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AN EXAMINATION OF THE ASSOCIATION BETWEEN SLEEP QUALITY AND PSYCHOLOGICAL DISTRESS AMONG UNIVERSITY STUDENTS IN THE MIDDLE EAST: A CROSS-SECTIONAL CORRELATIONAL STUDY

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I, Ayesha Saeed Mohammad Ibrahim Alsuwaidi, the undersigned, a graduate student at the United Arab Emirates University (UAEU), and the author of this thesis entitled "*Examining Association and the Level of Sleep Quality and Psychological Distress Among University Students in the Middle East: A Cross-Sectional Correlational Study*", hereby, solemnly declare that this is the original research work done by me under the supervision of Dr. Zahir Vally, in the College of Medicine and Health Sciences at UAEU. This work has not previously formed the basis for the award of any academic degree, diploma or a similar title at this or any other university. Any materials borrowed from other sources (whether published or unpublished) and relied upon or included in my thesis have been properly cited and acknowledged in accordance with appropriate academic conventions. I further declare that there is no potential conflict of interest with respect to the research, data collection, authorship, presentation and/or publication of this thesis.

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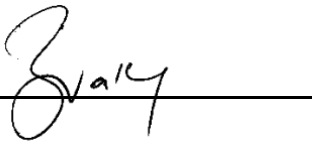
   Signature  Date 04/12/2023

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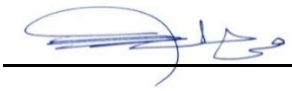
   Signature  Date 04/12/2023

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Abstract

Literature reviews have revealed that there are limited studies on sleep quality in the United Arab Emirates (UAE) and that few studies are available in the Middle Eastern region. The objective of this study was to examine the association between sleep quality and psychological distress among university students in the Middle East. A correlational cross-sectional design was determined and a self-administered online questionnaire was used. The electronic survey was circulated amongst students on campus and received 435 responses from three universities namely, Menoufia University in Egypt, Sultan Qaboos University in the Sultanate of Oman, and United Arab Emirates University in the (UAE). The survey consisted of the Sleep Quality Scale (SQS) and the Kessler Psychological Distress Scale (K10) Arabic version to measure psychological distress. As a preliminary exploration, the SQS used in the study was translated into Arabic as the sample's native language is Arabic. The translated SQS value of Cronbach's alpha was (.814), indicated a moderate level of internal consistency. Sleep quality is complex as it consists of many factors. This study examined six factors of SQS: daytime dysfunction, restoration after sleep, difficulty in falling asleep, difficulty in getting up, satisfaction with sleep, and awakening during sleep. Moreover, it was hypothesised that Poor sleep quality will be positively associated with psychological distress in university students. The results of the study ($p = .005$), ($r = .133$) confirmed that there was a statistically significant positive correlation between sleep quality and psychological distress among university students in the Middle East. In addition, all six factors were statistically significantly correlated with sleep quality. Furthermore, sex, age, and college enrollment had no significant difference in sleep quality. Finally, the prevalence of poor sleep quality among Arab university students and its association with psychological distress needs further research.

Keywords: Mental Health, Middle East, Psychological Distress, Sleep Problems, Sleep Quality, University Students.

Title and Abstract (in Arabic)

دراسة الرابطة بين جودة النوم والضيق النفسي لدى طلبة الجامعة في الشرق الأوسط: دراسة ارتباطية مقطعية

الملخص

كشفت المراجع أن هناك دراسات محدودة حول جودة النوم في دولة الإمارات العربية المتحدة، وقليلاً ما تتوفر الدراسات في نطاق الشرق الأوسط. كان الهدف من الدراسة تقييم العلاقة بين جودة النوم والضيق النفسي لدى طلاب الجامعة في الشرق الأوسط. تم تحديد نوع الدراسة الارتباطية المقطعية واستخدام استبيان إلكتروني، حيث تم توزيعه على الطلاب في الحرم الجامعي واستلام 435 مشارك من ثلاث جامعات: جامعة المنوفية في مصر، جامعة السلطان قابوس في سلطنة عمان وجامعة الإمارات العربية المتحدة في دولة الإمارات. تضمن الاستبيان مقياس جودة النوم (SQS) ومقياس كيسلر النسخة العربية (K10) لقياس الضيق النفسي. وباعتباره استكشافاً أولي تمت ترجمة مقياس جودة النوم المستخدم في الدراسة إلى اللغة العربية حيث أن اللغة الأم للعينة هي العربية. وأشارت قيمة الألفا كرونباخ إلى (.814) ، مما دل على مستوى معتدل من الاتساق الداخلي. قد تكون جودة النوم معقدة لتعدد عواملها، وفي هذه الدراسة قمنا بفحص ستة عوامل لجودة النوم: الخلل الوظيفي خلال النهار، التجدد بعد النوم، صعوبة النوم، صعوبة الاستيقاظ، الرضا عن النوم، والاستيقاظ أثناء النوم. علاوة على ذلك، افترضت الدراسة أن جودة النوم ستترتب عليها علاقة ارتباطية إيجابية مع الضيق النفسي لدى طلاب الجامعة. أكدت النتائج(r = .133) ،(p = .005) أن هناك علاقة إيجابية ذات دلالة إحصائية بين جودة النوم والضيق النفسي لدى طلاب الجامعة في الشرق الأوسط. بالإضافة إلى ذلك، كانت العوامل الستة جميعها مرتبطة معنوياً وإحصائياً. من ناحية أخرى، لم يكن للجنس، العمر والكلية الملتحق بها فرقاً واضحاً في جودة النوم. وأخيراً، إن انتشار سوء جودة النوم بين طلاب الجامعات العربية وما يرتبط به من ضيق نفسي يحتاج إلى المزيد من البحث.

مفاهيم البحث الرئيسية: الصحة النفسية، الشرق الأوسط، الاضطرابات النفسية، مشاكل النوم، جودة النوم، طلاب الجامعة.

Author Profile

Ayesha Saeed Mohammad Ibrahim Alsuwaidi is a Graduate Student at the United Arab Emirates University in Alain. She has two years of research experience working as a Research Assistant at UAEU and published two papers. In 2021 she started working at Takalam Online Counseling as an Outreach officer in Abu Dhabi. Ayesha received her Master of Science in Clinical Psychology from the Department of Clinical Psychology, College of Medicine and Health Sciences at UAE University. She received her bachelor's degree in Arts in Psychology from the United Arab Emirates University in UAE.

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Special thanks go to my colleagues who witnessed all the tears and sweat that came along with the birth of my thesis.

Dedication

To my beloved supporters who stand by my side in every milestone

Table of Contents

List of Tables

List of Abbreviations

K10	Kessler Psychological Distress Scale
SQS	Sleep Quality Scale
UAE	United Arab Emirates
UAEU	United Arab Emirates University

Chapter 1: Introduction

1.1 Overview

Sleep is a universal phenomenon that occupies nearly a third of human existence (Lee-Chiong, 2004). Sleep takes between 20% and 40% of the day in most humans. Insufficient sleep duration and poor sleep quality have been associated with several adverse health outcomes (Grandner, 2017). Insufficient sleep is a pervasive and prominent problem in modern society. A considerable body of evidence suggests that insufficient sleep causes hosts of adverse medical and mental dysfunctions. Indeed, good sleep is necessary for good physical and mental health and a good quality of life (Chattu et al., 2018).

Many factors can influence sleep, including a person's genetics, knowledge, beliefs, attitudes about sleep, and overall health (Grandner, 2017). Both quantitative and qualitative components of sleep can define sleep quality. The quantitative part includes the sleep duration, whereas the qualitative part is a subjective measure of the depth and feeling of restfulness upon awakening (Safhi et al., 2020). Sleep quality can be predicted through five variables: perceived stress, sleep hygiene, sleep deficiency, world-view, and site (Doolin et al., 2018).

This study will address the topic of sleep quality, specifically with the young adult population, to explore the association between sleep quality and psychological distress among university students in the Middle East. It was feasible to measure the sleep quality and psychological distress levels by utilizing validated measurement scales, i.e., the Sleep Quality Scale (SQS) and Kessler Psychological Distress Scale (K10). In addition, the study examined the six sub-factors of the SQS: daytime dysfunction, restoration after sleep, difficulty falling asleep, difficulty getting up, satisfaction with sleep, and awakening during sleep.

Young adults and students, in particular, seem at risk of developing sleep problems (Henrich et al., 2021). University students are at high risk for developing insomnia due to the stressful nature of academic life and often unhealthy sleeping habits. Sleep deprivation, difficulty falling asleep, and interrupted sleep patterns are commonly

reported complaints among university students (Ali et al., 2023). Therefore, it is critical to understand what may cause or aggravate poor sleep in students (Foulkes et al., 2019).

The rising levels of poor sleep quality and psychological distress have an adverse effect on mental and physical health. Moreover, psychological distress is considered a triggering factor for sleep disturbance (Safhi et al., 2020). Several studies in the Gulf region have shown a high prevalence of poor sleep quality and psychological distress, which may contribute to the further development of additional comorbid mental health problems (Alotaibi et al., 2020).

The findings of a plethora of studies are in agreement that an association between poor sleep quality and psychological distress exists (Almojali et al., 2017; Alotaibi et al., 2020; Safhi et al., 2020), however, the mechanisms underlying this demonstrated link remain unclear. A recent study conducted in the United Arab Emirates called for further exploration to enhance sleep quality in students, as it is highly warranted (Meer et al., 2022).

1.2 Relevant Literature

In this literature review, I will discuss the concept of sleep and its quality from a multiple dimensions approach as the paradigm shift for the sleep research field. The concept prompted awareness that one's sleep health needs to be understood from multiple dimensions rather than individual sleep characteristics, e.g., sleep duration only (Lee and Kaufmann, 2023).

I will share interesting findings on sleep quality and its association with psychological distress from existing research in the Middle Eastern region and some international findings. In the first section of the literature review, I will start with definitions of sleep quality and psychological distress. The second section will discuss theories on sleep. The third section addresses the prevalence and issues related to sleep. The fourth section will highlight comorbid psychological issues and diagnosis. Lastly, the fifth section will draw the association between sleep quality and psychological distress.

