Original Article

Demographic Differences in Insomnia and Anxiety and the Association with Cardiovascular Risk Factors among Jordanian Healthy Adult

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Abstract

Background: Prior studies showed that anxiety and insomnia are both associated with Cardiovascular Disease (CVD). There is a lack of literature related to the prevalence of insomnia and anxiety among healthy adult populations in developing countries as in Jordan, Therefore, this study aimed to examine the association between the CVD risk factors and both insomnia and anxiety among healthy adults had one or more modifiable CVD risk factors. **Materials and Methods:** A cross-sectional method was used to examine the prevalence of anxiety, insomnia, and demographical and clinical association with anxiety and insomnia among 1000 Jordanian adult participants using the Hamilton Anxiety Rating Scale and the insomnia severity index. Pearson's correlation was used to examine the correlation between anxiety and insomnia scores. Linear regression was used to examine predictors to anxiety and insomnia based on demographical and clinical details. **Results:** The result of the current study showed that (30.20%) of participants had higher anxiety scores, (29.70%) had moderate to severe insomnia. Moreover, there was a significant positive correlation between anxiety and insomnia scores, $p = 0.01$. Based on the current study findings only marital status and anxiety were unique predictors of insomnia $F_{(14,45)} = 989$, $p = 0.001$. Moreover, Predictors of anxiety were gender, hypertension, Diabetes mellitus, dyslipidemia, and insomnia $F_{(19,89)} = 989$, $p = 0.001$. **Conclusions:** Sleep and psychological well-being are important components of an adult's health and well-being. The study showed that marital status and anxiety are predictors of insomnia. Whereas, gender, hypertension, diabetes mellitus, dyslipidemia, and insomnia were predictors of anxiety. This study highlights the importance of the implementation of a primary prevention strategy for individuals with modifiable CVD risk factors to reduce anxiety and insomnia levels among adults.

Keywords: *Anxiety, cardiovascular risk factors, insomnia, Jordan*

Introduction

In the recent decades, there is considerable improvement in Cardiovascular Disease (CVD) positive outcomes; however, CVD remains the leading cause of morbidity and mortality globally.[1] In the United States, it is also the leading cause of death for people of most ethnic groups,[2] with an estimated cost around $200 billion annually in healthcare services, medications, and unproductivity.[3] Much of this is related to the limited implementation of prevention strategies and uncontrolled CVD risk factors among adults.[4] An increasing number of controlled cardiovascular risk factors have been associated with a lower incidence of CVD.[5] Therefore, moving adults toward ideal cardiovascular health is crucially important for prevention of CVD.

CVD is the leading cause of premature deaths. Indeed, one in every three dies from CVD in the United States.[2] Globally, CVD is responsible for 17.9 million deaths annually.[6] Modifiable risk factors of CVD, such as unhealthy diet, smoking, physical inactivity, obesity, and harmful use of alcohol, are responsible for raising the risk of chronic diseases, such as Coronary Heart Disease (CHD), Diabetes Mellitus (DM), and cancers.[7]

The modifiable risk factors of CVD among adults are common in the United States, according to the American Heart Association (AHA) published report showed that only 21.5% of adults meet the recommended physical activity guidelines in the United States. In addition, an unhealthy diet is responsible for 45.4% of US deaths caused by heart disease, stroke, and type 2 DM in 2012. The prevalence of

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smoking, obesity, high cholesterol level, and Hypertension (HTN) among adults in the United States is 15.10%, 37.70%, 11.90%, and 28.20%, respectively. Besides, DM ranged from 8.8% to 26.4%, while the prevalence of concurrent DM, HTN, and hypercholesterolemia among US adults was 6.30% in 2012.[2]

Evidence shows CVD has an association with a negative psychological state, such as anxiety and depression.[8] Anxiety is defined as a transitional emotional state of the human organism that varies in intensity and fluctuates over time.[9] Anxiety is common among patients with cardiac disease, about 20-30% of patients with ACS had high anxiety levels, 32% among patients with heart failure.[10] Although depression receives more attention in cardiac patients in the literature, anxiety has emerged as a significant psychological construct that is highly prevalent and coexist with depression among patients with CVD.[11] Evidence shows anxiety is one of the most important risk factors of CVD and can increase the risk of major cardiac events and mortality.[12]

