AMERICAN UNIVERSITY OF BEIRUT

THE ASSOCIATION BETWEEN SLEEP QUALITY AND ARRHYTHMIA SYMPTOMS IN PATIENTS WITH ATRIAL FIBRILLATION IN LEBANON

by
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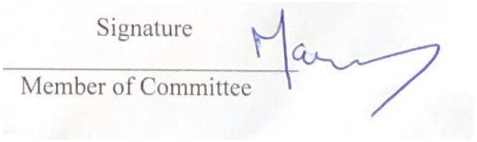

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ABSTRACT

OF THE THESIS OF

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Major: Nursing

Title: The Association Between Sleep Quality and Arrhythmia Symptoms in Patients with Atrial Fibrillation in Lebanon

Background: Atrial fibrillation (AF) is the most prevalent cardiac arrhythmia globally causing a major burden on many quality of life determinants, including sleep quality. Although there is extensive evidence showing reduced sleep quality among AF patients, there are limited data on the predictors of poor sleep among this population, and how specific AF symptoms correlate with poor sleep quality.
Aims: This study aimed to describe sleep quality in a sample of AF patients in Lebanon, examine the associations between sleep quality and the number and bothersomeness of specific AF symptoms, and determine the predictors of reduced sleep quality among these patients.
Method: This was a cross-sectional descriptive/correlational study conducted at the cardiology clinics of the AUB Medical Center. One hundred and forty-four AF patients were recruited, assessed for their heart rhythm, and asked about their sleep quality and AF symptoms through individual interviews, using the Pittsburgh Sleep Quality Index (PSQI) and Patient's Perspective of Arrhythmia Questionnaire (PPAQ). Clinical data were retrieved from the medical records.
Statistical Analysis: Descriptive analyses were conducted to describe the sample demographics, sleep quality, and other characteristics. Pearson r correlation tests were run to determine associations between AF symptoms (frequency/bothersomeness) and sleep quality. In addition, t tests and ANOVA were conducted to measure the association between the sleep quality index, demographic and clinical variables. Multivariate linear regression analyses were conducted to determine the predictors of sleep quality among AF patients.
Results: The majority of the sample suffered from poor sleep quality (91%). The most prevalent AF symptoms were fatigue, dyspnea, heart flutter and headache whereas the most bothersome symptoms were fatigue, chest pressure and dizziness. Most symptoms and their bothersomeness were significantly associated with sleep quality. The number of AF symptoms, bothersomeness of symptoms, intake of caffeine before bedtime, and history of COPD were independent predictors of poor sleep quality.
Conclusions: Health care professionals need to manage the symptoms of AF patients and regularly assess their quality of sleep**.** Education to avoid caffeine intake late in the day is also recommended. Future studies are needed to test the effect of symptom management interventions on sleep quality in AF patients.

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CHAPTER I

INTRDUCTION

A. Background

Atrial fibrillation (AF) is the most prevalent cardiac arrhythmia globally affecting 2-4% of the world's adult population according to the 2021 update of Heart Disease and Stroke Statistics (American Heart Association [AHA], 2021). This number is expected to increase by 2.3-folds with the increasing population size and enhancement in the diagnosis and early detection (European Society of Cardiology [ESC], 2020). By definition, AF is a supraventricular tachyarrhythmia with disorganized atrial activation that results in an ineffective atrial contraction. Atrial fibrillation shows on the electrocardiogram (ECG) as irregular R-R intervals when atrioventricular conduction is present, absent distinct repeating p waves, and irregular atrial activity. Moreover, AF is mainly categorized into four different types: paroxysmal AF, which involves recurring episodes of AF that terminate spontaneously or with an intervention within seven days of onset; persistent AF, which lasts longer than seven days; long-standing AF, which persists more than 12 months; and the permanent AF, which is a state when the clinician and the patient accept to stop further attempts of rhythm restoration (January et al., 2014).

The real burden of this disease lies in its negative impact on the quality of life of many patients, and that is due to both, the associated symptoms and the end-organ complications such as those resulting from strokes. Symptoms of AF vary significantly among patients ranging from no symptoms at all to fatigue, dyspnea, palpitations and syncope among many

others, up to severe hemodynamic instability and cardiovascular events such as cerebrovascular accidents. Thus, not all AF patients are alike; and consequently, their quality of life outcomes are strongly dependent upon their disease presentation and symptomatology. One of the quality of life determinants that has been recently highlighted in the literature to be significantly affected in AF patients is sleep quality. Approximately, half of AF patients report poor sleep quality, and this high prevalence is positively associated with the increase in AF symptom severity based on research that used standardized measurement scales (Szymanski et al., 2014). Therefore, investigating sleep quality in this population can form the basis for better patient management.

B. Study Significance

Studying sleep quality among atrial fibrillation patients is of high importance given the deleterious impact that poor sleep brings in these patients. Disturbances in sleep are known to be associated with poor glucose metabolism, metabolic syndrome, and higher risk for hypertension and cardiovascular disease (Cappuccio et al., 2017). Furthermore, reported poor sleep quality increases the vulnerability to nocturnal cardiac arrhythmias, which explains many of the cases of sudden nocturnal death in individuals with heart disease (Verrier, 2009). Therefore, detecting the relationships between the characteristics of AF symptoms and the patients' sleep quality can help predict poor sleepers based on symptomatology, and establish targeted strategies to improve their sleep quality.

On another note, sleep is a modifiable factor that impacts the quality of life. Therefore, investigating aspects and predictors of sleep quality helps shape lifestyle management strategies that can ultimately improve patients' outcomes. A recent study within the area of

sleep medicine has highlighted the role of health care providers in assessing their patients' sleep patterns, discussing sleep-related problems, and educating them on prioritizing adequate sleep in order to promote their cardiovascular health (Makarem et al., 2020). This study serves as the basis for sleep pattern assessment that can guide the integration of sleep health into cardiovascular health management, ensuring that sleep becomes an equal counterpart in AF management guidelines.

As for the Lebanese population, no sleep studies have been done on AF patients in Lebanon. Taking into account the negative situation this country has been witnessing throughout the past years with intersecting economic, political and security crises, along with the impact of the COVID-19 pandemic, the Lebanese population has become more vulnerable to mental and physical health deterioration, with growing numbers of depression, mood disorders, healthcare negligence, noncompliance to medications and consequently, poor disease management, along with other risk factors that predispose to poor sleep quality. Therefore, conducting studies that can predict sleep quality determinants in the Lebanese AF patients who are part of this vulnerable population is highly important in developing targeted strategies for sleep quality improvement and better health outcomes.

C. Aims of the Study

The aims of this study are to: 1) describe sleep quality in a sample of AF patients in Lebanon, 2) examine the associations between sleep quality and the bothersomeness and frequency of AF symptoms, and 3) determine the predictors of reduced sleep quality in these patients, taking into account the patients' arrhythmia symptoms, demographic characteristics, behavioral patterns, and other risk factors.

CHAPTER II

LITERATURE REVIEW

In the past decades, there has been a growing interest in understanding the relationship between atrial fibrillation and sleep quality. This relationship was illustrated by many research studies as a two-way loop whereby on one side, poor sleep quality was noted to increase the likelihood of developing AF (Christensen et al., 2018), and on the other side, AF itself was found to predispose patients to a poorer sleep quality (Szymanski et al., 2014). Since this research focuses on sleep quality as an outcome in atrial fibrillation patients, the literature review that was done included studies from the population of AF patients tackling their sleep quality objectively and subjectively. The databases searched were: CINAHL, PubMed, Medline, and Google Scholar mainly between the years 2010 and 2023. As for the period before that, no studies targeting associations between sleep quality and atrial fibrillation symptoms were found; the identified sleep studies back then were restricted to association between sleep disordered breathing or obstructive sleep apnea and atrial fibrillation.

A. Pathophysiological Relationship between Atrial Fibrillation (AF) and Sleep

Understanding the neural mechanisms regulating sleep and autonomic function is important for defining the relationship between cardiac morbidity and sleep disorders. Sleep is a complex homeostatic function regulated largely by the autonomic nervous system (ANS). Regularly, when sleepers transition from wakefulness to sleep, their respiratory rate

slows down as the parasympathetic tone increases and the cardiac sympathetic activity decreases. In the majority of cases, people with ANS disorders also have sleep disorders (Fink et al., 2018). Poor sleep quality and short duration of sleep have been shown to be significantly associated with lower levels parasympathetic activity and higher levels of sympathetic activity across daytime wakefulness, sleep-wake transitions, and overnight sleep. The main factor for this maladaptive process is the release of stress hormones, norepinephrine and epinephrine upon sympathetic activation. The increased circulating norepinephrine in people with sleep disorders may inhibit sleep and can be quite harmful on the long run. In contrast, the release of acetylcholine mediated by the parasympathetic nervous system promotes rest and relaxation (Jerath et al., 2019).

As for the explored pathophysiology that connects atrial fibrillation with sleep quality, the first experimental study of its kind to document objective relationships between induced atrial fibrillation and neural changes within human subjects was done by Wasmund and colleagues in 2003. This study was approved by the local institutional review board, and an informed consent was obtained from all patients. AF was induced with rapid atrial pacing and AF data were recorded for three minutes, then normal sinus rhythm was restored. In case of failure to restore sinus rhythm, electrical cardioversion was performed. The study showed that induced AF resulted in a significant increase in sympathetic activity compared with normal sinus rhythm, and an irregular ventricular response was associated with a higher sympatho-excitation compared with a regular ventricular response (Wasmund et al., 2003). Elevated levels of sympathetic activity have long been shown to have detrimental consequences on the quality of life of atrial fibrillation patients, especially when it comes to their sleep quality and architecture. A cross-sectional analysis of data

obtained from 527 adult participants in the Multi-Ethnic Study of Atherosclerosis (MESA) study has shown that lower levels of cardiac parasympathetic (vagal) tone and/or higher levels of sympathetic tone were significantly associated with short sleep duration, low sleep efficiency, and insomnia (Castro-Diehl et al., 2016).

It is important to note that AF represents a final phenotype for multiple disease mechanisms classified into atrial structural abnormalities and atrial electrophysiological abnormalities. Under the umbrella of electrophysiological abnormalities, the ANS, which encompasses the sympathetic, parasympathetic and intrinsic neural networks, plays an important role in the initiation and maintenance of AF, whereby the activation of the sympathetic tone can provoke atrial arrhythmias (January et al., 2014). Sympathetic stimulation increases intracellular calcium, which promotes automaticity. In many animal and human models, increased sympathetic activity had been observed preceding their AF onset (Chen et al., 2014).

Since there exists strong evidence illustrating the pathophysiology of AF as a dysfunction of the autonomic nervous system (ANS), and since networks of ANS nuclei play critical roles in differentially regulating wakefulness, non-REM sleep, and REM sleep, dysfunction of these networks is the suggested mechanism that underlies poor sleep quality and many sleep disorders in atrial fibrillation patients (Fink et al., 2018; Xi & Cheng, 2015).

B. Evidence of Poor Sleep Quality in AF Patients

AF significantly impairs the patients' quality of life across many levels, including daytime functional activity and sleep quality. In an observational study done by Kayrak and

colleagues (2013), one hundred fifty-three patients with AF and 150 age-matched control subjects with sinus rhythm were recruited. Baseline sleep quality of all participants was assessed using the Pittsburgh Sleep Quality Index (PSQI), and for all those who were eligible for electrical cardioversion, the effect of rhythm control on sleep quality was studied. Fifty-four out of sixty-five patients who had their sinus rhythm successfully restored were followed up for six months in outpatient clinics for ECGs and PSQI scores. At the last follow-up visit after six months, 15 patients out of the 54 had AF recurrence. Results of the statistical analysis showed that patients who maintained sinus rhythm had a significant improvement in sleep quality on PSQI scores compared to their baseline (8.7 ± 4.1 vs 7.2 ± 3.8, $P < 0.001$, respectively), whereas patients with AF recurrence had no significant improvement in PSQI after six months. Therefore, this study showed that AF is an independent predictor of poor sleep quality (Kayrak et al., 2013).

Furthermore, in 2015 Kwon and colleagues conducted a study on a subset of participants from the large ancillary Multi-Ethnic Study of Atherosclerosis (MESA) database that recruited participants from six U.S. communities. The subset included patients with satisfactory quality of the polysomnography results (n=2018) for which ECG recordings were studied. Cross sectional analysis revealed significantly lower odds of AF associated with longer duration of slow wave sleep; also, higher sleep efficiency was significantly associated with lower likelihood of AF (Kwon et al., 2015). Although this study focused on the odds of AF occurrence rather than sleep quality as an outcome of AF, yet its results drove a subsequent study by Kwon and colleagues later in 2018. The 2018 study compared the duration of Slow Wave Sleep (SWS) between patients with and without AF. This study used an unmatched 2:1 case-control study design whereby 139 patients with

AF and 66 patients without AF were referred to a diagnostic polysomnography sleep center. SWS represents an important objective measure of sleep quality as it is considered the most restorative sleep stage. In multivariate analysis, patients with AF had a significantly lower SWS compared to those without, independent of sleep apnea and other potential confounders (Kwon et al., 2018).

Therefore, the literature on the association between sleep and AF consistently showed a positive correlation between AF and poor sleep quality, and that AF is an independent predictor of reduced sleep quality among patients.