I will unpack a few studies that assessed the association between sleep quality and psychological distress among university students in the Gulf region, which is within my target frame. Literature reviews have indicated no studies on sleep quality and its association with psychological distress in the United Arab Emirates (UAE). This led me to take the initiative and explore my topic at the first university in the UAE and other universities in Oman and Egypt.

I will state my research questions, which I will be answering in this literature: What is the nature of the relationship between sleep quality and the psychological distress of university students in the Middle East? How different is it when comparing student's sex, age, and college enrollment in both sleep quality and psychological distress? What can psychometrics tell about variables that predict poor sleep quality and psychological distress?

1.2.1 Definitions of Sleep Quality and Psychological Distress

Understanding the definition of sleep quality is relevant to mental health as it is associated with many mental health issues. This study associated sleep quality with psychological distress. Starting with the phenomenon of sleep quality, it is a complex concept as it has many aspects that interact with the sleep element, but there is no consensus definition.

Sleep quality: is defined as an individual's self-satisfaction with all aspects of the sleep experience. The concept of sleep quality stems from a global concern for individuals who suffer from inadequate sleep, which can predispose them to poor health outcomes (Krystal and Edinger, 2022). In other words, sleep quality is a continuum that ranges from poor to healthy and reflects the satisfaction with the sleep experience, including sleep initiation, maintenance, quantity, and feeling of refreshment upon awakening (Ali et al., 2023; Rachlin, 2013).

The elements comprising sleep quality vary from person to person, and so does their relative importance, making it a highly subjective matter. However, some aspects of sleep quality can be measured quantitively, such as sleep duration, sleep latency, and number of awakenings (Al-Kandari et al., 2017). There are six domains to evaluate sleep

quality, e.g., daytime symptoms, restoration after sleep, problems initiating and maintaining sleep, difficulty waking, and sleep satisfaction (Shahid et al., 2011).

When it comes to the concept of psychological distress, it is a common psychological and emotional state in the modern world. Psychological distress is widely used as an indicator of the mental health of the population in public health, population surveys, and intervention studies. Yet the concept of psychological distress is still vague for some (Drapeau et al., 2012).

Psychological distress: is seldom defined as a distinct concept and is often embedded in the context of strain, stress, and distress (Ridner, 2004). It is largely defined as a state of emotional suffering, typically characterized by depressive and anxiety symptoms (Jing et al., 2021). In fact, psychological distress is a significant public health issue because it causes cognitive impairment, functional decline, physical disability, and increased healthcare usage. Certainly, psychological distress has a detrimental influence not only on one's physical health but also on one's quality of life (Zhang et al., 2022).

1.2.2 Theories on Sleep

I will share a decent number of sleep theories proposed between the time of the ancient Greek philosophers and the contemporary era. A wide range of theories have been put out on the function of sleep. It is very commonly said that the function of sleep may be due to the switching of the brain into a functional state that facilitates the clearance of degradation products of neural activity that accumulate during wakefulness (Xie et al., 2013).

One of the earliest theories, the *Psycho-biological theory* of sleep, proposes that sleep is an integral aspect of life rather than an illness or a result of chemical changes. Tromner's defense was "on various theoretical grounds that the optic thalamus is the seat which inhibits stimuli and produces sleep, concluding sleep is not a manifestation of a disease or self-poisoning of the body, but is an instinct of the organism. " Thus, the problem of sleep essentially becomes a psycho-biological problem (Coriat, 1911).

Many contemporary hypotheses focus on the brain and attempt to determine the purpose of sleep. But in this part, I will share only four of those timelines, which

comprise the inactivity theory, energy conservation theory, restoration theory, and brain plasticity theory. The *theory of inactivity* is grounded on the concept of evolutionary pressure, where beings that were inactive at night were not as likely to die from predators or injury in the dark when they would be mainly defenseless. This would mean creatures that were not active at night were more likely to survive predators or injuries in the dark (da Mota Gomes, 2020).

In *energy conservation theory*, the major purpose of sleep is to lower a person's energy consumption during the hours of the day and night when hunting for food is the least effective. This theory is supported by the fact that the body has decreased metabolism by up to 10% during sleep (Brinkman et al., 2018). Besides, a decrease in metabolic rate has been considered the mechanism by which sleep saves energy (da Mota Gomes, 2020).

Restoration theory considers that sleep permits the body to renovate and load cellular mechanisms required for biological roles that become decreased during the day. Sleep enables the body to replenish and repair cellular elements needed for biological processes that run out during waking time. This is supported by research demonstrating that several biological processes, including muscle repair, tissue growth, protein synthesis, and the release of many essential hormones for growth, occur predominantly while sleeping (da Mota Gomes, 2020).

Brain plasticity theory establishes that sleep is needed for neural restructuring and brain structure and function growth. This phenomenon is known as brain plasticity, but it is not entirely understood and has several critical implications. Moreover, it imposes that sleep is essential for maintaining basic brain functioning to reform significant memories (da Mota Gomes, 2020). No one theory fully explains everything. Hence, it is more likely that a combination of theories will contain the essential component that describes the essence of sleep.

1.2.3 Prevalence and Issues Related to Sleep

In this section, I will share various studies on sleep quality that revealed statistical data regarding the student population in the Middle East region. Several of these studies

concluded that more than 50% of university students reported having poor sleep quality (Al-Kandari et al., 2017; Cheng et al., 2012; Lemma et al., 2012). Local research on this topic is limited in the United Arab Emirates (UAE) (Meer et al., 2022). Ahmed et al. (2022) established a recent study, selecting three universities in the UAE, namely, (Ajman University, the University of Sharjah, and the American University of Sharjah) suggested that insomnia is highly prevalent among university students of both genders in the UAE and is somewhat more prominent in females. Regarding sleep quality, both genders scored almost identical scores of 19.5%, which indicates relatively bad quality of sleep and 2% for bad quality of sleep, respectively. Concerning problem sleeping, 37.9% of respondents had problems sleeping, 22.4% of females and 15.5% of males (Ahmed et al., 2022). Another study in the Gulf region in Al Kuwait found that many Kuwait University students from different majors experience poor sleep quality by exploring students' sleep hygiene awareness and hygiene practices. It was found that students in the age group 17 to 19 scored on (Kruskal-Wallis test, P = .032), indicating a significantly higher median hygiene awareness score compared to the older age groups, denoting poorer awareness among the young. In addition, the lowest median hygiene practice score (Kruskal-Wallis test, P = .019) belonged to the youngest age group, 17 to 19, indicating better practice than those aged 20 and above (Al-Kandari et al., 2017).

Ali et al. (2023) conducted a study at Qatar University, which indicated poor sleep quality in approximately 70% of their students. Moreover, it was found that 79% of the students in Qatar had poor sleep hygiene patterns. When comparing sleep quality in students from different colleges, it was found that students at the College of Education had an increased probability of having poor sleep (OR = .594; 95% CI = .41 -.861, P = .006). Compared to students from the College of Law, students from the College of Arts and Sciences (CAS) were 1.4 times more likely to have good sleep quality. On the other hand, students from CAS were 73% less likely to have good sleep quality when compared to students from the College of Sharia and Islamic Studies. Another factor was marital status; sleep quality was influenced by marital status, as single students were found to be 74% less likely to have good sleep quality (Ali et al., 2023).

Surprisingly, many studies draw attention to sleep quality in medical student groups, as they have shown high levels of psychological distress, anxiety, and depression

in different countries. Thus, the cumulative effect of stressors can make students more vulnerable to poor psychological well-being. In this part, I will compare some recent statistical data from Middle Eastern studies to Asian and Western studies.

According to a study conducted on 305 medical students at Mohammed Bin Rashid University in Dubai, poor sleep quality was present in 30% of their students, excessive daytime sleepiness (EDS) in 40%, and insomnia symptoms in 33% of students (Meer et al., 2022). Alotaibi et al. (2020) built comparative statements of prevalence in the quality of sleep at the Saudi medical college, which resulted in 77% of the participants having poor-quality sleep. This result is similar to other studies in Saudi Arabia at King Saud bin Abdulaziz University, which was between 76% and 74.2%. However, a study from the Southern region of Saudi Arabia had a different result, 29.7%. On the other hand, internationally, medical students' sleep quality has generally been found to be better, 50.9% in the United States, 55.8% in Ethiopia, 19% in China, and 40% in Lithuania.

The prevalence of stress levels in participants in the Saudi medical college was 63.5%, which is also higher than in local and international studies. For instance, a prevalence of 53% was found in two colleges in Riyadh and 41.9% in Malaysia (Alotaibi et al., 2020). Similar studies in the USA, Taiwan, and Iran showed that most college students suffer from sleep disturbances, and around 67.2% suffer from poor sleep (Afandi et al., 2013).

1.2.4 Comorbid Psychological Issues and Diagnosis

In this section, I will share some relevant literature highlighting prognosis and comorbid disorders that might or might not be influenced by sleep problems, as well as medications that interfere with sleep quality. Sleep influences the course and prognosis of several disorders, such as cardiovascular, respiratory, renal, gastrointestinal, infectious, rheumatologic, and endocrine disorders. Likewise, sleep quality and its architecture may be altered by medical disorders (Lee-Chiong, 2004).

Poor sleep is associated with adverse health outcomes. To be specific, both sleep disorders and sleep characteristics are associated with poor health outcomes, e.g., short

and long sleep duration is associated with obesity and mortality. However, our sleep is characterized by more than simply its duration. Sleep quality, efficiency, timing, regularity, and daytime sleepiness are also associated with adverse health outcomes (Buysse, 2018).

When it comes to mental health problems related to students, many types of research demonstrated that students 'poor sleep quality is linked to increased tension, irritability, depression, confusion, and generally lower life satisfaction (Buboltz et al., 2001; Pilcher et al., 1997). Sleep quality is mostly affected by stress and anxiety, which are common among university students (Al-Kandari et al., 2017).

