 (16.9)	233 (12.8)	143 (7.9)
e) Cough or snore loudly	1360 (75.2)	245 (13.5)	117 (6.5)	87 (4.8)
f) Feel too cold	587 (32.2)	441 (24.2)	465 (25.5)	331 (18.1)
g) Feel too hot	707 (39.0)	456 (25.1)	444 (24.5)	208 (11.5)
h) Had bad dreams	735 (40.4)	614 (33.7)	329 (18.1)	143 (7.9)
i) Have pain	908 (49.9)	433 (23.8)	287 (15.8)	190 (10.5)
j) Other reasons	898 (54.1)	268 (16.1)	262 (15.8)	232 (14.0)
During the past month, how would you rate your sleep quality overall?				
	Very good	Fairly good	Fairly bad	Very bad
	315 (17.3)	938 (51.5)	378 (20.7)	191 (10.5)
During the past month, how often have you taken medicine (prescribed or "Over the counter") to help your sleep?				
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
	1532 (84.3)	128 (7.0)	88 (4.8)	69 (3.8)
During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
	653 (35.9)	484 (26.6)	448 (24.6)	233 (12.8)
During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
	No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
	353 (19.3)	619 (33.9)	617 (33.8)	237 (13.0)

* Total number of valid students who responded to the survey questions

92

Furthermore, the respondents' answers to the questionnaire items have shown that almost all students with good sleep quality – identified by PSQI scores - were able to correctly predict their sleep quality as good (Table 10). On the other hand, only 43% of the students who had bad sleep quality were able to correctly classify their sleep quality as bad. Additionally, around 70% of the students were found to have a sleep efficiency of 85% or higher in the previous month, indicating that most students have short sleep latency and spend the majority of their time in bed asleep.

Table 10. Subjective and objective sleep quality as perceived by Qatar University students (N=1549*)

Calculated sleep quality n (%)	Perceived sleep quality n (%)	
	Good sleep quality	Poor sleep quality
PSQI score ≤5 (Good sleep quality)	462 (98.0)	8 (2.0)
PSQI score >5 (Poor sleep quality)	614 (56.9)	465 (43.1)

*Number of students for whom the PSQI score was calculated

Similarly, the SHI-related findings have also indicated that poor sleep hygiene is common among QU students as the majority (78.8%) of them had SHI scores higher than 16 with a mean score of 21.79±6.69 as shown in Tables 11 and 12. The most commonly reported negative sleep habits by the responding students included engaging in activities that may keep them awake before sleeping time (64.7%) and using bed for things other than sleep such as watching television and studying (46.4%) as reported in Table 13.

Table 11. Sleep hygiene index score distribution among Qatar University students (N= 1690[*])

Mean+/- SD	21.79+/- 6.69
Minimum score	0
Maximum score	43

*Number of students for whom the SHI total score was computed
* Minimum attainable score is 0 and maximum possible score is 52

Table 12. Qatar University student respondents' sleep hygiene index scores (N=1690*)

SHI score category	**n (%)**
0-16[**]	359 (21.1)
17-52[***]	1331 (78.8)

*Number of students for whom the SHI total score was computed
**This score category indicates a good sleep hygiene
***This score category indicates worse sleep hygiene

The test of difference for the mean in PSQI scores and SHI scores across different sociodemographic characteristics was performed and the results are presented in Tables 14 and 15. A statistically significant difference in the mean of PSQI scores was found between different colleges and gender categories (Table 14). Students from the College of Law had the highest PSQI median scores (worst sleep quality), while students from the College of Medicine had the lowest scores (best sleep quality). A post-hoc pairwise comparison of sleep quality between colleges revealed that the statistical significance in the Kruskal-Wallis test was driven by the significant differences between the following colleges: Medicine and Law (p=0.035), Pharmacy and Law (p=0.037), Education and Business & Economics (p=0.044), Education and Arts & Sciences (p=0.013), Education and Law (p=0.001) Health Sciences and Law (p=0.032), Sharia & Islamic Studies and Law (p=0.018).

Table 13: Frequency of different sleep hygiene practices among Qatar University students (N= 1726[*])

Questions	Never n (%)	Rarely n (%)	Sometimes n (%)	Frequently n (%)	Always n (%)
1) I take daytime naps lasting 2 or more hours	403 (23.3)	503 (29.1)	386 (22.4)	258 (14.9)	176 (10.2)
2) Going to bed at various times from day to day.	120 (7.0)	362 (21.0)	546 (31.6)	429 (24.9)	269 (15.6)
3) Getting out of bed at various times from day to day.	153 (8.9)	476 (27.7)	544 (31.7)	362 (21.1)	182 (10.6)
4) I exercise to the point of sweating within 1 hour of going to bed.	1245 (72.1)	288 (16.7)	125 (7.2)	51 (3.0)	17 (1.0)
5) I stay in bed longer than I should (after waking up) two or three times a week.	243 (14.1)	422 (24.5)	470 (27.3)	353 (20.5)	236 (13.7)
6) I use tobacco or caffeine (for example: coffee or tea) within 4hrs of going to bed or after going to bed	695 (40.4)	320 (18.6)	360 (20.9)	199 (11.6)	147 (8.5)
7) I do something that may wake me up before bedtime (for example: play video games, use the internet, or clean).	125 (7.3)	146 (8.5)	336 (19.5)	464 (27.0)	649 (37.7)
8) I go to bed feeling stressed, angry, upset, or nervous.	272 (15.8)	463 (26.9)	572 (33.2)	282 (16.4)	132 (7.7)
9) I use my bed for things other than sleeping or marital intimacy (for example: watch television, read, eat, or study).	283 (16.5)	252 (14.7)	388 (22.6)	343 (20.0)	453 (26.4)
10) I sleep on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).	1162 (67.6)	294 (17.1)	169 (9.8)	60 (3.5)	34 (2.0)
11) I sleep in an uncomfortable bedroom (for example: too bright, too stuffy, too hot, too cold, or too noisy).	1103 (64.2)	319 (18.6)	181 (10.5)	74 (4.3)	42 (2.4)
12) I do important work before bedtime (for example: pay bills, schedule, or study).	261 (15.2)	325 (18.9)	528 (30.8)	364 (21.2)	239 (13.9)
13) I think, plan, or worry when I am in bed.	140 (8.1)	280 (16.3)	520 (30.2)	365 (21.2)	415 (24.1)

*Number of participants who have answered at least one of the SHI questions.

Similarly, a significant difference in SHI scores was found between different students' colleges and age categories with p values of 0.024 and <0.001, respectively (Table 15). It was noted from the analysis that students from the colleges of Education and Sharia & Islamic studies had the lowest median of SHI scores, indicating that they had better sleep habits than other colleges.

Table 14: Difference in sleep quality scores between different sociodemographic variables

Variable	PSQI score Mean (SD)	PSQI score Median (IQR)	p value*
Gender			**0.014**
Male	7.1 (2.9)	7 (4)	
Female	7.7 (3.3)	7 (5)	
Age category			0.463
≤ 23	7.6 (3.2)	7 (5)	
>23	7.7 (3.4)	7 (5)	
Country of origin			0.110
Qatar	7.7 (3.4)	7 (5)	
Other countries	7.4 (3.1)	7 (4)	
Marital Status			0.138
Single	7.7 (3.3)	7 (5)	
Married	7.3 (3.3)	7 (5)	
College			**0.034****
Arts and Sciences	7.9 (3.4)	7 (5)	
Business and Economics	7.6 (3.1)	7 (4)	
Education	7.1 (3.5)	7 (4)	
Engineering	7.6 (3.3)	7 (5)	
Health sciences	6.9 (2.8)	7 (4)	
law	8.2 (3.1)	8 (4)	
Medicine	6.7 (2.9)	6.5 (4)	
Pharmacy	6.8 (3.1)	7 (6)	
Sharia and Islamic studies	7.4 (3.3)	7 (6)	

*p value was computed using Mann-Whitney U test
**p value calculated using the Kruskal-Wallis test

Table 15. Difference in sleep hygiene scores between sociodemographic variables

Variable	SHI scores Mean (SD)	SHI scores Median (IQR)	p value*
Gender			0.101
Male	20.9 (7.1)	21 (9)	
Female	21.8 (6.5)	22 (9)	
Nationality			0.097
Qatari	21.8 (6.6)	22 (9)	
Non-Qatari	21.4 (6.6)	22 (9)	
Age category			**<0.001**
≤ 23	22.1 (6.4)	22 (8)	
>23	20.7 (6.9)	21 (10)	
Marital Status			0.138
Single	22.1 (6.5)	22 (8)	
Married	20.0 (6.7)	20 (8)	
College			**0.024****
Arts and Sciences	21.8 (6.5)	22.0 (9.0)	
Business and Economics	22.0 (6.5)	22.0 (8.0)	
Education	19.9 (6.3)	20.0 (9.0)	
Engineering	22.2 (6.6)	22.0 (9.0)	
Health sciences	21.8 (7.5)	21.0 (11.0)	
law	22.5 (6.9)	22.0 (9.0)	
Medicine	22.1 (5.6)	21.0 (6.0)	
Pharmacy	21.5 (6.3)	21.5 (9.0)	
Sharia and Islamic studies	20.2 (6.7)	20.0 (9)	

*p value was computed using Mann-Whitney U test
**p value calculated using the Kruskal-Wallis test

A positive association was identified between the sleep quality and sleep hygiene scores through linear regression analysis with a correlation coefficient of 0.394 (p<0.001). The assessment of the correlation between sleep quality and different sociodemographic variables revealed that gender was the only variable significantly associated with sleep quality (p=0.014) as shown in Table 16. In addition, the use of a

sleep aid was significantly correlated with the PSQI score. On the other hand, the SHI score was significantly associated with students' age and marital status (p<0.001 for both) as described in Table 17. Moreover, the use of OTC products and prescription medicine was significantly associated with SHI scores, indicating that a correlation exists between the use of some sleep aids and sleep hygiene. The findings have also confirmed that all of the sleep parameters including sleep latency and sleep efficiency which were used in the calculation of the PSQI scores were significantly correlated with the PSQI and the SHI scores (p< 0.001) as shown in Tables 18 and 19.

Table 16. Association between students' sleep quality and sociodemographic variables

Variable	Correlation with PSQI global scores	
	R	*p-value**
College	-0.027	0.291
Gender	0.062	**0.014**
Age	0.019	0.464
Marital status	-0.038	0.138
Country of origin	-0.041	0.110
Use of herbal products	0.155	**< 0.001**
Use of OTC products **	0.260	**< 0.001**
Use of Prescription medicine	0.120	**< 0.001**

*p value was calculated using Spearman Rank test
**Over the counter products

Table 17. Association between students' sleep hygiene and sociodemographic variables

Variable	Correlation with SHI scores	
	R	*p-value**
College	-0.012	0.614
Gender	0.040	0.101
Age	-0.098	**< 0.001**
Marital status	-0.137	**< 0.001**
Country of origin	-0.040	0.097
Use of herbal products	0.021	0.383
Use of OTC products **	0.153	**< 0.001**
Use of Prescription medicine	0.061	**0.012**

*p value was calculated using Spearman Rank test
**Over the counter products

Table 18. Correlations between different sleep parameters and sleep quality among students

Variable	Correlation with PSQI global scores	
	R	*p-value**
Sleep latency (minutes)	0.504	**< 0.001**
Duration of sleep (hours)	0.621	**< 0.001**
Sleep efficiency	0.501	**< 0.001**
Subjective sleep quality	0.682	**< 0.001**
Use of sleep aids (during past month)	0.363	**< 0.001**
Excessive daytime sleepiness	0.435	**< 0.001**

*p value was calculated using Spearman Rank test

Table 19: Correlations between different sleep parameters and sleep hygiene among students

Variable	Correlation with SHI scores	
	R	p-value*
Sleep latency (minutes)	0.222	< 0.001
Duration of sleep (hours)	0.150	< 0.001
Sleep efficiency	0.103	< 0.001
Subjective sleep quality	0.315	< 0.001
Use of sleep aids (during past month)	0.124	< 0.001
Excessive daytime sleepiness	0.234	< 0.001

*p value was calculated using Spearman Rank test

The results of the simple logistic regression analysis are presented in Table 20. The findings indicate that "College" as an independent variable has significant effects on students' sleep quality (p=0.031). To understand this relationship, the PSQI score for each college was compared to PSQI scores of the College of Arts & Sciences which was used as the reference category. According to the results of this analysis, a significant difference was found between College of Arts & Sciences and the College of Education as it was shown that students from College of Arts & Sciences are 59% less likely to have good sleep quality as compared to students from the College of Education (OR=0.594; 95% CI=0.41-0.861, p=0.006). Additionally, there was a statistically significant difference between sleep quality of students in College of Arts & Sciences and those in the colleges of Law and Sharia & Islamic Studies. The findings indicate that students from College of Arts & Sciences are more likely to have good sleep quality by 1.4 folds as compared to students in the College of Law (OR=1.415, 95% CI=0.884-2.264, p=0.148). On the other hand, students from College of Arts & Sciences are around 73% less likely to have good sleep quality when compared to students from the College of Sharia & Islamic Studies (OR=0.733, 95% CI=0.461-1.164, p=0.188). Overall, college as an independent variable has contributed to only

1% of the variance seen in sleep quality.

Additionally, the students marital status was found to have a significant effect on the sleep quality; single students were reported to be 74% less likely to have good sleep quality as compared to married students (OR=0.738, 95% CI= 0.571-0.953, p=0.02). However, the contribution of this variable to the variance seen in sleep quality was less than 1%. Gender had also a significant influence on sleep quality, as it was shown that male students were 1.3 times more likely to have good sleep quality compared to female students (OR=1.31, 95% CI=0.965-1.78, p=0.083).

On the other hand, sleep hygiene contributed to around 7% of the variance observed in sleep quality such that individuals with sleep hygiene scores less than or equal to 16 were four times more likely to have good sleep quality as compared to their counterparts who scored higher than 16 on the SHI (OR=3.825, 95% CI=0.965-1.78, p<0.001). This indicates that students who adopt healthy sleep habits were more likely to have better sleep quality.

The combined effects of different sociodemographic variables, sleep hygiene, and the college designation can explain around 8% of the change observed in sleep quality (Table 21). However, sleep hygiene was the only variable that showed a significant effect on sleep quality such that students with better sleep hygiene practices (SHI score ≤16) were four times more likely to have good sleep quality (OR= 3.66, 95% CI= 2.8-4.8 , p < 0.001).

Table 20: Simple regression analysis on the association between students' sociodemographic characteristics and sleep hygiene with sleep quality[*]

Variable	B	S.E.	Wald	P[**]	Exp(B)
College [***]	R^2=1.1%				
College			16.896	**0.031**	
Business and Economics	0.133	0.163	0.661	0.416	1.142
Education	-0.521	0.189	7.579	**0.006**	0.594
Engineering	0.010	0.169	0.004	0.953	1.010
Health sciences	-0.137	0.289	0.225	0.635	0.872
Law	0.347	0.240	2.094	**0.148**	1.415
Medicine	-.186	0.420	0.196	0.658	0.831
Pharmacy	-0.444	0.399	1.235	0.267	0.642
Sharia and Islamic studies	-0.311	0.236	1.735	**0.188**	0.733
Gender	R^2= 0.2%				
Female	0.270	0.156	2.998	**0.083**	1.31
Age	R^2= 0.1%				
More than 23 years old	-0.125	0.119	1.112	0.292	0.882
Marital status	R^2= 0.3%				
Married	-0.304	0.131	5.420	**0.020**	0.738
Nationality	R^2 < 0.001%				
Non-Qatari	-0.061	0.115	0.282	0.595	0.941
Sleep Hygiene	R^2 = 6.7%				
SHI scores > 16	1.342	0.134	100.381	**<0.001**	3.825

*Simple analysis was conducted using binary logistic regression to assess the effects of each variable on sleep quality.
**Significant if P value <0.2
***College of Arts and sciences used as the reference

Table 21. Multiple regression analysis on the association between students' sociodemographic characteristics and sleep hygiene with sleep quality. [*]

Variable	B	S.E.	Wald	P[**]	Exp (B)
$R^2=7.5\%$					
College			8.830	0.357	
Business and economics	0.101	0.178	0.321	0.571	0.781
Education	-0.370	0.207	3.177	0.075	0.691
Engineering	-0.031	0.187	0.027	0.869	0.969
Health sciences	-0.156	0.308	0.256	0.613	0.855
Law	0.213	0.254	0.700	0.403	1.237
Medicine	-0.482	0.435	1.228	0.268	0.617
Pharmacy	-0.550	0.416	1.754	0.185	0.577
Sharia and Islamic studies	-0.177	0.258	0.473	0.492	0.837
Gender	0.244	0.177	1.910	0.167	1.276
Marital status	-0.198	0.146	1.831	0.176	0.821
Sleep hygiene[***]	1.298	0.137	90.022	**<0.001**	3.661

*Multiple logistic regression conducted to assesses the effect of each variable when other variables are kept constant.
** Significant if P value< 0.05
***Measured by SHI scores

4.1.3. Students' perceptions of other factors influencing sleep quality (open-ended responses)

Some of the responding students provided additional reasons for their inability to sleep well in the past month. Content analysis of the students' responses generated 11 main themes summarized in Table 22. The most frequently reported issue among the participants was related to the theme "symptoms of physical illness" as many of the students have indicated that they could not sleep due to chronic illnesses such as *'diabetes'*, *'acid reflux'* or *'sinusitis associated with headache and pain'*. Some respondents highlighted that incidents of acute medical conditions as a reason for inability to sleep within the past month. One student reported that *'pain associated with urinary tract infections'* as the cause of sleep disturbance. Others have related their inability to sleep to *'food poisoning'* and *'cold'*, as an example.

Table 22: Additional reasons for students' inability to sleep *

Themes	Number of quotes
Symptoms of disease	63
Psychological problems	48
Children waking up	43
Overthinking	43
Sleeping habits	42
Sleep disturbances	35
Academic pressure	32
Family problems	11
External noise	10
Medication related	5
Other reasons	13

*These themes were extracted from the participants' responses on question 5 J

The second most reported theme was "psychological problems" which included factors such as anxiety, depression and panic. For example, some of the respondents indicated that they could not sleep because of *'anxiety and fear'*, '*anxiety that affects the colon and causes difficulty breathing'*, *'fear of the future'* and *'depression'*. Additionally, overthinking which is triggered by worries about academic performance or life problems was a predominantly reported reason for lack of sleep. In this regard one student said: *'Marital problems and the psychological pressure of the university affects me'*.

Students also indicated that their engagement in negative sleep hygiene practices including daytime naps, consumption of stimulants (e.g. caffeine) and excessive use of electronic devices especially before sleep affected their sleep quality. Some of the students suggested that their sleep was often interrupted during the previous month due to noises from different sources including children waking up. The following were examples of the statements reported by students: *'The loud noises that come from the street'*, *'The reasons are that I can't sleep rapidly when I go to bed, it sometimes takes me around 3 hours'*.

A significant number of the responding students indicated that they had a sleep problem including *"insomnia"*, *"interrupted sleep",* which prevented them from enjoying a good night sleep in the previous month. Some of the students related their sleeping problem to the use of some medications which prevented them from sleep, while others indicated that they were unable to sleep without taking sleep aids.

4.1.4. *Arabic sleep hygiene index reliability assessment*

Overall, the participants found the Arabic version of the SHI to be simple, clear and brief. However, several changes were necessary to ensure the cultural adaptability of the instrument. These changes included removing the word "alcohol" in question number 6 (I use alcohol, tobacco, or caffeine within 4 hr of going to bed or after going to bed). Also, the word "sex" in question number 9 (I use my bed for things other than sleeping or sex) was replaced with "marital intimacy". After these changes were implemented, the Arabic SHI was administered to the study population. The SHI score was calculated for 1588 students who have provided answers for all of the Arabic SHI questions. The findings have shown that the Arabic version of the SHI has an acceptable internal consistency reliability with an overall Cronbach's alpha of 0.589. Deleting items from the scale was not associated with a large change in the Cronbach's alpha value. However, the deletion of either item 1 or item 5 was associated with an increase in the Cronbach alpha value to 0.603 and 0.604, respectively (Table 23). Indicating that removing these items improves the internal consistency of the Arabic SHI. Interestingly, deleting item 2 "I go to bed at different times from day to day" did not change Cronbach's alpha value. Whereas deleting any of the other remaining items was associated with a lowering in the Cronbach alpha value, indicative that the removal of these items decreases the internal consistency of the Arabic SHI.