C. Atrial Fibrillation Symptomatology and Sleep

In light of the discussed the pathophysiology, AF presents detrimental clinical consequences that affect the patients' well-being and quality of life across many levels. AF symptoms are considerably variable, not only among different patients, but also for the same patient at different time intervals; and this variability is due to both, direct and indirect effects of the arrhythmia. In fact, AF often co-exists with other cardiac conditions such as heart failure and valve diseases, making the existing symptoms multifactorial. However, despite all the existing challenges, a systematic and standardized evaluation of the symptoms and functional status of AF patients is crucial when selecting management strategies. AF symptoms range from non-existent at all to severe hemodynamic events requiring hospitalization.

As reported by Fuster and colleagues in 2011, AF may be initially recognized by palpitations or by its hemodynamic or thromboembolic events after an asymptomatic period. Patients with permanent AF usually become less symptomatic over time or may

report symptoms intermittently. Patients with paroxysmal AF are often symptomatic during their AF episodes. The majority of symptomatic AF patients report symptoms such as palpitations, chest pain, dyspnea, fatigue, lightheadedness, or syncope. Polyuria is less common and may be associated with the release of atrial natriuretic peptide, usually in the beginning or termination of the AF episode. In patients who go a long time unaware of their arrhythmia, tachycardia-mediated cardiomyopathy may result from a sustained rapid ventricular response. Syncope is rare in AF but could occur as a result of conversion in patients with sinus node dysfunction or with rapid ventricular rates in patients with hypertrophic cardiomyopathy (Fuster et al., 2011).

To provide an accurate and objective assessment of AF symptoms, several scales have been developed for this purpose, such as the Canadian Cardiovascular Society Severity of Atrial Fibrillation Scale CCS SAF (Dorian et al., 2006), the European Heart Rhythm Association (EHRA score) (Wynn et al., 2014), the Patient's Perspective of Arrhythmia Questionnaire (PPAQ) (Wood et al., 2009), among others… According to a community based study that enrolled 10,087 AF patients, 6,235 (61.8%) were symptomatic according to the EHRA classification system and 3852 (38.2%) were asymptomatic. As for the AF, the most common self- reported symptoms were palpitations occurring in 32.7% of these patients, dyspnea with exertion and fatigue (27.6% and 26.4% respectively), dizziness (20.6%), dyspnea at rest (10.3%), exercise intolerance (10%), and a number of other less frequent symptoms such as chest tightness and syncope (Freeman et al., 2015).

On the other hand, data on the association of AF symptoms with sleep quality is yet limited. In 2014, and as previously mentioned, Szymanski and colleagues were able to s

how that low sleep quality is common in AF patients occurring in almost half of the sample. Their study employed an exploratory correlational design where they assessed sleep quality of 177 hospitalized patients through the Pittsburgh Sleep Quality Index (PSQI); findings showed that poor sleep quality is related to the severity of the symptoms and its prevalence rises with every degree of the EHRA score (Szymanski et al., 2014). However, the study population was restricted to hospitalized AF patients; and to date, no studies have clearly highlighted which AF symptoms are specifically related to the poor sleep quality in AF patients; and what the true predictors for poor sleep quality within the AF population are, taking into account AF symptoms, demographic characteristics, medical/ psychological history, and behavioral characteristics.

Later in 2018, Risom et al., conducted an experimental study to assess the effect of a rehabilitation program on sleep quality post AF ablation. This study recruited 210 patients treated with ablation for AF from the randomized CopenHeart trial. A rehabilitation program was tested, and sleep quality was measured according to PSQI questionnaire before and after the intervention. Anxiety, depression, and the EHRA scores were assessed. Although the rehabilitation program showed no significant effect on sleep quality, yet the study contributed important findings. Patients who experienced anxiety, depression, or AF symptoms reported worse sleep quality than those without these experiences. Additional research in this field is warranted since it might be argued that symptomatology screening along with detection of anxiety, depression, and other potential determinants of poor sleep quality can be of high benefit for improving the management of this vulnerable population by addressing these problems.

In Lebanon, there is no national registry for patients with atrial fibrillation; and data on the prevalence, incidence, and real burden of this population is not available. One report of the very few studies on AF was published in 2019 on the epidemiology of AF at the American University of Beirut Medical Center, where 103 AF patients were included. The recruited sample was analyzed for some demographic, medical, and social characteristics whereby 57% were men, 92% had non-valvular AF etiology, 60% had paroxysmal AF, 25% had persistent AF, 30% were with coronary artery disease, 28% were diabetic, 72% were hypertensive, 20% had congestive heart failure and 19% were smokers. Other data collected was related to the CHADVASC scores and anticoagulation treatment (Sabra, 2019). Yet, no sleep studies have been done on AF patients in Lebanon.

D. Determinants of Sleep Quality

Looking through the determinants of sleep quality, the Lebanese literature on this matter was reviewed. A study done by Al Karaki and colleagues in 2020 was found, which has shown through cross sectional analysis that insomnia was very high in the Lebanese population and its presence was associated with drinking caffeine before sleep more than two days per week, increased stress, and increased anxiety and depression scores. This study highlighted the fact that all of the identified risk factors for insomnia were modifiable and treatable (Al Karaki et al., 2020). Another study by Chami and colleagues in 2019 showed that short sleep duration is highly prevalent among Lebanese population of Beirut, where 39% of the study sample reported sleeping less than six hours per night. Factors associated with short sleep duration were daytime fatigue, higher caffeine intake, and sleep

debt evidenced by longer sleep duration on the weekends. Chami et al. also acknowledged that individuals with self-reported mental health disorders were excluded from the study; however, the high prevalence of undiagnosed anxiety and depression among the Lebanese population could have also contributed to shorter sleep duration in the study sample (Chami et al., 2019).

Furthermore, a review published in 2020 by Mirjat and colleagues that examined a variety of factors that influence sleep quality has found that subjective complaints related to sleep were influenced by the presence of obstructive sleep apnea, sleep disorders such as insomnia, alcohol and caffeine consumption, physical activity, tobacco smoking, and some medical conditions such as diabetes, hypertension, and heart failure (Mirjat et al., 2020). It is worth mentioning that AF patients were not excluded from this study nor analyzed independently. Additionally, other medical conditions that affect sleep quality were also identified by Parish such as chronic obstructive pulmonary diseases (COPD) and restrictive lung diseases due to oxygen desaturations, coughing, and dyspnea; and GERD due to symptoms related to acid reflux. Chronic kidney disease and diseases that cause chronic pain (fibromyalgia and cancer) are also associated with poor sleep quality (Parish, 2009).

E. Gaps in the Literature

In conclusion, there are limited studies that clearly explain the relationship between AF symptomatology and sleep quality, and more specifically, which AF symptoms are related to the poor sleep quality in AF patients. Additionally, no data were found on the predictors of poor sleep quality among AF patients worldwide. As for Lebanon, sleep quality assessment remains of high importance especially within the context of the

country's current disturbed situation, which has majorly affected the psychological wellbeing and health behaviors of this population.

F. Research Questions

1. What is the proportion of poor sleepers among a sample of atrial fibrillation patients from AUBMC?
2. Is the number of symptoms in patients with atrial fibrillation associated with sleep quality?
3. What is the relationship between the bothersomeness of specific AF symptoms and the patients' sleep quality?
4. What are the predictors of sleep quality in patients with atrial fibrillation?

CHAPTER III

THEORETICAL FRAMEWORK

For this study, the Theory of Unpleasant Symptoms (Lenz et al., 1997) has been adopted to guide the research questions. This middle range nursing theory has been used to describe sleep as it interacts with other symptoms. As shown in figure 1, the model consists of three main elements: the symptoms, the influencing factors, and the outcome. Symptoms are the main component of the model and are defined in terms of intensity, quality, duration, and distress. As for the influencing factors, they are the physiological, psychological, and situational factors influencing the symptom experience. The third component is the outcome, defined as the impact on an individual's ability to perform functional or cognitive activities such as activities of daily living, social interaction and, role performance (such as work).

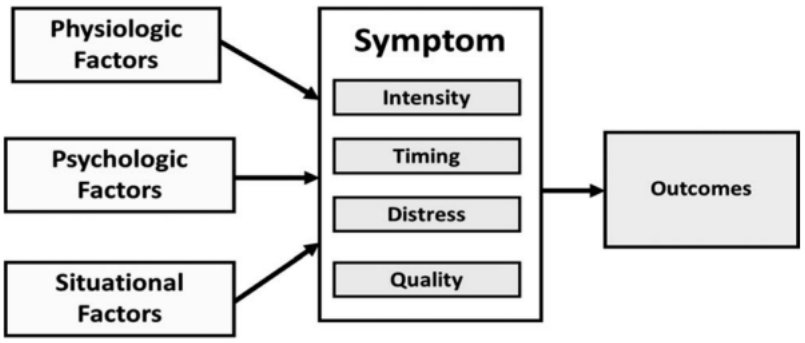

Figure 1. Theory of Unpleasant Symptoms.

In this study, the outcome examined was sleep quality. According to Nelson, Davis, and Corbett (2022), sleep quality is defined as an individual's level of satisfaction with all the elements of the sleep experience. Sleep quality has four main aspects: sleep efficiency, sleep latency, sleep duration, and wake after sleep onset. Sleep efficiency represents the ratio of the amount of total time asleep versus the total time in bed. Sleep latency refers to the duration it takes to transition from wakefulness to sleep. As for sleep duration; it is the total amount of asleep hours in a full day minus any arousals a person may have. The last main attribute is the wake after sleep onset, which represents the total amount of wakefulness time after sleep onset and before final awakening (Nelson et al., 2022). All of these attributes were measured in this study through the adopted sleep quality questionnaire.

The main predictor of sleep quality of the model is the symptom experience represented by the patient's atrial fibrillation symptoms. As elaborated by Lenz and colleagues (1997), each symptom or group of symptoms may have specific characteristics or dimensions; this study has focused on the following:

- Timing: This dimension represents the frequency and duration of occurrence of the symptom, which means how often the symptom occurs and how long it lasts. Duration and frequency will be directly assessed by the study's questionnaire.
- Distress: It represents the degree of discomfort or bothersomeness of the individual by the symptom. Patients will be asked indicate how much they are bothered by the symptom on a Likert scale, in order to understand how they are interpreting the

experience. This dimension of symptom experience mostly contributes to the quality of life.

- Quality: the quality represents the way in which the symptom is manifested. Some patients may find it hard to describe the quality of symptoms since people differ in their ability to pinpoint the symptom accurately by applying a label for it and differentiate it from other symptoms. For this proposed study, the questionnaire employed specifies a range of qualities of symptoms upon which the patient will assessed and questioned.

As for the influencing factors that affect this experience, three categories were identified by Lenz and colleagues, which guided our assessment of sleep quality determinants. Those include:

- Physiologic factors: Those are system pathologies that can be related to the symptom experience and study outcome, including an existing chronic disease, such as hypertension and chronic kidney disease.
- Psychologic factors: Those include the patient's mental state, mood, or affective reaction to illness, which may interfere with the symptom experience and study outcome. For this study, history of anxiety and depression were assessed, along with the subjective experience and affect towards the symptoms.
- Situational factors: those are aspects of the social life and physical environment that may affect the patient's experience. Relevant situational factors include family and marital status, employment status, and lifestyle behaviors such as alcohol consumption, caffeine, and smoking status.

All of these factors have been previously shown to be related sleep quality (Mirjat et al., 2020; Parati et al., 2016; Parish, 2009). Moreover, demographic variables that may influence this relationship, namely age and gender will be assessed.

Accordingly, the adjusted model that will be adopted as a theoretical framework that guides the study is illustrated in figure two.

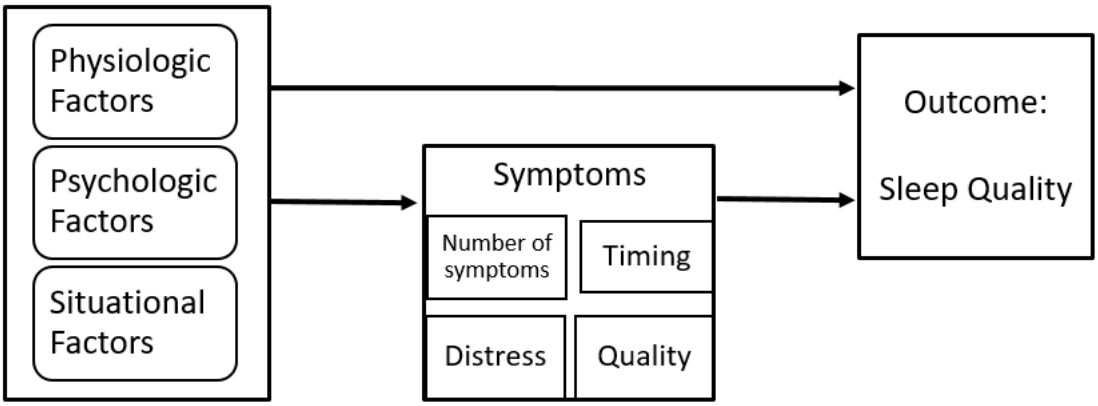

Figure 2. Conceptual Model of the Study.

The model in figure two additionally demonstrates a direct relationship between the influencing factors and the sleep quality as an outcome. The reason is that poor sleep quality can be in many circumstances an outcome of physiological, psychological, and/or situational factors regardless of the presence or dimensions of the symptom experience. For instance, psychological stress and anxiety can lead to the activation of the sympathetic nervous system, causing increased wakefulness and poor sleep quality regardless of other symptoms (Han, Kim, & Shim, 2012). Furthermore, sleep disturbances such as difficulties initiating sleep and difficulties maintaining sleep can be secondary to heart failure (Broström et al., 2004).