Lee-Chiong et al. (2004) stated that almost every medication has some effect on sleep, either as a primary therapeutic effect of the drug or as an adverse reaction; psychopharmacological treatments, e.g., Antidepressants, Lithium, Antipsychotics, Sedative hypnotics, Anti-parkinsonian drugs, etc. Moreover, insomnia can complicate therapy with medication, e.g., Stimulants, Theophylline, Antidepressants, Beta-adrenergic blockers, etc (Lee-Chiong, 2004).

1.2.5 Association Between Sleep Quality Factors and Psychological Distress

In this section, I will talk about the nature of the association between sleep quality and psychological distress, supporting it with a literature review from East to West region. In addition, playing factors that possibly run the association such age, gender, residential status, sleep duration, disturbance, deprivation, and hygiene.

A Chinese study found that sleep quality substantially influenced psychological distress (Zhang et al., 2022). It was agreed by many studies of the existence of a strong association between sleep quality and stress (Almojali et al., 2017; Alotaibi et al., 2020; Safhi et al., 2020). Recent studies at King Saud University confirm that stress level is significantly associated with poor sleep quality. It was demonstrated that a high level of stress is a significant predictor of poor quality of sleep, while psychological distress is considered a triggering factor for sleep disturbance (Safhi et al., 2020). Although a link was identified between sleep quality and psychological distress, the specific mechanistic mechanisms behind this link remain unknown. Exploring the moderated mediation

pathways between sleep quality and psychological distress contributes to developing more effective methods of early diagnosis and prevention of psychological distress (Zhang et al., 2022).

The association in the student sample, poor sleep quality, was associated with higher self-reported negative mood, anxiety, and stress, the strongest predictors of subjective sleep quality. This line of work indicates that mood and cognitive reactions to stress will likely play an important role in the complex psychological interactions that affect sleep quality (Henrich et al., 2021; Lund et al., 2010). Alotaibi et al. (2020) result's study indicated that poor quality of sleep score ($P < .001$) significantly associated with elevated mental stress levels in the student's sample.

Regarding the *Age factor*, young adulthood is a sensitive time for experiencing poor sleep quality. Sleep deprivation, difficulty falling asleep, and interrupted sleep patterns are commonly reported complaints among university students (Ali et al., 2023). Young adults and students seem to be at risk of developing sleep problems, and longitudinal research has shown that the transition from adolescence to adulthood is marked by several social and biological changes that may affect sleep quality (Henrich et al., 2021; Park et al., 2019). However, Meer et al. (2022) findings indicated no significant difference in age by the quality of sleep in the university students.

When it comes to *Gender factors* had a significant effect on sleep quality, with male students being more likely to have better sleep quality than female students by 1.3 folds (OR = 1.31, 95% CI = .965 -1.78, P = .083) (Ali et al., 2023). Poor sleep quality among university students was significantly associated with females (Al-Kandari et al., 2017). However, Alotaibi et al. (2020) explored the relationship between sleep quality, stress, and academic performance among medical students and found no significant association between gender and sleep quality was found.

When it comes to *Residential status*, it is crucial to understand what may cause or aggravate poor sleep in students; some factors, including sleep environment and life stressors, can worsen sleep quality. First-year students living on campus are particularly worthy of attention due to their distinctive sleeping circumstances, as they adapt to a new lifestyle, sleep close to new peers, and experience environmental noise and

academic stress. An interview study in the United Kingdom addressed that roommates and friends were central to poor sleep quality on campus because they caused excessive noise and provided an easy opportunity to socialize late into the night (Foulkes et al., 2019). University students are vulnerable to sleep disturbances due to environmental factors, such as reduced parental guidance and freedom to choose their bedtime, increased academic stress, and increased amount of time spent on studying or extracurricular activities. These mentioned factors are associated with a decrease in total sleep duration as well as a deterioration in sleep quality (Al-Kandari et al., 2017).

When it comes to *Sleep duration*, the latest study that was done in Dubai revealed a significant positive correlation between total sleep duration and overall sleep quality with enthusiasm during the day (Meer et al., 2022). These factors are associated with a decrease in total sleep duration and a deterioration in sleep quality (Al-Kandari et al., 2017). Reduced sleep duration and quality sleep have unfavorable health consequences, resulting in increased morbidity and mortality (Safhi et al., 2020).

When it comes to *Sleep disturbance*, early studies conducted in 1989 and 1997 concluded that sleep disturbance could be either a cause, symptom, or comorbidity with stress or with a psychiatric disorder (Almojali et al., 2017; Chang et al., 1997; Ford and Kamerow, 1989). Sleep disturbances can be a clinically valuable predictive sign of depression, as they tend to precede the onset of a depressive episode or relapse (Alvaro et al., 2013; Henrich et al., 2021). Considering the adverse consequences that sleep disturbances may have on students' academic performance, mental health, and productivity, it is important to determine the prevalence of poor sleep quality (Ali et al., 2023).

Sleep deprivation can also be harmful to students; studies have demonstrated that insomnia may cause psychiatric disorders, psychosocial stress, and dysfunctions such as decreased work efficiency and learning disability (Abdulghani et al., 2012; Eliasson et al., 2009). Sleep deprivation (<7 hours of sleep) has also been reported to affect more than 50% of the adult population in Qatar (Ali et al., 2023).

Sleep hygiene is the most influential factor impacting sleep quality. Qatar proved that students with good sleep hygiene were about four times more likely to have good

sleep quality than those with poor sleep hygiene, as it was detected that 79% of Qatar University students have poor sleep hygiene patterns (Ali et al., 2023). Good sleep hygiene results in enhanced physical and psychological well-being, such as improved cardiovascular function, metabolism, immune system, attention, cognition, memory, and mood regulation (Meer et al., 2022).

Other playing factors were explored in a study among Egyptian families, with results indicating that age, sex, and co-sleeping influence sleeping arrangements, thus impacting overall sleep quality (Doolin et al., 2018). It was found that racial and ethnic minorities, especially in the context of socioeconomic disadvantage, achieve less quality sleep (Grandner, 2017). Studies have also shown that stress and worry about academic performance or examinations are significantly associated with poor sleep quality (Ali et al., 2023).

1.3 Statement of the Problem

Sleep evolved from merely a collection of physiological activities to being reflected in psychological frameworks. Sleep quality has a significant impact on mental health, which can cause disturbance in human functioning as well as psychological distress. Poor sleep quality is one of the emerging issues that university students in the Middle East deal with daily, and it can have a negative effect on their psychological well-being. Extensively, poor sleep has a substantial immediate influence on students' psychological distress, and that was proven by numerous of literature.

1.4 Research Objectives

This study aimed to examine the association between sleep quality and psychological distress among university students in the Middle East to define the nature of the relationship. Alongside, evaluate the six sub-factors “daytime dysfunction, restoration after sleep, difficulty in falling asleep, difficulty in getting up, satisfaction with sleep, and awakening during sleep” predicted sleep quality in individuals. This study highlighted the importance of sleep quality as part of health hygiene for all university students, as the prevalence of poor sleep quality and psychological distress was high within the Middle East region. This study addressed and answered several

research questions proposed in literature within the Arab population by giving descriptive, inferential, and psychometric data on university students. As a first initiative, the sleep quality instrument was translated into Arabic as there was no Arabic version of the Sleep Quality Scale. The research topic and instrument used in the study might appeal to further studies.

Chapter 2: Methods

2.1 Research Design

The study used a correlational, cross-sectional design and a self-administered questionnaire survey. The survey was circulated amongst university students on the campuses of three universities in the Middle East, namely, Menoufia University in Egypt, Sultan Qaboos University in the Sultanate of Oman, and United Arab Emirates University in the (UAE). All surveys were administered in Arabic, the native language of participants in this region. The survey was designed to provide data related to the level of sleep quality and psychological distress amongst this population. Data collection occurred in October 2023 during the Fall semester of the 2023/2024 academic year.

2.2 Data Collection

The survey only examined the self-evaluation and subjective appreciation of sleep quality and psychological distress, as a self-administered questionnaire measured it, and these two measurement scales were not complemented with other measurements. The survey consisted of two validated measurement instruments, including the Sleep Quality Scale (SQS) and the Kessler Psychological Distress Scale (K10), to measure psychological distress; both scales are available on the internet and can be used for free. Additionally, the survey had questions related to student demographics.

2.2.1 Sleep Quality Scale (SQS)

The Sleep Quality Scale (SQS) developed by Yi et al. (2006) (Appendix A) consists of 28 items. It uses a four-point Likert-type scale to which respondents indicate how frequently they exhibit certain sleep behaviors (0 = “few,” 1 = “sometimes,” 2 = “often,” and 3 = “almost always”). It assesses six factors related to sleep quality, including daytime dysfunction, restoration after sleep, difficulty falling asleep, difficulty getting up, satisfaction with sleep, and difficulty maintaining sleep. The SQS is a commonly used tool for assessing sleep quality in adults. It has shown strong validity in capturing various aspects of sleep quality, such as sleep duration, sleep disturbances, and sleep efficiency (Yi, Shin and Shin, 2006). Total scores can range from 0 to 84, with higher scores demonstrating more acute sleep problems (Shahid et al., 2011). Scores that

range from 0 to 5 “indicate good sleep quality,” 6 to 21” indicate mildly poor sleep quality,” 22 to 42 “indicate moderately poor sleep quality,” 43 to 63 “indicates severely poor sleep quality” and 64 to 84 “indicates acute sleep problems.” According to The Pittsburgh Sleep Quality Index (PSQI) global score, a score higher than 5 indicates poor sleep quality, while a score less than 5 reflects good sleep quality. This cut-off score was associated with a sensitivity of 89.6% and specificity of 86.5% to detect poor sleepers (Ali et al., 2023). The SQS has been demonstrated to reliably detect clinically meaningful changes in sleep quality (Snyder et al., 2018). Yi et al. (2006) reported an internal consistency of $\alpha = .92$ and a test-retest reliability of .81, acceptably high-reliability coefficients, thus indicating that the SQS is a reliable and valid measure with which to assess sleep quality in clinical practice and research (Shahid et al., 2011).

