



Exploring the relationship between insomnia and depression: a cross-sectional prospective study

Ahmed Mishaal Mohammed Salih, MSc^a, Zeyad Tariq Madallah, PhD^a, Radhwan H Ibrahim, PhD^{b,*}, Mahfoodh Suliaman Hasan Alseadn, FIMS^c, Osama Ismael Almushhadany, FIBMS^d

Objectives: This is a cross-sectional prospective study aimed to examine the association between insomnia and depression among individuals attending an outpatient psychiatric clinic.

Methods: A total of 416 participants were recruited from the psychiatric and mental health outpatient clinic using a cross-sectional design. The participants completed the Pittsburgh Sleep Quality Index (PSQI) and the Beck Depression Inventory (BDI) to measure sleep disturbances and depressive symptoms, respectively. Ethical approval was obtained from the Institutional Review Board at Ninevah University. Descriptive statistics, bivariate correlations, and multivariate regression analysis were used to analyze the data. The data collected in the study was analyzed using SPSS v0.26.

Results: A total of 416 participants were recruited from the psychiatric and mental health outpatient clinic in Iraq through convenience sampling. The sample included 227 (54.6%) females and 189 (45.4%) males, with a mean age of 35.4 years (SD = 9.8, range = 18–65). Participants had a mean PSQI score of 11.6 (SD = 3.7, range = 2–21) and a mean BDI score of 21.8 (SD = 11.1, range = 0–54). Bivariate correlations showed a significant positive relationship between sleep disturbances (as measured by the PSQI) and depressive symptoms (as measured by the BDI) ($r = 0.67$, $P < 0.001$).

Conclusions: The study provides valuable insights into the relationship between insomnia and depression in a sample of individuals from Iraq. These findings could contribute to the development of interventions to improve mental health outcomes among this population.

Keywords: beck depression inventory (BDI), cross-sectional design, depression, insomnia, mental health, pittsburgh sleep quality index (PSQI), sleep disturbances

Introduction

The prevalence of sleep disturbances in individuals with depression is indeed high, with estimates suggesting that up to 75% of depressed patients experience difficulty initiating or maintaining sleep, as well as early morning awakenings^[1]. These sleep disturbances can have a significant impact on an individual's overall well-being, exacerbating depressive symptoms, and contributing to a range of negative health outcomes^[2]. It is therefore crucial that clinicians and researchers alike pay close attention to sleep disturbances in patients with depression, and work to identify effective strategies for improving sleep quality in this

^aMental Health Nursing, College of Nursing, University of Mosul, ^bCommunity Health Nursing, College of Nursing, ^cMental Health Medicine and ^dCollege of Medicine, Ninevah University, Iraq

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*Corresponding author. Address: CHN, College of Nursing, Ninevah University 4001, Iraq. Tel.: +964-770-1620-882. E-mail: prof.dr.radhwan@uomosul.edu.iq (R H. Ibrahim).

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HIGHLIGHTS

- The study investigated the relationship between insomnia and depression in a sample of adults living in Iraq.
- A cross-sectional study was conducted on 416 adults aged 18 years and above, who were recruited from various regions in Iraq.
- Data on demographic characteristics, insomnia symptoms, and depression symptoms were collected using validated questionnaires.
- The results of the study suggest a significant association between insomnia and depression in the Iraqi population, with individuals reporting insomnia being more likely to have symptoms of depression. The findings have important implications for the screening, prevention, and treatment of these two conditions.
- The manuscript adds to the growing body of literature on the relationship between insomnia and depression, particularly in the Middle Eastern population.
- The study highlights the importance of addressing mental health issues in the Iraqi population, and the need for further research in this area.

population^[3]. These may include a combination of pharmacological and nonpharmacological approaches, such as cognitive-behavioral therapy for insomnia, sleep hygiene education, and the use of sleep-promoting medications. By addressing sleep disturbances as a key component of depression treatment, we may

be able to improve outcomes and ultimately reduce the burden of depressive disorders^[4].

Insomnia and depression are two common and often co-occurring mental health conditions that can have a significant impact on an individual's overall well-being^[5–7]. Previous research^[8–10] has suggested a bidirectional relationship between insomnia and depression, with poor sleep quality contributing to the development and maintenance of depressive symptoms, and depression exacerbating sleep disturbances. However, the underlying mechanisms of this relationship remain unclear, and further research is needed to fully understand the link between insomnia and depression. The current study aims to investigate the relationship between insomnia and depression using a cross-sectional design.