Table 23: Changes in reliability measure when deleting selected items in the Arabic sleep hygiene instrument (N=1588)

Item	Scale mean if item is deleted[*]	Scale variance If item is deleted	Cronbach's alpha if item is deleted
1. I take daytime naps lasting two or more hours.	19.4	36.6	0.603
2. I go to bed at different times from day to day.	19.2	32.7	0.589
3. I get out of bed at different times from day to day.	18.6	30.4	0.540
4. I exercise to the point of sweating within 1hr of going to bed	18.8	31.0	0.550
5. I stay in bed longer than I should (after waking up) two or three times a week	20.	35.8	0.604
6. I use tobacco or caffeine (for example coffee or tea) within 4 hrs of going to be or after going to bed.	18.8	30.2	0.545
7. I do something that may wake me up before bedtime (for example: play video games, use the internet, or clean).	19.5	31.3	0.571
8. I go to bed feeling stressed, angry, upset, or nervous.	17.9	30.7	0.551
9. I use my bed for things other than sleeping or marital intimacy (for example: watch television, read, eat, or study).	19.1	31.1	0.552
10. I sleep on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).	18.5	30.3	0.563
11. I sleep in an uncomfortable bedroom (for example: too bright, too stuffy, too hot, too cold or too noisy).	20.2	33.6	0.579
12 I do important work before bedtime (for example: pay bills, schedule, or study).	20.2	32.7	0.568
13. I think, plan or worry when I am in bed.	18.8	31.8	0.572

*The scale for each item ranges between 0 (never) and 4 (always), while the total scale ranges between 0 and 52

4.2. Phase 2: Healthcare providers' perspective and experiences with insomnia management at primary healthcare centers in Qatar

4.2.1. Participants' characteristics

A total of 19 HCPs from 5 different PHCCs in Qatar were interviewed in the period between June and December 2019. Participating HCPs included 11 physicians (MDs) of whom 10 were general practitioners and one psychiatrist working at a mental health clinic at PHCC, and 8 pharmacists (PHs). Out of the 19 participants, 11 were males and 8 were females. Participants' characteristics are summarized in Table 24.

Table 24. Characteristics of healthcare providers interviewed

Participant's code	Gender	Insomnia training
MD 1	Male	No
MD 2	Female	No
MD 3	Male	No
MD 4	Female	No, but received mental health training.
MD 5	Female	No
MD 6	Male	No
MD 7	Male	No
MD 8	Female	No, but received mental health training.
MD 9	Male	No
MD 10	Male	No
MD 11*	Male	A licensed psychiatrist.
PH 1	Female	No
PH 2	Female	No
PH 3	Male	No
PH 4	Female	No
PH 5	Female	No
PH 6	Male	No
PH 7	Male	No
PH 8	Male	No

MD: Medical Doctor, PH: Pharmacist, *: Psychiatrist at mental health clinic in PHCC.

4.2.2. Themes generated from the one-to-one interviews

Five major themes emerged from the interviews including: general perspectives on insomnia, views on primary healthcare as the setting for insomnia diagnosis and management, current practices of insomnia management at PHCCs, HCPs perceptions on their role regarding insomnia management, and challenges with insomnia management in primary care. The themes and subthemes are summarized in Table 25.

Table 25. Themes and subthemes relating to healthcare providers' perspectives and experiences with insomnia

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Theme 1: General perspectives on insomnia
Insomnia prevalence and clinical presentations (MDs, PHs)
Impact of insomnia (MDs, PHs)
Insomnia as a symptom (MDs, PHs)
Importance of addressing insomnia (MDs, PHs)

Theme 2: Primary healthcare as the setting for insomnia diagnosis and management
Priority for the management of underlying medical conditions (MDs, PHs)
Primary healthcare most appropriate for insomnia management (MDs, PHs)
Recognition of the need to refer complex cases (MDs, PHs)
Routine mental health screening at primary healthcare centres (MDs)
The need for diagnostic tools and tests to help physicians in diagnosing insomnia (MDs)

Theme 3: Current practices of insomnia management at primary healthcare centers
 Pharmacological management of insomnia (MDs, PHs)
Non-Pharmacological insomnia therapies (MDs, PHs)
Knowledge of HCPs regarding the management of insomnia (MDs, PHs)

Theme 4: Healthcare professionals' role perception regarding insomnia management
Physicians' specific roles (MDs, PHs)
Pharmacists' specific roles (PHs)

Theme 5: Challenges for insomnia management in primary care (MDs, PHs)
Time constrain (MDs, PHs)
Lack of insomnia guidelines (MDs, PHs)
Patient related factors (MDs, PHs)
Lack of privacy for consultation (PHs)
Insufficient patient education (PHs)
Physicians' reaction to pharmacists' interventions (PH)
Need for HCPs training (MDs, PHs)
Need for specialized sleep clinic and PHCCs (MDs, PHs)

MDs: Theme or subtheme emerged from the physicians' interviews
PHs: Theme or subtheme emerged from the pharmacists' interviews

4.2.2.1   Theme 1: General perspectives on insomnia

This was a predominant theme that emerged from the HCPs interviews regarding issues related to their perception of insomnia as a disease or a condition affecting health. Several subthemes were identified under this theme, including insomnia prevalence and clinical presentations, impact of insomnia, understanding insomnia as a symptom and the importance of addressing insomnia.

Insomnia prevalence and clinical presentation

Physicians indicated that insomnia is a problem that affects around 10-20% of their patients, some have also suggested that it is a problem which they see on a daily basis. However, pharmacists perceived insomnia as being uncommon at PHCCs and suggested that only around 4 patients present with insomnia complaints weekly. Overall, the HCPs interviewed perceived insomnia as particularly being common among individuals with mental illnesses, those who have chronic diseases and patients on multiple medications.

'So, you find that the group that takes a medication or multi-medications for chronic diseases are above 45 or 50, he is taking more than one medication for diabetes, hypertension, dyslipidemia. So, these are critical groups, as we call them, they complain a lot of insomnia.' (MD10)

There was agreement between HCPs that most people presenting with insomnia were elderly individuals and young patients, particularly adolescents and high school students who were going through a transitional period in their lives. Some have also

suggested that elderly patients were more prone to insomnia due to their living circumstances as they mostly live alone and are often not involved in social activities. There was also the suggestion that women going through their menopause and experiencing life changing events such as separation from children after marriage could result in sleeping problems.

'We see for example...from what we have seen, I mean, I have seen elderly patients complaining from it [referring to insomnia]. *She could be a menopausal woman, older than 70, older than 60 and so.'* (MD5)

'Insomnia, sleep disturbance we see it…mostly in two groups or among students who are in middle school or high school and elderly patients, these are the age groups that complains mostly from sleep disorders.' (MD 9)

HCPs also suggested that some social factors including living circumstances, going through life changing events or having problems either at work or home could result in the development of insomnia. Also, lack of family support especially for adolescents who are going through an important phase of their lives could contribute to worsening their sleep quality.

Themes that emerged primarily from MDs have reported that insomnia patients often present with complaints of tiredness, fatigue, headache, dizziness, lack of concentration, nervousness and muscle ache. Other patient complaints mentioned by participants were more aligned with the classical insomnia symptoms including difficulty falling asleep, interrupted sleep and consequences of disrupted sleep such as affecting daytime performance especially at work. Participating PHs perceived that most patients do not disclose insomnia symptoms to them. Thus, PHs discover the

patient may be suffering from insomnia when reviewing the patient's medications, or occasionally this may be brought up during a medication counseling session.

HCPs interviewed thought that patients often seek professional help for insomnia when they fail to manage their sleep problem on their own. Some suggested that the patients' desperate need for sleep coupled with the daytime consequences of sleep deprivation forces patients to see a physician. MDs believed that seeking the help of a healthcare professional is best especially if there is an underlying problem, either physical or psychological. Interestingly, some suggested that patients seek help at PHCCs because they believe that MDs at these settings are more likely to prescribe medications on their request, unlike in secondary care where more assessments are often needed before resorting to the use of medicines. Table 26 provides a summary of the insomnia prevalence and related patient characteristics when they present at PHCC as perceived by the HCPs interviewed.

Impact of insomnia

HCPs in this study demonstrated awareness about the health complications associated with insomnia and its effects on patients' health and quality of life. They indicated that lack of sleep affects the individuals' mood and worsens pre-existing or underlying mental illnesses such as depression and anxiety. Individuals with sleep deprivation also tend to be impulsive and can easily get aggressive against others. HCPs also indicated that insomnia is often associated with physical complications such as tiredness, headache and lower concentration. They also highlighted that lack of sleep has significant effects on individuals' performance during the day, especially at work, resulting in lower productivity, more absenteeism, and increased risk of committing

mistakes which may have serious consequences, especially for individuals working at high risk jobs where mistakes cost lives.

Table 26. Insomnia presentations' profile

Prevalence	Affected populations	Common complaints	Reasons for seeking help
Around 10-20% of patients attending PHCCs present with insomnia complaint.	Elderly individuals Teenagers and high school students Women at menopause	-Difficulty falling asleep -Interrupted sleep -Tiredness - Headache and dizziness - Lack of concentration -Nervousness - Muscle aches	Failed to manage their insomnia at home. Insomnia affecting patients' daytime performance. Patients want to take a medication to help them sleep.

Insomnia as a symptom

HCPs in this study indicated that insomnia is often not considered as an independent health problem; rather, they perceived it to be a symptom of an underlying disease. It was perceived that primary insomnia was a rare presentation at PHCCs, and that for most patients the symptoms are associated with secondary insomnia. HCPs identified psychiatric illnesses and chronic medical conditions as the main causes of insomnia symptoms in patients presenting at primary care settings. Specifically, depression and anxiety were highlighted as the most common psychiatric illnesses among insomnia patients. Additionally, other factors such as stress and family problems

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were reported to contribute to the development of insomnia.

'Around 70% of the cases are secondary insomnia while 20-30% of the cases are primary insomnia.' (MD 11)

'Insomnia is often considered to be part of a system and not an independent disease. They consider that insomnia accompanies anxiety, insomnia accompanies depression, or it could be the other way around; because depression comes with one of the two either too much sleep or lack of sleep.' (MD10)

'Most of the patients who present with depression or anxiety have insomnia.' (MD 11)

Moreover, HCPs believed that certain chronic diseases such as diabetes and hypertension, which are prevalent among patients attending PHCCs, were also linked with the development of insomnia. In addition, both physicians and pharmacists acknowledged that insomnia could be caused by some medications.

'...it could be a symptom of a disease or a side effect of a medication because these individuals have polypharmacy and it could be due to social circumstances.' (MD 6)

'...even for people who have gastritis, they will experience esophageal reflux, which will be problematic. They cannot sleep, they will not be able to sleep because of this problem.' (PH 5)

It was perceived that poor sleep hygiene practices were also linked to the incidence of insomnia among patients attending PHCCs in Qatar. HCPs indicated that some sleep-related behaviors and habits, such as staying up late and napping were culturally acceptable. Additionally, consuming stimulants, engaging in activities which might keep them awake late at night and using bedrooms for activities other than sleep

were perceived as common habits among the general population in Qatar. Moreover, it was suggested that unusual work routines, which involves staying awake at night for work and napping cause sleep disturbances.

'I think there's a cultural thing where people find it acceptable to sleep for hours during the day and you know maybe struggle at night to sleep and I don't know why. So, there's basic medical, lack of medical education basically.' (MD7)

'Because some people are living in their bedroom, they eat, drink, sleep and watch TV in their bedrooms. How would they be able to sleep? How would the sleep induction even happen?' (MD6)

'...people seem to think "oh, let me have a cup of coffee" or tea or even hot chocolate, I mean that's going to make you go to the toilet, it might wake you up... and even if they do wake up [to go to the] *toilet, I would say even water perhaps… and some people think: "oh, reading a book is good", but actually you are stimulating. So, some people think: "oh, let me watch some TV", some people go to sleep…watching TV or watching a film, but actually you are stimulating your brain, aren't you? So, that is actually poor practice to do.'* (MD 8)

'That he is doing something wrong. That there is something, for example, in his lifestyle wrong, and this is causing insomnia. What is the mistake? It could be psychological, or it could be routine related like the [unhealthy] *sleeping habits or psychological like work pressure or pressure at home…'* (PH 7)

Importance of addressing insomnia

Overall, most HCPs recognized insomnia as an important health problem which needs to be managed and not to be left for patients to manage it on their own. However, some believed that there are a few patients who may be able to self-manage their

sleeping problems. They also indicated that sleeping problems need to be treated early on by HCPs before it becomes more complicated and affect the patient's life. There was also an overall perception that insomnia is not currently receiving the needed attention at PHCCs and that it is not taken seriously by HCPs.

'...it is a problem, and a very important one. It affects patient's life. Anything affecting patient's life is an important issue regardless of how simple it is.' (PH 5)

'...like when a patient is complaining of something, [HCPs] *should take him seriously not ignore him. Even when they take his concern into consideration, they should take the problem seriously and they should diagnose it and treat it correctly.'* (PH 2)

4.2.2.2   Theme 2: Primary healthcare as the setting for insomnia diagnosis and management

Primary healthcare is most appropriate for insomnia management

A recurrent theme that emerged from the HCPs interviews was related to their perception that PHCCs are the best places for the management of insomnia in Qatar. HCPs indicated that sleep problems should be managed by HCPs and that patients should seek the help of MDs instead of relying on un-trusted sources for health information (e.g. internet, relatives…etc.). HCPs strongly believed that PHCCs are easily accessible by patients in Qatar, which supports being the most appropriate settings for insomnia management. There were also limitations to this role voiced by some of the respondents, stating that PHCCs were qualified to manage only mild forms of insomnia, leaving the more severe forms to be managed at specialized hospitals. However, there was a unified believe that insomnia treatment should be initiated at

PHCCs.

'These are our [referring to PHCC] *cases; these are our cases. But this is something, you know, we call it psychosocial, this is ours, I mean they* [insomnia cases] *belong to family physician…'* (MD 9)

'It is possible for some cases, but other cases may need different medications. Some cases need other medications which are not available here [referring to PHCC].*'* (PH 3).

Recognition of the need to refer complex cases

A common view amongst the HCPs in this study was that patients with severe insomnia and those not responding to the treatment provided by MDs at PHCCs should be sent for consultations with specialists. Predominant reasons that were given included beliefs that that psychiatrists have the authority to prescribe specialized insomnia medications (such as benzodiazepines and z-drugs) and they can monitor response to therapy. Another reason was the belief that PHCCs are not equipped to deal with complex insomnia cases; therefore, patients who have more complicated cases are often referred to mental health hospitals for further assessment and management.

'If initially the patient was treated well here, he would not need to go to secondary care. As we are here primary care, the hospital is secondary care. But, if you waited and left the patient without care, and nobody is listening to him, of course his condition will deteriorate, and eventually you will refer him to the hospital.' (PH 1)

'So, I think for the very small minority of patients who need them I'd refer them to psychiatry.' (MD 7)

'…we work within our own limits. First of all, we continue trying to treat the patient until a specific point at which we need to refer [the patient] *to the specialist. But of course, we must have a role, because it is not possible for us to refer all the cases, first of all this will lead to patient crowding at the other institutions.'* (MD 5)

Some of the MDs in this study also indicated that they refer patients to the mental health clinics at primary care to receive psychological therapies such as CBT. Likewise, some pharmacists suggested that they could refer some patients back to the physician if they noticed that they had a significant sleeping problem which was not detected or addressed by the physician. Surprisingly, some of the HCPs interviewed seemed to be unaware about the availability of mental health services at PHCCs in which psychotherapies such as CBT are offered. Some of the HCPs believed that referral to the mental health clinics available at some of the PHCCs across Qatar is advantageous as it helps in combating patients' resistance against receiving treatment at mental health hospitals whether it was due to their fear of the social stigma or because some perception of insomnia as an insignificant health problem.

'…but we sometimes refer them to…psychological, behavioral treatment in our health centers [specialized in the provision of mental health services] *for behavioral therapy, not…pharmacological therapy.'* (MD6)

There were mixed opinions between MDs in relation to the waiting time required before referral to secondary institutions as some indicated that it was usually a quick process that required around one month while others said that it often takes longer than a month for patients to be seen once they are referred. Some MDs suggested that they attempt to manage insomnia during this waiting period with non-

pharmacological therapies and herbal products.

'We can try to treat the simple cases which doesn't need medications, there is no need to refer these to the specialist. We can try using the simple natural ways first, then we could refer to the doctor. I don't like referring patients to the psychiatrist immediately. I like to make use of my chance with the patient and to give the patient her chance and time with me. Then if I couldn't know the cause and reached a dead end then we ask help from the consultant.' (MD 5)

'I mean, if he was taking the medications but there was no improvement, of course, we refer him to a specialist or consultant, secondary care or tertiary care to discover why his symptoms are not improving [despite already on pharmacotherapy].*'* (MD 3)

Prioritizing management of underlying medical conditions

Overall, HCPs believed that the management of the underlying causes of insomnia was often prioritized over the insomnia treatment. Some HCPs also indicated that providing treatment for insomnia without managing the underlying cause would be ineffective and would not resolve the sleep problem. It was also stressed that assessing and managing sleep problems at the same time of managing the underlying cause of insomnia was important.

'Certainly, we need to solve the problem first and then we should monitor to see if the results of this treatment influence insomnia.' (MD 5)

'So often when I'm doing a care [plan] *the first thing is sleep while I'm doing everything else like investigating other problems…'* (MD 7)

Routine mental health screening at PHCCs

The physician respondents emphasized that at PHCCs routine screening for mental illnesses has been introduced and is regularly undertaken during the patient assessment, more specifically screening for depression and anxiety. It was reported that this assessment is initially done by the nurse and if the patient was found to have symptoms associated with mental illness, the physician would be informed to so that it could be addressed or managed as deemed appropriate.

'Mental health assessment is usually done by the nurse; it usually involves screening any patient who is 18 years or older. Patients are asked 4 questions; 2 of them are about anxiety and the remaining 2 questions are related to depression. If this [screening] *test showed that the patient has a problem, we continue the assessment and we ask the remaining questions which include some questions related to sleep.'* (MD 4)

There was an overall perception that MDs at PHCCs were prepared to deal with mental illnesses and that some had received adequate training on the management of psychiatric illnesses. Additionally, MDs indicated that they have regular lectures as part of their continued medical education (CME) program in which different topics and health problems are discussed. Some suggested that training on insomnia management could also be provided as part of these CME programs

'The same way we were given courses for anxiety and depression and we started treating patients here, of course [referring to] *mild cases, it was definitely very useful.'* (MD 3)

The need for diagnostic tools and tests for insomnia

Although MDs at PHCCs indicated their readiness to manage patients with mental illness, the need for tools including validated questionnaires to help with the diagnosis of insomnia was highlighted.

'But we need a questionnaire which could be given...the doctors could be encouraged to include the sleep questionnaire to be given at each patient's visit. It could increase the number of patients diagnosed [referring to insomnia] *...'* (MD 2)

4.2.2.3 Theme 3: Current practices of insomnia management at primary healthcare centers

Pharmacological management of insomnia

There was an overall awareness that at PHCCs in Qatar, there is limited insomnia specific treatments available, although other classes of medications such as antihistamines, anxiolytics, anti-psychotics and antidepressants were available and often used for the management of insomnia. The physician respondents indicated that they prescribe medications only for transient insomnia linked to jet lag, bereavement or if the patient came with a complaint of lack of sleep lasting for few days. On the other hand, HCPs suggested that no treatments were available for the management of chronic insomnia.

'*...we don't have benzodiazepines in our health center, so we don't use these* [controlled medications] *it's forbidden. They are not available in our clinic.'* (MD 6)

The medications often prescribed at PHCCs were described to be mainly antihistamines or antidepressants. MDs had mixed opinions about prescribing antihistamines for insomnia as some were against their use because they have not been approved to be used as hypnotics, believe they are not effective for treating insomnia, or because their sedative effects vary from one patient to another. Physicians also indicated that they prescribe them for short relief of insomnia symptoms, and for a maximum duration of one week. Prescribing antidepressants or anxiolytics with sedative properties to help with sleep was perceived as mostly indicated for individuals with other comorbid psychiatric problems, although occasionally these might be used for individuals with only insomnia. There was an agreement between HCPs that insomnia medications are often prescribed for short course of therapy to manage acute insomnia cases. Additionally, participating pharmacists indicated that they are not allowed to dispense more than one-month supply of antihistamines.

'... [if] the physician feels that they [referring to patients with insomnia] *need to be started on some sort of a medication, we do have a* [number of] *formulary* [medications, such as] *anti-depressants and anti-anxiolytics* [that] *we can prescribe.'* (MD 8)

'...we do not have for example short acting [benzodiazepine]*, this is surely not available. Mostly we have…for insomnia alone promethazine, chlorpheniramine or antihistamine medications which causes drowsiness. Other than that, not directly for insomnia but for anxiety or depression.'* (PH 3)

There was however an overall perception that this limited availability of medications to treat insomnia, more specifically regarding hypnotic medications, was appropriate. HCPs believed that prescribing hypnotics should be left only for specialists

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who have enough knowledge and experience in dealing with these medications. Also, some highlighted the fact that these medications require close follow up and monitoring by a specialist which is often not possible at PHCCs. Additionally, the interviewed HCPs perceived that the need for hypnotics at PHCCs is low and does not justify adding these medications to the formulary. There were also concerns voiced by HCPs about possible abuse of hypnotics by patients if these medications were more readily available at PHCCs.