2.2.2 Kessler Psychological Distress Scale (K10)

The Kessler Psychological Scale (K10) (Kessler et al., 2003) (Appendix B) consists of 10 items with a five-point, Likert-type scale, to which respondents indicate how frequently they exhibit certain emotional states of non-specific psychological distress (1 = “none of the time,” 2 = “a little of the time,” 3 = “some of the time,” 4 = “most of the time,” and 5 = “all of the time”) with a time range of over the preceding four weeks. The K10 is a widely used tool used to identify levels of anxiety and depressive symptoms such as nervousness, hopelessness, restlessness, depression, sadness, and worthlessness experienced recently.

A total score is obtained by summing all items with total possible scores ranging from 10 to 50. The cut-off scores that may be used as a guide are as follows: a score under 20 “were likely to be considered well,” a score of 20-24 “was likely to have a mild stress/mental disorder,” a score of 25-29 “were likely to have moderate stress/mental disorder” and a score of 30 and over “were likely to have a severe stress/mental disorder” (Addonizio, 2011; Victorian Population Health Survey, 2001). It has been extensively researched in various cultural backgrounds and has demonstrated good validity and reliability. The total internal consistency of K10 was $\alpha = .83$, which shows high reliability. Results from exploratory factor analyses showed that the K10 has a two-factor solution that accounted for approximately 66% of the variance (Milkias et al.,

2022). The Arabic version of the K10 had strong scale reliability, with Cronbach's α equal to .88, and high factorial and construct validity (Easton et al., 2017). Overall, the K10 has shown strong validity in capturing psychological distress symptoms, making it a valuable tool for various settings, such as clinics, research, and surveys.

The demographics that will be collected in (Appendix C) including sex, age, nationality, residential, level of education, and college, will be obtained from participants to analyze sample subgroups and compare the results to come up with a conclusion and answer the research questions.

2.3 Participants

The study population was all registered undergraduate and postgraduate university students aged 18 and above from the Middle East region. Using the convenience sample technique, the students voluntarily answered an online survey that was received from the university's email and social networks. A minimum sample size of (400) students to cover a variety of university students of different sexes, ages, nationalities, residential, levels of education, and college. The students who were part of the study were required to meet the following: (A) they had to be enrolled for the current semester, (B) they had to be able to read and understand Arabic, (C) they had to be able to give informed consent by clicking on "I agree to be part of a study, and all information will be treated with confidentiality".

2.4 Procedure

The online survey was created using a Google form to ease the process of collecting all responses and automatically transferring them into an Excel sheet for processing the statistical software. The survey consisted of an information sheet with consent, demographics, a sleep quality scale, and a Kessler psychological distress scale, which took approximately 10 minutes to complete. Before the data collection started, ethical approval was obtained from the Institutional Review Board (IRB) (ERSC_2023_3491) at United Arab Emirates University (UAEU). The consent sheet was carried out before the survey, attached with the study information sheet, which included the objectives, participants' right to withdraw, safety, privacy, and

confidentiality. The students' participation was voluntary, and the collected data was solely used for study purposes. Three universities agreed to send out the survey to their students. Using the convenience sample technique, university students from Egypt, Oman, and the United Arab Emirates voluntarily answered an online survey via email and social networks. A minimum sample size of (400 students) was targeted for the participants, and we have reached 435 participants. Then, I started processing the collected data.

2.5 Data Analysis Plan

Statistical analyses were performed on collected data using the Statistical Package for the Social Sciences (SPSS) software. The correlation analysis was performed using Pearson correlation on the principal variables of sleep quality and psychological distress and additional factors. Pearson test was administered to accept or reject the study hypothesis, “H1 Poor sleep quality will be positively associated with psychological distress in university students”. Inferential statistic such as ANOVA test was used to check for significant difference between the additional variables to accept or reject the following hypothesis; “H2-a Sleep quality will vary between student's sex, H2-b Sleep quality will vary according to the student's age, H2-c Sleep quality will vary according to the college students enrolled, H3-a Psychological distress will vary between student's sex, H3-b Psychological distress will vary according to the student's age, and H3-c Psychological distress will vary according to the college students enrolled in”. And lastly running Linear Regression test to check the predicted hypothesis on the six sub-factors of sleep quality; “H5- Restoration after sleep will positively predict sleep quality in university students, H6- Difficulty in falling asleep will positively predict sleep quality in university students, H7- Difficulty in getting up will positively predict sleep quality in university students, H8- Satisfaction with sleep will positively predict sleep quality in university students, H9- Awakening during sleep will positively predict sleep quality in university students, and H10- Psychometric results of individuals with poor sleep quality will predict psychological distress”. To ensure the reliability of our questionnaire, an internal consistency reliability test was run to check for Cronbach's alpha value.

Chapter 3: Results and Discussions

3.1 Frequency of Demographics Variables

A total of 435 students responded to the questionnaire. The sample of university students consisted of 137 (31.5%) male and 298 (68.5%) female respondents. The age range of the participants in this study was between 18 years old to 45 years old. The average age of the university students was 19.15 years (SD = 2.858). Approximately 4.6% of the subjects were Arab Emiratis, 2.3% were Arab from The Gulf, 82.8% were Middle Eastern, and 10.3% were African. Most of the sample were undergraduate students, around 90%, while the rest were graduate students doing their master's degree (5.9%) and 3.7% doing their doctoral degree. Most responses came from students enrolled in Education college, which represented 68.7% of the sample, and the second highest college was Humanities and Social Sciences, which represented 21.4%. The other college's responses ranged between 2.1% and 1.1%. Regarding resident status, around 417 students live outside the campus, while only 18 students live on the campus responded to the questionnaire as shown in Table 1.

Table 1: The frequency of demographic variables

Variables	Mean	SD
Age	19.15	2.858
Gender	Frequency	Percent
Male	137	31.5
Female	298	68.5
Nationality		
Arab (Emirati)	20	4.6
Arab (The Gulf)	10	2.3
Arab (Middle Eastern)	360	82.8
African	45	10.3
Level of Education		
Bachelor's degree	394	90
Master's degree	25	5.9
Doctoral degree	16	3.7
College Enrolled		
Business & Economics	5	1.1
Humanities & Social Sciences	93	21.4
Information Technology	9	2.1
Engineering	6	1.4
Education	299	68.7
Law	4	.9
Agriculture & Vet	5	1.1
Science	1	1.8
Medicine & Health	8	1.8
Graduate Studies	5	1.1
Resident Status		
Live in campus	18	4.1
Live out campus	417	95.9
Total	N = 435	100%

N: Number, SD: Standard deviation.

3.2 Frequency Distribution of Sleep Quality and Psychological Distress

Table 2 provided cutoff scores to allow further interpretations. Regarding sleep quality, the highest percentage of students, 49.3%, had severely poor sleep quality. While 45.7% of the students had moderately poor sleep quality, 2.2% had mild poor sleep quality, and 2% had acute levels of poor sleep quality. In this study, only .4% seemed to have good sleep quality. When it comes to psychological distress, the highest percentage of students, 48.2%, had severe psychological distress. While 25.3% had moderate psychological distress and 19.1% had mild psychological distress. However, only 7.4% seemed to be psychologically well. When comparing the frequency between females and males, it was clear that the majority of the students who had severely poor sleep quality and psychological distress were females.

Table 2: The frequency of sleep quality and psychological distress

Indicate	Frequency	%	Between	Sex	Indicate	Frequency	%	Between	Sex
	Poor Sleep quality		M	F		Psychologically distressed		M	F
Mild	10	2.2	6	4	Mild	83	19.1	38	45
Moderate	199	45.7	57	142	Moderate	110	25.3	59	51
Severe	215	49.3	71	144	Severe	210	48.2	30	180
Acute	9	2	2	7	-	-	-	-	-
	Good Sleep quality					Psychologically well			
Well	2	.4	1	1	Well	32	7.4	10	22
Total	N = 435	100	137	298	Total	N = 435	100	137	298

M: Males, F: Females.

3.3 Descriptive Results of Sleep Quality Scale SQS

Table 3 provides an overview of the responses to all 28 items of the sleep quality scale for the sample, which consists of N = 435. The descriptive data of the Sleep Quality Scale (SQS) reveal an overall mean score of (1.53) and (SD = .412), which indicate a positive perception of sleep quality.

Table 3: Descriptive statistic of sleep quality scale 28 items

Items	N	Mean	SD
I have difficulty falling asleep	435	1.02	.877
I fall into a deep sleep	435	1.48	.929
I wake up while sleeping	435	1.34	1.027
I have difficulty getting back to sleep once I wake up in middle of the night	435	1.29	1.015
I wake up easily because of noise	435	1.83	1.135
I toss and turn “move”	435	1.86	1.077
I never go back to sleep after awakening during the night	435	.94	.961
I feel refreshed after sleep	435	1.41	1.055
I feel unlikely to sleep after sleep	435	.90	.906
Poor sleep gives me headaches	435	2.13	.995
Poor makes me irritated	435	1.77	1.146
I would like to sleep more after waking up	435	1.42	1.075
My sleep hours are enough	435	1.46	.913
Poor sleep makes me lose appetite	435	1.06	1.047
Poor sleep makes hard for me to think	435	1.91	1.014
I feel strong after sleep	435	1.69	1.001
Poor sleep makes me lose interest in work or others	435	1.83	.989
My fatigue is relieved after sleep	435	1.90	.911
Poor sleep cause me to make mistakes	435	1.57	1.026
I am satisfied with my sleep	435	1.43	1.000
Poor sleep makes me forget things easily	435	1.52	1.085
Poor sleep makes it hard to concentrate	435	1.85	.992

N: Number; SD: Standard deviation.

Table 3: Descriptive statistic of sleep quality scale 28 items (continued)

Sleepiness interferes with my daily life	435	1.25	.980
Poor sleep makes me lose desire in all things	435	1.45	1.075
I have difficulty getting out of bed	435	1.35	1.017
Poor sleep makes me easily tired	435	1.71	.996
I have a clear head after sleep	435	1.77	1.018
Poor sleep makes my life painful	435	1.71	1.015
Total of sleep quality	435	1.53	.412

N: Number; SD: Standard deviation.