Several studies have investigated anxiety among the general population and showed there is a range in the prevalence of anxiety between 3.80% and 25%.[13] Another study found that 33.70% of adults have anxiety.[14] A previous study reported that the prevalence of anxiety in adults is 18.10% of adults in the United States. Also, the period of age between 30 and 44 years has the highest anxiety level (35.10%) age, 45-59 years (30.80%), and then 18-29 years have (30.20%) and (15.30%) in the age more than 60 years.[15] Moreover, Shah, Mohammad[16] found that women have a higher anxiety level than men, married, and unemployed have higher anxiety level.

Insomnia is comorbid with many psychological states, including anxiety, and is the most common sleep disorder.[17] Insomnia is defined as the presence of difficulty in initiating or maintaining sleep or experiencing nonrestorative sleep.[18] A large scale of studies showed that insomnia is associated with CVD mortality and morbidity.[19,20] Furthermore, a meta-analysis and a systematic review showed that insomnia is associated with increased incidence, development, and mortality of CVD.[20,21]

The prevalence of insomnia ranges in different populations, for example, 10-15% in the general population in the United States and 21% in patients with medical conditions,[22] 6% in Qatar,[23] and 26.6% in China.[24] Insomnia increases in patients with a comorbid condition, the prevalence of insomnia increased only among adults with diabetes and joint pain.[25] Moreover, a recent study showed that insomnia symptoms were associated with an increased risk of CVD by 18%.[26] The prevalence of insomnia among women was higher than among men, increased with age, and was independently associated with widowed, divorced, and disabled.[24] Also,[24] showed that insomnia is associated with a higher level of education.

Evidence shows insomnia is associated with CVD risk factors such as cigarette smoking and alcohol drinking,[24] HTN,[27] but the association with type 2 DM is confounded.[28] CVD has become a major health problem in Middle Eastern countries due to the increasing prevalence of risk factors of CVD in the last decades.[29] In Jordan, one of the Middle Eastern countries, CVD is responsible for 37% of all deaths, which is higher than CVD deaths in both the United Kingdom and the United States, 25% and 30%, respectively.[6] This increase in CVD deaths is due to several unhealthy lifestyles that have been spread among the Jordanian population, such as tobacco use, which is the highest in Jordan when compared with the Middle Eastern countries.[30]

Recent published research among Jordanian patients with Acute Coronary Syndrome (ACS) underwent Percutaneous Coronary Intervention (PCI) indicated that 62.30% of patients had HTN, 53.80% DM, 48.80% hypercholesterolemia, 43.50% of patients were smoker, 39.4% of patients had family history of premature CVD, and 28.8% were obese. Only 3.80% did not have any of these CVD risk factors. Patients had more than three and more than four risk factors was presented in 57.4% and 29.5%, respectively. Women had three CVD risk factors more than men.[31]

There are no available data related to insomnia in healthy adults in Jordan. Only a study focused on sleep disturbances among university students by using the global Pittsburgh Sleep Quality Index (PSQI) and showed that sleep disturbances were prevalent in Jordan and also, no significant relationships were found between sleep disturbance and age and gender.[32]

Evidence from previous studies shows that anxiety and insomnia are both associated with CVD.[17] There is a dearth of literature related to the prevalence of insomnia and anxiety among the healthy adult population in developing countries, where a high prevalence of CVD risk factors has occurred in the last few years and the availability of secondary prevention strategies. Furthermore, insomnia is underdiagnosed and neglected in developing countries. To the best of our knowledge, there is no available study seeking to find the association between CVD risk factors and insomnia and anxiety among healthy adults in developing countries, so this is the first study of its kind. Therefore, this study aimed to examine the association between the CVD risk factors and both insomnia and anxiety among healthy adults who had one or more modifiable CVD risk factors not previously diagnosed with CVD. This study aimed to examine the association between the CVD risk factors and both insomnia and anxiety among healthy adults who had one or more modifiable CVD risk factors.

Materials and Methods

A cross-sectional survey method was used to assess the

prevalence of anxiety, insomnia, and demographical and clinical association with anxiety and insomnia among the Jordanian population from January to October 2019.