'No, I am telling you, as long as we don't have a specialized clinic, we must not have medications...specialized for this problem, and these medications are of course costly and must be saved for special clinics, therefore it is normal that it is not available at the centre.' (PH 7)

However, there were a few who suggested that the unavailability of insomnia medications at PHCCs was inconvenient for some patients, as they have to wait longer to be seen by a specialist and be prescribed a medication which is not available at PHCC. HCPs emphasized that adding hypnotics to the PHCC formulary would require enforcing a strict control over these medications, while others suggested that hypnotic refills could be safely dispensed at PHCCs although the initial prescribing authority should continue to be limited to psychiatrists. This was specifically recommended to reduce the workload on hospitals and to enhance accessibility of certain medications.

'Not having these medications [in the PHCC] *makes it more difficult for the patient to receive these medications. He would find it hard to go get an appointment and…'* (PH 2)

'It could be useful. But I don't support adding them, honestly, not everyone is trained on these medications.' (MD 4)

'I think if they were added it would be a disaster because the kind of patients, we have are very demanding and they don't take no for [an answer] *and if they knew it* [referring to a hypnotic medication] *was there they would want it to be prescribed. I can see it easily being abused, so I don't think it's a good idea at all.'* (MD 7)

There was a sense of reluctance among HCPs interviewed in this study towards the use of medications for insomnia management. Predominantly, participants believed that medications should be the last resort for insomnia management and that it should be reserved for resistant symptoms that significantly impacts the patient's health and safety. These views were supported by HCPs believes that providing medications would discourage patients from putting effort in changing their unhealthy lifestyle to manage their sleep problem. Additionally, both MDs and PHs considered medications as a quick fix which would control the symptoms of insomnia in the short term but will not likely solve the problem. In addition, HCPs expressed their concerns about the safety of hypnotics and were specifically worried about the risks of dependence and tolerance associated with these medications. The interviewees were also worried that these medications could be misused and that physicians could be pressured by patients to prescribe.

'I don't want the patient to become dependent on it [referring to hypnotic medication] *and use it for life. I want the patient's insomnia to get better, because if the person got used to a medication for insomnia, they will have to use it for life.'* (MD 5)

'... a person has to [try] as hard as he can by himself without medications. If his condition became really bad, then he can try antihistamine. But I do not prefer going to medications directly especially antipsychotic medications, I do not like them.' (PH 1)

'Well, if it was used for long term of course it has well known side effects, first of all the patient will become addicted to these medication, it could also affect the memory of course it [worsen] *Alzheimer's* [symptoms].*'* (PH 7)

HCPs highlighted on the importance of following up with patients once treatment is initiated. Physicians indicated that they usually have regular follow ups with their patients to monitor their improvement with therapy. However, some of the HCPs suggested that it was often difficult to follow up with patients especially after referral to other institutions, as patients hardly return to meet the same physician at PHCC. Similarly, PHs noted that patients are usually looking for a quick solution for their sleep problem and if the treatment provided by one physician was not effective, they would go to a different physician. Some of the MDs proposed that monitoring insomnia patients should be done at secondary care in which more resources are available for insomnia management. While others argued that primary care is suitable for monitoring insomnia patients especially with the introduction of the new family physician module in which each patient is assigned to one physician.

'We always have to follow up with all the patients. We don't only treat them as acute cases, we tell the patient to come back if she didn't improve… [they are asked to] come back again in one week or one month depending...' (MD 5)

'...we don't really get the patients coming back to see us that often either. Once you've referred them, they just don't seem to come back, and they just disengage.' (MD 7)

'...but if we want to add a medication then they must, the problem is that if you advise him (to take a medication) *he could take the medication and leave. But you need him to come back, so that he could follow-up with you.'* (PH 3)

Non-pharmacological insomnia therapies

A variety of perspectives regarding the use of non-pharmacological therapies emerged from the interviews, with some participants voicing doubts on the efficacy of these therapies especially if the cause of insomnia was not treated first, while others suggested that these therapies could be useful. Those questioning the use of non-pharmacological products have related that to the lack of evidence to support the efficacy and safety of these products. Despite that there was an overall sense that these products are safe as they are not associated with side effects and risks of dependence or abuse. HCPs who suggested that non-pharmacological treatments could be useful have indicated that the efficacy of such therapies is subjective and depends on the patients' personal beliefs and expectations. Some have also indicated that their opinion on the efficacy was based on personal experiences.

Overall, non-pharmacological therapies appeared to be favored by HCPs over pharmacological treatment options for insomnia management. HCPs indicated that they frequently provided sleep hygiene advice to patients complaining from sleeping problems. This practice was related to HCPs perception of sleep hygiene as important for achieving sleep quality. However, physicians perceived that unhealthy sleep habits and practices are deeply rooted in Qatar's culture. Furthermore, some of the PHs indicated that they encourage patients to enhance their spirituality through improving

their relationship with god and reading Quran as a way to help in improving their sleep. Likewise, others have suggested that positive thinking or doing some relaxing activities such as yoga could help insomnia patients.

'...part of the problem is the culture which makes it OK to sleep during the day and stay awake at night. Therefore, more needs to be done in terms of psychoeducation.' (MD 11)

'We try to help him, we…tackle the sleep pattern and sleep hygiene, sometimes we need to educate the patient about the sleep hygiene. There are wrong habits we try to avoid them, the atmosphere of the house; hot, cold, too hot, too cold. dark, illuminated, not alone.' (MD 6)

'No medication needed. Just like the easy kind of for most people easy kind of advice on how to change their sleeping habits with profound results so far beyond any drugs or anything else I can do for them. So, that's time well spent.' (MD 7)

'You get some things … that can help. Such as essential oils, I mean these things people seem to think it doesn't really help, but it does, it can help, …things like we mentioned warm bath, things like that, that can help. I mean we do it for babies and they instantly go to sleep. So, and there has been evidence that show it has, …. changing your sleeping habits or having good sleep habits will help, … to keep away from coffee, tea and things like that, and just stressing on the importance.' (MD 8)

'For me personally, according to my opinion there are some specific things like avoiding drinks that contains sugar or stimulating drinks like tea and other stimulants. For example, to have a warm shower, having dim light, read a book and read Quran so these are the general advices…' (PH 8)

'Non-pharmacological...the first thing would be to change his lifestyle; this is the first treatment he must follow. Such as to sleep early, to prepare himself for sleep, avoid for example consuming a lot of stimulants, avoid too much thinking about the subject (maybe referring to insomnia), these are the treatments, drink for example milk, roselle...I mean herbal things which could help him to relax.' (PH 7)

'This is my personal opinion; it needs psychological intervention. This condition does not require medications; it needs someone to listen, talk and understand them.' (PH 1)

Overall, there was a general perception among physicians that CBT was an effective treatment for insomnia. However, concerns were voiced by some of the HCPs in regard to its efficacy if the cause of the sleep problem was not managed first. Some indicated that they had no previous experience with CBT and thus preferred not to comment about its efficacy. There were differing views regarding the provision of CBT at PHCC, some MDs believed they were prepared to provide this service to their patients, others were more inclined to refer their patients to specialists, and some recommended training some of the HCPs at PHCCs to offer this service. Most of the PHs interviewed were not aware about the availability of CBT at PHCCs.

'I have heard about the cognitive thing but...ahhh... I haven't really tried it with my patients, I try only the first one [probably referring to the sleep hygiene].*'* (MD 5)

'The best thing is to do CBT or that you talk with him before the CBT, you reach to the point of making a connection with the patient and that there are things which we need to think about them logically but not deeply. You can talk... the importance of the CBT is that it builds the patients self-confidence.' (MD 10)

'So, CBT doesn't work well for something that is a physical physiological problem. So, if someone is just working a shift pattern, how is a CBT going to help? But CBT could help if they're stressed out and they're having trouble switching off. So, you can you know as a kind of rumination thing that can use CBT, you can use CBT to kind of address some of those things. So yeah it depends on what the cause is, root causes is...' (MD 7)

Knowledge about insomnia management approaches

HCPs at PHCCs perceived that their knowledge about insomnia treatments was insufficient and therefore suggested that prescribing and managing patients requiring pharmacological treatments should be the role of psychiatrists.

'Because of the side effects [referring to hypnotic medications] *and the data of all of that, because they have more side effects, because I see many cases that receive psychiatric therapy and sometimes the patients receive medications which I might not even know. So, when I log into the system, I see a number of medications; so, is this side effect caused by the medication? It's preferable for these medications to be prescribed by psychiatrist not us'* (MD 1)

'... honestly, not everyone is trained on these medications. Physicians shouldn't be allowed to treat insomnia on their own.' (MD 4)

Some of the PHs indicated that they had prior knowledge about CBT, and some indicated that they got that knowledge through personal reading. Also, among PHs, some indicated not being familiar with the term "sleep hygiene"; however, all were aware of practices and behaviors associated with sleep hygiene and reported to be providing advice to patients on these on a regular basis.

'I have heard about the cognitive behavioral therapy, ok, CBT, yes, but, ahh, I think they made a clinic or something like this in primary healthcare…but CBT is for everything is not insomnia only' (PH 6)

A summary of the current practices for insomnia management at PHCCs in Qatar is provided in Table 27.

Table 27: Current practices for insomnia management at primary care in Qatar

Subtheme	Categories	Summary
Pharmacological management of insomnia	1a. Limited pharmacological options for insomnia management 1b. Duration of therapy 1c. Hesitancy about pharmacological insomnia management 1d. Continuity of care	Overall, HCPs interviewed acknowledged the lack of insomnia medications at PHCCs in Qatar. However, there was a general agreement that this was appropriate because these medications were perceived to be advanced and requiring a specialist's care. Additionally, it was suggested that the treatments currently available at PHCCs including antihistamines, antidepressants and anti-psychotic medications were enough for primary care settings. Moreover, HCPs expressed their hesitancy towards prescribing and dispensing medications for insomnia management. This hesitancy was mainly derived by concerns about the safety of these medications including issues related to medication dependence. Furthermore, regular follow ups with patients were deemed to be important to monitor patient's improvement.
Non-pharmacological treatments	2a. Non-pharmacological therapies are the preferred treatment options 2b. Perceptions on the safety and efficacy of non-pharmacological therapies	There was an overall preference for the use of non-pharmacological treatments for insomnia management. HCPs viewed non-pharmacological therapies including some OTC products as safe but expressed some doubts about the efficacy of these therapies.
Knowledge about insomnia management approaches		There was an overall sense among HCPs that their knowledge about insomnia treatments and management approaches was insufficient.

4.2.2.4 Theme 4: Healthcare providers' perspectives on their role in insomnia management

Physicians' role in insomnia management

A prominent view among the HCPs interviewed was that the assessment and management of insomnia was mainly the role of physicians. MDs highlighted the importance of history taking during insomnia assessment and diagnosis. According to MDs, the assessment of insomnia often includes asking about sleep routine, sleep environment and daily routine including work related issues. Despite the perceived importance of asking about sleep; some MDs admitted that assessment of sleep is not part of the routine patient assessment at PHCCs. Also, it was suggested that questions about sleep problems are often quick and superficial.

In their talk about the assessment of sleep problems, MDs stressed on the importance of building a rapport with patients before asking further questions and doing a thorough assessment. MDs suggested that through history taking they often determine the cause of insomnia which could be physical, mental or medication related which is then confirmed through further testing. Additionally, MDs indicated that as part of the diagnosis they classify insomnia as either acute or chronic depending on the duration of the complaint and as primary or secondary based on the cause. The classification then guides the insomnia management.

'At the beginning [referring to the initial assessment of insomnia]*…I try to see if there is a psychological component or if it was really a medical condition that is related to age, menopause and things like that or is it something that needs treatment, medications I mean.'* (MD 5)

'...it is just a side question [referring to the assessment of insomnia]*; I ask him for example: " do you sleep well?", " do you eat well, how is you eating?", " you sleep for how many hours?", you see how. And the number of sleep hours are not an indication of…sleep 8 hours doesn't mean he is sleeping well. So, of course, I have to ask.'* (MD 9)

'...it's all in the history, I mean 70% of our work. People think "is it a blood test, is it…", no it's history. So, 75%, you know, you could…get some idea of diagnosis just by history taking.' (MD 8)

Physicians indicated that their approach to patient care involves treating the patient as a one unit and taking all different aspects of the patients' life into consideration while managing insomnia. MDs felt that some factors including patients' lifestyle, living circumstances, social aspects and nature of their work were important and should be accounted for when managing sleep problems. Additionally, some MDs believe that all the patient's health problems and concerns should be addressed at the same time instead of managing each problem in isolation. Moreover, some physicians highlighted the importance of patients' engagement in decision making to ensure that patients' needs, and preferences are considered.

'…the patient is treated as a whole; we don't take the patient only as a person who has diabetes and say, " just take the pill in the morning and at night". This is the secret behind the success of the chronic diseases clinic, that we spend more time with the patient and talk to him more, and as I told, there are aspects which might be missed when we are dealing with the patient…' (MD 1)

'So, we try to do something…sleep hygiene, the social economy, food, type of foods,

when to sleep, the drinks, the medicines, ... the stimulation, it causes bad sleep or insomnia… we tackle all these aspects: the disease, the pain, the fear, the anxiety, the depression, the polypharmacy we will tackle everything.' (MD 6)

Additionally, physicians indicated that they often counseled their patients about medications prescribed. MDs said that they often educate their patients about antidepressants or antipsychotics prescribed by telling them that these medicines are not hypnotics and that they do not cause addiction. MDs have also suggested that they provide information related to the expected onset of action and side effects of medications prescribed. On the other hand, the psychiatrist indicated that when hypnotics are prescribed patients are always warned about the addictive potential of these medications and are informed that these medications are for short term use only.

'To deal with the patient and warn him regarding the medication side effects and instruct him on how to take the medication, because they have many side effects,'(MD1)

Furthermore, some MDs indicated that they usually attempt to enhance patients' knowledge about normal sleep, sleep problems and treatment approaches for insomnia. However, some MDs recognized the need for enhancing patients' awareness about sleep hygiene and engaging in educational campaigns targeting patients attending PHCCs.

'…sometimes patients come with their relatives, elderly who have chronic diseases, as part of health education we need to tell him about the number of hours of sleep, and it must not be less than 8 hours… This is part of the health education ...' (MD 1).

'But top of the list would be actually hanging a big poster in the waiting room in places like this saying like "Are you tired, how much sleep are you getting?"' (MD 7)

Pharmacists' roles in insomnia management

PHs perceived that they had an important role in providing patient counselling while dispensing medications. Some PHs indicated that they usually counsel patients about the best time for medication intake to avoid sleep disturbance, if insomnia was caused by a medication. They also noted that they educate their patients about possible drug-drug interactions and advise them on possible alternatives to medications that might be causing insomnia. Furthermore, PHs highlighted their role in clarifying misunderstandings about medications and encouraging patients to get information from trusted sources. However, some PHs indicated that counselling provision was not always feasible in the pharmacy due to time constrains associated with workload in the dispensary, or due to patient-related attitudes who do not appear to be interested in the education provided by PHs.

'... [referring to PHs providing counseling to patient with insomnia] *when to take the medication, whether he should eat or not when taking the medication, and if there was any specific side effect to this, like for example… If there was a drug-drug interaction, avoid those drugs and avoid them for at least 2 hours…things like these.'* (PH 1).

On the other hand, PHs indicated that their role in insomnia assessment and management is often limited to informing MDs if they identified untreated sleep problems while performing some PHs-related duties such as medication reconciliation or when reviewing patient medication profiles.

'This is not the duty of the pharmacists [referring to patient assessment for insomnia], *pharmacists don't provide these treatments because this is a primary care setting and the pharmacist here is not a clinical pharmacist, therefore, pharmacists are not involved much in this…'* (PH 1).

'The patient will not come directly [to the pharmacist] *to tell you that "I have insomnia", he comes to you after he has already seen the physician and got the prescription'* (PH 3).

'It [referring to the pharmacist's role in insomnia management] *is limited, except in the "intensive medication reconciliation". The pharmacist would notify the physician* [if he noticed a sleeping problem] *and he will deal with the patient based on the severity of insomnia.'* (PH 5).

Some PHs perceived that they had other specific roles in insomnia management at PHCCs; one of which is responding to consultations from other HCPs. PHs reported that they are often contacted with questions relating to medication availability, side effects, efficacy, onset of action, safety, the recommended duration of therapy or issues surrounding the choice of treatment in specific cases. PHs highlighted that the questions received were often in the context of acute insomnia as chronic insomnia cases are not managed in primary care. Overall, PHs perceived that consultations coming from other HCPs about sleep problems were not very common. Some PHs believe that this was related to the fact that PHCCs are not specialized to manage sleep problems. While others perceived that overall, insomnia is not a very common problem at PHCCs to begin with.

'...no physician has ever called me and said could this medication be the cause of [insomnia] *and so on…'* (PH 6).

'...they [referring to physicians at PHCC] *also ask about our opinion in regard to the side effects of the medication, the duration of use and the extent to which these medication could result in an effect, this is our area, that is why doctors always ask us about them.'* (PH 1).

PHs also identified other opportunities for insomnia management during their interaction with patients while dispensing medications, such as identifying patients who may be experiencing sleeping problems as a result of medication-related issues due to duplicate therapy, drug-drug interactions or simply untreated sleep problems. PHs believed that there is an opportunity for their involvement particularly when patients request clarification or education on complicated therapeutic regimens, or when addressing patients concerns about specific medication side effects, risk of addiction and withdrawal symptoms upon discontinuation. PHs suggested that they could use this chance to ask about sleep-related problems, provide more education on sleep hygiene and overall enhance patients' understanding on the available treatments or adherence issues. Some PHs also stated that if treatment modification was required, they could intervene and contact the patient's physician. PHs anticipated that they had more chance of identifying sleeping problems when dealing with patients on chronic medications. However, they suggested that it is sometimes difficult for them to use these opportunities effectively to identify sleep problems especially when they do not have complete medication information.

'If I believe that the drug is the problem, I will contact the doctor and ask the patient to go back to the physician to give him an alternative medication, something that helps in reducing the problem' (PH 5)

It was highlighted that PHs play an important role in reassuring patients on the choice and efficacy of insomnia treatments. Considering that PHs are the last HCPs that the patients interact with before leaving PHCCs, they are in a suitable position to provide patients with emotional and psychological support to ensure adherence. It was suggested that this would in turn reduce any apprehensive behaviors surrounding medications and treatments, which could help in calming them down and probably minimize the effect of stress on their sleep. Some perceived that for the most part patients feel comfortable discussing their sleep problems with PHs; which gives the PH opportunities for being part of the assessment process.

'There is none except if the patient said something from his side, he says for example: " I..I can't sleep, I can't rest and so, the doctor prescribed some medications, so would these medicines really help me to sleep or not ?"' (PH 7)

'...and another thing that they commonly say is "If I took this medication for a while would I become addicted it?"' (PH 1)

4.2.2.5   Theme 5: Challenges with insomnia management in primary care

HCPs identified several barriers and challenges which limits their ability to assess and manage sleep problems at PHCCs (Figure 2). Both MDs and PHs complained of time constraints as they have indicated that the time spent with each patient is often not enough for doing adequate patient assessment and management of insomnia. MDs suggested that with the high patient load at PHCCs it might not be

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possible to devote more than 15 minutes to each patient. Similarly, PHs highlighted that it is often difficult for them to ask patients questions and retrieve their medication history from the computer in a short time.