3.3.1 Descriptive Results of The Six Sub-Factors of Sleep Quality

When it comes to the six factors, including 28 items, in Table 4, factor 1 includes 12 items and is termed daytime dysfunction. It was composed of items representing symptoms resulting from poor sleep {Q10 Headache due to poor sleep, Q11 Irritated feeling due to poor sleep, Q14 Decrease of appetite due to poor sleep, Q15 Difficulty in thinking due to poor sleep, Q17 Decrease of interest in work or others due to poor sleep, Q19 Increase of mistakes due to poor sleep, Q21 Increase of forgetfulness due to poor sleep, Q22 Difficulty in concentrating due to poor sleep, Q23 Sleepiness that interferes with daily life, Q24 Decrease of desire due to poor sleep, Q26 Getting tired easily at work due to poor sleep, Q28 Painful life due to poor sleep}. Factor 2 included four items, termed restoration after sleep, which seemed to measure the primary function of sleep; {Q8 Refreshed feeling of the body after sleep, Q16 Regaining vigor after sleep, Q18 Relief of fatigue after sleep, Q27 Clear-headed feeling after sleep}. Factor 3 included four items, termed difficulty in falling asleep and was composed of items about sleep initiation; {Q1 Difficulty in falling asleep, Q4 Difficulty in getting back to sleep after nocturnal awakening, Q6 Tossing and turning sleeplessly, Q7 Never falling asleep after awakening during sleep}. Factor 4 included three items, termed difficulty in getting up: {Q9 Feeling unlikely to sleep, Q12 Wish for more sleep after getting up, Q25 Difficulty in getting up after sleep}. Factor 5 included three items; it was termed satisfaction with sleep and was associated with the level of overall gratification and

sufficient sleeping time; {Q2 Deep sleep, Q13 Enough sleep time, Q20 Satisfaction with sleep}. Factor 6 included two items; it was associated with awakening during sleep and was termed difficulty in maintaining sleep; {Q3 Waking up during sleep, Q5 Waking up easily due to noise}.

Table 4: Descriptive statistic of sleep quality six factors

	N	Mean	SD
Daytime dysfunction	435	19.77	8.193
Restoration after sleep	435	6.76	3.207
Difficulty in falling asleep	435	5.11	2.490
Difficulty in getting up	435	3.66	2.079
Satisfaction with sleep	435	4.37	2.103
Awakening during sleep	435	3.17	1.729
Total	435	42.85	11.539

N: number; SD: standard deviation.

3.4 Descriptive Results of Kessler Psychological Distress Scale K10

Table 5 provides an overview of the responses to all ten items of the Kessler 10 scale for the sample, which consists of N = 435. The descriptive data of the (K10) reveal an overall mean score of (3.022) and (SD = .861), which indicates a positive perception of K10 among the university students. Moreover, Item 2 had the highest mean score of (3.29), which indicates high agreement on the statement “How often did you feel nervous”. Item 10 had the lowest mean score of (2.89), which indicates low agreement on the statement “How often did you feel worthless.

Table 5: Descriptive statistic for Kessler 10 psychological distress

Items	N	Minimum	Maximum	Mean	SD
How often did you feel tired out for no good reason	435	1	5	3.01	1.085
How often did you feel nervous	435	1	5	3.29	1.063
How often did you feel so nervous that nothing could calm you down	435	1	5	3.00	1.130
How often did you feel hopeless	435	1	5	3.09	1.131
How often did you feel restless or fidgety	435	1	5	2.89	1.107
How often did you feel so restless you could not sit still	435	1	5	2.89	1.170
How often did you feel depressed	435	1	5	3.01	1.137
How often did you feel that everything was an effort	435	1	5	3.15	1.161
How often did you feel so sad that nothing could cheer you up	435	1	5	3.01	1.192
How often did you feel worthless	435	1	5	2.89	1.241
Total of psychological distress	435	1	5	3.022	.861

N: Number; SD: Standard deviation.

3.5 Correlation Analysis Between Different Variables

The correlation analysis was performed using the Pearson correlation test on principal variables of psychological distress and sleep quality to accept or reject the study hypotheses. In addition, a correlation test was performed on other variables such as demographic variables and the six sub-factors of sleep quality.

3.5.1 Relationship Between Sleep Quality and Psychological Distress

The correlation was positive and significant at the .01 level, 2-tailed. Hence, hypothesis H1 was supported: “Poor sleep quality will be positively associated with psychological distress in university students.” This shows that increased poor sleep

quality would lead to increased psychological distress among university students. In other words, individuals with a higher score on SQS indicate poor sleep quality and tend to report higher scores on the K10 psychological distress scale. The value of r = .133 suggests a positive but weak linear relationship between sleep quality and psychological distress.

3.5.2 Relationship Between Sleep Quality and Demographic Variables

Sleep quality (SQ) and demographic variables, as shown in Table 12 in the appendix, did not correlate significantly with any of the demographical variables. Nevertheless, I will report only three of the variable's correlations. Sleep quality and sex were very weak, positively correlated, and insignificant (r = .031, p = .513). Sex is not found to be related to sleep quality in this sample. Sleep quality and age were very weak and positively correlated but insignificant (r = .076, p = .115), with no relationship between age and sleep quality in this sample. Sleep quality and college enrollment were found to be very weak, negatively correlated, and insignificant (r = - .046, p = .334), proposing that enrolling in a specific college does not affect sleep quality in this sample.

3.5.3 Relationship Between Sleep Quality and The Six Sub-Factors of Sleep Quality

The six sub-factors were all correlated significantly with the total sleep quality at the .01 level (2-tailed), as shown in Table 6. When it comes to the correlation of the six factors within each other, Factor 1 Daytime dysfunction is positively correlated with Difficulty in falling asleep (r = .321), Difficulty in getting up (r = .451), and Awakening during sleep (r = .155). Both of these correlations are significant, except Restoration after sleep (r = .060), which was insignificant. Factor 1 and Satisfaction with sleep (r = -.040) were negatively correlated and insignificant. Factor 2 Restoration after sleep was negatively correlated with difficulty falling asleep (r = -.138) and difficulty getting up (r = -.292). Both of these correlations are significant, except Factor 2 was positively correlated with Restoration after sleep (r = .06) but not significant. Awakening during sleep (r = -.022) was negatively correlated and insignificant. Factor 3 Difficulty in falling asleep is positively correlated with Daytime dysfunction (r = .321), Difficulty in getting up (r = .414), and Awakening during sleep (r = .374). Factor 3 negatively correlates with Restoration after sleep (r = -.138) and Satisfaction with sleep (r = -.291).

All of these correlations are significant. Factor 4 Difficulty in getting up is positively correlated with Daytime dysfunction (r = .451), Difficulty in falling asleep (r = .414), and Awakening during sleep (r = .148). Factor 4 is negatively correlated with Restoration after sleep (r = -.292) and Satisfaction with sleep (r = -.300). All correlations are significant. Factor 5 Satisfaction with sleep is positively correlated with Restoration after sleep (r = .573). Factor 5 is negatively correlated with Daytime dysfunction (r = -.04), Difficulty in falling asleep (r = -.291), Difficulty in getting up (r = -.300), and Awakening during sleep (r = -.161). All of these correlations are significant. Factor 6 Awakening during sleep is positively correlated with Daytime dysfunction (r = .155), Difficulty in falling asleep (r = .374), and Difficulty in getting up (r = .148). Factor 6 negatively correlates with sleep satisfaction (r = -.161). All of these correlations are significant except factor 6 and Restoration after sleep (r = -.022) were negatively correlated and not significant.

3.5.4 Relationship Between Psychological Distress and Demographic Variables

As shown in Table 12 in the appendix, psychological distress and demographic variables correlated significantly with three demographic variables. Psychological distress and sex were found to be weak, positively correlated, and significant (r = .290, p = .004) higher psychological distress associated with a particular sex. Psychological distress and age were found to be very weak, positively correlated, and significant (r = .106, p = .026), proposing that as age increases, psychological distress tends to increase. Psychological distress and college enrollment were very weak, positively correlated, and significant (r = .138, p < .001) higher psychological distress associated with a particular college.

3.5.5 Relationship Between Psychological Distress and Six Sub-Factors of Sleep Quality

Psychological distress correlated with all six sub-factors of sleep quality, as shown in Table 12 in the appendix. Psychological distress and Factor 1 (Daytime dysfunction) were found to be positively correlated and significant (r = .222, p < .001). As psychological distress increases, daytime dysfunction also increases. Psychological distress and Factor 2 (Restoration after sleep) were found to be negatively correlated and significant (r = -.316, p < .001). The higher psychological distress is associated with

poorer restoration after sleep. Psychological distress and Factor 3 (Difficulty in falling asleep) were found to be positively correlated and significant ($r = .187$, $p < .001$). The higher psychological distress is associated with more difficulty falling asleep. Psychological distress and Factor 4 (Difficulty in getting up) were found to be positively correlated and significant ($r = .304$, $p < .001$). The higher psychological distress is associated with more difficulty getting up in the morning. Psychological distress and Factor 5 (Satisfaction with sleep) were found to be negatively correlated and significant ($r = -.266$, $p < .001$). Higher psychological distress is associated with lower satisfaction with sleep. Psychological distress and Factor 6 (Awakening during sleep) were positively correlated and significant ($r = .113$, $p = .018$). The higher psychological distress is associated with more frequent awakenings during sleep.

Table 6: Correlation between the total sleep quality and six factors scores

	SQS	F1	F2	F3	F4	F5	F6
SQS Sleep quality scale							
F1 Daytime dysfunction	.893**						
F2 Restoration after sleep	.339**	.060					
F3 Difficulty in falling asleep	.483**	.321**	-.138**				
F4 Difficulty in getting up	.477**	.451**	-.292**	.414**			
F5 Satisfaction with sleep	.172**	-.040	.573**	-.291**	-.300**		
F6 Awakening during sleep	.332**	.155**	-.022	.374**	.148**	-.161**	

SQS: Sleep quality; F1-F6: Six factors of sleep quality.

3.6 Results of Inferential Statistic

One-way ANOVA results of Sleep quality, demographic variables, and six sub-factors of sleep quality. Although there was a difference in SQS frequency between females and males, the inferential statistic indicated no significant difference in sex. Table 7 showed no significant difference between demographic variables “sex, age, and college enrolled in” with sleep quality. Hence, hypotheses H2-a, H2-b, and H2-c are all rejected. However, there was a significant difference between sleep quality and all six sub-factors.