For the purpose of recruiting participants for the current study, a simple random sampling technique for houses was used. A sample of individuals was recruited from the capital city of Jordan, Amman. Participants were approached by pharmacy students at the American University of Madaba, who received training in data collection and research methods. Eligibility criteria were healthy adults aged 40 years or older; who hold Jordanian nationality; have one or more CVD risk factors and are willing to participate in the study. Exclusion criteria were individuals previously diagnosed with CVD, and/or anxiety disorder, insomnia, or any other comorbidities.

The sample size was calculated based on a 95% confidence level; and 3.0% confidence interval; the estimated total number of Jordanians living in Amman is about 1 million. Calculation of sample size revealed the need for at least 1000 participants.

A list of house numbers was obtained from Greater Amman Municipality with a total number of 2005,127. A thousand and five hundred houses were randomly selected and approached by researcher assistants.

However, individuals in 240 approached houses refused to participate in the study without explanation the reasons. In addition, 440 houses were approached, and they did not respond after knocking on the main door/ringing the bell. Two thousand and nine hundred individuals were available at the time of data collection in the remaining 820 houses. Seven hundred and fifty-five had previously been diagnosed with CVD, 119 had other diseases, 960 did not meet the inclusion criteria (aged less than 40 years old), and 55 did not complete most of the questionnaires. As a result, 1011 participants were included in the current analysis.

In addition to demographic data sheets and clinical details, the Hamilton Anxiety Rating Scale and the Insomnia Severity Index were used.

The Hamilton Anxiety Rating Scale (HAM-A, Hamilton 1959) is a 14-item scale designed to assess the individual's level of both psychic and somatic anxiety, measured on a 5-point Likert scale ranging from 0 (not present) and 4 (Severe). Total scores range from 0 to 56; scores with 28 or more indicate a higher anxiety level. The tool was translated into Arabic and its psychometric properties of the tool have been demonstrated with an Arabic-speaking sample.[33]

The Arabic translation of the insomnia severity index (ISI) was developed by Morin and colleagues (1993) and was used to assess insomnia status among refugees. The ISI includes seven questions with five options ranging from 0 to 4; a higher score indicates worse sleeping disturbances. The total possible score ranges from 0 to 28. The ISI has four categories: 0 to 7 indicates no clinical insomnia; 8 to 14 is subthreshold insomnia; and 15 or more indicates moderate to severe insomnia. Previous research has demonstrated adequate validity and reliability of the Arabic version of the ISI scale; with Cronbach's alpha of 0.84.[34] The Arabic version of the ISI showed adequate reliability with Cronbach's alpha of 0.89.[35] The reliability of the ISI in the current study was adequate with Cronbach's alpha of 0.92.

Ethical approval was obtained from the American University of Madaba. Subsequently, study participants were recruited in their homes. The data collectors contacted possible participants to assess their eligibility, explain the research objectives and methods, and provide them with a printed copy of the informed consent form. Consent forms were obtained from welling participants. Each participant was given study questionnaires, demographics, and a clinical data sheet. Data collection was conducted in January to October 2019.

Statistical package for social sciences (SPSS) version 21 IBM Corp., 2017 was used to analyze the data. Descriptive statistics, including frequencies, mean (M), and standard deviation (SD), were used to analyze the data. In addition, Pearson's correlation was used to examine the correlation between anxiety and insomnia scores. Linear regression was used to examine predictors of anxiety and insomnia based on demographic and clinical details. The significant level was 0.05 or less in the statistical tests.

Ethical considerations

Ethical approval was obtained from the American University of Madaba ethical committee (IRB: H18001) on the 1st of October 2018. Along with a consent form, an information sheet was distributed to each participant, including details of the study's purpose, and explaining data collection. Participants were informed that their participation in the study was voluntary.

Results

Demographical and clinical details

As shown in Table 1, the demographical details of the study participants showed that the majority were aged categorized from 40 to less than 50 years old 50.10 (49.60%), males 510 (50.40%), had bachelor's university degree, and currently working 682 (67.50%).

Analysis of the participants' clinical details is shown in Table 2, which revealed that the majority of participants were overweight or obese 670 (66.30%), nonsmoker 616 (60.90%), not diagnosed with HTN 742 (73.40%), not diagnosed with diabetes mellitus 829 (82%), and not diagnosed with dyslipidemia 832 (82.30%).