Challenges:

1. Lack of privacy
2. Physicians' response to pharmacists' interventions

Pharmacists

1. Responding to consultations from other HCPs.

2. Answering patients' drug related questions.

3. Opportunities for insomnia assessment (e.g. medication dispensing).

4. Comforting patients

Patient counselling and education

Physicians

1. Insomnia assessment, diagnosis and managment

2. History taking

Challenges:
1. Time
2. Lack of insomnia guidelines
3. Patients related issues (stigma, hiding insomnia complaint)
4. Insufficient knowledge & training
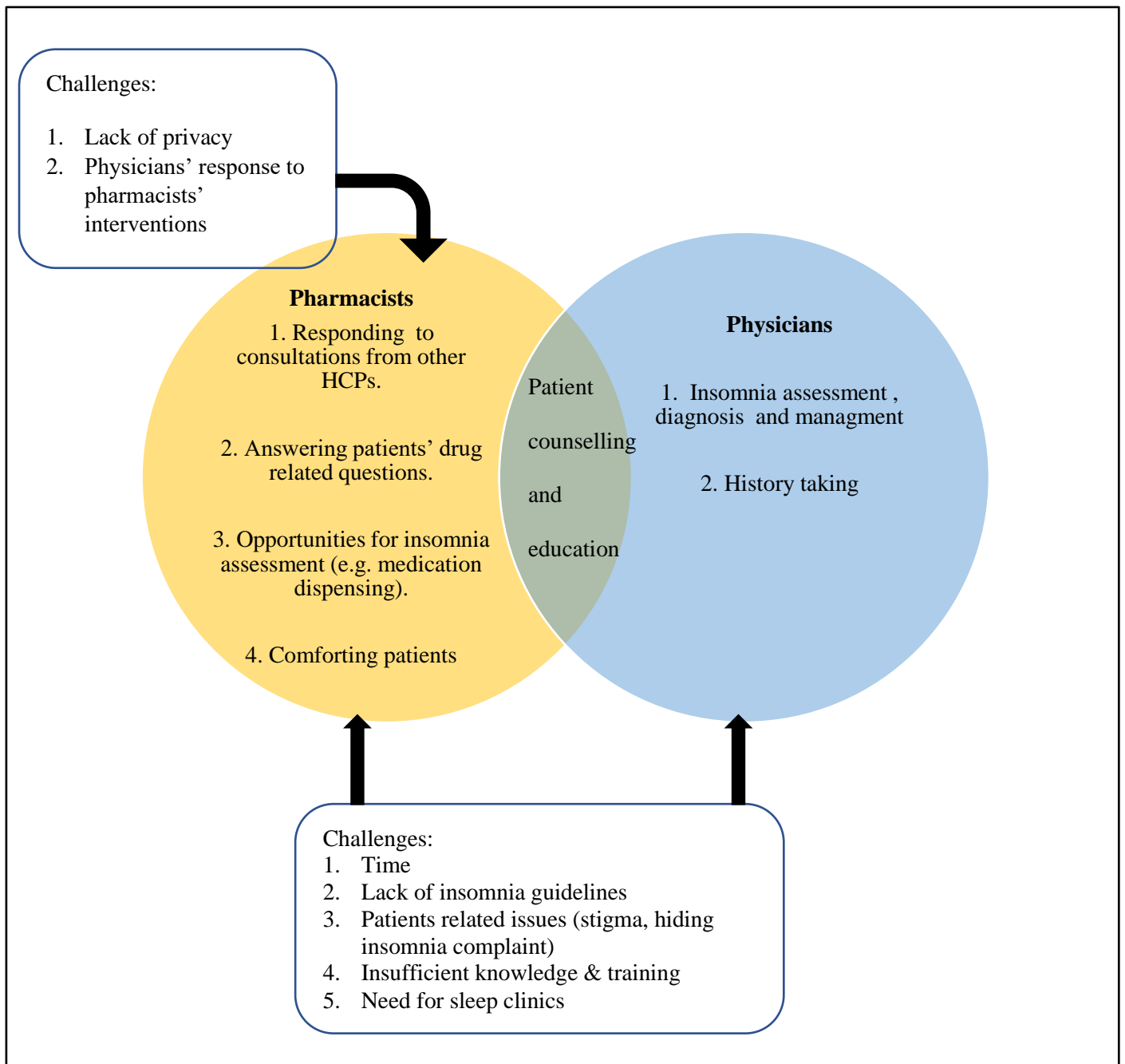5. Need for sleep clinics

Figure 2. Healthcare providers' roles in primary care and barriers to insomnia management

Despite the limited time available, PHs indicated that most of them are committed to provide quick sleep hygiene advice to patients complaining from insomnia. However, PHs recognized that more time is necessary for patients who are referred for intensive medication reconciliation.

'... [regarding the difficulties that doctors face] *one of them is actually time constraint, that we cannot give patients time and ask more questions because these questions specifically require more...time from the patient and doctor.'* (MD 2)

'*At least 30 minutes. Of course, in 15 minutes...we can know* [if the patient has insomnia] ... *but treating it will definitely take more time and it* [referring to the appointment] *might extend to the time of the next patient's appointment.'* (MD 5)

There were mixed views among PHs about the availability of insomnia guidelines at PHCCs in Qatar. Predominantly it was perceived as a challenge to adequately addressing insomnia. Some MDs indicated that they often refer to international guidelines or medical databases available on the PHCCs' website when dealing with insomnia cases.

'*I haven't seen guidelines related to insomnia on our website. There are no guidelines specific for insomnia on the PHCCs' website. But we usually visit Up-to-date or NICE guidelines'* (MD 4)

'*Honestly, I haven't read any guidelines on insomnia. I have only read about the treatment approaches from websites, but I haven't seen any specific guideline.'* (MD 5)

'We don't have any guidelines for the diagnosis and assessment of insomnia. But I refer to the oxford handbook, it has a section on insomnia, it is really good. There is a great need to have a guideline even for physical problems which might be causing insomnia.' (MD 11)

'...they definitely have it on the system. I haven't seen it myself, but physicians should know about it. If I got a patient, I have a guideline to follow. I do not go back to guidelines unless I have an unfamiliar [diagnosis] *or to check the diagnosis and treatments prescribed by the physician... to check if it is correct…Other than that, I do not really check … or when I receive email assign for a guideline or for general knowledge if I would like to read on a particular topic. But they are obligated to follow the guidelines more* [referring to physician].*'* (PH 2)

HCPs also suggested that patients' beliefs and attitudes could act as an obstacle to proper identification and management of insomnia. One of these main challenges highlighted by both MDs and PHs was the lack of disclosure of sleep problems by patients. It was suggested that patients rarely come with insomnia as the main complaint, instead, insomnia is often mentioned as a side problem during conversations. HCPs related this observation to patients' discomfort with discussing sleep problems which are often linked to mental illnesses. Additionally, they suggested that patients may not be taking insomnia seriously enough or that they might be denying the existence of a problem to begin with. One interviewee related the inadequate patients' reporting of sleep problems to the counselling provided at PHCCs, as patients are often told to expect insomnia as a common side effect of many medications. Nevertheless, it was suggested that a subgroup of patients, especially elderly and some individuals with mental illnesses, are often more engaging and open to discuss their problems more openly.

'Insomnia is not the main complaint. Usually patients bring it up when they are talking about their other problems.' (MD 4)

'... this [referring to insomnia] *is a hidden complaint, you know, he will not come to you saying: "I can't sleep", this is usually rare, you know, this kind of patients are rare…'* (MD 9)

'...because the patient does not present with insomnia as a main problem. He comes with other medical problems and he will mention insomnia while talking. It is rare to see a patient coming with insomnia as their main complain.' (PH 2)

'Some patients have more tendency to talk, especially elderly people. He wants to talk, and he is comfortable with this pharmacist. So, he will start telling you that, for example, "I have this problem these days and I cannot sleep at night".' (PH 5)

Another important challenge which was mentioned by some MDs was related to the lack of transparency in the part of the patient in reporting more specifics on their health-related problems or regarding their medications. Contributing factors to this challenge was suggested to be related to the patient's personality (for example being shy) or simply related to discomfort most patients experience when sharing information, they might feel is more personal and not related to their physical presentation.

' ...[the difficulties are related to] *the patient herself as a person, some patients have difficult personalities and some, for example, are looking for the easiest solution which is to directly use medication and she is not willing to make effort and listen to the advice. So, this is considered as a difficult patient. Or the patient might not be completely honest, she could be hiding something, she might be taking a specific medication and she doesn't want to tell about it, or she might have a disease and she is*

hiding it' (MD 5)

Patients' stigma against mental illnesses was identified by HCPs in this study as a significant barrier to the management of insomnia in primary care settings. Both MDs and PHs working at PHCCs agreed that insomnia is often linked to mental illnesses which are viewed negatively by the society. HCPs indicated that this stigma influences the treatment seeking behavior among patients; resulting in resistance against referral to a mental health hospital for treatment and follow up. HCPs believe this is usually linked to the patients' fear of being labelled as mentally ill by the society. The interviewees suggested that these beliefs have serious implications on patients who may choose to avoid treating their problem until their condition deteriorates.

Some of the MDs interviewed felt that the integration of mental health services into primary care though the introduction of mental health clinics might encourage patients to seek professional help without worrying about being stigmatized. Yet, one MD had a different view and suggested that the mental health clinics currently operating at PHCCs may not be very helpful in avoiding this stigma, as patients would still be drawing attention because they are receiving a special care provided by a psychiatrist.

'A lot of people don't want to be [referred to mental health services]*, a lot of resistance, they don't want to be referred, they don't want to be labelled. They're scared of what their friends and family would think, this is a horrible kind of stigma. So, it's very difficult, that's the thing that needs to be tackled, I think.'* (MD 7)

'...we have a stigma against insomnia, anxiety, stress, depression, these names or terms we try to escape from as Arabs. If you try to separate the service and tell the patient to

go to mental health hospital, he wouldn't go. He would never agree to enter there, so it is better to provide the same service in a secured place; for example the patient when he enters to the physician's room nobody would know if he is coming for depression, anxiety, or just insomnia. But if you separate the service, then the patient will run away from you. Because we are not prepared....' (MD 10)

'...generally, people are afraid of saying things which might indicate that they are...have depression, so people don't disclose information related to this topic...' (PH 7)

'This is the problem, the society's negative view is there, for me to visit a psychiatrist, no, it is difficult, I am not crazy, I don't have a psychiatric problem or that, for example, some people in the society would say that this person was seeing a psychiatrist, it could be that he only had insomnia, simple anxiety, just depression, they would say no, he has a psychiatric illness and they consider him as crazy.' (PH 3)

Another challenge that emerged from the HCPs interviews was related to patients' attitudes towards medications. HCPs indicated that they commonly interact with two different types of patients, the first of which want medications to manage their problems regardless of the cost or probable side effects, while the second type of patients do not prefer taking medications and are often worried about the safety. PHs indicated that the first group of patients often search for quick solutions and mostly come after they have tried some OTC products. In relation to psychotherapies such as CBT, one MD suggested that patients' attitudes towards such therapies are often influenced by their previous experiences. There was a predominant perception that these types of therapies are not usually favored by patients.

'There is a culture here of wanting medications and not giving the patient a medicine means you are a bad doctor.' (MD 11)

'There are patients, for example, when you are counselling him on the medication would find that he has a lot of doubts, he is doubting a lot and is reviewing with you and, I mean not in an acceptable, but a little too much.' (PH 3)

'They are psychologically vulnerable. They have anxiety from everything. So, if he read the pamphlet, then he would develop all the side effects listed. It is all psychological.' (PH 5)

PHs have reported some additional factors which they perceived as barriers to the management of sleeping problems at PHCC, one of which is the lack of privacy in the pharmacy. This might prevent patients from asking questions or discussing their sleep problems with PHs. The pharmacy window is a busy area where there is almost always a queue of patients waiting to take their medications. However, one PH has talked about the availability of a closed consultation room in which patients could have some privacy. Additionally, PHs perceived the counselling provided to patients at PHCCs as insufficient. Some PHs recommended assessing the patients' general awareness about sleep problems before providing education in relation to insomnia, its consequences or the basic non-pharmacological management strategies.

'There is no privacy on the window, because in front of you is the and there is another patient here and another patient there and there and here…so…some patients are not shy and would talk, but other patients, no, they would be shy to talk about their problems.' (PH 1)

'…they [referring to physicians] *do not give proper advice. They just…they just give the patient what they want.'* (PH 2)

Furthermore, PHs indicated that one of the barriers which might prevent them from playing an active role in insomnia management was related to physicians' response to their interventions. PHs considered the management of insomnia to be the physicians' duty, therefore they were worried that their attempts to contribute to the management of sleep problems might create conflicts with physicians due to role overlap. Others suggested that PHs' interventions and recommendations might be perceived by some MDs as an additional workload.

'In addition, if we intervened in physicians work, some of them take it personally and get annoyed.' (PH 1)

'As I said, we will not do anything as pharmacists. It is the physicians' responsibility. It has to come from them. If they did not request … if they did not … they would say, this is an additional load on us, we already have enough work...' (PH 2)

HCPs highlighted the need for training courses on the diagnosis and management of insomnia at PHCCs. Both MDs and PHs agreed that physicians need to be trained since they are more involved in insomnia management. MDs also indicated that they could benefit from receiving training sessions or workshops on insomnia diagnosis and management (as part of the CME sessions). Considering that insomnia diagnosis and management was not included in the PHs' job description, some PHs suggested that they did not need to receive training. However, PHs indicated that if these duties became part of the PHs' role they should be properly trained.

The need for specialized clinics to manage sleep problems at PHCCs in Qatar was a predominant suggestion by HCPs. They indicated that opening these clinics which will be operated by physicians with special training in sleep medicine would help

in improving insomnia management. It was also suggested that having these clinics will help HCPs in dedicating more time for the management of insomnia unlike the current situation in PHCCs in which insomnia is not receiving enough attention. It was expected that this will help in minimizing the stigma associated with these conditions at PHCCs since that treatment will be provided in regular clinic hours, by MDs. It was also suggested to have protected time slots for MDs so that they can provide additional time for patients presenting with sleep problems.

'The main point here is that we really need specialized clinics for these patients here at primary care.' (PH 1).

'There should be a specialized clinic for this, and it should be treated in specific hospitals, I mean they can have their own medications, get special care and so. Like this [referring to the current system in PHCC] *the patients will mix up, like insomnia patients with normal patients with patients with acute problems... all will be mixed up, there will be no focus on them, even if we make a specialized clinic for them, due to the patient flow in the centre it will be different and not possible to make a special clinic for insomnia.'* (PH 7).

'There is a need for a shared guidance in general for sleep. There is a need for sleep clinic where they can do sleep study, assessment and tests. Patients with severe insomnia are referred there...' (MD 11).

CHAPTER 5: DISCUSSION

This chapter provides an in-depth interpretation and analysis of the results presented in the previous chapter. The first part of this chapter will discuss the findings obtained from university students and will attempt to provide an explanation of these results with reference to the existing body of literature. The second part will focus on analyzing perceptions about insomnia and its management as viewed through the lens of healthcare providers working at PHCCs in Qatar.

5.1. Arabic sleep hygiene index's reliability

As part of this study the SHI was translated to Arabic language and the translated instrument was used for assessing the sleep hygiene practices in the study sample. The Arabic SHI had moderate internal consistency with Cronbach's alpha of 0.59 which is lower than the reported Cronbach's alpha for the English (0.66 and 0.64) and Turkish (0.70) versions of the instruments (172,203,205). Assessing other psychometric properties of this instrument including reproducibility and validity measures was not possible due to time restrictions.

5.2. Phase 1: Exploring sleep patterns, behaviors and the use of sleep medicines among university students in Qatar

For the most part, the results obtained in this phase of the study have contributed towards advanced understanding of the prevalence of insomnia and sleep hygiene patterns among university students in Arab populations, and add to the limited research and published literature currently available in the Arab region.

The findings of this study conducted among QU students have shown that more than two-thirds had poor sleep quality. Similar results have been reported from other Arab countries as it was shown that the prevalence of insomnia among university students from KSA, UAE and Jordan ranged between 67 and 85% (105,110,111,114). The mean PSQI score found among QU students (7.57) was similar to those reported for students from Kuwait and KSA (around 7), but was slightly lower than the scores reported for students from Jordan (8.01) (105,114,211). Studies undertaken in other Arab countries such as Palestine, Bahrain and Lebanon reported lower prevalence rates of poor sleep quality among university students, ranging between 9.8 and 59% (102,106–109,118). These prevalence rates appear to be higher than those reported in other adult populations (30%), which confirms previous research findings which suggested that young adults, including university students, are at higher risk for insufficient sleep and insomnia (16,18,34,78,79,91,119). The prevalence reported among QU students is also higher than the 5% insomnia prevalence detected among the general population in Qatar (32).

Sleep fragmentation, which is a common feature of insomnia, was reported by 60% of the respondents while in a similar study from Bahrain only 40% of the students were found to suffer from interrupted sleep (102). Sleep interruption was often related to some physical complaints often caused by symptoms of a chronic disease condition such as diabetes or an acute illness. This finding corroborates to the notion that individuals with chronic diseases are at higher risk for insomnia (212,213). In particular, chronic painful physical conditions such as backache and joint problems were found to worsen insomnia symptoms and result in sever daytime consequences (214).

Many of the students also complained of psychological problems including anxiety, depression and panic, which are most likely related to the tremendous amount of stress and academic pressure to which the students are subjected. This finding is consistent previous reports from the literature which suggested that stress was the factor mediating the association between mental illnesses and insomnia in university students (99,100,119). The students' stress also translates into excessive thinking about their academic performance and the tasks awaiting completion (98). As a result, this prevents students from falling asleep and if they managed to sleep those worries and thoughts often find their way into their dreams and appear as nightmares, preventing them from having a peaceful sleep.

Some of the participants related their inability to sleep to some negative sleeping habits including sleeping late, daytime naps and consuming stimulants late at night. These habits are known to be common among university students and were associated with increased likelihood of poor sleep quality in this population (84,85,98,112,115,116,118,122,128).

Despite the high prevalence of poor sleep quality found among QU students, several findings in this study suggest that students are mostly unaware of having a sleeping problem and many appear to have developed compensatory mechanisms. This is evidenced by the following findings:

- Only about a third of QU students appeared to be sleep deprived or having insufficient sleep (<6 hours). This was consistent with the findings of studies conducted among university students in Egypt, China and India in which around 12-50% of the sample had insufficient sleep (<7 hours) (78,90,106,112,113). The discrepancy seen between poor sleep quality and sleep insufficiency among

university students suggests that sleep quality is not determined solely by the number of hours of sleep.

- Around 60% of the students found difficulty with falling asleep within 30 minutes of going to bed at least once a week, and 30% reported an average sleep latency higher than 30 minutes. However, the majority of the students had a sleep efficiency of 85% or higher indicating that the time spent in bed before sleep is minimal. These findings fall within the range for sleep latency reported in epidemiological studies done among university students (78,92,94,107,109,112,118). Similarly, previous studies have also shown that university students often report good sleep efficiency (>85%) (105,118).

- Less than 50% of QU students with poor sleep quality (as identified by PSQI score >5) perceived their sleep quality to be bad. This was consistent with reports from previous studies which have shown that university students are not always capable of correctly determining their sleep quality. One study conducted among university students in the US found that 62% had poor sleep quality (measured by PSQI); nevertheless, only 27% described their sleep quality as poor (90). Similarly, around 38.4%, 22.2% and 56.8% of students with poor sleep quality from India, Ethiopia and Brazil, respectively, were able to correctly rate their sleep quality as poor (78,97,99). However, it seems that students with good sleep quality are more likely to accurately predict their sleep quality and this was confirmed by a study which found that students who have perceived their sleep quality to be good had lower mean scores on the insomnia severity index (111).

Overall, these findings combined indicate that university students tend to overestimate the quality of their sleep. This could be attributed to lack of awareness about the

characteristics of healthy sleep, which might play a role in shaping their perceptions of their sleep quality. Importantly, this indicates that some students who do not complain from any sleep problem may indeed be suffering from poor sleep quality or insomnia. This observation highlights the importance of using validated instruments for identifying sleep quality rather than relying on participants' self-reports or complaints.

The use of sleep aids was not a common practice among QU students as only one-quarter of the sample admitted to trying sleep aids previously, while only around 16% indicated that the use was within the previous month. This finding was consistent with the results of a study that was conducted among Ethiopian university students, which found that 21% of the participants had used sleep aids in the past month (100). However, evidence from the published literature suggests that the use of sleep aids is even less common among university students as only 1% of Palestinian and Japanese, 6% of Lithuanian and around 9% of Egyptian, Ethiopian, Brazilian and Saudi Arabian university students indicated the use of sleep aids (80,92,97,99,109,116,118). In contrast, it was found that around 46% of medical students from Saudi Arabia reported a previous use of sleep medicines (117).The use of sleep medicine was significantly associated with worse sleep quality in previous studies, suggesting that individuals who take sleep medicine at least once a week are 14 times more likely to have poor sleep quality compared to those who do not take these remedies (107).