Table 7: ANOVA of sleep quality and additional factors

Variables	df	F	Sig.
Sex	1	.428	.513
Age	12	1.493	.123
College	9	.699	.797
F1 Daytime dysfunction	36	51.565	< .001
F2 Restoration after sleep	12	6.602	< .001
F3 Difficulty in falling asleep	12	12.252	< .001
F4 Difficulty in getting up	9	16.299	< .001
F5 Satisfaction with sleep	9	3.376	< .001
F6 Awakening during sleep	6	9.990	< .001

F1-F6: Six factors of sleep quality.

One-way ANOVA results of psychological distress, demographic variables, and six sub-factors of sleep quality. There was a difference in PD frequency between females and males; the inferential statistic confirmed the significant difference. Table 8 showed that there was a significant difference between demographic variables “sex and college enrolled in” with psychological distress. Hence, hypotheses H3-a and H3-c are both accepted. Interestingly, variable age had no significant difference with psychological distress. Hence, H3-b was rejected. However, there was a significant difference between psychological distress and all six sub-factors of sleep quality.

Table 8: ANOVA of psychological distress and additional factors

Variables	df	F	Sig.
Sex	1	39.659	< .001
Age	12	.886	.561
College	9	2.132	.026
F1 Daytime dysfunction	36	1.818	.003
F2 Restoration after sleep	12	5.024	< .001
F3 Difficulty in falling asleep	12	2.146	.013
F4 Difficulty in getting up	9	6.198	< .001
F5 Satisfaction with sleep	9	4.069	< .001
F6 Awakening during sleep	6	2.684	.014

F1-F6: Six factors of sleep quality.

3.7 Results of Linear Regression

The model summary in Table 9 presents two models of linear regression. In Model 1, the correlation coefficient between the dependent and independent was .133, which is considered significant, and the p-value ($p = .005$) is less than the significance level of .05. The R Square value of .018 indicates that 1.8% of the variance in psychological distress is explained by sleep quality. When it comes to Model 2, it is considered stronger than Model 1 as the correlation coefficient was .423, proposing a moderate positive relationship between variables, and it is significant. The R Square value of .179 indicates that the independent variable and other factors within the model explain 17.9% of the variance in psychological distress. The model F change is significant ($p < .001$), indicating that adding Sleep quality sub-factor variables significantly improved the model's fit.

Table 9: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.133	.018	.016	8.358	.018	7.841	1	433	.005
2	.423	.179	.168	7.685	.161	16.837	5	428	< .001

a Predictors: (Constant), Sleep quality
b Predictors: (Constant), Sleep quality, Satisfaction with sleep, awakening during sleep, Difficulty in getting up, Difficulty in falling asleep, Restoration after sleep
c Dependent Variable: Psychological distress.

Table 10 below presents the coefficients for each predictor variable in the regression model. They were starting with model 1 ($t = 2.800$, $p = .005$), which is significant. In model 2, sleep quality was ($t = 3.270$, $p = .001$) considered highly significant. Factor 1 was excluded in this model, so it starts with Factor 2. Restoration after sleep ($t = -5.041$, $p < .001$) is significant. In Factor 3, difficulty falling asleep ($t = -.727$, $p = .468$) is insignificant. Difficulty in falling asleep does not significantly impact psychological distress in this model. Factor 4 Difficulty getting up ($t = 1.333$, $p = .183$) is insignificant. Factor 5 Satisfaction with sleep ($t = -1.952$, $p = .052$) is insignificant. Lastly, Factor 6, Awakening during sleep ($t = .270$, $p = .788$) is insignificant. The results indicated that F3, F4, F5, and F6 do not significantly impact psychological stress in this model. Overall, model 2 is considered to be significant.

Table 10: Coefficients

Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	26.102	1.543		16.918	<.001
	Sleep quality	.097	.035	.133	2.800	.005
2	(Constant)	29.736	1.638		18.153	<.001
	Sleep quality	.172	.053	.236	3.270	.001
	F2	-.823	.163	-.313	-5.041	<.001
	F3	-.141	.194	-.042	-.727	.468
	F4	.332	.249	.082	1.333	.183
	F5	-.451	.231	-.113	-1.952	.052
	F6	.065	.240	.013	.270	.788

a Predictors: (Constant), Factors variables: (F1) Daytime dysfunction, (F2) Restoration after sleep, (F3) Difficulty in falling asleep, (F4) Difficulty in getting up, (F5) Satisfaction with sleep, and (F6) Awakening during sleep.
b Dependent Variable: Psychological distress.

3.7.1 Psychometric of Arabic Translated SQS

Testing the reliability of the Sleep Quality Scale SQS that was translated into the Arabic language has shown the value of Cronbach's Alpha (.814) indicates a good level of internal consistency among the 28 items in the translated scale that was administered to the 435 students whose first language was Arabic. The score suggests some degree of internal consistency among the 28 items. As a preliminary exploration, I have run a Pearson correlation test between translated SQS items. Table 11 in the appendix shows that most of the correlations had p-values less than .05 (2-tailed), suggesting significant associations between the 28 items. I will start with reporting the items that were considered stronger than the other items' correlation which is “I have difficulty falling asleep” is positively correlated with; “I have difficulty getting back to sleep once I wake up in the middle of the night” (r = .395), “I feel unlikely to sleep after sleep” (r = .301), “My sleep hours are enough” (r = .396), “Poor sleep gives me headaches” (r = .206). While item “I have difficulty getting back to sleep once I wake up in the middle of the night” was positively correlated with; “I feel unlikely to sleep after sleep” (r = .175), “Poor sleep gives me headaches” (r = .175), “Poor sleep makes me lose interest in work

or others" (r = .182). When it comes to negatively correlated items, it was found that "I have difficulty falling asleep" has a negative correlation with "I feel refreshed after sleep" (r = -.180) and "I am satisfied with my sleep" (r = -.255) was negatively correlated item. When it comes to the item "I have difficulty falling asleep," it was found to be positively correlated with various sleep-related issues, such as difficulty in falling into a deep sleep, waking up while sleeping, difficulty getting back to sleep, and others. The item "I fall into a deep sleep" is considered negatively correlated with "I have difficulty falling asleep" (r = -.291). Overall, Table 8 showed various significant correlations, some of which are positive and some negatively correlated with each other, but most of them met at a significant level.

3.7.2 Psychometric of Arabic Translated K10

The value of Cronbach's Alpha (.915) indicated a very high level of internal consistency among the ten items in the K10 scale Arabic version. This suggests that items within the scale measure the same underlying concept of psychological distress. In this case, all items are highly consistent with each other.

3.8 Discussions

This study explored the relationship between sleep quality and psychological distress among university students in the Middle East. The independent variable, Sleep quality, was found to correlate positively with the dependent variable, psychological distress. The statistical results confirmed that psychological distress is significantly associated with poor sleep quality; an increase in poor sleep quality would lead to increased psychological distress among university students.

Hypothesis H1 was supported: "Poor sleep quality will be positively associated with psychological distress in university students." Safhi et al. (2020) demonstrated that a high level of psychological distress significantly predicts poor sleep quality. Another large study of college students found that emotional distress was the most significant predictor of poor sleep quality (Henrich et al., 2021; Lund et al., 2010). This finding aligns with the findings of a plethora of studies that agree that an association between poor sleep quality and psychological distress exists (Almojali et al., 2017; Alotaibi et al.,

2020; Safhi et al., 2020). Indeed, the nature of the relationship between sleep quality and psychological distress was confirmed, although the specific mechanistic mechanisms behind this link are still unknown (Zhang et al., 2022).

These results have not only confirmed the association between the two principal variables but have also indicated that the proposed six sub-factors of sleep quality by Yi et al. (2006), namely, daytime dysfunction, restoration after sleep, difficulty in falling asleep, difficulty in getting up, satisfaction with sleep, and difficulty in maintaining sleep, were correlated significantly with total sleep quality score. However, only five of the six sub-factors correlated significantly with psychological distress: restoration after sleep, difficulty falling asleep, difficulty getting up, satisfaction with sleep, and difficulty maintaining sleep.

It was explicit that the study demonstrated a high prevalence of poor sleep quality, psychological distress, and perhaps even alarming scores. Poor sleep quality was prevalent among university students; approximately 49.3% had a severe level of poor sleep quality. The prevalence score of this study was close to what was reported in other studies; more than 50% of university students reported having poor sleep quality (Al-Kandari et al., 2017; Cheng et al., 2012; Lemma et al., 2012). In a student sample, 14.4% of respondents reported poor Sleep quality on SQS, a prevalence lower than that reported by several studies (Alnaser et al., 2021). Current literature reviews showed an increase in the prevalence of poor sleep quality. Alotaibi et al. (2020) found that 77% of the participants reported poor sleep quality. A recent study in Qatar found that 70% of the students at Qatar University had poor sleep quality (Ali et al., 2023). Similarly to Qatar, there is a high prevalence of poor sleep quality (76%) among Sudia Arabic medical students (Almojali et al., 2017).

On the other hand, psychological distress was found to be high in university students in this study; 48.2% had severe psychological distress. Compared with Saudi Arabia, stress prevalence is documented as 63% and 53% in King Saud and King Faisal Universities (Safhi et al., 2020). In a different study, 63.5% reported some psychological stress (Alotaibi et al., 2020).

Students' sex, age, and college enrollment were found to not correlate significantly with sleep quality in this study. Sleep quality and sex were positively correlated but not significant; sex does not appear to be related to sleep quality. Alotaibi et al. (2020) agreed that no significant association between gender and sleep quality was found. However, the frequency of this study has shown that most of the percentage are females with severely poor sleep quality. Ali et al. (2023) revealed that male students are likelier to have better sleep quality than female students. With that, males have better sleep quality than females in this study. Sleep quality and age were positively correlated but also not significant, meaning there was no relationship between age and sleep quality in this sample.