Additionally, the questionnaire adopted for AF symptoms assessment does not entail the severity of symptoms but rather the concept of "bothersomeness". Symptom severity does not necessarily correlate with bothersomeness, and not all severe symptoms experienced by patients are perceived as disturbing. The concept of 'bothersomeness' factors in another dimension to the symptom experience, which the patient's own judgement and perception of the negative effect of the experience, which has a direct impact on the quality of life. Therefore, assessment is needed for symptom distress in the hopes of reducing symptom-related negative consequences on the quality of life outcomes. (Li et al., 2019; Wu et al., 2015). This conceptual model additionally highlights a new factor in the symptom experience, which is the number of symptoms a patient has.

For this study, and based on the conceptual model, the following two hypotheses were tested:

1. Higher number of AF symptoms is associated with worse sleep quality.
2. Higher bothersomeness of AF symptoms is associated with worse sleep quality.

CHAPTER IV

METHODS

A. Research Design

This study utilized a cross-sectional descriptive/correlational design. This design is appropriate for the research question since there is no intervention being tested, and given that the independent and dependent variables are tested for an association, not causation. The dependent variable under study is the sleep quality measured by the PSQI, while the independent variables are AF symptoms' bothersomeness and frequency measured by the PPAQ. Other extraneous variables that have been controlled for are: past medical condition (diabetes, hypertension), history of anxiety and depression, smoking, caffeine and alcohol consumption, age, and gender.

B. Sample Size, Sampling Design and Recruitment Method

The study sample was a convenience sample of AF patients recruited from the American University of Beirut Medical Center (AUBMC) outpatient cardiology clinics. After obtaining approval from the institutional review board (IRB) of the university, sample recruitment took place during the clinic hours of electrophysiologists and other cardiologists at AUBMC. The sample inclusion criteria included: 1) Adult patients (18 years or older), 2) with any type of atrial fibrillation diagnosed at least one month prior to presentation, because both questionnaires examine the patient's experience with symptoms and sleep in past one month. Exclusion criteria included: 1) patients previously diagnosed with a cognitive disorder such as dementia or dysfunction that prevent them from

answering the interview questions assessed using the U-ARE Questionnaire for Older Adults, 2) pregnant or breast feeding women, and 3) those diagnosed with sleep apnea, any primary sleep disorder, HF with ejection fraction < 45%, or COPD requiring device or oxygen therapy during sleep.

All potential participants, after signing the consent form, underwent a brief rhythm check on an ECG machine after having obtained approval to use the monitor from the department administration. The ECG was not being printed-out and the screen was directly assessed by the researcher, who is a trained clinician, for identification of the patients' rhythm at the time of the study.

It was not possible to rely on previous literature to estimate the sample size needed for this study due to the limited number of studies on sleep quality predictors among AF patients. Therefore, the sample size for this research study has been calculated using the sample size formula for multiple linear regression with a moderate effect size, power of 80%, α 0.05, and ten predictors for the regression model, which yielded a minimum sample size of 144 subjects after accounting for a 20% refusal rate (Polit & Beck, 2008). The effect size was extrapolated from a previous study done by Kayrak and colleagues in 2013 who assessed predictors of poor sleep quality among AF patients through multivariate logistic regression with $R^2 = 0.15$ (moderate effect size).

A total number of 154 eligible patients were recruited in this study between the months of June and November 2023. Ten patients refused to participate when first approached by the clinic nurse accounting for a 7% refusal rate, for reasons mainly related to time limitation, need to sign on documents (consent form), and lack of interest in research studies. The final sample size included 144 patients.

C. Procedure and Research instruments

After IRB approval was secured on June 10, 202, the cardiologists were informed about the study and asked for permission to recruit their patients through an email (See Appendix I). The cardiologists and the clinic nurse were informed about the study and participant eligibility criteria, and provided a script for use in recruiting patients (see Appendix II). The clinic registered nurse who was the first point of contact with patients in the outpatient setting was involved in the study. The clinic nurse at AUBMC is responsible for gathering information about patient's chief complaint, current medications, and vital signs, and is usually known to the patients who repeatedly visit the clinic.

The researcher visited the clinic in the morning and asked the clinic nurse to identify patients with atrial fibrillation who have appointments on the same day. The patients presenting to the cardiology clinics were assessed by the clinic nurse for atrial fibrillation through reviewing their electronic records. The recruitment took place either in the nursing office while the clinic nurse was taking the vital signs, or in the lobby. The same nurse recruited the patients through the invitation script. Those who accepted to participate were then approached by the researcher.

Therefore, recruitment was mainly done by the clinic nurse. However, since time could not always allow all AF patients to be approached while they wait to get admitted to their physicians, and since cardiologists were by that time well informed about this research and its workflow, they were also able to contribute in identifying eligible participants and referring them to the researcher after the appointment. The researcher was present most of

the time in the clinic. Additionally, cardiologists helped in identifying eligible patients who came for a first visit to AUBMC and did not have previous medical records at AUBMC.

After the clinic nurse identified patients who were eligible for the study, those who agreed to participate were referred to the researcher, who is a registered nurse, and who did an ECG in the clinic room after obtaining the patients' informed consent. The purpose of the ECG was to identify the patient's heart rhythm at the time of recruitment. A four-lead ECG was enough to determine AF, therefore only four limb leads were attached to the patient. The ECG monitor was utilized for this purpose. There was no material cost for doing a four-lead ECG, with cost restricted to machine utilization; the ECG strip was not being printed out to avoid any further costs, and was only being examined on the monitor by the researcher who is a registered nurse. The four-lead ECG took 1-3 minutes, which is the time needed for lead attachment on the 4 limbs and rhythm examination.

After obtaining their informed consent in a private room or zone in the clinic (see Appendix IV), and completion of the ECG, participants were asked by the researcher, through an interview, to respond to two questionnaires; the Patient's Perspective of Arrhythmia Questionnaire (PPAQ) (Wood et al, 2009) Arabic version to detect their symptoms' bothersomeness and frequency, and the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989; Grandner et al., 2006) Arabic version that detects their sleep quality. Additional data were inquired and documented on the 'Sociodemographic and Medical Form' (see appendix VI), including age, gender, medical history, history of ablation, smoking status, caffeine and alcohol consumption. The researcher was directly asking about socio-demographic data from the participant and was able to access the medical record for medical history, health behaviors (e.g. smoking and alcohol consumption),

treatments and medications (see Appendix VI). The three questionnaires took 10 to 15 minutes to complete.

1. Patient Perspective on Arrhythmia Questionnaire (PPAQ)

The PPAQ has been adopted in this study to assess the patients' AF symptoms. The advantages this questionnaire provides are: it being a disease-specific questionnaire for arrhythmia patients, measuring patient sensitive outcomes, and providing a wide range of arrhythmia related symptoms. As for the EHRA and CCS-SAF, which are widely used questionnaires, the former attempts to categorize patients into four groups according to symptom severity only, regardless of the type, frequency, duration, or bothersomeness of the symptom, and the latter has fewer types of symptoms compared to the PPAQ and does not take into account symptom bothersomeness. Therefore, the PPAQ was found to provide the most relevant and accurate data that address the research questions.

The PPAQ includes 33 items categorized into four main sections that cover the frequency and duration of the arrhythmia episode, the presence and the extent to which patients perceive these symptoms as bothersome, the extent to which daily activities are affected by the arrhythmia episodes, and the number of days when activities are restricted due to the symptoms. The items of these sections are scored on a numeric Likert scale depicting a spectrum of increasing intensity or severity. The final score is calculated as a sum of each section separately. The frequency of the AF episode is scored from 0–9, with higher scores denoting more frequent occurrence; the duration ranges from 0–8, with higher scored denoting longer duration; the number of arrhythmia related symptoms could range from 0 (no symptoms) to 18 (all symptoms). As for the bothersomeness of each symptom,

the score ranges from 0–4 (higher scores= higher severity). The 10-item Impact of Arrhythmia subscale scores range from 0 to 100 (higher scores = worse impact). The final two questions score ranges from 0–31 days where higher scores showed more days per month when functioning is restricted (missed work or schools, and cutting down on usual activities) by AF episodes (Wood et al., 2017). Yet, for this study we only used the first three questions related to symptoms frequency and bothersomeness, which serve the study aims. As for the questions on the impact of AF symptoms, they were not used in the current study.

The questionnaire was assessed and validated for the use in AF patients in 2017, and has been translated to six different languages including Arabic, which was used in this study (Appendices E, F). Content validity of the PPAQ has been tested by Wood and colleagues in 2009, yielding a good internal validity index where experts agreed that 100% of all the PPAQ items were extremely comparable to the original four qualitatively derived concerns. As for the Impact on Life items, all ten items demonstrated good reliability, with a Cronbach's alpha coefficient of 0.93. High internal consistency was tested as well yielding Kuder-Richardson 20 (KR-20) result of 0.84 for the dichotomous symptom list (Wood et al., 2009). An Arabic version of this questionnaire was tested in the Lebanese population (data analysis in progress). In this study, The KR-20 for the symptoms was .72 and the Cronbach alpha for the bothersomeness scale was .59. Deleting the bothersomeness of sweating and passing out would increase the Cronbach alpha coefficient to .74.

2. Pittsburgh Sleep Quality Index (PSQI)

The questionnaire used to measure self-report of sleep quality was the PSQI (Buysse et al., 1989). The PSQI is the most commonly used questionnaire to assess subjective report of sleep quality due to many reasons. The PSQI quantifies sleep quality by a numeric score that helps in an accurate distinction among individuals with good or poor sleep quality. Compared to other questionnaires, the PSQI has the highest number of studies investigating its psychometric properties and has shown convergent validity in the majority of studies, suggesting that it can be considered as the gold standard for self-perceived sleep quality (Fabbri et al., 2021).

The PSQI includes 19 items that yield seven component scores: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction (See appendices G & H). The PSQI has a numeric scale for sleep quality whereby the cut-off point for poor sleep quality is a score equal to or higher than 5 points, with a maximum value of twenty-one points on the whole questionnaire.

Buysse (1989) who initially developed this scale conducted psychometric testing of PSQI items showing that the cut-off score of 5 correctly identified 88.5% of all patients and controls, representing a sensitivity of 89.6% and a specificity of 86.5% (kappa = 0.75, $p <$ 0.00l) in identifying good and poor sleepers. Additionally, the PSQI yielded acceptable validity as it represents a standardized sleep quality measure that distinctly identifies good from poor sleepers, and is highly comparable with polysomnography. As for the reliability of this tool, Buyusse's study demonstrated a high degree of internal consistency where the

seven component scores had an overall reliability coefficient (Cronbach's alpha) of 0.83 (Buysse et al., 1989).

A Jordanian study that tested the Arabic version of PSQI showed that this tool is reliable and valid for measuring subjective sleep quality among Arabic cardiac patients. Psychometric testing of the Arabic PSQI yielded good internal consistency reliability with a Cronbach's alpha coefficient of 0.74 (Suleiman et al., 2012). In the current study, the Cronbach alpha coefficient for the PSQI was 0.44.

3. Electrocardiogram (ECG)

The gold-standard for the diagnosis of AF is its detection on an electrocardiogram (ECG) by a trained clinician. Atrial fibrillation shows on the ECG as irregular R-R intervals, absence of distinct repeating p waves, and irregular atrial activity (American College of Cardiology/AHA, 2014). According to a systematic review by Taggar and colleagues, ECGs had the greatest accuracy for detecting atrial fibrillation. AF can be measured with 12 leads, fewer than 12 leads, or a single lead, with a 93% sensitivity and 97% specificity for 12-lead, and 91% sensitivity and 95% specificity for non 12-lead ECG (Taggar et al., 2016). For this study, and since non 12-lead ECG is highly sensitive and specific for the diagnosis of AF, only four limb leads have been applied for ECG assessment for participants to save time and resources.

In addition, patients' medical records were reviewed and patients were asked about their age, level of education, occupation, marital status and living condition, medical history, current medications, smoking status, in addition to other variables stated in the sociodemographic and medical form (Appendix VI).

4. The U-ARE Questionnaire for Older Adults

Knowing that patients who are previously diagnosed with cognitive disorders were already excluded from the study, older adults without a significant cognitive disease were being assessed for their decision making capacity and their ability to provide a well informed consent through the U-ARE questionnaire, which was developed in 2020 by Hamilton and colleagues to evaluate the decisional capacity of older adults attempting to provide an informed consent to participate in a research study (Hamilton et al., 2020). The U-ARE protocol is an easily adapted approach that attempts to avoid exploitation of a vulnerable population, while facilitating scientific research with older adults who have potential cognitive impairments. The U_ARE protocol is based on Appelbaum & Grisso's theoretical model for evaluating a patient's decisional capacity to provide informed consent to participate in research. U-ARE stands for Understanding, Appreciating, Reasoning, and Expressing. The four elements of the protocol are evaluated through a step-wise approach including several questions that test whether patients understand the relevant information, appreciate the consequences of their decisions, use reasoning to weigh their options, and express a consistent choice (see appendices K & L).

For this study, older adults who were above 65 years of age and who did not have a previous diagnosis of cognitive impairment were assessed for their decisional capacity after the researcher presented and explained the informed consent and prior to their attempt to agree and sign. The first question targeted their understanding of the relevant Information provided by the researcher, and it goes as follows:

Question 1: "What is your understanding of what you will be doing during your participation in the study? Do you have to participate?"