Poor sleep hygiene practices were found to be common among university students in Qatar as around 79% scored higher than the cutoff point of 16 on the SHI (203). In particular, students reported engaging in awakening activities before sleep and using bed for purposes other than sleep such as for watching television or studying. This is consistent with the findings of other studies which indicated that university

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students commonly engage in negative sleep hygiene practices up to 5 days per week (77,89). Practices reported in these studies included engaging in strenuous exercises within 2 hours before sleep. Evidence also suggests that some habits including lack of exercise and studying or watching television in bed were associated with poor sleep quality (215). Lack of awareness about the impact of such practices on sleep might be the reason why students engage in such behaviors (77,89). It was previously shown that the majority of university students were not aware that performing active exercise or engaging in emotionally upsetting activities around bedtime and using bed for various activities could negatively impact their sleep (77). A significant number of university students were misinformed on issues related to daytime napping and use of sleep aids (77). On the other hand, other studies have argued that knowledge about sleep hygiene does not necessarily influence individuals' behaviors and practice of sleep hygiene (216).

A substantial proportion of the QU students indicated that they go to sleep while feeling angry, stressed or nervous. Similarly, thinking, planning and worrying in bed were all common habits in around 45% of the sample in this study. Overthinking was also one of the prominent themes identified by students for their inability to sleep. These findings are not surprising and are expected in this population which is subjected to a significant amount of pressure and stress and many studies from various countries have consistently shown that stress is common among university students (79,217–220). Worries about academic performance, passing courses and future plans are the most common causes of stress among university students (221). Additionally, studying for prolonged periods of time, assessments and time constraints were other documented causes of stress in this population (220). Furthermore, it was found that university

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students frequently worry about their sleep quality and whether they were getting enough sleep which might further contribute to their sleeping problem (84,89,221). More than 30% of the respondents had inconsistent sleep schedules and reported that they stayed in bed longer than needed at least two or three times a week within the previous month. Students have also indicated that they sleep late mostly to study or complete their assignments. This is consistent with previous reports which identified irregular sleeping patterns as a common behavior among university students (84,85,98,112). Similarly, going to bed late was considered the most common sleep habit among Saudi university student (115). Excessive daytime sleepiness, which is a consequence for insufficient sleep, was also found to be prevalent among QU students affecting more than 60% of them. This observation was in agreement with the results of preceding studies which discovered that between 37% to 57% of Saudi students had excessive sleepiness (107,116,117,126). Also, irregular sleeping patterns including delayed wake up times and getting out of bed later were shown to be more common among students suffering from chronic insomnia (87).

The results of this study indicate that at least a quarter of the QU students have reported commonly taking daytime naps lasting 2 hours or longer in the previous month. This proportion is significantly less than the findings of other studies which have shown that between 49% and 86% of university students take daytime naps (109,112,116,117). However, the results of this study are similar to that of a Saudi study which has shown that around 23% of the students reported taking daily naps. The lower prevalence of nap taking behavior observed in this study could be due to limiting the question to long naps that lasts for a minimum of 2 hours. In fact, a meta-analysis done previously have identified the mean duration of daytime naps in university students as

54 minutes (112). Daytime naps can be an effective compensation mechanism in individuals suffering from sleep deprivation. Indeed, short daytime naps which does not exceed 30 minutes are recommended to maintain alertness and enhance performance for the remaining part of the day (222). However, naps lasting for longer than 30 minutes have negative effects, resulting in lethargy and disorientation shortly after waking up and altering night-time sleep. Midday napping is also a common practice in Arab and Muslim societies in general as it is a practice that has been recommended in Islam and practiced by the Prophet (223). Therefore, it is expected that the number of university students who commonly take daytime naps, regardless of the duration, is probably underestimated in this study since QU is a Muslim-students dominated university. Hence, it is recommended in future studies to include an additional item on the frequency of taking naps without restricting the duration.

Another coping mechanism for lack of sleep manifests through the consumption of stimulants. Caffeine containing beverages are commonly consumed by individuals suffering from insufficient sleep. However, the consumption of caffeine or tobacco within 4 hours of sleep was not a common behavior among QU students as only 20% reported engaging in this practice. Also, only very few students reported exercising vigorously within one hour of sleep. In contrast, other studies have suggested that caffeine intake was highly prevalent among university students in Arab countries with regular consumption of caffeine being reported by more than 65% of students (116,118,128). Additionally, around 28% of Palestinian university students reported late night caffeine intake at least once a week (109). Similarly, around 65% of university students from the US indicated that they drink caffeine containing beverages within 4 hours of going to bed at least once a week (89).

Environmental factors such as noise, light and temperature were identified in other studies as important factors that influence the university students' sleep quality (89,113). Nonetheless, environmental factors were not shown to be a source of annoyance for most of QU students; yet those complaining from external factors were often individuals who had young children who wake up at night crying and requiring attention.

At least 70% of university students spend more than 3 hours daily on electronic devices, with laptops and smart phones being the most used devices (130,224). Electronic devices are important for university students as they provide them with easy access to educational material, facilitating communication with colleagues, instructors and social media, as well as for engaging in extracurricular activities (224,225). However, the use of electronic devices, especially around the sleep time, can disturb the night-time sleep and alter its quality. In the present study, some students indicated that using electronic devices and playing video games prevented them from falling asleep. Studies are suggesting that mobile phones' dependency is common among university students (226). Addiction to mobile phones was associated with sleep disturbance and use of sleep medication.

A statistically significant correlation between sleep hygiene practices and sleep quality was identified among QU students; suggesting that students with better sleep hygiene are more likely to have good sleep quality. The association between sleep hygiene and sleep quality among university students has been frequently reported in the literature (77,83,203,215). In particular, one study found that a one unit increase in sleep hygiene practice score is associated with a corresponding decrease in PSQI score by 0.08 (77). It was even suggested that some sleep hygiene practices could predict

insomnia severity among university students both concurrently and up to 2 months later (83). The main sleep hygiene practices predicting sleep quality were improper sleep scheduling, engaging in arousing behaviors near bedtime and sleeping in uncomfortable environment (83). It is worth noting that the first two of these habits were also the most common sleep related behaviors among QU students.

The effects of different sociodemographic characteristics of the participants on sleep quality and sleep hygiene were also investigated in this study. The results from the regression analysis have shown that students from the colleges of Education and Sharia & Islamic studies had better sleep quality than students from the College of Arts & Sciences. Interestingly, the test of difference has also revealed that students from these two colleges had better sleep hygiene practices. These findings provide an additional confirmation about the correlation between sleep hygiene and sleep quality in QU students.

The findings have suggested that sleep quality differed significantly between different colleges and genders. Notably, students from the college of Law were shown to have the worst sleep quality (mean PSQI score of 8.2) while students from the college of Medicine had the best sleep quality (mean PSQI score of 6.7). Nevertheless, this result is different from the observations in other studies which indicated that medical students usually have worse sleep quality than students from other colleges. Specifically, several studies have found that Medical students tend to have worse sleep quality than Law students (92,227,228). It was shown that both Medical and Law students spend longer time studying and have less free time. Studies have also suggested that Medical students often get less sleep and have worse daytime dysfunction. Yet, daytime sleepiness was found to be more common among Law

students (227). Although the reasons for this observation cannot be certainly determined, the variance in sleep hygiene patterns across different colleges could provide some explanation, as students from the college of Law were shown to have worse sleep hygiene than Medical students in the current study. This is coherent with the findings of the regression analysis which has shown that sleep hygiene was the main factor influencing sleep quality in QU students. Previous studies which included Law students noted that this population is often stressed due to the competitive nature of the Law school, and these students were also more prone to depression and anxiety (229,230).

The findings have also identified a significant correlation between sleep quality and gender with female students having worse sleep quality (mean PSQI score of 7.7). It is well known that females are more vulnerable to sleep problems, and a large body of evidence today suggests that female university students have worse sleep quality than their male colleagues (78,84,85,87,90,96,122). Likewise, meta-analysis of 31 epidemiological studies proved that females were at higher risk for having insomnia with a risk ratio of 1.41 (231). This finding was confirmed again in a study that was conducted in Egypt, which found that females scored higher on the insomnia scale (232).

Furthermore, marital status was found to be a significant predictor of sleep quality in this study, as married students were more likely to have better sleep quality. The marital status was also significantly associated with the sleep hygiene scores. This finding is indeed interesting and was unexpected, especially that many individuals have reported inability to sleep due to children waking up. Therefore, it was expected that married students would have worse sleep quality than single students. Due to the small

number of students who identified themselves as divorced or widowed (n= 51), they were considered as single students and therefore some of the single students could have children preventing them from sleeping. However, considering the size of this group it is unlikely that it had a significant influence on the results. In addition, there is mixed evidence in the literature in regards to the effects of marital status on sleep quality; as some studies were in line with the findings of this study and reported that single students were more likely to have poor sleep quality while others failed to find an association between the two variables (82,98,118,215,233–235). Another study that was conducted among Kuwaiti university students has suggested that married students have better awareness about sleep hygiene (211). In this study awareness of sleep hygiene was not assessed, however, married students appeared to have better sleep hygiene practices, yet the difference between the SHI scores was not statistically significant. Furthermore, the effect of marital status on sleep quality disappeared after accounting for other variables in the multiple logistic regression analysis.

In the current study age was identified as an important factor which significantly predicted sleep hygiene, such that older university students (> 23 years) were more likely to have better sleep hygiene. This is comparable with the findings of previous research which indicated that younger individuals have less awareness about sleep hygiene and often tend to adopt unhealthy sleep habits (236,237). However, like in previous studies, this study also failed to find a significant correlation between sleep quality and age (90,118). In contrast, a study that was conducted among medical students identified age as a significant predictor of sleep quality and indicated that the probability of poor sleep quality increases with age (215). Therefore, the effects of age on sleep quality remains to be a controversial issue.

No significant difference in sleep quality scores was identified for nationality and marital status variables. Likewise, sleep hygiene scores for different nationalities, marital status and gender categories were not found to be significantly different. The effects of college and sociodemographic variables on sleep quality were all diminished after accounting for other variables in the multiple logistic regression. After putting all other factors into consideration, sleep hygiene was the only variable that continued to have a significant effect on sleep quality. The findings indicated that each of the different sociodemographic variables including college contributed to less than 2% of the variance seen in sleep quality. In contrast, sleep hygiene alone was responsible for around 7% of the change seen in sleep quality with odds ratio of 3.82; suggesting that individuals with good sleep hygiene are approximately 4 times more likely to have good sleep quality.

5.2.1. Strengths and limitations

Up to our knowledge, this study is the first in Qatar exploring sleep hygiene practices of university students. The findings helped in clarifying some of the unknowns about the prevalence of poor sleep quality among university students in an Arab country and described some of the most common sleep habits in this population. This study found that poor sleep quality was highly prevalent and affected more than two-thirds of the university students. Similarly, poor sleep hygiene practices were common among these students. Importantly, sleep hygiene was identified as the single most important factor that influences sleep quality.

Nevertheless, this study has some limitations which includes not assessing

students' knowledge and beliefs about sleep and sleep hygiene which could influence their behaviors and habits. The second limitation is related to missing to stratify students according to the year of study which was not done because there is little evidence in the research about the effects of the year of study on sleep quality. Additionally, using proportionate sampling technique was not feasible in this study, however, using the universal sampling technique the resulting proportion of students per college in the sample studied was found to be comparable to the proportion of students per college registered for that academic semester. Moreover, due to time limits it was not possible to assess other reliability and validity measures for the newly translated sleep hygiene instrument, yet this could be done in future projects. This tool is available to be used in other Arabic speaking populations.

5.2.2. *Recommendations for future research*

There is a need to spread awareness among university students on sleep problems and their consequences. Therefore, it is recommended to launch awareness campaigns focused on educating students on sleep, sleep hygiene and optimal lifestyle habits which would help in improving sleep quality. This intervention needs to be provided to all QU students and should be reinforced every year with the entry of new students to the university. A meta-analysis has previously shown that sleep hygiene education improves different sleep parameters including sleep onset latency (by 5 minutes) and total sleep time (by 25 minutes). This intervention was also found to significantly improve sleep quality and insomnia severity as it reduced PSQI score by 3 points and the ISI Score by 2 points (65). The implementation of this campaign

should be followed by conducting further research to explore the impact of this intervention on students' knowledge about different aspects of sleep and their practice of healthy sleeping habits. Furthermore, ways for managing students' sleeping problems through the provision of psychological services by professionals in university should be explored. Such services could be provided by the Student Counselling Center in QU which currently provides psychological and emotional support for students.

5.2.3. Conclusion

In conclusion, insomnia and poor sleep quality affects the majority of QU students and is associated with excessive daytime sleepiness. Most of QU students also have inadequate sleep hygiene practices. College, marital status, gender and sleep hygiene significantly influenced the sleep quality. After controlling for other variables, sleep hygiene effects remained significant and students with good sleep hygiene practice were 4 times more likely to have good sleep quality.

5.3. Phase 2: Healthcare providers' perspective and experiences with insomnia management at primary healthcare centers in Qatar

This phase of the study has helped in shedding the light on HCPs perspectives and experiences with insomnia at PHCCs in Qatar. This is the first study in Qatar exploring the diagnostic and management approaches for insomnia, in an effort to identify important gaps in the provision of insomnia care to patients accessing primary care services.

Overall, HCPs viewed insomnia as a relatively common problem which they deal with on daily basis in their practice. Insomnia presentations appear to be particularly common among elderly patients, teenagers and individuals with chronic diseases or mental illnesses. It is well known that elderly people are often more susceptible for insomnia which often coexists with other of chronic illnesses such as physical disabilities, respiratory problems and depressive symptoms (38,238). Since primary healthcare corporation is the main provider of care for the management of chronic diseases in Qatar, insomnia related to chronic illnesses is expected to be common among PHCCs' attendants (239). This finding is consistent with the characteristics of insomnia patients reported previously from PHCCs in other countries, which confirms that this is a universal problem which is not likely to be affected by culture (191,198). Additionally, the observed prevalence of insomnia among adolescents and high school students is specifically linked to the physiological changes and psychological problems which are common in this age group (240,241). The academic workload coupled with the psychological stress associated with transition to adulthood and early school schedules compromises sleep quality and quantity in this population (240,242).

The emerging themes from the HCPs interviews highlighted the importance of insomnia as a health problem which requires management at primary care. Overall, it was evident that HCPs recognized the detrimental consequences of sleep deprivation including its effects on daytime performance and productivity. It was suggested that patients often seek out medical attention when they feel that their sleep problem is affecting their lives or when their attempts to manage the problem on their own fails. This was also shown in previous studies which suggested that patients consult their HCPs about insomnia when its effects on their lives become evident (195,199). These findings highlight the need for enhancing public awareness about the importance of sleep and the key indicators of sleep problems for which patients need to seek medical attention. Therefore, PHCCs could play an important role in improving public's attitudes towards sleep by providing routine sleep health education.

However, there was also some a sense of dissatisfaction with the amount of attention insomnia complaints were currently getting at PHCCs. Perceptions that both, some HCPs as well as some patients, did not take insomnia seriously emerged from these interviews. Similar reports have been observed in other studies, reporting that patients were not satisfied with the current approach for insomnia management and suggesting that they often felt that their sleep complaints were not taken seriously by HCPs (199). From their experience, HCPs suggested that patients usually come with complaints of tiredness, headache, dizziness or lack of concentration while other complain of their inability to have good sleep. However, it was harder for pharmacists to spot insomnia patients probably because they usually do not receive complaints about sleep problems from patients. Previous research studies have shown that patients tend to hide their sleep concerns and avoid disclosing them even to physicians, thus routine

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assessments and queries on sleep by HCPs including pharmacists should occur along with regular questioning about lifestyle habits which affects health in primary care settings (15,48,192,193,243).

HCPs generally perceived insomnia as a symptom of an underlying problem which could be either physical, psychological or medication related. In this study the interviewees predominantly linked insomnia to anxiety and depression. It was also suggested that depression and anxiety are responsible for around 50% of the insomnia cases seen in practice (53). As a matter of fact, depression and anxiety are known to be the two most common mental health problems at PHCCs in Qatar affecting up to 36% of Qatari patients (68,244). These findings are also consistent with those derived from similar studies which suggested that HCPs at primary care settings usually considered insomnia to be secondary to another problem and often stress on the importance of identifying the cause of insomnia (191,195,198,199). As a result, the treatment of the perceived cause of insomnia appears to be the priority, while insomnia itself may be left without being addressed until later stages in the management process.

This attitude towards initiating insomnia management seems to be a common practice in primary care settings as studies from other countries (Australia and the UK) have also reported that HCPs prefer to treat the perceived cause of insomnia first (191,195,198). However, this practice is not supported by evidence from the literature as it was shown that traditional treatments of depression often fail to resolve insomnia symptoms in up to 50% of the patients (245). Moreover, baseline insomnia was identified as a significant predictor of improvement in psychiatric illnesses after therapy while subjective sleep quality predicts the risk of depression recurrence (245,246). The current practice is also against the directions of the latest insomnia

guidelines which abandoned the old primary/secondary classification of insomnia and recommended treating insomnia as an independent health problem (10,13). Some studies have even suggested that treating insomnia first could be beneficial in preparing patients for further treatment of the comorbid psychiatric illness (247). Therefore, this indicates that the currently followed treatment approach in PHCCs which depends on treating comorbid conditions only is not optimal and opposes the evidence in the literature.

Furthermore, the interviewees indicated that routine mental health assessments were performed for all patients attending PHCCs. This suggests that they probably perceived that the diagnosis of mental illnesses would facilitate the identification of insomnia cases. HCPs also believed that physicians were provided with adequate training to deal with mental illnesses but highlighted the need for additional training on sleep medicine and insomnia management. This is consistent with the recommendations of previous studies which also identified the need for enhancing HCPs knowledge and skills in insomnia diagnosis and management (195). It is worth mentioning that many of the PHCCs' staff have received mental health training in preparation for the identification of mental illness (75).

The HCPs interviewed also acknowledged that sleep habits and social factors could contribute to the development of insomnia. It was suggested that some poor sleep hygiene practices including late sleeping time and daytime sleeping were normalized by culture and due to that they were often acceptable. Similarly, other habits such as stimulants consumption at night were also considered to be common among insomnia patients. This was also shown in previous research studies which suggested that differences in sleeping habits between different countries, races and ethnicities could

be explained by the cultural differences (248–250). Yet, the extent of Arabic culture's influence on sleep habits has not been explored previously.

There was a consensus among HCPs in this study that insomnia management should be initiated at primary care settings which were believed to be qualified to manage simple insomnia cases. However, a predominant sense of lack of preparedness was also detected among the HCPs interviewed. This was mainly related to the lack of knowledge and resources including guidelines, training, and medications to help with insomnia management. Therefore, referral to specialized institutions such as the mental health hospital was a preferred option for most HCPs, especially for complicated insomnia cases that fail to respond to the initial therapy. The referral was also recommended to provide patients with the chance of meeting a specialist who could do further assessment and prescribe insomnia specific treatments which are not available at PHCCs. In contrast, referral to specialized institutions was not common among Saudi physicians despite their reported poor knowledge of sleep problems' management (251). These findings highlight the need for professional training on the importance of screening for sleep problems and the recommended management strategies.

Some physicians also indicated that they refer their patients internally to the mental health clinics which were recently opened at PHCCs to receive CBT. The mental health clinic is run by a psychiatrist who comes once weekly to meet patients referred to the clinic. Additionally, some PHCCs now have a support clinic which is run by a team that consists of a psychologist and a social worker who provide patients with psychological therapy including rehabilitation to enable them to function optimally within the community (75). Yet, many of the HCPs interviewed were unaware about the availability of this service, which suggests that more work is needed to spread the

awareness about mental health services among HCPs working at PHCCs. On the other hand, those who knew about the service thought that it was useful as they perceived that it may help in reducing the stigma associated with mental illnesses. Interestingly, studies from primary care practices in Australia and the UK have also suggested that physicians rarely refer their patients to receive behavioral therapy at specialized clinics (e.g. sleep clinics or mental health clinics) (195,198). The few referrals to these clinics mostly involved individuals with sleep apnea or comorbid psychiatric illnesses (58). To enhance the utilization of mental health services available at PHCCs it is recommended to familiarize HCPs with the role of these clinics in the management of mental disorders including psychological and behavioral therapies available through lectures, posters and flyers.

The identification of sleep problems could happen during the history taking process, as some of the HCPs indicated that they might ask briefly about sleep as part of their general patient assessment. History taking is also important to help in determining the underlying cause of insomnia (252). HCPs acknowledged the importance of building a rapport with patients before asking about sleep. This was mainly because questions about sleep and lifestyle could be too personal for some patients; especially that sleep problems are often linked to mental illnesses. Other HCPs suggested that discussing sensitive issues with patients might require more than one appointment (199).