Table 1: Sample demographical characteristics with anxiety and insomnia scores

Factors	Categories	Number (%)	Mean Anxiety (SD)	Mean Insomnia (SD)
Age in years	40 to <50	501 (49.60)	22.38 (7.20)	8.21 (7.19)
	50 to <60	310 (30.70)	6.51 (0.36)	6.96 (0.39)
	≥60	200 (19.80)	7.72 (0.54)	6.86 (0.48)
Gender	Female	501 (49.60)	23.43 (7.54)	8.53 (7.40)
	Male	510 (50.40)	21.23 (6.47)	7.48 (6.67)
Marital status	Married	796 (78.70)	21.94 (6.75)	7.59 (6.92)
	Not married	215 (21.30)	23.72 (8.15)	9.50 (7.35)
Education level	Less than secondary	59 (5.80)	23.71 (8.06)	9.59 (8.58)
	Secondary school	234 (23.10)	23.26 (7.65)	8.54 (7.43)
	Bachelor	584 (57.80)	21.97 (0.28)	6.80 (0.28)
	Post-bachelor	134 (13.30)	21.57 (6.23)	6.67 (0.57)
Employment	No	329 (32.50)	23.61 (7.78)	8.47 (7.44)
	Yes	682 (67.50)	21.70 (6.67)	7.78 (6.85)

Table 2: Sample clinical details with anxiety and insomnia scores

Factors	Categories	Number (%)	Mean Anxiety (SD)	Mean Insomnia (SD)
Body mass index	Within normal	341 (33.70)	21.96 (6.63)	8.04 (7.52)
	Overweight or obese	670 (66.30)	22.51 (7.33)	7.98 (6.81)
Smoking	Smoker	395 (39.10)	22.30 (6.81)	8.27 (6.92)
	Nonsmoker	616 (60.90)	22.33 (7.29)	7.83 (7.14)
Hypertension	Yes	269 (26.60)	23.70 (7.72)	8.68 (6.78)
	No	742 (73.40)	21.83 (6.80)	7377 (7.14)
Diabetes mellitus	Yes	182 (18)	23.86 (8.02)	8.60 (6.87)
	No	829 (82)	21.98 (6.84)	7.87 (7.09)
Dyslipidemia	Yes	179 (17.70)	24.40 (8.14)	8.98 (7.0)
	No	832 (82.30)	21.87 (6.78)	7.79 (7.05)

Anxiety and insomnia prevalence and correlation

Descriptive analysis of the anxiety scores showed that the mean anxiety score was 22.32 (SD = 7.10), and participants' scores ranged from 14 to 54. Based on anxiety categories, 305 participants (30.20%) had higher anxiety scores (i.e., 28 or more).

In addition, participants' insomnia scores were mean (SD) 8.0 (7.05) and ranged from 0 to 27. Based on insomnia categories, 300 participants (29.70%) had moderate to severe insomnia. The Pearson correlation test showed that there was a significant positive correlation between anxiety and insomnia scores (r = 0.35, p = 0.001).

Predictors of anxiety

As shown in Table 3, for the purpose of examining predictors of anxiety, linear regression was utilized. Demographical details, insomnia, and clinical details including coronary artery disease risk factors were included as possible predictors for anxiety. The model was significant $F_{(14,45)}$ = 989, p = .001. The full model explained 17.10% of the variance in anxiety. Gender was a statistically significant predictor, $t_{(4,31)}$ = 1009, p = 0.001, which indicates that females predict higher anxiety. Diabetes mellitus was a significant predictor $t_{(2,41)}$ = 1009, p = 0.016 indicating that diabetic participants predict higher anxiety. HTN was another significant predictor $t_{(2,19)}$ = 1009, p = 0.028, indicating that hypertensive participants predict higher anxiety. Dyslipidemia was a significant predictor $F_{(3,38)}$ = 989, p = 0.001, indicating that dyslipidemia participants predict higher anxiety. In addition, insomnia was a significant predictor $F_{(11,06)}$ = 989, p = 0.001, indicating that partisans with higher insomnia predict higher insomnia.