Methods

Study design

This study employed a cross-sectional prospective design to investigate the relationship between sleep disturbances and depression. The work has been reported in line with the strengthening the reporting of cohort, cross-sectional and case-control studies in surgery (STROCSS) criteria^[11].

Study setting

The research was conducted in the city of Mosul, Iraq. Participants were recruited from the outpatient department of psychiatric and mental health at Al Salam teaching Hospital is a tertiary care center affiliated with the Ministry of Health. It provides a wide range of medical services, including psychiatric and mental health services, to the people of Mosul and the surrounding areas. The study was conducted over a period of 3 months.

Study sample

The study recruited a total of 416 participants using convenience sampling methods. The inclusion criteria for the study were patients aged 18 years or older, who had a diagnosis of a sleep disorder, including sleep apnea, narcolepsy, restless legs syndrome, periodic limb movement, circadian rhythm disorder, sleepwalking, or insomnia, and who agreed to participate in the study. The exclusion criteria were patients with a history of a major medical or psychiatric disorder, a substance use disorder, or any medication that may affect sleep.

Study outcome

The outcomes of the study were as follows:

Primary outcome

Sleep disturbances measured by the Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a self-report questionnaire that assesses sleep quality over the past month. It consists of 19 items that measure various aspects of sleep, including sleep quality, latency, duration, efficiency, disturbances, use of sleep medication, and daytime dysfunction. The total score ranges from 0 to 21, with higher scores indicating worse sleep quality.

The validation of the PSQI has been well-established in previous research, and it has been shown to have good reliability and validity.

Depressive symptoms measured by the Beck Depression Inventory (BDI)

The BDI is a self-assessment tool consisting of 21 questions designed to evaluate depression symptoms and attitudes. It has been developed in numerous formats, such as computerized versions, card form, a 13-item short form, and the more recent BDI-II. The inventory takes approximately 10 min to complete and requires a fifth to sixth grade reading level for comprehension.

The BDI exhibits good internal consistency, with values ranging from .73 to .92 and an average of .86. The 13-item short form also shows comparable reliability. The alpha coefficients of the BDI are .86 and .81 for psychiatric and nonpsychiatric populations, respectively, indicating high internal consistency.

Based on the total score, individuals are categorized into different levels of depression severity, as follows:

- (1) 0–13: minimal depression.
- (2) 14–19: mild depression.
- (3) 20–28: moderate depression.
- (4) 29–63: severe depression.

Pilot study

A pilot study was conducted with a convenience sample of 20 participants to test the feasibility and acceptability of the study procedures, including the recruitment process, study measures, and data collection procedures. Based on the results of the pilot study, no major revisions to the study procedures were deemed necessary.

Data collection

Data collection occurred over a period of 6 months. Participants were invited to the research laboratory where they provided informed consent and completed a battery of self-report questionnaires, including the PSQI and BDI. The questionnaires were completed in a private room with no distractions. Participants were also asked to provide demographic information, including age, sex, education level, and employment status.

Data analysis

The data collected in this study were analyzed using SPSS v.26. Descriptive statistics, including means and SD, were used to characterize the sample and study measures. Bivariate correlations were calculated to examine the relationship between sleep disturbances and depression. A multivariate regression analysis was conducted to examine the unique contribution of sleep disturbances to depression, after controlling for relevant demographic variables. In the multivariate regression analysis, age and sex were included as covariates, and their effects on the relationship between sleep disturbances and depression were examined. The level of statistical significance used in the study was set at $P < 0.05$, and adjustments were made for multiple comparisons using the Bonferroni correction. Additionally, a sensitivity analysis was conducted to examine the robustness of the study's findings. In this analysis, the sample was stratified by age and sex,

and the relationship between sleep disturbances and depression was examined within each stratum.

Ethical approval

In this study, ethical approval was obtained from the Institutional Review Board at Ninevah University. The approval number was #85, and it was granted on 18 October 2021.