It was suggested that the identification of insomnia in patients attending PHCCs might be difficult due to the absence of reliable diagnostic tools and questionnaires for insomnia assessment in clinical practice. Due to that, the assessment of insomnia is not part of the routine practice at PHCCs and is only explored if sleep problems were

suspected. Lack of screening services and resources for sleep problems has also been reported in other countries such as Australia and Saudi Arabia (191,251). The current health assessment practices followed at PHCCs often fail to identify insomnia patients and were found to be less effective than validated instruments in diagnosing insomnia (253,254). Diagnostic tools are important to provide HCPs with standardized criteria for insomnia assessment and diagnosis thus, eliminating subjective differences in the diagnostic process. Other studies from primary care have also recommended the incorporation of simple diagnostic instruments such as the ISI into the routine history taking conducted by primary care physicians (191). The evidence available also suggests that the accuracy of insomnia assessing questionnaires is comparable to that of polysomnography (255). Regular integration of these tools into the assessment process would help in the early recognition of sleep complaints, which in turn may improve individual's health, cognitive function and quality of life hence avoiding deterioration to chronic insomnia (256).

HCPs reported that medications specifically indicated for insomnia treatment were not available at PHCCs in Qatar, and that other classes of psychiatric disorders' medications including antidepressants and anxiolytics were often dispensed for insomnia patients. Interestingly, the interviewees were generally satisfied with the treatment options available at PHCCs as they believed that hypnotics should only be available at more specialized health institutions. This finding supports the notion that HCPs' view insomnia as a symptom which could improve if the underlying cause was treated, but also suggests that there is suboptimal insomnia management as some participants indicated that they prefer using antidepressants or antipsychotics for insomnia management. Despite the fact that these agents are not approved for insomnia

treatment and most guidelines do not recommend their use, as the benefits of these agents do not outweigh the associated risks including side effects (191).

Overall, HCPs interviewed expressed hesitance about prescribing and dispensing hypnotics, and suggested that prescribing authority for these agents should only be granted to individuals with enough knowledge and experience in dealing with these medications. In addition, many HCPs believed that medications were not the solution for insomnia, and only worked as a quick fix without lasting effects. HCPs were also specifically worried about the safety of hypnotics which are also known to cause dependence and tolerance (195). This was consistent with the findings of previous studies which reported that HCPs often hold negative perceptions on the use of hypnotics for insomnia management (191,195,198,257,258).

Due to the lack of hypnotics at PHCCs, some HCPs indicated that other medications including antidepressants and antihistamines were often prescribed for transient insomnia. Other studies have also shown that some HCPs prefer prescribing sedative antidepressants because of the perceived safety with long term use as compared to hypnotics (191,258). While others were not comfortable with the use of these medications (i.e. antidepressants and antihistamines) for insomnia because they were not approved for this indication and due to lack of evidence on efficacy in the literature. This contrasts with the findings of a study from the UK which indicated the preference of antihistamines for insomnia management due to the safety of these medications (258). It was previously reported that HCPs expect that patient coming with a sleep complaints to have tried other simple treatment options and therefore might feel obliged to prescribe medications (199). Generally, HCPs in this study were aware that pharmacological therapies should be used for short term only.

However, there were also concerns raised regarding the limited medications available at PHCC to treat insomnia and was viewed as problematic for patients who will need to go through the lengthy referral process before they can get appropriate treatment. Consistent with findings from similar studies, some of the interviewed HCPs indicated that prescribing hypnotics was a direct result of patients' pressure and demand for medications, and highlighted the need for regular follow-ups with insomnia patients to monitor their response to therapy (191,195,198,257). However, maintaining regular follow-ups was perceived to be difficult since most patients come looking for a quick solution and many of them do not return after referral to specialized institutions. These findings, coupled with the prescribing hesitancy described above, further highlight the need to develop local clinical guidelines that include patients' treatment expectations for improving physicians' therapeutic skills at PHCCs.

Among the HCPs interviewed, there was a predominant preference for the use of non-pharmacological therapies for managing insomnia, in particular, sleep hygiene education. The preference for non-pharmacological therapies for insomnia management seems to be a common treatment pattern in primary care settings (191,195,198,254). Previous studies have consistently shown that HCPs at primary care usually provide advices related to healthy sleep habits while medications are used only when non-pharmacological therapies are not effective (195). However, some physicians from previous studies expressed their concerns about patients' acceptance of sleep hygiene advices as some worried that patients may perceive that their physicians are not taking their complaints seriously, while others doubted that their patients would follow sleep hygiene recommendations (195,199). Studies from primary care settings are collectively suggesting that behavioral therapies are more efficacious

for insomnia management than sleep hygiene alone (259). One study in particular has shown that 6 weeks of CBT-I was sufficient to treat insomnia in 88% of patients who received the therapy (200). Likewise, A meta-analysis of 22 trials which evaluated the effects of CBT-I on insomnia management concluded that of CBT-I delivery for 4-6 weeks helped in improving almost all sleep outcomes including sleep quality (63). CBT for insomnia was proven to be effective not only in treating sleep problems but also in improving symptoms of comorbid psychiatric illnesses (200,247,260,261). Additionally, CBT-I reduces the need for sleep medications as compared to sleep hygiene alone (200,261). These findings suggest that the efficacy of sleep hygiene alone is limited, and that CBT-I is more effective for insomnia management.

However, there was an overall perception among HCPs in this study that CBT-I, despite being the first line treatment for insomnia according to most guidelines, is rarely used in practice; a finding that has also been consistently reported in the literature (10,11,13,191,195). Only few of the HCPs referred their patients to the support clinic where CBT services are offered by a certified psychologist, simply because many of them were unaware about the availability of this new service, a finding that was also reported in a previous study (75). Inadequate knowledge about insomnia treatments and guidelines' recommendations may also be responsible for the suboptimal utilization of this service (195). These findings suggest that the development of local policies to guide insomnia management should recommend the use of sleep hygiene not as a monotherapy but rather as a component of other more effective behavioral therapies such as CBT-I. One benefit of the CBT-I, as reported by patients, is that it enables deeper understanding of sleep hygiene and helps people in changing their old habits though trying different techniques until they find the best approach for them

(262).

The themes that emerged in regards to the HCPs' perceptions of their role in insomnia management were mostly in line with traditional practice models by which insomnia's assessment, diagnosis and treatment were considered the physicians' role, and medication dispensing along with some counselling were regarded as the role for pharmacists. This was also reported in other studies, indicating that primary care settings being the first point of contact with the healthcare system, patients often tend to discuss their sleeping problems with physicians rather than pharmacists (194). However, previous studies have also reported that pharmacists often thought that physicians were not spending sufficient time educating their patients about healthy sleep or on the adequate use of hypnotic (198). In this study it was also suggested that physicians should have a greater role in providing non-pharmacological treatment options for insomnia patients. Pharmacist respondents highlighted that they respond to questions mostly from physicians about drug specific information including availability, efficacy, safety or the choice of therapy in specific clinical situations. However, pharmacists perceived consultations relating to insomnia management were generally rare at their practice sites. Nevertheless, there is still a potential role for pharmacists in the detection and management of sleep problem especially those involving medications. Research in other countries have shown that pharmacists could be trained to contribute to the detection, management and promotion of public awareness regarding insomnia (263,264). Pharmacists involvement in screening of patients with sleep complaints would help in the early identification of insomnia patients who would then be referred to physicians for in-depth assessment and treatment. Pharmacists from a previous study indicated that they often refer their

patients with sleep complaints back to physicians for further assessment and management (198). Expanding the pharmacists' role would also help in reducing the workload on physicians at primary care, thus giving them with more time to spend with patients having serious health problems.

Pharmacists indicated that they have several opportunities which they could use to identify sleep problems and manage them. The most common opportunity of interaction between pharmacists and patients is during medication dispensing in which pharmacists could identify drug related problems. Medication related problems affecting sleep could also be identified during the intensive medication reconciliation process in which the pharmacists engage with patients to take their medications' history. When such problems are identified, pharmacists contact physicians and recommend modifying the treatment regimen. pharmacists also address patients' questions relating to the safety of medications including issues about the dependence and withdrawal syndrome. Addressing patients' concerns and solving their drug related problems could contribute to enhancing the patients' medication adherence and improving their treatment outcomes.

Interestingly, it was suggested that pharmacists could also play a role in addressing patients' concerns and supporting them psychologically while dispensing medications. Additionally, some patients may develop a trusting relationship with a specific pharmacist with whom they discuss their problems and concerns. Considering the short duration of interaction between pharmacists and patients at PHCCs, it seems surprising that a relationship could be developed. However, it was suggested that mutual personal disclosure between patients and HCPs plays an in important role in building trust between the two. This could happen during short conversations through

which the patient connect with pharmacists on a personal level and as a result opens up to them (265). In fact, patient's perceptions of their pharmacists' trustworthiness influences their willingness to collaborate and share personal information (266). It was also noted that patients' satisfaction with pharmacists' expertise is also influenced by the relationship quality and the level of trust in the pharmacist. This suggests that patients who trust their pharmacists are more willing to discuss sensitive issues with them and tend to view their pharmacists as competent and knowledgeable. Studies from primary care settings in Qatar showed that patients view pharmacists as a reliable source for medication related information but they did not expect them to have a role in the management of their health problems (267). Additionally, most patients indicated they trusted physicians more than pharmacists and therefore they mostly consulted physicians for drug related questions (267,268). The lower trust in pharmacists could be related to lack of public's awareness of the broader role of pharmacists in the healthcare system which extends beyond medication dispensing to the provision of patient care. Also, the current system in PHCCs in which pharmacists only dispense medications prevents patients from having meaningful interactions with pharmacists.

It is worth noting that pharmacists frequently talked about physicians' role during their discussion of insomnia management while physicians rarely discussed the role of pharmacists in relation to insomnia treatment. These findings suggest that overall, physicians in Qatar support more traditional roles for pharmacists. This was also reported in a previous study conducted at a primary care setting in Qatar which discovered that physicians often perceived pharmacists' role to be limited to medication counselling and checking for prescription accuracy, rather than involving any consultative role relating to optimization of patients' drug therapy (269). In another

study physicians indicated that pharmacists' role should not exceed responding to drug related questions and patient education (198). These observations may also help in explaining the low number of consultations reported by pharmacists in this study.

HCPs interviewed identified several challenges which limit their ability to manage insomnia adequately in PHCCs. One of the important challenges identified was related to the lack of time, as both physicians and pharmacists agreed that the amount of time they spend with patients is often not enough to address sleep problems, a finding that was also reported in previous studies (198,199). As a result, insomnia may not be discovered and managed appropriately leading to the development of chronic insomnia which is more difficult to treat. One of the proposed solutions for this problem was to increase the duration of the appointments for patients presenting with sleep complaints. This problem could also be addressed by delegating some of the physicians' duties to other healthcare professionals (e.g. pharmacists, nurse or health educator) as part of a new service model that targets patients with complicated disease conditions including insomnia. Additionally, assigning the medication dispensing duties to pharmacy technicians would give the pharmacists more time to provide clinical services (e.g. medication history taking, identification of drug related problems and patient counselling) for the management of various health conditions (270).

Pharmacists also indicated that their opportunity for managing insomnia in the pharmacy is often limited by the lack of privacy. This was also identified in a previous study in which pharmacists suggested that their work environment prevents them from providing optimal care for insomnia patients (198). This was also supported by the findings of a study that was conducted in Qatar in which patients indicated that lack of privacy at the pharmacy was one of the barriers that prevented them from asking

questions (267). Despite the availability of consultation rooms in some healthcare centers, only few patients are referred to these rooms. Referrals are mostly restricted to patients with complex medication regimens and multiple comorbidities, thus excluding a wide range of insomnia patients who might not fit in this category. Importantly, pharmacists acknowledged the need for additional patient education in relation to sleep problems.

Furthermore, pharmacists' contribution to the management of insomnia was often limited due to their worries about crossing the professional boundaries with physicians. Pharmacists believed that physicians had the lead role in the management of insomnia at PHCCs and felt that their advices and consultations might be considered as an additional and unnecessary intervention. Nevertheless, the collaboration between pharmacists and physicians is necessary to enhance patients' treatment outcomes. In fact, the interprofessional collaboration between physicians and pharmacists at primary care settings could help in improving the identification and management of insomnia. Particularly, one study reported that the integration of pharmacists into family medicine practice model resulted in the identification of drug related problems in around 94% of the patients assessed (271).

Another important barrier to the management of insomnia which was reported by HCPs in this study was related to the unavailability of guidelines for insomnia in PHCCs in Qatar. This is consistent with the findings of previous studies which recommended developing guidelines for insomnia in primary care settings (191,198). It was also suggested that some physicians may avoid asking about sleep problems due their uncertainty about the optimal treatment approaches for insomnia, especially in the absence of clear guidelines (191). However, the findings have shown that some of the

pharmacists were unaware about the lack of insomnia guidelines in their practice site which suggests that they may not have had the chance to search for these guidelines and use them in practice.

A direct result to the lack of insomnia guidelines is the variability in the management approaches between different HCPs which increases the chance of using inappropriate treatments which could be ineffective. This was evident in the present study, in which the lack of evidence-based guidelines resulted in the frequent use of medications not known to be effective for insomnia, whereas the first line treatment for insomnia, CBT-I, which is proven to be effective was rarely recommended. Additionally, insomnia might be perceived as being unimportant problem by some HCPs due to the absence of local treatment policies, which could result in prioritizing the management of other health problems leading to insomnia deterioration. Thus, the introduction of clear guidelines focusing on the latest, evidence-based approaches for insomnia assessment and treatment might help in encouraging the early recognition and treatment of insomnia. Moreover, evidence available emphasized the need for enhancing physicians capacity and skills to provide the required non-pharmacological insomnia therapies in general practice settings (270).

Another important challenge highlighted was related to patients' attitudes and beliefs about sleep problems. Recounting their previous experiences, the HCPs interviewed indicated that insomnia is mostly a hidden complaint and is rarely presented as the chief complaint during patients' presentation. The lack of insomnia reporting by patients at primary care has been repeatedly reported in previous studies (15,48,192,193). Possible explanations for this include patients' view of insomnia as a trivial problem and their fear of linking their sleep problems with mental health issues.

This is consistent with the findings of other studies which reported that patients with insomnia tend to avoid seeking professional help due to their worry about how the society would view them (193). It was also suggested that the stigma against insomnia and mental illnesses influences treatment choices, as some treatment alternatives might be considered invalid because of the stigma associated with them (194,272,273). Stigmatizing beliefs and attitudes against mental illnesses and their treatments are also common among Arabic populations (274). As a result, patients may refuse referral to specialized institutions such as the mental health hospital due to their fear of being labelled as mentally ill individuals by the society. Considering that sleep assessment is not part of the routine medical examination at PHCCs, sleep problems not reported by patients would probably be missed and untreated (191). These findings indicate that patients tend to delay seeking professional help for sleep problems while guidelines are recommending the early recognition and management of insomnia (256). Therefore, it is the responsibility of the healthcare system to account for patients' expectations and experiences while developing guidelines for insomnia management to optimize the patient care (270). Also, HCPs should be encouraged to be more proactive in the assessment of sleep problems which should be done routinely.

Overall, all HCPs interviewed recognized the need for training physicians to prepare them for the diagnosis and treatment of sleep problems. Physicians suggested that this training could be offered as part of their regular CME sessions. The need for HCPs training on insomnia management was also identified in other studies (195,198,251). The findings of this study have consistently shown that physicians are often reluctant to use pharmacological treatments for insomnia and rather prefer offering non-pharmacological management in the form of sleep hygiene education.

However, patients were only given counselling on sleep hygiene and not CBT-I. Some HCPs also expressed their uncertainty about the effectiveness of CBT when used for insomnia treatment. These findings suggest that despite the perceived benefits of non-pharmacological treatment options, HCPs at PHCCs require additional training and resources to enable them to use these interventions.

Moreover, HCPs recommended opening sleep clinics at PHCCs to improve the management of sleep problems. It was suggested that these clinics should be managed physicians specifically trained in sleep medicine. Sleep health education currently provided for health sciences students seems to be insufficient worldwide and in Arab countries, therefore there is a need to focus on improving sleep related content of health sciences' curricula to enhance the awareness of future HCPs about the importance of sleep problems and their management (275–277).

5.3.1. Strengths and limitations

Insomnia and its management have not been explored in sufficient detail in previous studies conducted in Qatar. To our knowledge, this is the first qualitative study in the published literature that has been undertaken to investigate the perspectives and experiences of HCPs with insomnia management in Arab countries. The study has helped in clarifying the current approaches for management of sleep problems at primary care settings and highlighted important gaps and practice barriers which may limit how insomnia is prioritized and managed in primary care.

This study has also included a diverse group of healthcare providers from various PHCCs including individuals with additional mental health qualifications (i.e.

psychiatrist) and training. The number of participants included in the study was enough to achieve the saturation. Moreover, exploring the perspectives of two professions within the primary care setting has helped in viewing the insomnia problem from two different perspectives, enabling the comparison between the perceptions and roles of the two different healthcare professionals.

Another strength of this study was related to the coding process, which was done by one researcher, thoroughly reviewed together with a second researcher and then reached consensus through discussion with a set of three researchers. However, this study is limited in that patients' perspectives of insomnia and their experiences with treatment were not explored and only HCPs points of view were described. Additionally, perspectives of community pharmacists who are easily accessible by members of the community were not included in this study due to time constraints. Since this study is qualitative, the findings are not in any way generalizable and only represent the perspectives of the sample interviewed.

Another potential limitation to this study is related to the interviewer bias, as it expected that the interviewer's perceptions and expectations might have influenced the way of asking questions and guiding the interview. However, considering that all the interviews were conducted by the same researcher, the effect of this factor was probably uniform throughout the interviews.

5.3.2. Recommendations for future research

This study has helped in clarifying how HCPs at PHCCs manage insomnia and identified the barriers they face in their practice. However, future investigations

utilizing quantitative methods would provide more objective information in regards to the prevalence of insomnia at PHCCs, the associated risk factors, and specific management strategies for insomnia. The findings of this study suggested that many insomnia patients are referred to secondary institutions, therefore conducting future studies to investigate the management of sleep problems at those institutions can provide a more insight into current pharmacological and non-pharmacological strategies in the management of insomnia in Qatar.

Overall, the interviews conducted highlighted important gaps in the current diagnosis and management approaches for insomnia at PHCCs in Qatar. First of all, the assessment and management of sleeping problems in the current practice is highly variable and depends on HCPs clinical judgment as no clear guidelines are available in these settings. Additionally, HCPs lack confidence in insomnia management at PHCCs primarily because they perceive their knowledge and experience with these issues as insufficient. To improve the management of sleep problem at primary care HCPs should receive adequate training and they should be supported with the development of clear guidelines and the provision of diagnostic tools for insomnia.

Expanding the role of other HCPs (e.g. pharmacists) to be involved in the assessment of sleeping problems and patient monitoring is also important. There is also a need to enhance the collaboration between HCPs and psychologists at PHCCs to facilitate patients' referral for behavioral therapies. Considering the important role of patients in the identification of sleep problems it would be important to enhance the public awareness about the importance of sleep and the consequences of sleep problems through launching campaigns and initiatives focusing on sleep.

5.3.3. *Conclusion*

In conclusion, HCPs in this study viewed insomnia as an important health problem, yet several gaps preventing the adequate provision of insomnia assessment and management at PHCCs in Qatar emerged from the interviews. HCPs appear to be hesitant to prescribe medications and prefer educating patients on sleep hygiene. Additionally, hypnotics are not available at PHCCs and therefore medications not indicated for the management of insomnia are sometimes prescribed. Overall, there was a general sense among HCPs at PHCCs of being inadequately prepared for providing treatments as recommended in guidelines, such as CBT-I, and preference was to refer patients to specialized settings. Time constraints, lack of clinical guidelines and patient attitudes are some of the challenges to insomnia management identified by the HCPs in this study. Developing guidelines for insomnia, training HCPs and implementation of a sleep clinic were some of the suggestions provided to improve the management of sleep problems in PHCCs. Future research is warranted, particularly to explore strategies that can close the gaps in insomnia care that have been identified through this investigation at PHCCs in Qatar.