Predictors of insomnia

As shown in Table 3, for the purpose of examining predictors of insomnia, linear regression was utilized. Demographical details, anxiety, and clinical details including coronary artery disease risk factors were included as possible predictors for anxiety. The model was significant $F_{(14,45)}$ = 989, p = 0.001. The full model explained 12.8% of the variance in insomnia. Marital status was a statistically significant predictor, $t_{(2,25)}$ = 1009, p = 0.024, which indicates that not being married predicts higher insomnia. In addition, anxiety was a significant predictor, $F_{(11,06)}$ = 989, p = 0.001, indicating that participants with higher anxiety predict higher insomnia.

Discussion

Findings from this study provided an estimate of the

Table 3: Predictors of insomnia and anxiety

Predictor	Anxiety			Insomnia		
	*b	**t		b	t	*p*
Smoking	−0.41	−0.93	0.35	−0.46	−1.01	0.31
Body mass index	0.42	0.95	0.33	−0.17	−0.39	0.69
Age	−0.34	−1.17	0.24	−0.42	−1.41	0.15
Gender	−2.05	−4.31	0.001*	−0.21	−0.43	0.66
Marital status	0.73	1.42	0.15	1.17	2.25	0.024*
Education	−0.15	−0.53	0.56	−0.30	−1.00	0.31
Job	−0.79	−1.62	0.10	0.045	0.091	0.92
Diabetes mellitus	1.37	2.41	0.016*	0.103	0.17	0.86
Hypertension	1.13	2.19	0.028*	0.43	0.82	0.41
Dislipidemia	1.87	3.38	0.001*	0.42	0.74	0.45
Insomnia	0.32	11.06	0.001*			
Anxiety				0.33	11.06	0.001*
Constant	18.99	9.69	0.001*	0.74	0.35	0.72

*b: Unstandardized beta, **t: fitted value,
***p: significance value: significant predictors ($p < 0.05$)

prevalence of insomnia and anxiety among healthy adults with risk factors for developing CVDs. Higher prevalence of insomnia was significantly predicted from being unmarried and anxious. Inarguably, sleep is a basic physiological need that gives individuals a sense of well-being. It can determine the readiness of the person to initiate the activities of a new day. Sleep disruption, or insomnia, is a common health problem in the general population nowadays. The quality of sleep is influenced by many factors, physical, socioeconomic, as well as psychological ones.[24] Among socioeconomic factors, being unmarried was a significant predictor of insomnia in the current study. Several studies in this regard came in agreement with this study's findings. Although elderly indicated that individuals' marital status, as being unmarried, was significantly associated with their levels of insomnia.[36] Further emphasized that by that by actigraphy. It was reported that better actigraphy data about the sleep pattern and quality of older adults with positive marital relationship, ages between 62 years and 90 years, compared to unmarried ones or those with marital relationship strain.[36]

Social processes can influence sleep process. Marriage is the key social relationship that can affect physical and emotional aspects of an individual's life. If successful, marriage can promote better sleep outcomes. Literature provides additional theoretical explanations for this relationship between sleep and marital status in terms of three models, the social and emotional, the material and time, and the stress model.[36] In the social and emotional, marriage is recognized as a source of emotional support and social integrity. It is a source of emotional and social stability as this relationship is legally, socially, and religiously accepted. Moreover, marriage provides the sense of belonging and companionship, which gives the opportunity for individuals to talk and to be listened to. This may reduce the effect of stress,[37] and consequently, better sleep. In the material and time resource model, compared to unmarried, married individuals are reported to have better physical and mental health, which may improve sleep outcomes.[38] Also, they can gain better financial well-being by bringing together material resources and time investments. Recent research has also pointed to the benefits of marriage for the order and cleanliness of the household through greater role clarity and specialization compared to other living arrangements,[39] suggesting a favorable physical environment as another resource that is available for married people. The provision of emotional support, a sense of social integration, and material and other resources can have a positive and important input to health which can protect against stress. Physical health, psychological well-being, and the household environment that are maintained through marriage can mediate the quality of sleep.