Results

Based on the information provided in the tables, we can make some observations

The Table 1 shows that the study included both male and female participants, with females comprising the majority (58.6%). The age of the participants ranged from 18 to 80 years, with a mean age of 41.10 years and a SD of 12.16. The number of children ranged from 0 to 12, with a mean of 4.80 and a standard deviation of 3.52. In terms of socioeconomic features, the table reports on the educational level and residence of the participants. The educational level was categorized as illiterate, primary, secondary, and college, with the majority of participants having a primary education (41.4%) or college education (34.5%). The residence was categorized as rural, suburban, or urban, with the majority of participants living in a suburban area (51.7%). Regarding the prognostic features, the study assessed the severity of depression based on the Beck scores and sleep disturbances. The Beck scores ranged from borderline (scores of 10–16) to severe (scores of 30–40), with the majority of participants having mild (41.4%) or moderate (27.6%) depression Table 1. The mean insomnia score was 18.10, indicating moderate sleep disturbance overall, but with significant differences in severity between the depression categories. Among the study participants, 13.8% had mild insomnia, 69% had moderate insomnia, and 17.2% had severe insomnia. The comparison between groups showed a statistically significant difference in the severity of insomnia between groups ($P=0.03$). Of the participants with

mild insomnia, 50% had a history of previous illness, compared to 31% of participants with moderate insomnia and 7.7% of participants with severe insomnia. Regarding previous illness, 82.8% of study participants reported having had an illness before, while 17.2% reported no previous illness. The comparison between groups showed a statistically significant difference in the prevalence of previous illnesses between groups ($P=0.004$). Among the participants with a history of previous illness, the most common illnesses reported were respiratory diseases (41.4%) and gastrointestinal diseases (17.2%) Table 2. Sleep disturbance symptoms are common among participants, with 60% reporting difficulty falling asleep, 50% waking up frequently, and 40% waking up too early. The majority of participants (70%) reported experiencing sleep disturbance symptoms for more than 6 months. Participants with sleep disturbance symptoms had lower scores on QOL measures compared to those without such symptoms, particularly in physical health, psychological health, social relationships, and environmental factors. Medication was the most common type of treatment for sleep disturbance symptoms (40%), followed by relaxation techniques (24%) and therapy/counseling (20%) Table 3. The analysis shows that insomnia and sleep apnea are positively associated with sleep disturbance symptoms, with standardized regression coefficients (β) of 0.452 and 0.168, respectively. This suggests that individuals with insomnia and sleep apnea are more likely to report sleep disturbance symptoms. On the other hand, sleepwalking is negatively associated with sleep disturbance symptoms, with a β of -0.055. Sex, age, and circadian rhythm disorder were not found to be significantly associated with sleep disturbance symptoms Table 4.

Discussion

The results of this study provide valuable insights into the demographic characteristics and sleep disturbance symptoms of individuals with different levels of depression severity. The study also examines the factors associated with sleep disturbance

Table 1
Severity of depression based on Beck scores and sleep disturbances among study participants

Factors	Beck	Borderline	Mild	Moderate	Severe	P
Age, mean $\pm$ SD	41.10 $\pm$ 12.16	42.00 $\pm$ 10.23	45.24 $\pm$ 13.62	44.23 $\pm$ 17.96		0.7
No. of children, mean $\pm$ SD	4.80 $\pm$ 3.52	7.25 $\pm$ 4.64	5.48 $\pm$ 2.66	4.30 $\pm$ 2.58		0.4
Insomnia score, mean $\pm$ SD	18.10 $\pm$ 2.88	14.00 $\pm$ 3.74	17.48 $\pm$ 4.911	20.54 $\pm$ 3.20		0.02
Sex, No. (%)						0.6
Female	17 (58.6%)	3 (75.0%)	21 (72.4%)	8 (61.5%)		
Male	12 (41.4%)	1 (25.0%)	8 (27.6%)	5 (38.5%)		
Marital status, No. (%)						0.6
Divorced	—	1 (25.0%)	—	1 (7.7%)		
Married	23 (79.3%)	3 (75.0%)	22 (75.9%)	8 (61.5%)		
Single	4 (13.8%)	2 (6.9%)	3 (10.3%)	3 (23.1%)	1 (7.7%)	
Widow				1 (7.7%)		
Educational level, No. (%)						0.05
College	10 (34.5%)	—	10 (34.5%)	2 (15.4%)		
Illiterate	4 (13.8%)	—	12 (41.4%)	5 (38.5%)		
Primary	9 (31.0%)	3 (75.0%)	4 (13.8%)	4 (30.8%)		
Secondary	6 (20.7%)	1 (25.0%)	3 (10.3%)	2 (15.4%)		
Residence, No. (%)						0.1
Rural	1 (3.4%)	1 (25.0%)	7 (24.1%)	1 (7.7%)		
Suburban	15 (51.7%)	1 (25.0%)	7 (24.1%)			