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APPENDIX A. COMPLETE DATABASE SERACH

Table 1. PubMed (1966- April 2018)

Date	Combination of terms used	Results	Limitations	Results after limitation
28/3	(sleep disorders AND insomnia*) AND (Instrument OR questionnaire OR measure OR scale)	3786	Observational studies, validation studies human studies English Arabic Adults (19-65+)	99
28/3	*(Insomnia OR sleep deprivation) AND (Instrument OR subjective measure OR questionnaire)*	6387	Validation studies Observational studies Human English Arabic Adults (19-65+)	148
7/4	(sleep quality OR dyssomnias OR daytime sleepiness) AND (instrument OR questionnaire OR scale)	23529	Validation studies Human English Arabic Adults (19-65+)	394
7/4	*(Sleep hygiene OR sleep habits OR sleep practices) AND (Instrument OR questionnaire OR measure*)*	3258	Validation studies Observational studies Human English Arabic Adults (19-65+)	40
28/3	(("sleep arousal disorders" OR "sleep disturbance") AND insomnia* OR sleepiness) AND (Instrument OR questionnaire OR scale OR measure)	15989	Validation studies Human English Arabic Adults (19-65+)	135
7/4	("sleep efficiency" OR "sleep dissatisfaction") AND (Instrument OR questionnaire OR scale OR measure)	1480	Validation studies Observational studies Human English Arabic Adults (19-65+)	41
7/4	("sleep disorders" OR " sleep quality" OR " sleep deprivation" OR "sleepiness" OR " insomnia" OR "sleep dysfunction" OR "dyssomnias" OR "sleep arousal disorders") AND (instrument OR tool OR scale OR questionnaire OR survey OR "patient-reported outcomes") AND ("validation studies" OR "psychometric properties")	451	No study limits Human English Arabic Adults (19-65+)	320
Total number of articles = 1,197				

Table 2.	Complete Database search. Embase (1980- April 2018)			
Date	Combination of terms used	Results	Limitations	Results after limitation
26/3	('sleep arousal disorder'/exp OR 'sleep arousal disorder' OR 'insomnia'/exp OR 'insomnia' OR 'sleep quality'/exp OR 'sleep quality' OR 'daytime somnolence'/exp OR 'daytime somnolence') AND ('questionnaire'/exp OR 'questionnaire' OR 'scale'/exp OR scale OR measure) AND ('validation study'/exp OR 'validation study')	204	Diseases: Insomnia, daytime somnolence and sleep disorders Somnolence -Human -questionnaire Validation studies Observational studies -cross sectional -Validation process - Age (young adults to very elderly) Publication type: Articles Conference abstracts Conference papers Reviews	109
27/3	('sleep hygiene'/exp OR 'sleep hygiene' OR 'sleep habit' OR 'sleep practices') AND (instrument OR 'questionnaire' OR scale OR measure) AND 'validation'	26	Diseases: Insomnia, daytime somnolence and sleep disorders Somnolence -Human -questionnaire Validation studies -Instrument validation -Validation process -cross-sectional, retrospective studies Age (young adults to very elderly) Publication type: -Articles -Conference abstracts	7 (alert)

27/3	('sleep habit'/exp OR 'sleep habit' OR 'sleep hygiene'/exp OR 'sleep hygiene') AND ('questionnaire'/exp OR 'questionnaire' OR 'survey'/exp OR 'survey') *The option (search as broadly as possible was selected from the Embase mapping options*)	864 (525 articles from Embase, 116 from Medline) 223 (both)	*Diseases:* Insomnia, daytime somnolence and sleep disorders Somnolence *Study type:* -Human -questionnaire -longitudinal studies -structured questionnaires -cross-sectional, -Prospective studies *Publication type:* All (including conference abstracts, conference papers and review) (except letter and editorials) *Age* (young adults to very elderly)	258 (91 from Embase)
27/3	('insomnia'/syn OR 'sleep quality'/syn OR 'sleep disturbance'/syn) AND 'questionnaire'/syn AND 'validation'/syn	980	*Diseases:* Insomnia, daytime somnolence and sleep disorders Somnolence Drowsiness *Study type:* -Human -questionnaire -validation studies -validation process - Instrument validation -cross-sectional, -Prospective studies *Publication type:* Articles, conference abstracts, conference papers	330 (Alert)
EMBASE Total =706			

APPENDIX B. INTERVIEW GUIDES

Physician's Interview Guide (English version)

Theme: Overall perspective and experience related to insomnia

1) From your experience, please describe the type of insomnia presentations in your everyday practice?

- Approximate number of patients who present with insomnia symptoms every week.

- The proportion of patients for whom insomnia is the primary reason to come to PHCC (how many patients presenting with insomnia as their only problem).

- Proportion of patients who present with different types of insomnia (e.g. transient or persistent/chronic, primary, comorbid, etc.).

- What is your view of insomnia as a medical condition? (Is it an important health problem which must be solved immediately or is it a problem that the patient should manage on their own, there is no need for medical attention?

- What comes to your mind when a patient complains of insomnia?

- In your opinion, should insomnia be managed at primary healthcare centers or at more specialized institutions (e.g. mental health hospital, HMC…etc.)?

Theme: Assessment and diagnoses of insomnia

2) What are the difficulties you face when diagnosing a patient with insomnia at your practice site?

- Is the assessment of sleep problems part of the routine practice at PHCCs?

- How do you diagnose insomnia?

- Do you follow a specific diagnostic algorithms or local guidelines to diagnose insomnia?

- What is your opinion about the usefulness of the guidelines available at your institution? (e.g. Are these guidelines useful for distinguishing between different sleep problems and accurately diagnosing the condition?)

- If no guidelines are available at your center are you aware of any other guidelines?
- If no guidelines are available at your center for insomnia management, what are the reasons for that?

  • Which are the complaints patients present with when they come to see you for insomnia?

• What do you feel makes patients decide to visit a healthcare professional for insomnia complaint?

• What causes of sleep problems do you commonly consider in your assessment of patients with insomnia?

• What strategies do you use to determine the underlying cause?

• From your experience, when a patient presents their sleeping problem along with other complaints (e.g. chronic pain or other medical conditions), how do you prioritize these problems? (e.g. would you manage insomnia first or the medical condition first?)

  - In such cases how often do you decide to treat insomnia first?
  - In what case scenarios do you delay the management of insomnia and for what reasons?

Theme: Treatment Approaches

3) What treatment options do you discuss with your patients?

• What makes you decide to provide a treatment option (pharmacological or non-pharmacological)?

• What is your opinion about the treatment options available for insomnia at your institution?

• What are the challenges you face when treating a patient with insomnia?

• Some medications for sleep problems might be available at HMC pharmacies only. Is it possible for you to prescribe these medications for your patients?

  - What is the process that you follow to prescribe these medications for your patients?

- Do you prescribe medications available in community pharmacies only? (e.g. OTC products, non-prescription products)

- Considering that sleeping problems are common, in your opinion should physicians at PHCCs be given more authority to manage sleeping problems on their own?

- What is your opinion about adding benzodiazepines, Z-drugs and other hypnotics to the PHCC's formulary?

- Is the care provided to patients with sleeping problems continuous (follow-ups with doctors or referral to other healthcare providers e.g. psychologists)?

- When do you decide to refer a patient with insomnia to a different healthcare provider?
  - Who are the healthcare providers available to whom patients could be referred?
  - What is the referral process?
  - Does the referral process move smoothly? (Is the referral to healthcare provider in the same institution or in a different institution?)
  - Approximately how long is the waiting time before the referral to the other healthcare providers?

- What do you know about sleep hygiene? (What are the components?)
  - What is your opinion about the usefulness of sleep hygiene?
  - How frequently do you provide patients who complain of insomnia with sleep hygiene advise?

- What is your knowledge about cognitive behavioral therapy for insomnia (CBT-I)?
  - What are the components of CBT-I?
  - Is this service available at your primary healthcare center? (Who provides the service, when is it provided and proportion of patients with insomnia that receive this service)
  - In your opinion do you believe that you can provide CBT for patients with insomnia? (If YES "how"? If NO, "why not"?)
  - Have you ever referred a patient for CBT for insomnia?

4) Which educational or training needs do you believe are essential for healthcare providers at primary healthcare centers to identify and manage sleeping problems?

Pharmacist's Interview Guide (English version)

Theme: Overall perspective and experience related to insomnia

1) From your experience, could you describe the profile of patients presenting with insomnia complaints?

   - Number of insomnia presentations per week

   - Patient profile: age, gender, other medical conditions

   - Which type of concerns do patients with sleeping problems voice when they come to the pharmacy

   - In your opinion, what makes the patient decide to visit a healthcare professional to discuss sleeping problems? (Health beliefs, Self-help tried, Impact on lifestyle, Work, Relationships, Safety, Feelings, Other people like the family, Expectations)

2) What is your view of insomnia as a medical condition? (Is it an important health problem which must be solved immediately or is it a problem that the patient should manage on their own, there is no need for medical attention?)

   - What comes to your mind when a patient complains of insomnia?

   - In your opinion, should insomnia be managed at primary healthcare centers or at more specialized institutions?

     - Is it an important health problem which must be solved immediately or is it a problem that the patient could manage it at home?).

     - How serious is insomnia as a condition?

     - Should sleep problems receive more attention from healthcare professionals?

Theme: Treatment approaches

3) In general, what do you know about the treatment approaches for insomnia?

4) What are the available treatment options for insomnia management at you setting? (Pharmacological treatments and Non-pharmacological means of therapy).

- What is your opinion on the variability of treatments available for insomnia management at your center?
- Are the treatments available at your center enough or is there a need for adding more treatments for patients suffering from insomnia?
- Sleep medicines such as Z-drugs and BDZs are not included in PHCC formulary, as a pharmacist and a healthcare provider what is your opinion on that?
- Some of OTC treatments for insomnia (melatonin, herbal products such as valerian) are not included in PHCC formulary (2017), in your opinion what is the reason for that?
  - Do you think including these medications in the formulary might help some patients?
  - What is your opinion about these medicines, are they effective, necessary?
- Which are the most common treatments that physicians recommend for managing insomnia at your site? (including pharmacological and behavioral)?

5) What do you know about sleep hygiene? (What are the components?)
- What is your opinion about the usefulness of sleep hygiene?
- How frequently do you provide patients who complain of insomnia with sleep hygiene advise?

6) What do you know about cognitive behavioral therapy for insomnia (CBT-I)?
- What are the components of CBT-I?
- Is this service available at your primary healthcare center? (Who provides the service, when is it provided and proportion of patients with insomnia that receive this service).
- In your opinion do you believe that you can provide CBT for patients with insomnia? (If YES "how"? If NO, "why not"?).
- Have you ever referred a patient for CBT for insomnia?

Theme: Pharmacist's role in the management of insomnia

7) What type of consultations do you receive from other health care providers regarding managing sleeping problems? (e.g. drug information, management strategies, side effects of medications).

   - How commonly do you receive such questions?
   - If the questions relate to medication, are these most often regarding those for treating sleeping problems or those that cause/worsen sleeping problems).

8) Have you ever done an intervention related to a sleep medicine? (e.g. Consulted a healthcare provider on removing a medication that worsens sleep, consulted a healthcare provider on adding a medication to manage a sleep problem).

9) Have you ever referred a patient with insomnia complaint to a different healthcare provider for further assessment or treatment?

10) What are the counselling points you provide to a patient complaining of insomnia? (e.g. Side effects, indication, other medications, etc.)

   - On average, how often do you provide counseling on sleep medications in a week?

11) What type of counseling do you mostly provide?   (e.g. Sleep hygiene, Cognitive behavioral therapy, medication usage, medication side effects, alternative medicine, natural products…etc.)

12) What are the guidelines available on sleep medicine at your site?

   - If available, how useful are these guidelines?
   - If not available, are you aware of any other local or international guidelines on insomnia management?
   - If not available, in your opinion what is the reason for that?
   - Cases of insomnia are not common?
   - Insomnia is not a serious health problem?
   - Patients are expected to manage these problems elsewhere (e.g. at home, community pharmacies)?

13) Which educational or training needs do you believe are needed for healthcare providers at primary healthcare centers to identify and manage sleeping problems.

Physician's interview guide (Arabic)

دليل مقابلة الأطباء

الموضوع: خبرة الطبيب مع الأرق و وجهة النظر العامة لهذه المشكلة

1) من خبرتك، صف لنا طبيعة حالات الأرق التي تراها خلال ممارستك اليومية لمهنتك ؟

- العدد التقريبي للمرضى الذين يحضرون مع أعراض الأرق أسبوعيا.

- نسبة المرضى الذين يكون الأرق هو السبب الرئيسي لزيارتهم المركز الصحي (كم عدد المرضى الذين يعانون من الأرق فقط؟).

- نسبة المرضى الذين يأتون مع أنواع مختلفة من الأرق (على سبيل المثال:أرق مؤقت، أرق المزمن، أرق غير مصاحب لأمراض اخرى، أرق مضاحب لأمراض اخرى... الخ) .

- كيف ترى الأرق كحالة مرضية؟ (هل تعتبرها مشكلة صحية هامة يجب أن تتم معالجتها فورا ، أم هل تعتقد أنها مشكلة يستطيع المريض حلها بنفسه دون الحاجة الى تدخل طبي ؟

- ماذا يتبادر الى ذهنك عندما يشكو مريض ما من الأرق ؟

- برأيك هل يجب أن تتم معالجة حالات الأرق في مراكز الرعاية الصحية الأولية أم في المؤسسات الأكثر تخصصا (على سبيل المثال: مستشفى الطب النفسي، مؤوسسة حمد الطبية...الخ) ؟

الموضوع: تقييم وتشخيص حالات الأرق

2) ما هى الصعوبات التى تواجهها عند تشخيص مريض ما بالأرق في مكان عملك؟

- هل السؤال عن مشاكل النوم و تقييمها جزء من الفحص المعتاد للمرضى في مراكز الرعاية الصحية الأولية؟

- كيف تشخص عادة حالات الأرق؟

- هل تتبع عملية تشخيصية معينة أو تستعمل الارشادات المحلية لتشخيص الأرق؟

- في رأيك، ما مدى الاستفادة من الارشادات العلاجية (treatment guidelines)الموجودة في مؤسستكم؟(على سبيل المثال: هل هذه الارشادات مفيدة للتمييز بين مشاكل النوم المختلفة و التشخيص بدقة).

- اذا لم تكن هناك ارشادات متوفرة في المركز الذي تعمل به، هل تعرف أي ارشادات اخرى؟

- اذا لم تكن توجد ارشادات لتشخيص وعلاج الأرق في المركز الذي تعمل به، ما هى أسباب ذلك؟

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- ماهي الشكاوي المعتادة التي تتلقاها من المرضى عندما يأتون لعلاج مشكلة الأرق؟

- برأيك مالذي يجعل المرضى يقررون زيارة متخصصي الرعاية الصحية (الأطباء و الصيادلة) عندما يعانون من الأرق؟

- ما هى أسباب مشاكل النوم التي تضعها في الاعتبار عادة عند فحص المرضى الذين يشكون من الأرق؟

- ما هى الاستراتيجيات التى تستخدمها لتحديد السبب الكامن وراء مشكلة الأرق؟

- من خبرتك، عندما يفصح لك المريض عن معاناته من مشكلة الأرق بالاضافة الى مشاكله الصحية الأخرى (مثلا: الالام المزمنة او الحالات المرضية الأخرى)، كيف تقرر أولوية علاج هذه المشاكل؟(مثلا: هل تعالج مشكلة االأرق أولا أم تقدم علاج المشاكل الصحية الأخرى على علاج الأرق)؟

  - وفي مثل هذه الحالات تقريبا كم هي عدد المرات التي تقرر فيها معالجة الأرق اولا؟
  - ما هي الحالات التي تقرر فيها تأخير علاج مشكلة الأرق ولماذا؟

الموضوع :الطرق العلاجية

3) ما هى خيارات العلاج التي تناقشها مع مرضاك؟

- ما الذي يجعلك تقرر اختيار علاج معين (علاج دوائي أو غير الدوائي)؟

- ما رأيك تنوع الخيارات المتاحة لعلاج الأرق فى مؤسستكم؟

- ما هى التحديات التى تواجهها عند علاج مريض الارق؟

- بعض أدويةعلاج الأرق متوفرة فى الصيدليات التابعة لمؤسسة حمد الطبية فقط. هل من الممكن بالنسبة لك أن تقوم بوصف هذه الأدوية لمعالجة مرضاك؟

  - ماهي الخطوات التي يجب أن تتبعها لوصف هذه الأدوية لمرضاك؟

- هل تقوم بوصف الأدوية المتوفرة في الصيدليات الخارجية (الصيدليات المجتمعية) فقط؟ (مثل: الأدوية التي يمكن أن تعطى بدون وصفة طبية(OTC medicines)...الخ).

- باعتبارحقيقة أن مشاكل النوم شائعة، برأيك هل يجب أن يمنح الأطباء في المراكز الصحية الأولية السلطة لمعالجة

أمراض النوم بأنفسهم ؟

- ما رايك في اضافة بعض أنواع الأدوية المنومة(على سبيل المثال: الـbenzodiazepines وZ-drugs وغيرها من المنومات الى قائمة أدوية المراكز الصحية الأولية؟

- هل الرعاية المقدمة للمرضى الذين يعانون من مشكلات النوم متواصلة (بمعنى: المتابعة مع الأطباء أو الاحالة الى مختصين مثل الأخصائيين النفسيين)؟

- متى تقرر احالة مريض الارق الى أحد متخصصي الرعاية الصحية الاخرين ؟

- من هم مقدمي خدمات الرعاية الصحية الذين يمكن تحويل المرضى اليهم؟
- كيف تتم عملية تحويل المرضى؟
- هل تم عملية تحويل المرضى بسلاسة ؟ (هل يتم تحويل المرضى الى مقدمي الرعاية الصحية في نفس المؤسسة او في مؤسسة مختلفة؟)
- كم تقريبا وقت الانتظار قبل تحويل المرضى الى موفري الرعاية الصحية الاخرين؟

• ماذا تعرف عن نظافة النوم (عادات النوم الصحية)؟ما هي مكوناته؟
  - في رأيك مامدى فائدة عادات النوم الصحية؟
  - هل تعطي عادة نصائح متعلقة بعادات النوم الصحية للمرضى الذين يشكون من الأرق(ما عدد المرات)؟

• ما مدى معرفتك عن العلاج السلوكي المعرفي للأرق ؟
  - ما هي مكونات العلاج السلوكي المعرفي للأرق ؟
  - هل هذه الخدمة متوفرة في مركزك الصحي ؟(من يقدم الخدمة، ما نسبة المرضى المصابين بالأرق الذين يتلقون هذه الخدمة).
  - برايك هل تعتقد ان بامكانك توفير خدمة العلاج السلوكي المعرفي للمرضى الذين يعانون من الأرق) ؟اذا كانت الاجابة نعم" كيف"؟ اذا لم يكن ذلك ممكنا" لم لا؟"
  - هل قمت من قبل بتحويل أحد مرضاك من أجل تلقي العلاج السلوكي المعرفي للأرق ؟

5) ماهي الاحتياجات التعليمية أو التدريبية الضرورية لمزودي خدمات الرعاية الصحية في مراكز الرعاية الصحية الاولية ليتمكنوا من تشخيص مرضى الأرق وتقديم العلاج المناسب لهم؟

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Pharmacist's interview guide (Arabic)

دليل مقابلة الصيادلة

الموضوع: خبرة الصيدلي مع الأرق و وجهة النظر العامة لهذه المشكلة

1) من تجربتك، هل يمكن ان تصف حالات المرضى الذين يشتكون من الأرق؟

- عدد المرضى الذين يحضرون مع أعراض الأرق أسبوعيا.
- صفات المرضى: السن، الجنس و الحالات الطبية الأخرى.
- ما هي المخاوف و الاهتمامات التي يبديها مرضى الأرق عندما ياتون الى الصيدلية؟
- برأيك ما الذي يحث مريض الأرق على زيارة أحدمقدمي الرعاية الصحية(الطبيب، الصيدلاني..الخ)لمناقشة مشاكل النوم التي يعاني منها؟ (المعتقدات الصحية، طرق العلاج الذاتي المستعملة، أثر المرض على حياة المريض، العمل،العلاقات،الأمن و السلامة،المشاعر، ضغط الأخرين مثل افراد الاسرة، التوقعات).