Similarly, Meer et al. (2022) findings indicated that there was no significant difference in age by quality of sleep in the university students. However, Rajeh et al. (2022) admitted that the literature has conflicting results about the effects of age on sleep quality. Sleep quality and college enrollment were found to be negatively correlated and insignificant; this proposes that enrolling in a specific college does not affect sleep quality in this sample. On the contrary, Rajeh et al. (2022) revealed a statistically significant difference in sleep quality between different colleges; the findings also revealed that the best sleep quality was recorded among students from the College of Medicine, which contradicts previous literature findings in which medical students were found to have the worst sleep quality. In this study, ANOVA results confirmed no significant difference between demographic variables “sex, age, and college enrolled in” with sleep quality. By that, hypotheses H2-a, H2-b, and H2-c were rejected.

Students' sex, age, and college enrollment were found to be significantly correlated with psychological factors in this study. Psychological distress and sex were found to be positively correlated and significant, with a higher psychological distress associated with a particular sex. When comparing the frequency between females and males, it was clear that the majority of the students who had severe psychological distress were females. Some studies have reported that female students have worse stress levels and sleep disorders (Alsalhi et al., 2018; Safhi et al., 2020). There was a difference in psychological distress frequency between females and males. The inferential statistic confirmed the significant difference.

On the other hand, different results were presented in the literature; there was no statistically significant difference between stress level and sex (Almojali et al., 2017; Safhi et al., 2020). Psychological distress and age were found to be positively and significantly correlated, proposing that as age increases, psychological distress tends to increase. However, the inferential results indicated no significant difference between students's age and level of psychological distress.

The literature did not discuss how psychological distress can differ with age in the student population. Interesting findings showed that anxiety and depression are associated with demographic information, e.g., age and gender (Alvaro et al., 2020). Psychological distress and college enrollment were found to be positively correlated and significant, with higher psychological distress associated with a particular college. A study detected high levels of stress among medical students (Almojali et al., 2017). ANOVA results confirmed that there was a significant difference between demographic variables “sex and college enrolled in” with psychological distress. Hence, hypotheses H3-a and H3-c are all accepted. However, variable age had no significant difference with psychological distress. Therefore, H3-b was rejected.

The regression result indicated that 17.9% of the variance in psychological distress is explained by sleep quality and the additional sub-factors. That explains the principle variables of the study variables, psychological distress, and sleep quality, improved by adding the sleep quality sub-factors to the model, which enhances the model by representing a moderate positive relationship between variables and significance. Many studies proposed measuring sleep hygiene as it was found that adopting good sleep hygiene results in enhanced sleep quality and physical and psychological well-being (Ali et al., 2023; Meer et al., 2022). Other studies have explored additional factors among Egyptian families, indicating that age, sex, and co-sleeping influence sleeping arrangements, thus impacting overall sleep quality (Doolin et al., 2018).

The psychometric outcomes of the study have provided a reliable measure when measuring poor sleep quality using the Sleep Quality Scale that was translated to Arabic as a preliminary exploration in the United Arab Emirates. The Pearson correlation test on

the translated Sleep Quality Scale suggested significant correlations between the 28 items, making it a significant tool in this study.

Additionally, the value of Cronbach's Alpha indicates a good level of internal consistency among SQS items in the translated scale that was administered to the 435 students whose first language was Arabic. Rajeh et al. (2022) attempted to translate SQS from English to Arabic, which was validated in the pilot study. Many studies have used the Sleep Quality Scale on the Arab population in Egypt, Jorden, and Saudi Arabia (Alnaser et al., 2021; Mahmoud et al., 2019; Rajeh et al., 2022). On the other side, the Kessler Psychological Distress Scale Arabic version showed a very high level of internal consistency among the ten items of this study. This suggests that items within the scale measure the same underlying concept of psychological distress. Similarly, Rajeh et al. (2022) have also administered Kessler 10 on the Arab population in Saudi Arabia.

The possible meaning of the results of the disproportionate distribution of gender is that the prevalence of female students is triple the prevalence of male students in various universities in the Middle East and that because males are usually expected to work earlier or complete their studies abroad, with all that there was no significant effect on the results. When it comes to this sample, most of them are enrolled in an education study, and that is due to the majority of volunteered students distributing the survey in education college, which has no significant effect on the results. One explanation for such high distress in this study sample may be that the sample comprised university students and the data collected during the midterm exams.

The study sample covers Middle Eastern culture, and usually, people within this culture have very similar religious practices when it comes to sleep, such as “Wudu” which means the procedure for cleansing parts of the body and reading sleep prayer. Another cultural factor affecting sleep quality could be sleep paralysis, which is very common around South Africa and the Gulf region. It is interpreted culturally as a “Jinn attack” which is a demon that causes sleep paralysis.

Chapter 4: Conclusion

4.1 Implications

The findings from the existing literature emphasize the prevalence of poor sleep quality and the high risk of developing sleep problems and psychological distress among Middle Eastern students. Confirming the existing association between sleep quality and psychological distress and understanding the association is crucial for developing effective interventions that address the specific needs of students in the Middle East. From a clinical view, poor sleep can articulate physical and emotional problems. Poor sleep quality can be a sign of various mental health issues as well as a cause of psychiatric issues. Researchers are just beginning to understand the complex interconnections between the neurobiological mechanisms underlying various psychiatric diagnoses and the mechanisms of sleep (Faulkner and Bee, 2016). Lee and Kaufmann (2023) demonstrated the importance of examining multiple sleep variables and how they impact health. Thus, it can reduce the risk of developing chronic conditions and possibly even mortality by promoting healthy sleep behaviors or providing treatments proven to work in diverse populations. Sleep can be a changeable lifestyle habit, which has received unique study due to its importance in maintaining good mental and physical health (Capezuti, 2016; Zhang et al., 2022). Generally, good sleep is essential to good health, and good sleep quality positively affects daily emotional functioning and reduces stress reactivity (Blaxton, et al., 2017; Henrich et al., 2021).

4.2 Limitations

The cross-sectional approach has certain intrinsic limitations, such as the inability to show a cause-and-effect relationship between psychological distress and sleep quality. There is a potential for encountering bias because the questionnaire distributed to students was online. Since convenience sampling was used, it limited generalized statements regarding the Middle Eastern population. Unfortunately, the topic of sleep quality was not sufficiently explored in the Middle East region, which may contribute to the high prevalence of poor sleep quality and psychological distress reported among university students. Ali et al. (2023) agreed on the sufficient exploration in the Arab

world. As an interesting observation, the nightmare was never explored in the SQS scale. However, it was mentioned in the Global Sleep Assessment Questionnaire (GSAQ) item 9, “Did you have nightmares, or did you scream, walk, punch, or kick in your sleep?” (Roth et al., 2002). Nightmares are not well documented, and whether this is reflected in objectively quantifiable physiological indices of sleep quality is unknown (Paul, Schredl and Alpers, 2015).

4.3 Recommendations

Further research is recommended to explore the underlying association mechanisms between sleep quality, sub-factors of sleep quality, and psychological distress. Doolin et al. (2018) revealed new avenues for future work in investigating sleep in different cultures by examining three variables that predict sleep quality: (worldview, sleep hygiene, and sleep deficiency). An interesting aspect of sleep is sleep paralysis, which has different cultural interpretations associated with bad dreams. It is worth exploring in the Middle East as it contributes to poor sleep quality. Launching longitudinal studies to evaluate the effectiveness of intervention programs and assess the long-term impact of improved sleep on students' mental health and academic performance. Sleep hygiene can improve various components of sleep quality and could be taught as a valuable method to improve sleep quality (Mahmoud et al., 2019). Safhi et al. (2020) recommend establishing courses that educate students about proper sleep hygiene and dealing with the stressful environment. Many studies recommended developing sleep hygiene education programs as an intervention and prevention strategy (Al-Kandari et al., 2017; Safhi et al., 2020). Educating students about sleep hygiene practices and promoting healthy sleep patterns through awareness campaigns and workshops can be beneficial. Implementing sleep counseling services, both individual and group-based, in Middle Eastern universities may help students manage their sleep problems as well as their psychological distress and develop effective coping strategies. In addition, universities and college officers may want to examine how campus and community environments contribute to students' sleep difficulties (Buboltz et al., 2001).

4.4 Conclusion

The current study demonstrated a significant association between sleep quality and psychological distress among the university student population in the Middle East region. Using two psychometric scales, the Sleep Quality Scale (SQS) and the Kessler Psychological Distress Scale (K10) in Arabic, they assessed a high prevalence of psychological distress and poor sleep quality among university students in this study. As part of our preliminary exploration, the Arabic translation of the Sleep Quality Scale has reflected a good internal consistency. For future research, I would suggest testing validity on a wider Arab population. The creator of the Sleep Quality Scale recommended constructing more items related to awakening during sleep in future studies (Yi et al., 2006). Thus, additional sub-factors related to sleep hygiene and duration are added to get in-depth information on sleep experience. Based on the given findings, it was recommended to provide adequate support counseling, guidance, and mental health prevention programs for both undergraduate and graduate students in all universities of the Middle East in order to maintain wellness.