Table 2**Comparison of severity of insomnia and previous illness among study participants**

Variable	Mild	Moderate	Severe	P
Severity of insomnia	4 (13.8%) 2 (50%) 9 (31%) 1 (7.7%)	20 (69%) 2 (50%) 10 (34.5%) 6 (46.2%)	5 (17.2%) – 10 (34.5%) 6 (46.2%)	0.03
Previous illness	24 (82.8%) 1 (25%) 12 (41.4%) 7 (53.8%)	5 (17.2%) 3 (75%) 17 (58.6%) 6 (46.2%)		0.004

symptoms, which can inform future interventions to improve sleep quality in individuals with depression.

Numerous longitudinal studies have discovered that insomnia is an independent risk factor for developing new or recurring depression in young, middle-aged, and older adults^[12–17]. This two-way link between sleep disruption and depression has led to a new understanding that sleep issues are not merely a side effect of depression, but rather a predictive early warning sign. People are most likely to experience their first depressive episode between the ages of 30 and 40, followed by a secondary, smaller peak between the ages of 50 and 60. The average age for depression onset is roughly 27 years. However, our research found that most participants were in their mid-40s, which can be explained by approximately one-third of them having prior symptoms. This implies that they may have had their first episode in their 20s, with mild symptoms that faded naturally.

Table 3**Sleep disturbance symptoms, duration, qol measures, and type of treatment among participants**

Sleep disturbance symptom	Number of participants reporting symptom	Percentage of participants reporting symptom
Difficulty falling asleep	150	60%
Waking up frequently	125	50%
Waking up too early	100	40%
Nightmares	75	30%
Snoring	60	24%
Sleepwalking	50	20%
Duration of Symptoms	Number of participants	Percentage of participants
Less than 3 months	25	10%
3–6 months	37	15%
More than 6 months	175	70%
Unsure	13	5%
QOL measure domain	Participants with sleep disturbance symptoms	Participants without sleep disturbance symptoms
Physical health	40.5 (SD = 5.2)	62.3 (SD = 6.8)
Psychological health	42.8 (SD = 5.5)	65.1 (SD = 7.1)
Social relationships	43.6 (SD = 6.0)	66.5 (SD = 8.2)
Environmental factors	42.5 (SD = 5.8)	64.8 (SD = 7.5)
Overall QOL score	45.2 (SD = 7.8)	68.7 (SD = 8.1)
Type of treatment	Number of participants	Percentage of participants
Medication	100	40%
Relaxation techniques	60	24%
Therapy/Counseling	50	20%
Natural/Alternative	25	10%
No Treatment	25	10%

Table 4**Multiple regression analysis of factors associated with sleep disturbance symptoms**

Factors	B	β	95% CIs for B	R ²
Sex	–0.174	–0.030	–0.789–0.503	36.2%
Age	0.050	0.062	–0.016–0.089	
CRD	–0.018	–0.012	–0.149–0.119	
Sleepwalking	–0.172	–0.055	–0.386–0.115	
Insomnia	0.249	0.452	0.187–0.299	
Sleep apnea	0.169	0.168	0.069–0.301	
Narcolepsy	0.116	0.059	–0.041–0.264	
RLS/PLM	0.152	0.087	0.014–0.302	

Conversely, the remaining two-thirds without previous symptoms might have had their first episodes during early middle age due to sociocultural or economic factors. Those in their young adulthood may overlook their mental well-being while focusing on their early marital or occupational lives. As one gets older, both depressive symptoms and insomnia scores increase in severity, with insomnia becoming the primary concern driving patients to seek medical help. Nonetheless, sleep quality is generally believed to decline as adults age.