The second question assessed the patient's appreciation of potential study consequences. Question 2: "What are the benefits of participating in this research study? Are there any risks?":

The third question assessed the patient's capacity of making a reasoned decision regarding participation.

Question 3: "How did you make your decision to participate or not participate in the study?"

The fourth and last question evaluated the patient's expression of a choice.

Question 4: "Do you want to participate in this study?"

After completing the questions, the researcher used her professional judgment to determine whether the older adult had a good decision-making capacity to consent to participate. For the first element of the protocol, patients were evaluated as having a good understanding capacity if they were able to comprehend the basic study procedures, their expected role in it, such as responding to three questionnaires, and recognize lack of obligation to participate. For the second element, patients were expected to be able to point out the indirect study benefits stated in the consent, and express, if present, any anticipated discomfort or risk from participating. The third element assessed the patients' ability to rationally justify the reason they made up their decision to participate. The last criterion to determine the patient's capacity for decisions was their ability to consistently express their decision whether or not to participate.

Only after the patient responded appropriately and consistently to all the questions did the researcher proceeded with the questionnaires. In case the patient did not express the proper understanding of his/her role in the study, its risks and benefits, and a consistent

decision, the researcher worked with the patient and their family or caregiver to determine the best course of action and excluded the patient from the study.

D. Ethical Considerations

IRB approval was secured before initiating the study since it involves human subject and access to their medical records and self-reports. In addition, a written informed consent was obtained from the participants, prior the data collection and rhythm examination. The informed consent described the study and its aim briefly and assured the patients of the voluntary nature of participation as well as the risks and benefits of participation. Confidentiality and anonymity were preserved as well, whereby no reporting or publishing of any data that directly identifies the patients (such as name or medical record number) will be made. Participants' names were documented on the consent form only. As for the rest of documents, each participant was identified by a specific numeral code (001 up to 144), without documenting other identifiers. Code numbers were used on the questionnaires and consent forms to help identify the patients in case further access to the medical record was needed. However, the consent forms and questionnaires were stored separately. All the completed documents were stored safely with the PI for the whole duration of the study and will be kept for three years after completion of the study. Hard copies were stored in the PI's office under lock. Electronic files were stored in a password protected computer. Three years after the completion of the study, hard copies of completed documents will be shredded and discarded, and electronic documents will be deleted.

On another note, special considerations and measures have been taken when dealing with participants who represent a vulnerable population. Participants who were older adults

(above 65 years old), were being assessed for decision making capacity using the U-ARE approach stated previously. Additionally, the researcher attempted to provide the older adult with adequate time for decision making and for asking questions and seeking clarification. The researcher also explained the study in simple terms and understandable language. Moreover, at many times when answers were not being accurately provided by the older adult, the researcher involved a family member or caregiver who was present with the patient. As for the informed consent, it was obtained in writing from the older adult participant. Yet, five participants in our study lacked the writing/ reading capacity and so, the consent was signed by their legally authorized representative (children or spouse).

Moreover, the collected data from participants were entered regularly and the sleep questionnaire scores were calculated. When a participant was found to have poor sleep quality according to the PSQI calculation, his physician was directly informed for further management and referral.

E. Statistical Analysis

The data were entered and analyzed using SPSS version 29. Descriptive analyses were conducted to answer the first research question on the proportion of patients with poor sleep quality and to describe the sample demographics, disease history, and other characteristics. Means and standard deviation were used for continuous variables, whereas counts and percent were used for categorical variables. A mean bothersomeness score was calculated as the mean of the bothersomeness scores of all the symptoms for each participant. For data that were on an ordinal scale such as bothersoemness, we reported also the median and interquartile range. As for the second and third research questions, Pearson

r correlation coefficients or their nonparametric equivalent were calculated to determine the associations between AF symptoms (frequency/bothersomeness) and sleep quality on numeric scales. In addition, the fourth research question was addressed through bivariate analyses using t tests and ANOVA to measure the association between the sleep quality index and demographic and clinical variables. Then, all the variables of interest were included in the multivariate linear regression model and backward elimination was applied to determine the significant factors that predict poor sleep quality among AF patients (demographics, disease history, symptoms, and behavioral factors).

CHAPTER V

RESULTS

A. Descriptive Statistics

The study sample consisted of 144 AF patients (47% males, aged 70.32 ± 12.47 years), with a mean body mass index (BMI) of (29.35 ± 6.23 kg/m2). Other demographic characteristics of the sample are described in Table 1. Of the 144 participants, 56.3% had atrial fibrillation on their ECGs at the time of recruitment, 10.4% reported having underwent ablation previously, and an average of 8.58 arrhythmia symptoms were reported (standard deviation = 3.21) to be present according to the participants' self-reports on PPAQ. Dyslipidemia and hypertension were the most prevalent comorbidities among the sample (57% and 52% respectively), coronary artery disease (CAD) was present in 34%, diabetes in 18%, and 11% of the sample had chronic kidney disease (CKD). As for the history of cardiovascular disease, 4.9% had suffered from myocardial infarction in the past, and 5.6% had a stroke. Only 15.3% had ejection fraction > 45%. The prevalence of other comorbidities is also illustrated in table 1. Regarding mental diseases, history of anxiety was reported by 16.7% of the sample and history of depression by 11.1%

Table 1 Sample characteristics (N=144)

Variable	**Frequency**	**Percent**
Sample demographics		
Gender (male)	68	47.2%
Age Mean ± standard deviation (Range)	70.32 ± 12.47 (36 – 92 years)	
BMI Mean ± standard deviation (Range)	29.35 ± 6.23 (18.99% - 59.43%)	
Marital status		

Married	113	78.5%
Single	9	6.3%
Divorced/widowed	22	15.3%
Education		
Up Intermediate	31	21.6
High school	35	24.3
Technical	10	6.9
University	68	47.3
Household Monthly Income		
Up to 350$	5	4.0%
351 to 520$	19	15.3%
521 to 800$	41	33.1%
Above 800$	59	47.6%
AF Data		
ECG in clinic		
Sinus rhythm	63	43.8%
Arial fibrillation	81	56.3%
Underwent ablation	15	10.4%
Number of arrhythmia symptoms	0 to 18 symptoms	
Mean $\pm$ standard deviation	8.58 $\pm$ 3.21	
Comorbidities		
Dyslipidemia	82	56.9%
Hypertension	75	52.1%
CAD	49	34.0%
Diabetes	26	18.2%
Anxiety	24	16.7
HF (EF > 45%)	22	15.3%
CKD	16	11.1%
Depression	16	11.1
COPD (not requiring oxygen)	11	7.6%
Stroke	8	5.6%
MI	7	4.9%

Legend: AF=atrial fibrillation; BMI=body mass index; CAD=coronary artery disease; CKD=chronic kidney disease; COPD=chronic obstructive pulmonary disease; EF=ejection fraction; HF=heart failure; MI=myocardial infarction

Reports of health habits showed that 57% of the study sample have never smoked, with the rest being either current or former smokers. Only 7.7% consumed alcohol more than once per month. As for exercise habits, the majority of the sample did not exercise at all or exercised once or twice a week (60%). Other lifestyle and health habits related to screen time and caffeine consumption are illustrated in table 2.

With respect to the first research questions, and according to the PSQI scores, a very high proportion of the study population (91%) suffered from poor sleep quality, taking 5 as a cutoff point for poor sleepers.

Table 2 Lifestyle and Health Habits

Variable	**Frequency**	**Percent**
Smoking status		
Never	82	56.9
Past	30	20.8
Current	32	22.2
Alcohol consumption		
Never or once per month or less	133	92.3%
Caffeine (beverage/day; Mean ± standard deviation (Range)	1.98 ± 1.44 (0 - 10 cups)	
Exercise		
0 times per week	76	52.8%
Once or twice per week	10	7.0%
3-5 times/ week	35	24.4%
6-7 times per week	23	16.0%
Screen time (hours/day) Mean ± standard deviation(Range)	3.23 ± 3.14 (0 – 20 hours/day)	
Use of mobile at bedtime	72	50.0%
Poor sleepers	131	91%

Symptom Characteristics

According to the PPAQ reports, the most prevalent arrhythmia symptom in the study population was fatigue and lack of energy (present among 76%) and the second most prevalent being trouble with sleeping (70%), both having mean bothersomeness scores of 3.07 (standard deviation [SD] .82) and 3.18 (SD = .90), respectively. Symptoms such as difficulty catching breath, headaches, heart flutter, passing a lot of urine and dizziness, were present in more than 50% of the sample, with mean bothersomeness scores of 2.37 to

3. Presence of other arrhythmia symptoms and their mean median bothersomeness are shown in table 3.

The reliability coefficient for the PPAQ was calculated. The KR-20 for the symptoms was 0.72

Table 3 Frequency of arrhythmia symptoms and their mean and median bothersomeness

Symptom	**Frequency (percent)**	**Mean bothersomeness ± standard deviation**	**Median bothersomeness (IQR)**
Fatigue/ no energy	109 (75.7)	3.07 ± .82	3 (3,4)
Trouble sleeping	101 (70.1)	3.18 ± .90	3 (3,4)
Hard to catch breath	76 (52.8)	2.66 ± .86	3 (2,3)
Headache	76 (52.8)	2.37 ± 1.09	2 (2,3)
Heart Flutter	75 (52.1)	2.59 ± .91	3 (2,3)
Passing a lot of urine	74 (51.4)	2.77 ± .79	3(2,3)
Lightheadedness/dizziness	73 (50.7)	3.00 ± .93	3 (2,4)
Heart racing	69 (47.9)	2.76 ± .95	3 (2,3)
Sweating	68 (47.6)	2.24 ± .87	2 (2,3)
Nausea	67 (46.5)	2.60 ± .95	3 (2,3)
Heart skipping	66 (45.8)	2.70 ± .93	3 (2,3)
Pounding feeling in neck	66 (45.8)	2.45 ± .81	2(2,3)
Loss of appetite	66 (45.8)	2.01 ± 1.05	2 (2,3)
Blurred vision	65 (45.1)	2.29 ± 1.00	2 (2,3)
Chest pressure	60 (42.0)	3.07 ± .78	3 (3,4)
Trouble concentrating	54 (37.8)	2.46 ± .93	2 (2,3)
Feeling warm/flushed	53 (37.1)	1.91 ± 1.03	2 (1,2.5)
Passing out	21 (14.6)	3.95 ± .22	4 (4,4)

Legend: IQR=interquartile range

Sleep Characteristics

As noted above, 91% of the sample had poor sleep quality. The mean and standard deviation of the global PSQI score was 9.92 (DS = 3.06), with a range of 3 to 17. Table 4 shows the mean and standard deviation of the PSQI component scores. The highest score was for the component sleep latency and the lowest for the component sleep efficiency. The

Cronbach alpha reliability coefficient for the PSQI in this study was .434 and deletion of none of the items could improve the internal consistency significantly. Deletion of the sleep disturbance and sleeping medicine items improved the Cronbach alpha coefficient only to .45 and .44, respectively.

Table 4 Means and standard deviation of the PSQI scales

Scale	**Mean ± Standard Deviation**
Subjective sleep quality	1.74 ± 1.06
Sleep latency	2.00 ± 1.04
Sleep duration	1.73 ± .97
Sleep efficiency	.56 ± .82
Sleep disturbances	1.47 ± .54
Use of sleep medications	.87 ± 1.07
Daytime dysfunction	1.56 ± .80

B. Correlational Analysis

With regard to the second research question, independent sample t test was run to determine the association between presence of specific arrhythmia symptoms and PSQI scores. Overall, the number of symptoms present per participant was significantly positively associated with sleep quality, Pearson r = .629, p <.001. Thirteen out of 18 arrhythmia symptoms were significantly associated with higher PSQI scores (i.e. poorer sleep quality). Those symptoms include heart flutter (p value <.001), heart skipping, pounding feeling in the neck, dizziness, passing a lot of urine at night, difficulty breathing,

heart race, chest pressure, and many others as illustrated in table 5. On the other hand, loss of appetite was associated with better sleep quality.

Table 5 Difference in PSQI scores by presence of specific AF symptoms

Symptom	**Mean± SD**	**Df**	**T**	**P value**
Flutter No flutter	11.27±2.59 8.45±2.88	142	-6.18	<.001
Skip No skip	10.79±2.94 9.18±2.99	142	-3.24	.001
Blurred vision No blurred vision	11.15±3.07 8.9±2.67	142	-4.71	<.001
Pounding feeling in the neck No pounding feeling in the neck	10.92±3.08 9.06±2.80	142	-3.80	<.001
Dizziness No dizziness	10.63±2.98 9.18±2.99	142	-2.91	.004
Headache No headache	10.21±3.42 9.59±2.60	142	-1.24	.218
Passing a lot of urine at night No urine	10.89±2.77 8.89±3.04	142	-4.14	<.001
Sweating No sweating	10.09±3.18 9.77±2.99	141	-.61	.543
Nausea No nausea	10.43±3.33 9.47±2.76	142	-1.90	.059
Fatigue No fatigue	10.18±3.05 9.09±3.00	142	-1.86	.065
Loss of Appetite No loss of appetite	9.68±3.30 10.12±2.86	142	.85	.399
Heart race No heart race	11.29±2.84 8.65±2.71	142	-5.70	<.001
Trouble concentrating No trouble concentrating	10.8±3.31 9.36±2.80	141	-2.78	.006
Passed out Have not passed out	11.62±2.67 9.63±3.04	142	-2.82	.005
Difficulty catching breath No difficulty catching breath	10.88±2.900 8.84±2.90	142	-4.22	<.001
Felt warm Have not felt warm	10.98±3.12 9.30±2.87	142	-3.29	.001
Chest pressure No chest pressure	11.35±2.69 8.88±2.93	141	-5.15	<.001

Trouble sleeping No trouble sleeping	10.94±2.54 7.51±2.86	142	-7.14	<.001

Legend: SD = standard deviation

As for the association of the bothersomeness of arrhythmia symptoms with sleep quality (research question 3), Pearson r correlation coefficient was run to test for its association with PSQI scores, yielding 11 out 18 symptoms with significant associations. Bothersomeness of fatigue and dizziness yielded the strongest association with poorer PSQI (r .437 and .401 respectively; p< .001). also, the more the bothersomeness of heart flutter, blurred vision, trouble concentrating, difficulty catching breath, and others, the worse the PSQI scores (see table 6).