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List of Publications

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Appendices

Appendix A

	Sleep Quality Scale (SQS)	مقياس جودة النوم (SQS)
1	I have difficulty falling asleep	أجد صعوبة في النوم
2	I fall into a deep sleep	أنام نوماً عميقاً
3	I wake up while sleeping	أستيقظ أثناء النوم
4	I have difficulty getting back to sleep once I wake up in middle of the night	أجد صعوبة في العودة إلى النوم عندما أستيقظ في منتصف الليل
5	I wake up easily because of noise	أستيقظ بسهولة بسبب الإزعاج
6	I toss and turn “move”	أتقلب في الفراش
7	I never go back to sleep after awakening during the night	لا أعود إلى النوم أبداً بعد الاستيقاظ
8	I feel refreshed after sleep	أشعر بالانتعاش بعد النوم
9	I feel unlikely to sleep after sleep	أشعر أنه من غير المحتمل معاودة النوم
10	Poor sleep gives me headaches	قلة النوم تسبب لي الصداع
11	Poor sleep makes me irritated	قلة النوم تجعلني أشعر بالغضب
12	I would like to sleep more after waking up	أود أن أنام أكثر بعد الاستيقاظ
13	My sleep hours are enough	ساعات نومي كافية
14	Poor sleep makes me lose appetite	قلة النوم تجعلني أفقد شهيتي
15	Poor sleep makes hard for me to think	قلة النوم تجعل من الصعب علي التفكير
16	I feel strong after sleep	أشعر بالنشاط بعد النوم
17	Poor sleep makes me lose interest in work or others	قلة النوم تجعلني أفقد الاهتمام بالعمل أو غيره
18	My fatigue is relieved after sleep	يخف التعب بعد النوم
19	Poor sleep cause me to make mistakes	قلة النوم تجعلني أرتكب أخطاء في العمل
20	I am satisfied with my sleep	أنا راضي عن نومي
21	Poor sleep makes me forget things easily	قلة النوم تجعلني أنسى الأشياء بسهولة أكبر
22	Poor sleep makes it hard to concentrate	قلة النوم تجعل التركيز في العمل صعباً
23	Sleepiness interferes with my daily life	النعاس يتعارض مع حياتي اليومية
24	Poor sleep makes me lose desire in all things	قلة النوم تفقدني الرغبة في كل شيء
25	I have difficulty getting out of bed	أواجه صعوبة في النهوض من السرير
26	Poor sleep makes me easily tired	قلة النوم تجعلني أتعب بسهولة في العمل
27	I have a clear head after sleep	أشعر بأن ذهني صافي بعد النوم
28	Poor sleep makes my life painful	قلة النوم تجعل حياتي شاقة
	0 Few = 0-3 times a month 1 Sometime = 1-2 times a week 2 Often = 3-5 times a week 3 Always = 6-7 times a week	0 نادراً = 0 أو 1-3 مرات في الشهر 1 بعض الأحيان = 1-2 مرات في الأسبوع 2 غالباً = 3-5 مرات في الأسبوع 3 دائماً = 6-7 مرات في الأسبوع

Appendix B

	Kessler 10 Scale (K10)	مقياس كيسلر (K10)
1	How often did you feel tired out for no good reason	متى كنت تشعر بالتعب الشديد دونسبب واضح
2	How often did you feel nervous	متى كنت تشعر بالعصبية
3	How often did you feel so nervous that nothing could calm you down	كنت تشعر بالعصبية إلى حد أنه لم يوجد ما يريح أعصابك
4	How often did you feel hopeless	كنت تشعر باليأس
5	How often did you feel restless or fidgety	كنت تشعر بعدم القدرة على الجلوس ساكناً
6	How often did you feel so restless you could not sit still	كنت تشعر بعدم الارتياح نفسياً لدرجة أنه لم يمكنك الجلوس ساكناً
7	How often did you feel depressed	كنت تشعر بالاكتئاب
8	How often did you feel that everything was an effort	كنت تشعر بأن كل ماتفعله متعباً
9	How often did you feel so sad that nothing could cheer you up	كنت تشعر بالحزن لدرجة أنه لم يوجد مايسرك
10	How often did you feel worthless	كنت تشعر بأن حياتك بلا معنى أو قيمة
	1 None of the time 2 A little of the time 3 Some of the time 4 Most of the time 5 All of the time Please answer according to the last 4 weeks	1 إطلاقاً 2 قليلاً 3 أحياناً 4 غالباً 5 دائماً يرجى الإجابة وفقا لآخر أربعة أسابيع

Appendix C

Demographic Survey	الاسئلة الديموغرافية
What is your gender	ماهو جنسك
What is your age	ماهو عمرك
What is your nationality	ماهي جنسيتك
What is your current level of education	ما هو مستواك التعليمي الحالي
Which college are you in	بأي كلية تلتحق
Do you live in the University dorm	هل تسكن في السكن الجامعي

Appendix D

Table 11: Sleep quality scale correlation between all items and the total sleep quality

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14
S1														
S2	-.291**													
S3	.254**	-.279**												
S4	.395**	-.233**	.260**											
S5	.073	-.209**	.280**	.268**										
S6	.215**	-.053	.245**	.093	.128**									
S7	.146**	-.156**	.119*	.308**	.168**	.077								
S8	-.180**	.269**	-.058	-.144**	.084	-.005	.001							
S9	.301**	-.190**	.144**	.396**	.167**	.075	.379**	-.084						
S10	.206**	.071	.148**	.175**	.140**	.286**	.003	.096*	.094*					
S11	.245**	-.007	.152**	.182**	.092	.204**	-.004	-.025	.154**	.492**				
S12	.185**	.035	.219**	.164**	-.016	.187**	-.005	-.203**	.071	.263**	.363**			
S13	-.255**	.232**	-.081	-.175**	.032	-.031	-.008	.329**	-.084	-.006	-.087	-.241**		
S14	.244**	-.001	.136**	.139**	.048	.177**	.079	.051	.107*	.317**	.347**	.054	.003	

S1-S28: Sleep quality scale items.

Table 11: Sleep quality scale correlation between all items and the total sleep quality (continued)

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14
S15	.085	.028	.112*	.077	.137**	.252**	-.003	.123*	.110*	.409**	.313**	.158**	.043	.292**
S16	-.159**	.188**	-.120*	-.149**	.092	.037	-.029	.612**	-.099*	.05	-.063	-.270**	.352**	.01
S17	.131**	.075	.085	.075	.07	.208**	.05	.078	.068	.322**	.344**	.213**	.013	.240**
S18	-.096*	.258**	-.093	-.107*	.095*	.065	-.07	.439**	-.077	.167**	.054	.002	.337**	.048
S19	.145**	.06	.09	.072	.025	.159**	.037	.063	.116*	.322**	.337**	.221**	.023	.274**
S20	-.261**	.193**	-.096*	-.211**	.039	-.048	.029	.436**	-.068	-.033	-.179**	-.309**	.532**	-.024
S21	.181**	-.023	.141**	.134**	.054	.123*	.096*	-.044	.149**	.310**	.246**	.196**	-.037	.212**
S22	.154**	.043	.122*	.143**	.041	.201**	.078	.052	.101*	.384**	.290**	.212**	.038	.238**
S23	.255**	.033	.161**	.116*	-.076	.159**	.062	-.076	.164**	.234**	.240**	.345**	-.056	.213**
S24	.236**	.089	.134**	.099*	-.053	.175**	.024	-.058	.147**	.363**	.416**	.319**	-.028	.322**
S25	.323**	-.04	.06	.123**	-.043	.145**	-.002	-.195**	.154**	.219**	.277**	.405**	-.154**	.132**
S26	.148**	.077	.120*	.102*	.041	.195**	-.047	-.03	.059	.342**	.319**	.277**	0	.263**
S27	-.173**	.260**	-.136**	-.118*	-.012	.013	-.061	.487**	-.139**	.148**	.037	-.218**	.281**	.098*
S28	.298**	.088	.084	.126**	.022	.163**	.008	.001	.198**	.421**	.392**	.246**	-.018	.232**
Total	.332**	.125**	.289**	.292**	.246**	.398**	.195**	.261**	.294**	.616**	.553**	.351**	.160**	.467**

S1-S28: Sleep quality scale items.

Table 11: Sleep quality scale correlation between all items and the total sleep quality (continued)

	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	Total
S15															
S16	.036														
S17	.465**	.016													
S18	.097*	.511**	.109*												
S19	.498**	.013	.541**	.105*											
S20	.011	.522**	-.059	.364**	-.103*										
S21	.331**	-.075	.373**	.02	.436**	-.066									
S22	.488**	-.046	.499**	.113*	.560**	-.052	.486**								
S23	.269**	-.150**	.375**	-.007	.358**	-.162**	.372**	.341**							
S24	.361**	-.102*	.458**	.031	.489**	-.116*	.392**	.504**	.440**						
S25	.205**	-.274**	.216**	-.137**	.219**	-.298**	.184**	.214**	.387**	.260**					
S26	.432**	-.077	.511**	.049	.516**	-.149**	.410**	.582**	.375**	.540**	.378**				
S27	.138**	.622**	.095*	.496**	.125**	.457**	.003	.107*	-.078	.018	-.204**	.035			
S28	.455**	-.009	.487**	.149**	.469**	-.101*	.451**	.517**	.359**	.550**	.290**	.588**	.124**		
Total	.614**	.207**	.624**	.335**	.635**	.100*	.539**	.654**	.497**	.623**	.342**	.625**	.294**	.669**	

S1-S28: Sleep quality scale items.

Appendix E

Table 12: Correlation analysis between all variables

	SQ	PD	Age	Sex	Nat	Edu	Res	Coll	F1	F2	F3	F4	F5	F6
SQ														
PD	.133**													
Age	.076	.106*												
Sex	.031	.290**	.018											
Nat	.007	.000	-.260**	.035										
Edu	-.032	.041	.218**	-.046	.053									
Res	-.028	-.029	.219**	.041	-.364**	.070								
Coll	-.046	.138**	-.062	.465**	.018	.022	.046							
F1	.893**	.222**	.083	.053	.015	.005	-.045	-.006						
F2	.339**	-.316**	-.153**	.055	.029	-.128**	-.050	.031	.060					
F3	.483**	.187**	.186**	-.084	-.085	.038	.070	-.137**	.321**	-.138**				
F4	.477**	.304**	.165**	-.083	-.062	.046	.106*	-.098*	.451**	-.292**	.414**			
F5	.172**	-.266**	-.198**	.048	.116*	-.104*	-.102*	.027	-.040	.573**	-.291**	-.300**		
F6	.332**	.113*	.172**	.017	-.022	.019	.012	-.059	.155**	-.022	.374**	.148**	-.161**	

SQ: Sleep quality; PD: Psychological distress; Age; Sex; Nat: Nationality; Edu: Education; Res: Residential status; Coll: College enrolled in; F1: Daytime dysfunction; F2: Restoration after sleep; F3: Difficulty in falling asleep; F4: Difficulty in getting up; F5: Satisfaction with sleep; F6 Awakening during sleep.

UAE UNIVERSITY MASTER THESIS NO. 2023:124

This study addressed the topic of sleep quality, specifically with the young adult population, to explore the association between sleep quality and psychological distress among university students in the Middle East.

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