The relationship between insomnia and anxiety was found to be reciprocal and bidirectional which was evident in this study. Insomniac individuals are at higher risks for developing anxiety disorder and symptoms of anxiety may contribute to insomnia.[40] Additionally, Ellis, Perlis[41] have significantly predicted the role of insomnia in the future onset of anxiety. On the other hand, people with conditions like anxiety are more prone to report troubled sleeping. Consistently, anxious adults showed higher levels of insomnia[42] as anxiety can keep the mind active during the nighttime.

The relationship between anxiety and CVDs is well established. Traditional literature tends to report persistent anxiety as a risk factor for CVDs.[43] Anxiety in this study was predicted from clinical details/risk factors of DM, HTN, dyslipidemia, and insomnia. Being diabetic, hypertensive, with abnormal lipids metabolism profile, and insomniac will be at higher risk of having anxiety.

Anxiety is a common mental disorder that was found to be predicted by any alteration in physical well-being like DM, which was evident in this study. Consistently, a significant association was found between diabetes and elevated anxiety symptoms and disorders.[44] Variable incidence of anxiety among diabetics that range from 14% to 55.10% was found.[45] It has been documented that diabetic patients are as twice or even more likely than the general population to suffer from anxiety.[46] Several hypotheses provided explanations regarding the association between diabetes and anxiety. Diabetic individuals may have certain levels of anxiety due to their diagnosis of diabetes,[44] perception that the disease will impose undesirable lifestyle changes, fear of short and long-term complications of DM such as diabetic retinopathy, neuropathy, nephropathy, cardiovascular diseases, and sexual dysfunction.[47] Additional sources of anxiety can include compliance with dietary modifications, treatment regimens, exercise routines, smoking cessation, and blood glucose level monitoring.

There have been several studies that have examined the association of anxiety disorders with HTN as a CVD risk

factor. Mixed and sometimes controversial findings were found in this regard.[48] Anxiety was reported to have an association with HTN.[48] Hamam, Kunjummen[49] in a large prospective study found that there was no association of anxiety with HTN. Contradictory findings were documented in three studies. In three studies, psychological dysfunction measured by the GHQ questionnaire was associated with low blood pressure.[50] In one of the studies, it was found that participants who fall in the lowest 5% centile for systolic blood pressure had significantly lower anxiety scores as measured by the HAD scale than those with systolic blood pressures between the 40 and 60% centiles.[51] The possibility of the fluctuation of the relationship between anxiety and HTN might be attributed to variable measures of anxiety that may necessitate further exploration.

The study findings revealed that anxiety was predicted by dyslipidemia. Insufficient evidence was found to support this finding. The relationship between dyslipidemia and anxiety is unidirectional as dyslipidemia is expected among anxious individuals. Studies have identified that individuals who suffer from Generalized Anxiety Disorder (GAD) show elevated levels of serum lipids, particularly, cholesterol.[52] Only one study reported a certain level of anxiety among individuals with long-term awareness of hyperlipidemia on the HAD Scale.[53] A previous study found behaviors and brain functions among rats/mice with a high-cholesterol diet and found that the behavioral changes were consistent with anxiety disorders.[54]

It is crucial to highlight the importance of prevention strategies at both the community and the individual levels to prevent the development of CVD. The most important way to prevent CVD is to promote a healthy lifestyle throughout life. Prevention strategies must include a strong focus on lifestyle optimization (Addressing sleep problems and improving psychological well-being) to minimize the risk of developing CVD.

The limitations of this study are first, the study did not include other variables or blood tests of participants that may affect insomnia, CVD, and the study results. Second, data collection was conducted in one city (Amman, capital of Jordan) only. Third, a short period of follow-up of the study. However, one of the strengths of this study is that it provides valuable insights into the psychological impact of the patients' CVD.

Conclusion

Sleep and psychological well-being are important components of the lives of individuals. Insomnia and Anxiety are prevalent among individuals having certain modifiable CVD risk factors. Insomnia was prominent among unmarried and anxious individuals. Anxiety was more prevalent among those who have risk factors of DM, HTN, and dyslipidemia. Health policymakers should consider the implementation of a primary prevention strategy for individuals with modifiable CVD risk factors to reduce anxiety and insomnia levels among adults, in addition to preventing the increasing prevalence of CVD.

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Conflicts of interest

Nothing to declare.

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