Table 6 Association between bothersomeness of symptoms and sleep quality

Symptom	**Sleep quality (PSQI)**	
	Pearson r coefficient	**P value**
Heart Flutter (n=75)	.234	.042
Heart skipping (n=66)	.123	.326
Blurred vision (n=65)	.289	.019
Pounding feeling in neck (n=66)	.014	.911
Lightheadedness/dizziness (n=73)	.401	<.001
Headache (n=76)	.368	.001
Passing a lot of urine (n=74)	.057	.631
Sweating (n=68)	.235	.054
Nausea (n=67)	.307	.012
Fatigue/ no energy (n=109)	.437	<.001
Loss of appetite (n=66)	.317	.010
Heart racing (n=69)	.212	.080
Trouble concentrating (n=54)	.308	.023
Passing out (n=21)	.224	.328
Hard to catch breath (n=76)	.368	.001
Feeling warm/flushed (n=53)	.287	.037
Chest pressure (n=60)	.313	.15
Trouble sleeping (n=101)	.220	.027

*p<0.05; **p<0.01

C. Regression Analysis

In preparation for the multivariable regression analysis to identify predictors of sleep quality (research question 4), we conducted bivariate analyses with all the sociodemographic and clinical characteristics of the sample. Significant correlates were marital status, history of heart failure, history of COPD, drinking caffeine in the afternoon and the amount of caffeine consumed, use of mobile phone at bedtime, the number of symptoms, mean bothersomeness score, frequency of exercise and frequency of fast heart rate. Therefore, these variables (except for the amount of caffeine consumed as this was highly correlated with consumption of caffeine in the afternoon and thus may lead to collinearity) were entered in the backward stepwise linear regression to identify possible predictors of PSQI. The assumptions of multiple regression (normal distribution of the dependent variable, homoscedasticity, absence of collinearity and linearity of associations) were tested and no violation were noted with these variables. At each step, variables satisfying the elimination criterion were removed (p-value > 0.1), starting with nine variables that might theoretically be good predictors for PSQI. Those variables include: symptom bothersomeness, use of mobile within 1 hour of bedtime, history of COPD, frequency of fast heart rhythm in the past month, history of heart failure, marital status, time of caffeine consumption, frequency of exercise per week, number of arrhythmia symptoms. The backward stepwise linear regression model reduced those variables to six variables: marital status, history COPD and not requiring oxygen therapy at night, time of caffeine consumption, frequency of exercise per week, number of arrhythmia symptoms, and mean bothersomeness of arrhythmia symptoms. The procedure stopped when there were no variables left in the model that satisfy the elimination criterion (see Table 7). This final model was significant ($F_{6,136} = 31.31$, $p < .001$), fit the data as shown in Figure 1, and

explained 58% of the variance in the PSQI. Being un-married, having COPD, drinking caffeine in the afternoon, having more symptoms and being more bothered by the symptoms, and not doing exercise were associated with higher PSQI scores, i.e. poorer sleep quality. Un-married individuals have slightly worse sleep quality than married ones, with p value 0.065. Having COPD was associated with 1.64 higher PSQI score. Not drinking caffeine in the afternoon was associated with 1.67 lower score of PSQI. Every day of exercise per week related to .123 lower PSQI score. Every one additional AF symptom was associated with .386 higher score on the PSQI. Finally, every one point increase in the mean bothersomeness score was associated with 1.81 higher score on PSQI.

Table 7 The final model of the backward stepwise linear regression for PSQI predictors

Final Model	**B Coefficients**	**Standardized Coefficients (Beta)**	**T**	**P value**	**95.0% CI for B (upper bound)**	**95.0% CI for B (upper bound)**
Constant	3.952		3.500	<.001	1.719	6.185
Married or not	.817	.110	1.881	.062	-.042	1.676
History of COPD and not requiring oxygen therapy at night	1.637	.142	2.560	.012	.372	2.901
Time of caffeine consumption	-1.674	-.262	-4.467	<.001	-2.415	-.933
Frequency of exercise per week	-.123	-.103	-1.683	.095	-.268	.022
Number of arrhythmia symptoms	.368	.431	6.752	<.001	.261	.476
Mean bothersomeness of symptoms	1.181	.246	3.844	<.001	.573	1.788

Legend: CI=confidence interval

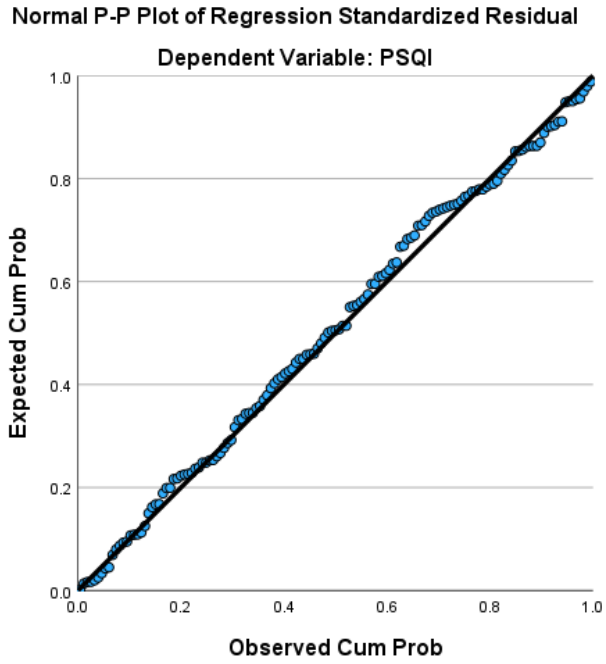

Figure 3 Normal P-P plot of the regression standardized residuals for the PSQI

CHAPTER VI

DISCUSSION

This cross-sectional study that was done in the outpatient department of a major referral medical center in Beirut, Lebanon, aimed to assess prevalence of poor sleep quality in a convenience sample of patients with AF, and to examine its associations with symptom frequency and bothersomeness, along with identifying the risk factors for poor sleep quality in the sample. The study results have shown that poor sleepers account for the vast majority (91%) of the sample of AF patients. Significant associations were found between high PSQI scores, and both, the frequency (13 out of 18 symptoms) and bothersomeness (11 out of 18 symptoms) of most of the arrhythmia symptoms. As for the significant predictors of sleep quality, the following were identified, history of COPD not requiring oxygen therapy at night, caffeine consumption before bedtime, number of arrhythmia symptoms, and mean bothersomeness of arrhythmia symptoms.

A. Prevalence of Poor Sleep Quality

Given that the sample was rather stable being outpatients and able to come to the clinic for their appointment, the fact that that only 15.3% had history of heart failure with EF > 45%, the extent of poor quality among these patients is concerning, as it may further contribute to their cardiovascular risk profile. Nevertheless, the extent of symptoms these patients had, and how bothered they were by them can explain the poor sleep quality. Studies by Kayrak et al. (2013) and Kwon et al. (2015) documented poor sleep in AF

patients. In the Arabic population, in 2012, a Jordanian study by Suleimani et al. that assessed sleep quality using PSQI has shown that cardiac patients reported an average global PSQI scores of 9.14 (SD = 2.34) with almost all the patients being poor sleepers except for one patient. Their study sample included participants who were at least 18 years old having coronary artery disease. Although AF was not being excluded nor identified in this study, yet both the Jordanian study and ours have shown alarming numbers of poor sleepers among Arabic cardiac populations. Previous sleep studies in Lebanon have shown relatively high number of sleep disorders and poor sleep quality compared to the literature worldwide. This was depicted by Chami et al. in 2019 who found that the prevalence of insomnia in a representative sample of the Lebanese adults from Greater Beirut and its suburbs was 34.5%, which is much higher than what was reported in other countries like France (5.6%) (Ohayon, 1996) and Canada (13.4%) (Morin et al., 2011). Knowing that insomnia disorder involves trouble falling and remaining asleep, early morning awakening, in addition to an associated daytime impairment, this disease is among various other factors that affect overall sleep quality. Therefore, the Lebanese literature is still lacking on the assessment of sleep quality in general.

This study has shown an alarming proportion of poor sleepers (91%) across a specific vulnerable cardiac population, which compared to similar studies in other countries that relied on similar sleep quality scale, is much higher. Specifically, a similar study done in Poland has shown that almost 50% of its sample who were AF patients had low PSQI (the cutoff for poor sleepers being 5 as well in that study), knowing that primary sleep disorders such as sleep apnea were not in their exclusion criteria. Additionally, their study sample were hospitalized patients who might as well have additional sleep disturbing factors that

contribute to poorer PSQI compared to our study sample that targeted patients in outpatient clinics (Szymanski et al. 2014). Participants in this study reported an average of 8.58 AF symptoms (SD = 3.21), with the most frequent being fatigue, trouble sleeping (reported by 70.1%), dyspnea, heart flutter and polyuria, which may interfere with sleep. In addition, the mean bothersomeness score was 3.07 (SD=.82) out of 4, which could account for the poor sleep quality in this sample. Looking at the components of sleep quality, the main problem was in sleep latency, with a mean of 2 out of 3 followed by sleep duration (mean 1.73). On the other hand, sleep efficiency had the lowest mean of .56 and the use of sleep medications also was not very frequent (mean .87) in this sample.

B. Associations of Poor PSQI with Arrhythmia Symptomatology

As shown in our results, there is a very strong positive correlation between the number of arrhythmia symptoms an AF patient has and sleep quality ($r = .629$, $p < .001$). Looking at specific symptoms, the presence of symptoms like heart flutter, blurred vision, pounding feeling in the neck, passing a lot of urine, heart race, difficulty catching breath, and chest pressure had the strongest association (p value less than .001). It was not possible to find any previous studies that examined which AF symptoms were specifically related to sleep quality among AF patients. In 2014, Szymanski did not find any correlation between the typical AF symptoms such as palpitations, dyspnea, and low exercise tolerance and sleep quality. However, he acknowledged that the "other symptoms" group, which included wide symptoms ranging from hot flushes, sweating and hand tremor were positively associated with poor sleep quality; yet, specific analysis for each of these symptoms was not performed. In light of our findings, the presence of most of AF symptoms had an evident

impact on an important quality of life parameter, which is sleep quality. Knowing that the higher the number of symptoms a patient is having reflects poorer disease control, patients suffering from a wide array of symptoms require more optimal medical attention and symptom management as this would evidently reflect on their quality of life. Multiple investigations within cardiovascular patient groups, have revealed a correlation between particular sets of symptoms and various health outcomes that encompass factors such as mortality, event-free survival, and major adverse cardiac events (Hwang et al., 2015; Hwang et al., 2012). This study provides an additional outcome that is affected by AF symptoms, and that is quality of sleep. Hence, the assessment of symptom clusters and sleep quality stands as a valuable contribution that cardiovascular nurses can provide to enhance clinical practice and the management of symptoms. On the other side of the spectrum, recent sleep medicine studies have notably emphasized the significance of sleep quality as a predictor of adverse cardiovascular outcomes, which in turn, further exacerbates the challenges with managing AF in poor sleepers (Lao et al., 2018).

Along with the number of AF symptoms, symptom bothersomeness represented another variable that influenced sleep quality, with small to moderate correlations between each symptom's bothrsomeness and the PSQI score. Our findings have shown a very significant association between the mean bothersomeness of many specific AF symptoms and sleep quality. Bothersomeness of fatigue and dizziness had the strongest association with poor sleep quality ($r = .437$ and .401, respectively). While the presence of fatigue and headache did not have significant association with sleep quality, the increase in bothersomeness of both symptoms was associated with worsened quality of sleep. The only study that examined the relationships between symptom intensity and sleep quality was by

Szymanski in 2014, which showed findings that were consistent with ours. In the EHRA I group of the 2014 study, where patients were free of AF symptoms, the occurrence of poor sleep quality was minimal. However, poor sleep escalated with increasing severity of symptoms, reaching its peak in the EHRA IV group (Szymanski, 2014). Symptoms that were assessed to determine the EHRA score were: palpitations, fatigue, dizziness, dyspnea, chest pain, and anxiety. Initially, AF induces specific neural alterations, leading to increased sympathetic nerve activity and persistent sympatho-excitation as a result of irregular ventricular response (Wasmund wt. al, 2003). This altered physiology is suggested to explain many of AF symptoms cluster. Accordingly, individuals experiencing more bothersome symptoms during the daytime are likely to endure increased symptom intensity during sleep.