2) كيف ترى الأرق كحالة مرضية؟ (هل تعتبرها مشكلة صحية هامة يجب أن تتم معالجتها فورا ، ام هل تعتقد أنها مشكلة يستطيع المريض حلها بنفسه دون الحاجة الى تدخل طبي ؟)

- ماذا يتبادر الى ذهنك عندما يشكو مريض ما من الأرق ؟
- برأيك هل يجب أن تتم معالجة حالات الأرق في مراكز الرعاية الصحية الأولية أم في المؤسسات الأكثر تخصصا (على سبيل المثال: مستشفى الطب النفسي، مؤسسة حمد الطبية...الخ) ؟
  - هل هو مشكلة صحية هامة يجب ان تحل على الفور او هل هى مشكلة ان المريض تمكن بالمنزل؟
  - مدى خطورة الارق كحالة صحية؟
  - هل يجب أن تحصل مشاكل النوم على المزيد من الاهتمام من أخصائىي الرعاية الصحية؟

الموضوع: تقييم وتشخيص حالات الأرق

3) بصفة عامة، ماذا تعرف عن الطرق المختلفة لعلاج الأرق؟

4) ما هى خيارات المتاحة لعلاج الأرق في مركزك الصحي ؟(العلاجات الدوائية وغير الدوائية)

- ما رأيك في تنوع العلاجات المتوفرة للأرق في مركزك الصحي ؟
- هل العلاجات المتوفرة للأرق في مركزك الصحي كافية أم هل هناك حاجة لاضافة المزيد من العلاجات؟

- بعض أدوية النوم مثل ال Z-drugs و benzodiazepines غير موجودة في قائمة أدوية المراكز الصحية الأولية ، كصيدلاني ما رأيك بهذا؟

- بعض العلاجات التي تعطى دون وصفة طبية للأرق(الميلاتونين ,ومنتجات الاعشاب مثل valerian)غير متضمنة في قائمة أدوية المراكز الصحية الأولية (2017) برأيك ما السبب في ذلك؟

  - هل تعتقد أن اضافة هذه الأدوية الى قائمة أدوية المراكز الصحية قد يساعد بعض المرضى؟

  - ما رايك في هذه الادوية، هل هي فعالة أو مهمة؟

- ما هي العلاجات الشائعة التي يصفها الأطباء لعلاج الأرق في مركزك الصحي ؟(سواء العلاجات الدوائية أو السلوكية)؟

5) ماذا تعرف عن نظافة النوم (عادات النوم الصحية)؟ما هي مكوناته؟

  - في رأيك مامدى فائدة عادات النوم الصحية؟

  - هل تعطي عادة نصائح متعلقة بعادات النوم الصحية للمرضى الذين يشكون من الأرق(ما عدد المرات)؟

6) ما مدى معرفتك عن العلاج السلوكي المعرفي للأرق ؟

  - ما هي مكونات العلاج السلوكي المعرفي للأرق ؟

  - هل هذه الخدمة متوفرة في مركزك الصحي ؟(من يقدم الخدمة، ما نسبة المرضى المصابين بالارق الذين يتلقون هذه الخدمة).

  - برايك هل تعتقد ان بامكانك توفير خدمة العلاج السلوكي المعرفي للمرضى الذين يعانون من الارق) ؟اذا كانت الاجابة نعم" كيف"؟ اذا لم يكن ذلك ممكنا" لم لا؟"

  - هل قمت من قبل بتحويل أحد مرضاك من أجل تلقي العلاج السلوكي المعرفي للأرق؟

الموضوع : دور الصيدلاني في علاج الأرق:

7) ما نوع الاستشارات التي تتلقاها عادة من مقدمى الرعاية الصحية الاخرين بخصوص علاج مشاكل النوم (مثال: المعلومات الدوائية،استراتيجيات العلاج، الاثار الجانبية للادوية).

- مامدى تكرار تلقيك لمثل هذه الأسئلة؟

- اذاكان السؤال بخصوص الأدوية، هل يكون السؤال عادة متعلق بالادوية المستخدمة لعلاج الأرق أم بالأدوية التي تسبب/تفاقم مشكلة الأرق؟

8) هل قمت من قبل بالتدخل لحل مشكلة متصلة بالنوم ؟(على سبيل المثال تقديم استشارة لأحد مزودي الرعاية الصحية الاخرين بخصوص ايقاف دواء يسبب مشكلة الأرق، أو التشاور مع أحد مزودي الرعاية الصحية بخصوص دواء يعالج مشكلة النوم).

9) هل قمت من قبل بتحويل مريض يشتكي من الأرق الى أحد مزودي الرعاية الصحية الاخرين (على سبيل المثال: طبيب، أخصائي نفسي) لتقييم حالة المريض أوللعلاج؟

10) ما هى النصائح التي تقدمها لمريض يشكو من الارق (على سبيل المثال: الأثار الجانبية للأدوية، دواع الاستخدام، الأدوية الاخرى وغيرها).

- وفى المتوسط ,كم مرة تقوم بتقديم المشورة حول الادوية المنومة اسبوعيا؟

11) ما نوع الاستشارة التي تقدمها في الغالب؟(على سبيل المثال: عادات النوم الصحية، العلاج السلوكي المعرفي، استخدام الأدوية، الأعراض الجانبية للأدوية، البدائل العلاجية للأدوية ، منتجات طبيعية وغيرها).

12) ما الارشادات المتوفرة لعلاج مشاكل النوم فى مركزك الصحي؟

- اذا كانت هذه الارشادات متوفرة، ما مدى الاستفادة منها ؟
- اذا لم تكن هذه الارشادات متوفرة في المركز الذي تعمل به، هل تعرف أي ارشادات محلية اخرى أو مبادئ توجيهية دولية بخصوص علاج الأرق؟
  - اذا لم تكن متوافرة، برأيك ما السبب في ذلك؟
    - حالات الأرق ليست شائعة.
    - الأرق ليس مشكلة صحية خطيرة.
    - يتوقع من المرضى أن يعالجو هذه المشاكل في أماكن اخرى (على سبيل المثال: في المنزل أو الصيدليات المجتمعية).

13) ماهي الاحتياجات التعليمية أو التدريبية الضرورية لمزودي خدمات الرعاية الصحية في مراكز الرعاية الصحية الاولية ليتمكنوا من تشخيص مرضى الأرق وتقديم العلاج المناسب لهم؟

Pittsburgh Sleep Quality Index (PSQI) English:

PITTSBURGH SLEEP QUALITY INDEX (PSQI)

INSTRUCTIONS: 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.

1. During the past month, when have you usually gone to bed at night?

   USUAL BED TIME _____

2. During the past month, how long (in minutes) has it usually take you to fall asleep each night?

   NUMBER OF MINUTES _____

3. During the past month, when have you usually gotten up in the morning?

   USUAL GETTING UP TIME _____

4. 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 _____

INSTRUCTIONS: For each of the remaining questions, check the one best response. Please answer all questions.

5. 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?	☐	☐	☐	☐

PSQI Page 1

	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	☐	☐	☐	☐
(e) Other restlessness while you sleep; please describe	☐	☐	☐	☐

SCORING INSTRUCTIONS FOR THE PITTSBURGH 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:

Component 1: Subjective sleep quality

Examine question #6, and assign scores as follows:

Response	Component 1 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:

Respo\nse	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 2 score: _____

Component 3: Sleep duration

Examine question #4, and assign scores as follows:

Response	Component 3 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) X 100 = Habitual sleep efficiency (%)

   (_____ / _____) X 100 = %

4. Assign component 4 score as follows:

Habitual sleep efficiency %	Component 4 score
> 85%	0
75-84%	1
65-74%	2
< 65%	3

Component 4 score: _____

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Component 5: Step disturbances

1. Examine questions #5b-5j, and assign scores for each question 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

5b score: _____

5c score: _____

5d score: _____

5e score: _____

5f score: _____

5g score: _____

5h score: _____

5i score: _____

5j score: _____

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

Sum of #5b-5j: _____

3. Assign component 5 score as follows:

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

Component 5 score: _____

Component 6: Use of sleeping medication

Examine question #7 and assign scores as follows:

Response	Component 6 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 6 score: _____

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Pittsburgh Sleep Quality Index (Arabic version)

Pittsburgh Sleep Quality Index

مؤشر جودة النوم

التعليمات

الاسئله التاليه تتعلق بعادات نومك خلال الشهر الماضي فقط. يجب ان تشير اجاباتك بدقه الى معظم الايام والليالي في الشهر الماضي. من فضلك اجب على جميع الاسئله.

1) خلال الشهر الماضي متى كنت تذهب عادة الى الفراش ليلا؟

ميعاد النوم المعتاد .... (مثلا: 10:30 مساء)

2) خلال الشهر الماضي كم كان عدد الدقائق التي تستغرقها حتى تخلد للنوم كل ليله عادة؟

عدد الدقائق .... (مثلا 10 دقائق)

3) خلال الشهر الماضي متى كنت تنهض من الفراش في الصباح؟

ميعاد النهوض من الفراش .... (مثلا: 7:30 صباحا)

4) خلال الشهر الماضي كم كان عدد الساعات الفعليه التي تنامها كل ليله ؟ (هذا قد يختلف عن عدد الساعات التي تقضيها في الفراش)

عدد ساعات النوم كل ليله .... (مثلا: 10:30 ساعات)

اختار الاجابه الافضل لكل من الاسئله التاليه. من فضلك اجب على جميع الاسئله.

5) خلال الشهر الماضي كم مره حدثت لك مشاكل خلال النوم لانك ....

	ليس خلال الشهر الماضي	اقل من واحده في الاسبوع	مره او مرتين في الاسبوع	ثلاث مرات او اكثر في الاسبوع
ا) لا تستطيع النوم خلال 30 دقيقه				
ب) الاستيقاظ في منتصف الليل او في الصباح الباكر				
ج) اضطررت للاستيقاظ من اجل الذهاب الى الحمام				
د) لا تسطيع التنفس بارتياح				
ه) السعال او الشخير العالي				
و) الشعور بالبرد الشديد				

1

				ز) الشعور بالحر الشديد
				ح) تساورك احلام سيئه
				ط) الشعور بالالم
				ي) اسباب اخرى رجاء اشرح .... خلال الشهر الماضي كم مره حدثت لك مشاكل خلال النوم بسبب ذلك

٦) خلال الشهر الماضي، كيف تقيم جودة نومك عموما

جيد جدا ----------

جيد الى حد ما------

سئ جدا-----------

سئ الى حد ما------

ثلاث مرات او اكثر في الاسبوع	مره او مرتين في الاسبوع	اقل من واحده في الاسبوع	ليس خلال الشهر الماضي	
				7. خلال الشهر الماضي كم مره اخذت ادويه موصوفه او غير موصوفه لتساعدك على النوم
				8. خلال الشهر الماضي كم مره واجهت مشكله بالبقاء مستيقظا اثناء القياده او اثناء تناول وجبات الطعام او خلال الانخراط في الانشطه الاجتماعيه

٩) خلال الشهر الماضي، كم كان حجم المشكله لديك للحفاظ على ما يكفي من الحماسه لانجاز الامور

لا مشكله على الاطلاق---------

فقط مشكله بسيطه جدا---------

مشكلة الى حد ما-------------

مشكله كبيره جدا-------------

2

١٠) هل لديك شريك في الفراش او تشارك الغرفه

لا يوجد شريك في الفراش او لا تشارك الغرفه ------

شريك في غرفة اخرى ------

شريك في الغرفه وليس الفراش ------

شريك في الفراش ------

١١) اذا كان لديك شريك في الفراش او تشارك الغرفه اساله/ او اسالها خلال الشهر الماضي، كم مره كان لديك

ثلاث مرات او اكثر في الاسبوع	مره او مرتين في الاسبوع	اقل من واحده في الاسبوع	ليس خلال الشهر الماضي	
				ا) شخير بصوت عالي
				ب) وقفه طويله بيت الانفاس اثناء النوم
				ج) رجل غير هادنه اثناء النوم
				د) نوبات من الارتباك اثناء النوم
				ه) اي عدم راحه اثناء النوم: اشرح من فضلك ....

3

Sleep Hygiene Index (SHI) English version:

SLEEP HYGIENE INDEX (SHI)

Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale to make your choice.

0	1	2	3	4
Never	Rarely	sometimes	Frequent	Always

1. I take daytime naps lasting two or more hours.	0 1 2 3 4 _____
2. I go to bed at different times from day to day.	0 1 2 3 4 _____
3. I get out of bed at different times from day to day.	0 1 2 3 4 _____
4. I exercise to the point of sweating within 1 hr of going to bed.	0 1 2 3 4 _____
5. I stay in bed longer than I should (after waking up) two or three times a week.	0 1 2 3 4 _____
6. I use tobacco or caffeine (for example: coffee or tea) within 4hrs of going to bed or after going to bed.	0 1 2 3 4 _____
7. I do something that may wake me up before bedtime (for example: play video games, use the internet, or clean).	0 1 2 3 4 _____
8. I go to bed feeling stressed, angry, upset, or nervous.	0 1 2 3 4 _____
9. I use my bed for things other than sleeping or marital intimacy (for example: watch television, read, eat, or study).	0 1 2 3 4 _____
10. I sleep on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).	0 1 2 3 4 _____
11. I sleep in an uncomfortable bedroom (for example: too bright, too stuffy, too hot, too cold, or too noisy).	0 1 2 3 4 _____
12. I do important work before bedtime (for example: pay bills, schedule, or study).	0 1 2 3 4 _____
13. I think, plan, or worry when I am in bed.	0 1 2 3 4 _____

Total score =_____

Sleep Hygiene Index (Arabic version)

مؤشر عادات النوم الصحية

بالأسفل، يرجى تقييم مدى صحة كل عبارة لك عن طريق وضع دائرة حول الرقم المناسب . استخدم المقياس لتحديد اختيارك. توجد قائمة من العبارات

4		3	2	1	0
دائماً		غالبا	أحياناً	نادراً	أبدا

--------------	4	3	2	1	0	آخذ قيلولة (غفوة) أو أكثر في النهار تستمر لمدة ساعتين أو أكثر	1
--------------	4	3	2	1	0	أذهب إلى السرير للنوم في أوقات مختلفة من يوم لآخر	2
--------------	4	3	2	1	0	أستيقظ من النوم في أوقات مختلفة من يوم لآخر	3
--------------	4	3	2	1	0	أمارس الرياضة حتى التعرق خلال الساعة التي تسبق ذهابي إلى السرير للنوم	4
--------------	4	3	2	1	0	أبقى نائماً في السرير(بعد استيقاظي) أطول مما يجب مرتين أو ثلاث مرات أسبوعياً	5
--------------	4	3	2	1	0	أتناول الشاي أو القهوة أو أدخن التبغ خلال الساعات الأربع التي تسبق ذهابي إلى السرير للنوم أو بعد ذهابي إليه	6
--------------	4	3	2	1	0	أمارس نشاطاً ربما يبقيني مستقيظاً قبل موعد النوم (على سبيل المثال: ممارسة ألعاب الفيديو، تصفح الإنترنت، التنظيف)	7
--------------	4	3	2	1	0	أذهب إلى النوم ولدي شعور بالتوتر أو الغضب أو الانزعاج أو العصبية	8
--------------	4	3	2	1	0	أستعمل سريري لأشياء آخرى غير النوم أو ممارسة العلاقة الزوجية (على سبيل المثال: مشاهدة التلفزيون، القراءة، تناول الطعام أو الدراسة)	9
--------------	4	3	2	1	0	أنام على سرير غير مريح (على سبيل المثال : فراش أو وسادة غير مريحة – عدم توفر عدد كاف من الأغطية أو البطانيات)	10
--------------	4	3	2	1	0	أنام في غرفة نوم غير مريحة (على سبيل المثال: شديدة الإضاءة– سيئة التهوية – شديدة الحرارة – شديدة البرودة – عالية الضوضاء)	11
--------------	4	3	2	1	0	أقوم بأداء أعمال مهمة قبل موعد النوم (على سبيل المثال: دفع الفواتير، جدولة مواعيدي، الدراسة)	12
--------------	4	3	2	1	0	أفكر – أو أخطط – أو أكون قلقاً عندما أكون في السرير	13
						مجموع النقاط =--------------	

APPENDIX D: ETHICAL APPROVAL LETTERS

Qatar University Institutional Review Board
QU-IRB

APP-04/06/2018/QU

October 17, 2018

Dr. Monica Zolezzi
College of Pharmacy
Qatar University
Tel.: 4403 5623
Email: mzolezzi@qu.edu.qa

Dear Dr. Monica Zolezzi,

Sub.: Research Ethics Expedited Approval
Ref.: Project titled, "Sleep patterns, behaviors and sleep medication use among Qatar University students"

We would like to inform you that your application along with the supporting documents provided for the above proposal, has been reviewed by the QU-IRB, and having met all the requirements, has been granted research ethics Expedited Approval for one year effective from October 17, 2018 till October 16, 2019.

Documents reviewed: IRB Checklist, IRB Application, Consent and Survey (English and Arabic), Responses to IRB queries and updated documents

Please note that all approvals are valid for a period of **one year** and renewals should be sought one month prior to the expiry date to ensure timely processing and continuity. Moreover, any changes/modifications to the original submitted protocol should be reported to the committee to seek approval prior to continuation.

Your Research Ethics Approval No. is: **QU-IRB 977-EA/18**
Kindly state both your application tracking number and the ethical approval number in all your future correspondence pertaining to this project.

Best wishes,

Dr. Mashael Al-Shafai
Chairperson, QU-IRB

Institutional Review Board
(IRB)
Office Of Academic Research

Qatar University-Institutional Review Board (QU-IRB), P.O. Box 2713 Doha, Qatar
Tel +974 4403-5307 (GMT +3hrs) email: QU-IRB@qu.edu.qa

Qatar University Institutional Review Board
QU-IRB

May 28, 2019

Dr. Monica Zolezzi
Graduate Student Supervisor
College of Pharmacy
Qatar University
Tel.: +974 4403-5623
Email: mzolezzi@qu.edu.qa

Dear Dr. Monica Zolezzi,

Sub.: Research Ethics Expedited Approval / CPH Graduate Student Project
Ref.: Student, Raja Mahamade Ali / Email ra1106733@student.qu.edu.qa
Project Title: "Healthcare providers' perspective and experiences on the management of insomnia at primary healthcare settings in Qatar"

We would like to inform you that your application along with the supporting documents provided for the above graduate student project, has been reviewed by the QU-IRB, and having met all the requirements, has been granted research ethics **Expedited Approval** based on the following category(ies) listed in the Policies, Regulations and Guidelines provided by MOPH for Research Involving Human Subjects. Your approval is for one year effective from May 28th 2019 till May 27th 2020.

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1) *present no more than minimal risk to human subject, and*
2) *involve only procedures listed in the following category (ies).*
__Categories 7:__ Research on individual or group characteristics or behavior (including but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

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Documents Reviewed: QU-IRB Checklist, Application(FS), PHCC Approval, Phase 2 (PHCC) Proposal, Physician's Interview Guide (Arabic & English), Pharmacist's Interview Guide (Arabic & English), Participants Information Sheet and Consent Form (Arabic & English), QU-IRB Review Form, responses to IRB queries and updated documents

Please note that all approvals are valid for a period of **one year** and renewal should be sought one month prior to the expiry date to ensure timely processing and continuity. Moreover, any changes/modifications to the original submitted protocol should be reported to the committee to seek approval prior to continuation.

Your Research Ethics Expedited Approval No. is: **QU-IRB 1097-EA/19**
Kindly state this number in all your future correspondence to us pertaining to this project. In addition, please submit a closure report to the QU-IRB upon completion of the project.

Best wishes,

Dr. Mohamed A. Elrayess
pp/ Chairperson, QU-IRB

Institutional Review Board
(IRB)
Office Of Academic Research

Qatar University-Institutional Review Board (QU-IRB), P.O. Box 2713 Doha, Qatar
Tel +974 4403-5307 (GMT +3hrs) email: QU-IRB@qu.edu.qa

Research/Project/Study
Approval Notice Form

Title of the Project:	Healthcare providers' perspective and experiences on the management of insomnia at primary healthcare settings in Qatar
Reference No:	PHCC/RC/18/12/004 **Date: 10/03/2019**
PI Name & Department	Raja Mahamade Ali, Master student, College of Pharmacy
Organization	Qatar University
PI Contact details	Email; ra1106733@qu.edu.qa ; Mob: 66616857
PHCC Co-PI Name & Department	Mohamed Moustafa Moursi, Pharmacist, Primary healthcare corporation, Alwaab healthcare center.
PHCC Co-PI Contact Details	Email: mmmoursi@phcc.gov.qa ; Mob: 30055809 / 70044813

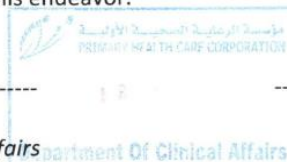| Required Information Checklist	Yes	No	N/A	Date
Research Proposal Submission Form signed and Completed	✓			
Investigator agreement Form Signed	✓			
Other Ethics Committee Approval (Please specify) e.g. Qatar University	✓			
Informed Consent Form Copy Provided	✓			
Sponsors	-----			
List of Health Centers included	1. Madinat khalifa HC (N) 2. Al-Khor HC (N), 3. Lebaib HC (N), 4. Airport HC (C), 5. West-bay HC (C), 6. Wakra HC (C) 6. Al- Rayyan HC (W), 7. Abu-baker Siddiq HC (W), 8. Mesaimeer HC (W).			

Dear Ms. Raja,

Having established that there are no material ethical issues relating to your request and having considered the logistical issues we have no objections to you carrying out this project. Therefore the Departments of Clinical Affairs and Operations give **approval** for it to commence. Please see the accompanying letter which sets out the **specific terms and conditions** of this approval that must be adhered to in carrying out your data collection. We wish you every success in this endeavor.

18/3/2019

Kind Regards,

Dr. Hanan Al Mujalli
Executive Director of Clinical Affairs

Dr. Samya Ahmad Al Abdulla
Executive Director of Operations

For more information: Researchsection@phcc.gov.qa

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