Our results imply that promptly recognizing and accurately identifying symptoms of atrial fibrillation (AF) through accurate scales such as PPAQ could contribute to pointing out patient groups that are susceptible to poor sleep quality. This is important, especially that recent research indicates that AF patients are less likely to seek timely treatment for their symptoms, for reasons related to the intermittent nature arrhythmia symptoms (McCabe, 2016). Current approaches to managing AF symptoms have predominantly centered on rate and/or rhythm control through medical or procedural means. However, there is a notable scarcity of approaches that encompass self-care strategies for improving symptom management.

C. Predictors of Poor Sleep Quality

Regarding factors that influence sleep quality, our findings were comparable to those in many previous studies on sleep quality predictors in general and sleep quality among AF patients specifically. Our study is suggesting that above all other predictors of poor sleep quality that have been extensively highlighted in literature to affect sleep such as caffeine consumption, exercise, and COPD, AF symptomatology (in terms of both the number and bothersomeness of symptoms) had the most significant predictive power over quality of sleep. This finding has a very important contribution in further highlighting the vulnerability of the AF population in terms of sleep quality; and it goes hand in hand with previous sleep studies on AF patients. As previously mentioned, Risom and colleagues have shown through their experimental study on AF patients that patients who experienced AF symptoms reported worse sleep quality than those without these experiences. Similarly, Szymanski's study findings showed that poor sleep quality is related to the severity of the symptoms and its prevalence rises with every degree of the EHRA score (Risom et al., 2018; Szymanski et al., 2014)

Based on earlier research, high caffeine consumption has various detrimental effects, extending beyond the cardiovascular system to include disruptions in sleep (Gardiner et al., 2023). Our findings revealed that consuming caffeine within 2 hours of bedtime was a predictor of poor sleep quality. This aligns with the findings of other investigators, who concluded that increased caffeine intake, especially in the evening, could adversely affect total sleep duration (Drake et al., 2013; Mirjat et al., 2020). The Lebanese study of Al Karaki et al. further highlighted this relationship, showing that high caffeine intake,

especially before sleep, more than two days per week was highly correlated with increased risk of developing insomnia (Al Karaki et al., 2020).

As for exercise habits, engaging in exercise training significantly influences the body's circadian rhythm by elevating body temperature. Subsequently, after exercising, the decline in body temperature alters the circadian rhythm and facilitates better sleep (Hower et al., 2018). Our study supported a trend for this relationship whereby exercise frequency was shown to be a predictor for a better sleep quality, though the association did not reach statistical significance. Other studies have supported this correlation such as that of Hartescu et al. who showed through a randomized control trial that increased physical activity improves sleep outcomes in inactive people with insomnia (Hartescu et al., 2015).

The fifth predictor of poor sleep quality in our model was COPD. Although we intended to control for COPD by excluding patients with COPD who require oxygen therapy during sleep, those with COPD who did not require oxygen were still more prone for poor sleep quality as per our findings. This suggests that having COPD even in stages that are not advanced enough to require respiratory therapy would still subject individuals to poorer sleep quality. In a secondary analysis, we did not find any difference between patients with COPD and their counterparts in the number, frequency nor bothersomeness of AF symptoms in this sample. The effect of COPD on objective and subjective sleep quality was previously illustrated in many research studies (Parish, 2009). One of the largest analyses examining objective sleep quality and its predictors in COPD showed that patients with COPD sleep poorly in comparison with historical normative populations (Mcsharry et al., 2012). Physiologically, the chronic hypoxaemia in patients with COPD might impact neurotransmitter levels such as serotonin, which contribute to poor sleep efficiency

(Kumar, 2011). These findings reinforce the need for optimal treatment of obstructive lung disease with bronchodilators and/or supplemental oxygen in order to alleviate nocturnal hypoxemia, and thus improve sleep quality (Budhiraja et al., 2015).

The sixth variable in this study shown to be a predictor for PSQI was marital status, whereby there was a trend for married individuals to have better sleep quality than non-married ones. This finding is supported by some previous studies. In 2022, a study by Matsumoto showed that being unmarried was associated with both inadequate sleep quality and quantity in men, while for women, it was more closely linked to poor sleep phase (Matsumoto et al., 2022). Earlier in 2012, data from 3,094 subjects showed that the mean PSQI score was greater among married (5.38 ± 3.43), separated couples (5.16 ± 2.20), and widowed (6.66 ± 3.78), versus single subjects (4.83 ± 2.93) with a significant difference (P = 0.04) (Asghari et al., 2012).

While the conceptual model provided a theoretical foundation for our research, the empirical evidence we have uncovered serves to bridge the gap between theory and real-world application, offering insights for effective sleep assessment and improvement action plans. The model initially illustrated direct relationships between the symptom experience along with demographic, physiologic, and psychologic factors that contribute to the study outcome, which is sleep quality. Among the demographics, there was a trend for married individuals to have better sleep quality than those who are unmarried. In this study age, employment status, and other demographic variables did not have significant effect on sleep quality. As for comorbidities that fall under the physiological factors of the conceptual model, COPD patients not requiring oxygen therapy were found to have significantly worse sleep quality than those without the disease. There was also a trend for

patients with HF to have poorer sleep quality than those without HF. Yet, this study did not show a significant impact of the psychological aspects on sleep quality, such as presence of anxiety or depression, which might be related to the low prevalence of mental diseases among the sample. Finally, specific relationships were found between the symptom experience illustrated in the model that encompasses nature, distress, and timing of symptoms, and sleep quality. The presence of 13 out of 18 symptoms had significant effect on sleep quality, which illustrated the effect of symptom quality or nature on the study outcome. The significant effect of symptom bothersomeness on sleep quality depicted the Distress aspect of the symptom experience in the theoretical model. As for the timing of the symptom experience, it was rather depicted when assessing frequency of fast heart rhythm in AF patients, and a trend was also identified whereby with more frequency in symptom experience, the PSQI scores were worse.

On another note, our study showed that whether the patient was in AF or not during the time of recruitment did not have a significant association with PSQI. This could be due to the fact that the PSQI questionnaire assesses patients' sleep quality over the whole past month prior to presentation, and therefore their heart rhythm during their clinic visit might not be enough to explain variations in PSQI scores, especially when it comes to patients with paroxysmal AF.

D. Limitations

This study has several limitations. First, it was limited to only one outpatient center in Beirut. Being one of the top medical centers in Lebanon, patients visiting this center belonged to a relatively high socioeconomic background. Second, we were not able to

perform ECGs for the whole sample due to time conflicts. For 30% of the sample, we had to rely on manual pulse check to determine whether they had an irregularly irregular heart rhythm, which is the classical sign of AF. However, as previously mentioned, an AF rhythm during the time of recruitment did not have a significant association with PSQI. Another limitation we acknowledge is that many mental health diseases in Lebanon might be underdiagnosed and the proportion of patients with anxiety and depression in this study was probably underestimated. Sleep problems are one feature of anxiety and depression. Still patients with these mood disorders may have been controlled on medications, which we did not measure in this study. Therefore, it is highly recommended that future studies with similar aims utilize specific diagnostic questionnaires to assess for anxiety and depression in people without a known history of mental disorders. One issue that was identified was the low Cronbach's alpha of the PSQI (.434) that could have affected the results. Basically, the correlations between the items of PSQI, and between each item and the total PSQI score are rather low, removing any item did not improve the Cronbach alpha significantly. Psychometric testing for PSQI have been done across many populations yielding varying reliability, with Cronbach alpha ranging from 0.43 (among 82 Japanese healthy participants), 0.65 (among Jordanian patients with CAD), up to 0.83 for 96 psychiatric patients and 52 control subjects in a psychiatric clinical population with insomnia (Buysse et al., 1989; Suleimani et al., 2010; Doi et al., 2000). Low and borderline reliability of PSQI have been previously attributed to the fact that subjects have large variances on PSQI components' means (Doi et al., 2000). Additionally, a Peruvian study that underwent factor analysis of the PSQI on a cohort of 642 women, proposed that overall Cronbach's α may not be simply interpreted as an index for the internal consistency of the

PSQI. This is because the calculation of Cronbach's α assumes that all items measure a single construct, while sleep quality seems to be multi-dimensional, which suggests that different aspects of sleep may not always correlate strongly with each other. Furthermore, the subjective nature of sleep quality perception, along with the heterogeneity in sleep patterns imply that different individuals may prioritize different aspects of sleep, and this variability can result in lower internal consistency. Further psychometric testing is needed in our population. Finally, since the design employed is a cross sectional correlational one, it did not permit to assess the incidence of poor sleep quality based on AF disease characteristics nor to make casual inferences between sleep quality and AF characteristics. Yet, the research findings have helped appreciate the real burden of atrial fibrillation on sleep quality, which would inform targeted strategies to detect and improve sleep hygiene and architecture for these patients.

CHAPTER VI

CONCLUSIONS

This study has shown that a big proportion from a sample of AF patients in Lebanon suffered from poor sleep quality, suggesting that the number of AF symptoms, bothersomeness of symptoms, intake of caffeine before bedtime, and history of COPD to be independent predictors of poor sleep quality. Additionally, this study was the first to further explore the links between specific symptoms from a large array of AF symptoms and sleep quality. Nursing assessments targeting specific symptom profiles among AF patients would help in establishing lifestyle strategies that focus on modifying and enhancing predictors of poor sleep quality discussed above, such as promoting avoidance of consumption of caffeine late in the day, in addition to symptom control interventions.

Given the limited literature on this topic, further research is needed. Future studies on nurse-led integrated care are highly needed for enhancing AF symptom management and improving sleep quality, especially that sleep plays a crucial role in cardiovascular health; and improvement in sleep quality was shown to enhance primary and secondary cardiovascular disease prevention efforts (Makarem et al., 2022). Using quasi-experimental and experimental designs, intervention studies to test the effect of symptom management on sleep quality are recommended. In addition, further psychometric testing of the PSQI is needed.

APPENDIX I

EMAIL TEMPLATE TO BE SENT TO CARDIOLOGY PHYSICIANS TO APPROACH THEIR PATIENTS

This email message is sent on behalf of Dr. Samar Noureddine in regards to a research study she plans to conduct at AUBMC, and in accordance with an approved pathway by the Medical Board to directly approach patients with the following inclusion criteria: 1) Adult patients (18 years or older) with any type of atrial fibrillation, and 2) diagnosed at least one month prior to presentation.

Dear Colleagues,

We are about to launch a study entitled: "The Association Between Sleep Quality and Arrhythmia Symptoms in Patients with Atrial Fibrillation in Lebanon"

The goals of this study are to:

1. Describe sleep quality in a sample of AF patients in Lebanon

2. Examine the associations between sleep quality and the bothersomeness and frequency of AF symptoms

3. Determine the predictors of reduced sleep quality in these patients

This email is to seek permission to approach and invite your patients to partake in the study. The study involves no more than minimum risk to the participants, written consent

will be sought. In addition and in accordance with Medical Board decision for minimal risk studies you have the option to opt out without the need for a justification if you prefer your patients not to be approached. **Should you have any concern or objection, please directly email the Principal Investigator, Dr. Samar Noureddine at sn00@aub.edu.lb simply stating your desire not to have your patients approached for this study.**

APPENDIX II

INVITATION SCRIPT
(ENGLISH VERSION)

AUB Social & Behavioral Sciences

INVITATION SCRIPT

Invitation to Participate in a Research Study

This notice is for an AUB-IRB Approved Research Study

for Dr. Samar Noureddine at AUB.

(Professor at Hariri School of Nursing)

It is not an Official Message from AUB

I am inviting you to participate in a research study titled "The Association Between Sleep Quality and Arrhythmia Symptoms in Patients with Atrial Fibrillation in Lebanon" that aims to examine the relationship between atrial fibrillations symptoms and sleep quality and explore the factors that predict poor sleep among a sample of patients with atrial fibrillation.

If you agree to participate, you will undergo an electrocardiogram (ECG) which involves attaching four leads to your extremities to assess your heart rhythm. This procedure takes 1-3 minutes to complete. Then, you will sit for an interview where you will be asked about demographic information, medical history, lifestyle behaviors, quality of your sleep, as well as symptoms you experience and their effect on your life. The

estimated time to complete these questionnaires is 10 to 15 minutes. In addition to directly asking you questions, your electronic medical records will be accessed to retrieve information related to your health history such as previous diseases, lifestyle behaviors (e.g. smoking and alcohol consumption), treatments and medications.

You are invited because we are targeting patients with atrial fibrillation who are above 18 years old, and have been diagnosed with atrial fibrillation since at least one month. Patients will be excluded from the study if they meet any of these criteria: previously diagnosed with sleep apnea or other sleep disorders, pregnant or breastfeeding women, those with cognitive disorders such as Alzheimer's disease, patients with chronic obstructive pulmonary diseases requiring device or oxygen therapy during sleep, and those having heart failure with ejection fraction < 45%.

The research is conducted at AUBMC outpatient cardiology clinics. Please read the consent form and consider whether you want to be involved in the study. If you have any questions about this study, you may contact the research team (Rasha Darweesh 03/224757) for further information.

APPENDIX III

INVITATION SCRIPT
(ARABIC VERSION)

AMERICAN UNIVERSITY OF BEIRUT

دعوة للمشاركة في دراسة بحثية

هذا الإشعار مخصص لدراسة بحثية معتمدة من

AUB-IRB

للدكتورة سمر نور الدين في الجامعة الأميركية في بيروت.

(أستاذ في مدرسة الحريري للتمريض)

*** ليست رسالة رسمية من الجامعة الأمريكية في بيروت ***

أدعوكم للمشاركة في دراسة بحثية بعنوان "العلاقة بين جودة النوم وأعراض عدم انتظام ضربات القلب لدى مرضى الرجفان الأذيني في لبنان" تهدف إلى فحص العلاقة بين أعراض الرجفان الأذيني ونوعية النوم وكذلك استكشاف العوامل التي تنبئ بضعف النوم بين عينة من مرضى الرجفان الأذيني. سيُطلب منك إكمال مقابلة حيث سنسألك معلومات ديموغرافية وتاريخك الطبي وأنماط سلوكية، جودة نومك، والأعراض التي تختبرها وتأثيرها على نمط حياتك.

إذا وافقت على المشاركة ، فستخضع إلى تخطيط كهربائي للقلب يتضمن ربط أربعة أسلاك بأطرافك لتقييم إيقاع قلبك. يستغرق هذا الإجراء من 1-3 دقائق حتى يكتمل. بعد ذلك، سوف تجلس لإجراء مقابلة حيث سيتم سؤالك عن المعلومات الديموغرافية والطبية وسلوكيات نمط الحياة وجودة نومك والأعراض التي تعاني منها وتأثيرها على حياتك. الوقت المقدر لإكمال هذه الاستبيانات هو 10 إلى 15 دقيقة. بالإضافة إلى طرح الأسئلة عليك مباشرة، سيتم الوصول إلى سجلاتك الطبية الإلكترونية لاسترداد المعلومات المتعلقة بتاريخك الصحي مثل الأمراض السابقة وسلوكيات نمط الحياة (مثل التدخين واستهلاك الكحول) والعلاجات والأدوية.

أنت مدعو لأننا نستهدف مرضى الرجفان الأذيني الذين تزيد أعمارهم عن 18 عامًا والذين شخِّصوا بالرجفان الأذيني في ضربات القلب على الأقل منذ شهر. سيتم استبعاد المرضى من الدراسة إذا استوفوا أيًا من هذه المعايير: تم تشخيصهم سابقًا بانقطاع التنفس أثناء النوم أو اضطرابات النوم الأخرى، النساء الحوامل أو المرضعات، الذين يعانون من اضطرابات الإدراك مثل مرض الزهايمر، المرضى الذين يعانون من أمراض الانسداد الرئوي المزمنة التي تتطلب جهازًا أو علاجًا بالأكسجين أثناء النوم، وأولئك الذين يعانون من قصور في القلب مع كسر طرد أقل من 45٪.

يتم إجراء البحث في عيادات أمراض القلب الخارجية في المركز الطبي في الجامعة الأمريكية في بيروت. يرجى قراءة نموذج الموافقة والنظر فيما إذا كنت تريد المشاركة في الدراسة. إذا كان لديك أي أسئلة حول هذه الدراسة، يمكنك الاتصال بفريق البحث. رشا درويش 03224757

APPENDIX IV

INFORMED CONSENT
(ENGLISH VERSION)

Consent to Participate in a Research Study

"The Association Between Sleep Quality and Arrhythmia Symptoms in Patients with Atrial Fibrillation in Lebanon"

Investigator: Dr. Samar Noureddine

Site where the study will be conducted:

American University of Beirut Medical Center

Study Protocol: SBS-2023-0019

You are invited to participate in a research study titled "The Association Between Sleep Quality and Arrhythmia Symptoms in Patients with Atrial Fibrillation in Lebanon" conducted by Dr Samar Noureddine, Faculty of Nursing at the American University of Beirut.

Please take time to read the following information carefully before you decide whether you want to take part in this study or not. Feel free to ask your doctor if you need more information or clarification about what is stated in this form and the study as a whole.

The purpose of the study is to examine the relationship between atrial fibrillation symptoms and sleep quality as well as explore the factors that predict poor sleep among a sample of 144 patients from these

clinics. I am reaching out to you because the nurse invited you to participate in this study and you accepted. You were selected for the study because you meet the following criteria: above 18 years old, and diagnosed with atrial fibrillation for at least a month ago. If you agree to participate in this research, you will be invited to sit for a brief rhythm check to identify your current heart rhythm. This procedure involves attaching four leads to your extremities and allows displaying your heart rhythm on a monitor; it takes approximately 1 to 3 minutes.

Then you will be asked to answer three questionnaires that take 10 to 15 minutes with the assistance of the researcher who will be documenting your answers in a private zone at the clinic. The first questionnaire is about sociodemographic information, medical history, and behavioral patterns, the second examines sleep quality, and the third assesses symptoms of atrial fibrillation and their effect on your daily activities. Electronic medical records will be accessed to retrieve information about your health history such as history of atrial fibrillation, sleep disorders, health related behaviors, and other medical conditions pertinent to the study.

Your participation in this study is voluntary. If you refuse to participate this will not affect your relationship with the medical center or the quality of care that you receive in any way. There will be no risks for participating in this study beyond those you experience in your daily life. If you experience any discomfort answering the questionnaire, you can stop the questionnaire and withdraw from the study at any time without consequences of any kind.

You will not receive payment or a direct benefit for participation in

this study. The results of the study will help in understanding relationships between atrial fibrillation and sleep quality and identifying factors that affect sleep among atrial fibrillation patients, which will then help in developing future strategies for improving sleep quality.

If you agree to participate in this research study, all the information collected will be kept confidential. Unless required by law, only the study doctor and designee, the ethics committee and inspectors from governmental agencies will have direct access to your medical records.

Please note that your name will be documented on the consent form only. As for the rest of documents, each participant will be identified by a specific numeric code, without documenting other identifiers. Code numbers will be used on the questionnaires and consent forms to help identify the patients in case further access to the medical record is needed before the end of the study. However, the consent forms and questionnaires will be stored separately. All the completed documents will be stored safely with the primary investigator for the whole duration of the study and for three years after completion of the study. Hard copies will be stored in the primary investigator's office under lock. Electronic files will be stored in a password protected computer. Three years after the completion of the study, hard copies of completed documents will be shredded and discarded, and electronic documents will be deleted.

Investigator's Statement:

I have reviewed, in detail, the informed consent document for this research study with _____ (name of patient, legal representative, or parent/guardian) the purpose of the study and its risks and benefits. I have answered to all the patient's questions clearly. I will inform the participant in case of any changes to the research study.

_____

Name of Investigator or designee

_____

Signature

_____

Date & Time

Patient's Participation:

I have read and understood all aspects of the research study and all my questions have been answered. I voluntarily agree to be a part of this research study and I know that I can contact Dr Samar Noureddine through sn00@aub.edu.lb /mobile number: 03 579451 or any of his/her designee involved in the study in case of any questions. If I feel that my questions have not been answered, I can contact the Institutional Review Board for human rights through irb@aub.edu.lb Telephone: 00961 -1-350000 or 1 374374, ext: 5445.

I understand that I am free to withdraw this consent and discontinue participation in this project at any time, even after signing this form, and it will not affect my care or benefits. I know that I will receive a copy of this signed informed consent.

_____ _____

Name of Patient or Legal Representative or Parent/Guardian **Signature**

_____

Date & Time

_____ _____

Witness's Name **Witness's Signature**
(if patient, representative or parent do not read)

_____

Date & Time

APPENDIX V

INFORMED CONSENT
(ARABIC VERSION)

AMERICAN UNIVERSITY OF BEIRUT

الموافقة على المشاركة في دراسة بحثية

"العلاقة بين جودة النوم وأعراض عدم انتظام ضربات القلب لدى

مرضى الرجفان الأذيني في لبنان"

المحقق: د. سمر نور الدين

الموقع الذي ستجرى فيه الدراسة:

المركز الطبي للجامعة الأمريكية في بيروت

SBS-2023-0019

أنت مدعو للمشاركة في دراسة بحثية بعنوان "العلاقة بين جودة النوم وأعراض عدم انتظام ضربات القلب لدى مرضى الرجفان الأذيني في لبنان" التي أجرتها الدكتورة سمر نور الدين، كلية التمريض في الجامعة الأمريكية في بيروت.

يرجى قضاء بعض الوقت في قراءة المعلومات التالية بعناية قبل أن تقرر ما إذا كنت تريد المشاركة في هذه الدراسة أم لا. لا تتردد في سؤال طبيبك عما إذا كنت بحاجة إلى مزيد من المعلومات أو التوضيح حول ما ورد في هذا النموذج والدراسة ككل.

الغرض من الدراسة هو فحص العلاقة بين أعراض الرجفان الأذيني ونوعية النوم وكذلك استكشاف العوامل التي تتنبأ بقلة النوم بين عينة من 144 مريضًا من هذه العيادات. أنا أتواصل معك لأن الممرضة دعتك للمشاركة في هذه الدراسة وقد قبلت. تم اختيارك لهذه الدراسة لأنك تستوفي المعايير التالية: عمرك فوق 18 عامًا، وتم تشخيص إصابتك بالرجفان الأذيني منذ شهر على الأقل. يتضمن هذا الإجراء ربط أربعة أسلاك بأطرافك ويسمح بعرض إيقاع قلبك على شاشة للتعرف على إيقاع

قلبك؛ يستغرق الأمر من 1 إلى 3 دقائق تقريبًا. ثم سيُطلب منك الإجابة على ثلاث استبيانات لا تستغرق أكثر من 10 إلى 15 دقيقة بمساعدة الباحث الذي سيوثق إجاباتك في منطقة خاصة بالعيادة. يتعلق الاستبيان الأول بالمعلومات الاجتماعية والديموغرافية والتاريخ الطبي والأنماط السلوكية، ويفحص الثاني جودة النوم ، ويقيم الاستبيان الثالث أعراض الرجفان الأذيني وتأثيرها على أنشطتك اليومية. سيتم الوصول إلى السجلات الطبية الإلكترونية لاسترداد معلومات حول تاريخك الصحي مثل تاريخ الرجفان الأذيني واضطرابات النوم وسلوكياتك المتعلقة بالصحة والحالات الطبية الأخرى ذات الصلة بالدراسة.

مشاركتك في هذا البحث مخيَر. إذا رفضت المشاركة، فلن يؤثر ذلك على علاقتك بالمركز الطبي أو جودة الرعاية التي تتلقاها بأي شكل من الأشكال. لن تكون هناك مخاطر للمشاركة في هذه الدراسة بخلاف تلك التي تواجهها في حياتك اليومية. إذا واجهت أي إزعاج من الإجابة على الاستبيان ، فيمكنك إيقاف الاستبيان والانسحاب من الدراسة في أي وقت دون عواقب من أي نوع. لن تتلقى مدفوعات أو فائدة مباشرة للمشاركة في هذه الدراسة. ستساعد نتائج الدراسة في فهم العلاقات بين الرجفان الأذيني ونوعية النوم وتحديد العوامل التي تؤثر على النوم بين مرضى الرجفان الأذيني ، والتي ستساعد بعد ذلك في تطوير استراتيجيات مستقبلية لتحسين نوعية النوم. إذا وافقت على المشاركة في هذه الدراسة البحثية، فسيتم الحفاظ على سرية جميع المعلومات التي تم جمعها. ما لم يكن مطلوبًا بموجب القانون، سيكون للطبيب المعني بالدراسة والمعين ولجنة الأخلاقيات والمفتشين من الوكالات الحكومية فقط إمكانية الوصول المباشر إلى سجلاتك الطبية.

يرجى ملاحظة أنه سيتم توثيق اسمك في نموذج الموافقة فقط. بالنسبة لبقية المستندات، سيتم تحديد كل مشارك برمز رقمي محدد، دون توثيق المعرفات الأخرى. سيتم استخدام أرقام الكود في الاستبيانات ونماذج الموافقة للمساعدة في تحديد المرضى في حالة الحاجة إلى مزيد من الوصول إلى السجل الطبي قبل نهاية الدراسة. ومع ذلك، سيتم تخزين نماذج الموافقة والاستبيانات بشكل منفصل. سيتم تخزين جميع المستندات المكتملة بأمان مع الباحث الأساسي طوال مدة الدراسة ولمدة ثلاث سنوات بعد الانتهاء من الدراسة. سيتم تخزين النسخ المطبوعة في مكتب الباحث ضمن القفل. سيتم تخزين الملفات الإلكترونية في جهاز كمبيوتر محمي بكلمة مرور. بعد ثلاث سنوات من الانتهاء من الدراسة، سيتم تمزيق النسخ المطبوعة من المستندات المكتملة والتخلص منها، وسيتم حذف المستندات الإلكترونية.

بيان المحقق:

لقد راجعت، بالتفصيل، وثيقة الموافقة المستنيرة لهذه الدراسة البحثية مع (اسم المريض أو الممثل القانوني أو الوالد / الوصي) _____ الغرض من الدراسة ومخاطرها وفوائدها.

لقد أجبت على جميع أسئلة المريض بوضوح. سأبلغ المشارك في حالة حدوث أي تغييرات في الدراسة البحثية.

_____

اسم المحقق أو من ينوب عنه

_____

التوقيع

_____

التاريخ والوقت

مشاركة المريض:

لقد قرأت وفهمت جميع جوانب الدراسة البحثية وتم الرد على جميع أسئلتي. أوافق طواعية على أن أكون جزءًا من هذه الدراسة البحثية وأعلم أنه يمكنني الاتصال بالدكتورة سمر نور الدين من خلال رقم الهاتف : 03- 579451 / sn00@aub.edu.lb

أو أي من ينوب عنه / عنها مشارك في الدراسة في حالة وجود أي أسئلة. إذا شعرت أنه لم يتم الرد على أسئلتي، يمكنني الاتصال بمجلس المراجعة المؤسسية لحقوق الإنسان من خلال irb@aub.edu.lb

هاتف: 00961350000 او 00961374374 داخلي: 5445.

أفهم أنني حر في سحب هذه الموافقة والتوقف عن المشاركة في هذا البحث في أي وقت، حتى بعد التوقيع على هذا النموذج، ولن يؤثر ذلك على رعايتي أو مزاياي. أعلم أنني سأتلقى نسخة من هذه الموافقة المستنيرة الموقعة.

_____

توقيع اسم المريض أو الممثل القانوني

أو الوالد / الوصي

_____

التاريخ والوقت

_____

اسم الشاهد توقيع الشاهد

(إذا كان المريض أو الممثل أو الوالد لا يقرأ)

_____

التاريخ والوقت

APPENDIX VI

SOCIODEMOGRAPHIC AND MEDICAL FORM

Code number: _____

Gender: □Male □Female Age: _____ years.

Time and date of arrival to clinic: _____

Physician consulted: _____

Reason for visit: _____

Nationality: _____

Marital status: □Married □Widowed □Divorced □Single

Height: _____Weight: _____

Living arrangement: □Alone □With spouse □With spouse and children

□With children

Work status: □Working □Retired □Housewife □On disability

Occupation: _____

What is the household's monthly income?

☐ Between USD 120 and USD 160

☐ Between USD 161 and USD 350

☐ Between USD 351 and USD 520

☐ Between USD 521 and USD 800

☐ More than USD 1000

Education: ☐Elementary ☐Intermediate ☐Secondary ☐Technical

☐University ☐Graduate

ECG findings in the clinic: _____

Medical history:

☐hypertension ☐HF (EF:____) ☐CAD ☐COPD ☐CKD ☐MI

Other:_____

History of ablation: ☐ Yes ☐ No Date: _____

Mental health: history of: ☐Anxiety ☐Depression

Medications: _____

Smoking history: ☐ Never ☐ Current (packs/day; years)

☐ Ex-smoker (Quit date _____)

Alcohol consumption: ☐ Never ☐ monthly or less ☐ 2-4 times a month

☐ 2-4 times a week ☐ 4 or more times a week

Caffeine consumption: (including tea, coffee, energy drinks)

During the afternoon or at bedtime: ☐ Yes ☐ No

Number of caffeinated beverages per day: _____

Exercise: type of exercise: frequency: days/week

Mobile use: Do you use your phone within 1 hour before bedtime: ☐ Yes ☐ No

Total screen-time per day: _____

When you were first diagnosed with atrial fibrillation, were you feeling change in heart rhythm?_____ Change in heart rate?_____ Change in pulse?_____ What was your chief complaint? (fatigue, SOB, …) _____

APPENDIX VII

PPAQ ENGLISH VERSION

1. In the past month, how often <u>on average</u> did your fast heart rhythm occur? (Check one answer only)

□	Three or more times daily
□	Twice daily
□	Daily or almost daily
□	4-5 times a week
□	2-3 times a week
□	About 1 time a week
□	About 2 times in the month
□	About 1 time in the month
□	About 2-4 times a year
□	Not at all

2. In the past month, how long <u>on average</u> did any episodes of the fast heart rhythm last? (Check one answer only)

□	Not applicable
□	A few seconds
□	About 1-5 minutes
□	About 5-10 minutes
□	About 11-15 minutes
□	About 20-30 minutes

□	About 30-40 minutes
□	About 45 minutes to one hour
□	Longer than one hour

Symptom List

(a) Have you had any of these symptoms with your fast heart rhythm in the last 4 weeks? (Check "yes" or "no" on each line)	NO	YES		(b) If present, how much did it bother you? (Check appropriate box on each line)				
				Not at All	A little Bit	Moderately bothersome	Quite a bit	Extremely bothersome
Heart fluttering	□	□		□	□	□	□	□
Heart skipping	□	□		□	□	□	□	□
Blurred vision	□	□		□	□	□	□	□
Pounding feeling in neck	□	□		□	□	□	□	□
Lightheadedness/dizziness	□	□		□	□	□	□	□
Headache	□	□		□	□	□	□	□
Passing a lot of urine	□	□		□	□	□	□	□
Sweating	□	□		□	□	□	□	□
Nausea	□	□		□	□	□	□	□
Fatigue/ no energy	□	□		□	□	□	□	□
Loss of appetite	□	□		□	□	□	□	□
Heart racing	□	□		□	□	□	□	□
Trouble concentrating	□	□		□	□	□	□	□
Passing out	□	□		□	□	□	□	□
Hard to catch breath	□	□		□	□	□	□	□
Feeling warm/flushed	□	□		□	□	□	□	□
Chest pressure when heart is racing	□	□		□	□	□	□	□
Trouble sleeping	□	□		□	□	□	□	□

Other:	□	□		□	□	□	□	□

The following questions ask specifically about how your fast heart rhythm has affected your activities. Please go over the activities below and mark how much you were limited due to your fast heart rhythm over the past 4 weeks.

3. During the past 4 weeks, how much did your fast heart rhythm interfere with the following things? (Check one box on each line)

	Not at all	A little bit	Moderately	Quite a bit	Extremely
Your mood	☐	☐	☐	☐	☐
Your ability to walk or move about	☐	☐	☐	☐	☐
Your sleep	☐	☐	☐	☐	☐
Your normal work (including both work outside of the home and housework)	☐	☐	☐	☐	☐
Your recreational activities	☐	☐	☐	☐	☐
Your enjoyment of life	☐	☐	☐	☐	☐
Your social activities (like visiting friends or close relatives, going out for dinner, or to the movies)	☐	☐	☐	☐	☐
Your ability to drive a car	☐	☐	☐	☐	☐
Your relationship with spouse/partner or boyfriend/girlfriend	☐	☐	☐	☐	☐
Your sexual relationship with spouse/partner or boyfriend/girlfriend	☐	☐	☐	☐	☐

4. During the past 4 weeks, how many days did you miss work or school due to your fast heart rhythm? Please circle the words "Not Applicable" if you do not work or are not in school at this time.

Not applicable | | | Days

5. During the past 4 weeks, how many days did you cut down on the things you usually do because of your fast heart rhythm?

| | | Days

APPENDIX VIII

PPAQ ARABIC VERSION

1. كم مرّة تسارعت نبضات قلبك خلال الشهر الماضي؟

(ضع علامة قرب إجابة واحدة فقط)

- ☐ ثلاث مرّات أو أكثر يوميّاً
- ☐ مرّتين يوميّاً
- ☐ يوميّاً أو شبه يوميّاً
- ☐ 4 الى 5 مرّات في الأسبوع
- ☐ مرّتين الى ثلاث مرّات في الأسبوع
- ☐ مرّة في الأسبوع تقريباً
- ☐ حوالي مرّتين طوال الشهر
- ☐ حوالي مرّة واحدة في الشهر
- مرّتين الى أربع مرّات في السنة
- ☐ حوالي
- ☐ ولا مرّة

2. لكم من الوقت كانت نوبات تسارع ضربات القلب تطول تقريباً خلال الشهر الماضي؟

(ضع علامة قرب إجابة واحدة فقط)

- ☐ لا ينطبق السؤال

□ بضعة ثواني
□ من دقيقة واحدة الى خمس دقائق
□ من 5 الى 10 دقائق
□ من 11 الى 15 دقيقة
□ من 20 الى 30 دقيقة
□ من 30 الى 40 دقيقة
□ من 45 دقيقة الى ساعة واحدة تقريباً
□ أكثر من ساعة

قائمة الأعراض

(أ) هل تزامنت أي من الأعراض التالية مع تسارع نبضات قلبك خلال الأسابيع الأربعة الماضية؟ (أجب بـ"نعم" أم "كلّا" على كلّ سطر)	كلا	نعم		في حال وجود العارض، الى أي حدّ يزعجك؟ (ضع علامة في الخانة المناسبة على كل سطر)				
				لا يزعجني بالمرّة	يزعجني قليلاً	إزعاج محمول	مزعج للغاية	فائق الإزعاج
رفرفة نبضات القلب	☐	☐		☐	☐	☐	☐	☐
تخطي ضربات القلب	☐	☐		☐	☐	☐	☐	☐
تغيّم الرؤية	☐	☐		☐	☐	☐	☐	☐
الشعور بضربات عنيفة في الرقبة	☐	☐		☐	☐	☐	☐	☐
طيْش/ دوار	☐	☐		☐	☐	☐	☐	☐
صداع	☐	☐		☐	☐	☐	☐	☐
التبوّل بشكل زائد	☐	☐		☐	☐	☐	☐	☐
تعرّق	☐	☐		☐	☐	☐	☐	☐
غثيان	☐	☐		☐	☐	☐	☐	☐
إرهاق/ انعدام القوّة	☐	☐		☐	☐	☐	☐	☐
فقدان الشهيّة	☐	☐		☐	☐	☐	☐	☐
نبضات سريعة	☐	☐		☐	☐	☐	☐	☐
صعوبة في التركيز	☐	☐		☐	☐	☐	☐	☐
فقدان الوعي	☐	☐		☐	☐	☐	☐	☐
صعوبة في التقاط الأنفاس	☐	☐		☐	☐	☐	☐	☐
شعور بالدفء	☐	☐		☐	☐	☐	☐	☐
ضغط على الصدر عند تسارع نبضات القلب	☐	☐		☐	☐	☐	☐	☐
نوم مضطرب	☐	☐		☐	☐	☐	☐	☐

أعراض أخرى :	□	□		□	□	□	□	□

تتناول الأسئلة التالية كيفيّة تأثير تسارع نبضات القلب على نشاطك اليوميّ. يرجى تقييم مدى تأثير تسارع نبضات القلب على مختلف أنشطك خلال الأسابيع الأربعة الماضية.

3. خلال الأسابيع الأربعة الماضية، إلى أي مدى أثّر تسارع نبضات قلبك على الأمور التالية؟

	لا تأثير	قليلاً	باعتدال	كثيراً	الى أبعد حدود
مزاجك	☐	☐	☐	☐	☐
قدرتك على المشي أو التحرّك	☐	☐	☐	☐	☐
نومك	☐	☐	☐	☐	☐
عملك (خارج وداخل المنزل)	☐	☐	☐	☐	☐
أنشطتك الترفيهيّة	☐	☐	☐	☐	☐
استمتاعك بالحياة	☐	☐	☐	☐	☐
نشاطك الاجتماعي (كزيارة الأقارب أو الأصحاب أو الخروج لتناول العشاء أو الذهاب الى دور السينما)	☐	☐	☐	☐	☐
قدرتك على القيادة	☐	☐	☐	☐	☐
علاقتك مع الزوج/ الشريك / أو الصديق/ الصديقة	☐	☐	☐	☐	☐
علاقتك الجنسية مع الزوج/ الشريك أو الصديق/ الصديقة	☐	☐	☐	☐	☐

4. كم مرّة تغيّبت عن العمل أو المدرسة خلال الأسابيع الأربعة الماضية بسبب تسارع نبضات قلبك ؟ يرجي وضع دائرة حول "لا ينطبق السؤال" إذا كنت لا تعمل أو لا تتعلّم حاليّاً.

لا ينطبق السؤال			يوماً

5. خلال الأسابيع الاربعة الماضية، كم يوم انقطعت عن نشاطاتك الروتينيّة بسبب تسارع نبضات قلبك ؟

		يوماً

APPENDIX IX
PSQI (ENGLISH VERSION)

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, what time have you usually gone to bed at night?

   _____

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

   _____

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

   _____

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 spent in bed.) _

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. Have bad dreams				
i. Have pain				
j. Other reason(s), please describe:				
6. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?				

7. 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
8. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?				
	Very good	Fairly good	Fairly bad	Very bad
9. During the past month, how would you rate your sleep quality overall?				

	No bed partner or room mate	Partner/room mate in other room	Partner in same room but not same bed	Partner in same bed
10. Do you have a bed partner or room mate?				
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
11. If you have a roommate or bed partner, ask him/her how often in the past month you have had:				
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:				

Note: Number 11 does not contribute to the total PSQI score and is not obligatory in the data collection for the proposed study

APPENDIX X
PSQI (Arabic Version)

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				

ز) الشعوربالحر 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-----

	ليس خلال الشهر الماضي	اقل من واحده قي الاسبوع	مره او مرتين في الاسبوع	ثلاث مرات او اكثر في الاسبوع
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----------

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

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

APPENDIX XI

THE U-ARE QUESTIONNAIRE (ENGLISH VERSION)

1) What is your understanding of what you will be doing during your participation in the study? Do you have to participate?
2) What are the benefits of participating in this research study? Are there any risks?
3) How did you make your decision to participate or not participate in the study?
4) Do you want to participate in this study?

APPENDIX XII
THE U-ARE QUESTIONNAIRE (ARABIC VERSION)

1- ما هو فهمك لما ستفعله أثناء مشاركتك في الدراسة؟ هل يجب عليك المشاركة؟

2- ما هي فوائد المشاركة في هذه الدراسة البحثية؟ هل هناك مخاطر؟

3- كيف اتخذت قرارك بالمشاركة أو عدم المشاركة في الدراسة؟

4- هل ترغب في المشاركة في هذه الدراسة؟

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