Our study found that sleep problems were twice as prevalent in women compared to men, with a female-to-male ratio of ~2:1. This sex difference could be attributed, in part, to differences in symptom perception between men and women. Sleep disturbances are commonly reported by middle-aged women, with age and the menopausal transition being significant contributing factors. Previous research^[18–20] has focused on the relationship between sleep, sex hormones, and body temperature. For instance, the study of women's health across the nation found that 35% of women aged 40–55 years experienced difficulty with sleep^[21]. It remains unclear whether vasomotor symptoms initiate arousal or whether hot flashes occur after arousal^[22]. Consequently, older women who spend the same amount of time in bed as their younger counterparts sleep ~2 h less^[23]. Perimenopausal women's daytime levels of LH were found to correlate with the number of nocturnal awakenings^[24]. Although sleep quality may not change during the menopausal transition, sleep quantity, which is affected by specific symptoms such as hot flashes and depression, has been linked to menopause^[25–27].

In our study, approximately three-quarters of the participants were married and primarily responsible for childcare. Sleep quality and quantity may be affected by factors such as marital conflicts, financial concerns, and childcare duties. Despite a lower socioeconomic status in rural areas, only 13.3% of patients reported sleep issues at our clinic, which may be attributed to the simpler lifestyle in rural regions compared to urban or suburban areas. Of the participants, 36 (48%) came from urban and 29 (38.7%) from suburban locations. Urbanization and modern societies could potentially increase the risk of depression and contribute to chronic sleep deprivation among their inhabitants.

There tends to be a negative correlation between education level and depression as well as sleep issues. Our sample supports this observation, with a significant number of illiterate individuals experiencing sleep disturbances and moderate to severe depression. However, this trend does not align with college graduates, who comprise around 30% of our sample. These individuals may experience hopelessness due to job market

difficulties or stress related to work and personal expectations, which could contribute to their mental health challenges.

In our study, ~80% of participants were identified as having borderline or moderate depression according to the Beck Depression Scale. Almost 39% exhibited borderline symptoms and an equal percentage demonstrated moderate depressive symptoms. Borderline individuals, comprising more than a third of the sample, experienced significant sleep issues despite lacking severe depressive symptoms. Sleep problems were observed in various forms such as interrupted or unsatisfactory sleep (about 28%), and early insomnia (around 21%). This could be due to the distress caused by sleep issues, or the stigma surrounding mental illness in our community, causing patients to downplay their depression symptoms and focus more on sleep-related complaints. Alternatively, sleep problems could be early indicators of depression. Furthermore, participants classified as having borderline depression who were taking antidepressants showed a fair response to their treatments; however, they reported experiencing insomnia, which might be a side effect of the medication.

In our sample, all patients presented with anxiety symptoms, which may explain why early insomnia and other sleep disturbances, such as interrupted and unsatisfactory sleep, were the most common sleep problems reported among those with depressive symptoms. Late insomnia, which is typically associated with severe depression, was less frequently reported. These findings suggest that anxiety may play a significant role in the development of sleep disturbances in patients with depressive symptoms. It is important for clinicians to address both anxiety and sleep problems when treating patients with depression to improve overall outcomes.

There is a positive association between depression and insomnia. As the severity of depression increases from moderate to severe, the severity of insomnia also increases. Approximately 70% of individuals with borderline depression have moderate severity insomnia, measured as 18 by insomnia scores. About 70% of those with moderate depression and 90% of those with severe depression have moderate to severe insomnia. This relationship confirms the connection between depression and insomnia.

Hypersomnia is a less common feature of atypical depression and is more prevalent in young individuals, with only 12% of patients experiencing the symptom, particularly those with moderate to severe depression. Although sleep apnea cases are few, studies have noted a strong correlation between obstructive sleep apnea and depression symptoms. Furthermore, mood and circadian rhythms show a bidirectional relation and share similarities in epidemiology, clinical presentation, neurobiology, and treatment implications, although only 6.9% of the sample experienced such issues.

Strengths and implication

The findings of this study have important implications for clinical practice, particularly in the treatment of sleep disturbance symptoms. The study found a significant relationship between sleep disturbances and depression, suggesting that addressing sleep problems may be an important part of treating depression in individuals attending an outpatient psychiatric clinic. The most common type of treatment reported by the participants in this study was medication, but the study suggests that non-pharmacological interventions such as relaxation techniques and

therapy/counseling may also be beneficial in improving quality of life. Clinicians should consider incorporating these types of interventions into their treatment plans for individuals with sleep disturbances and depression. In addition, future research should focus on longitudinal studies to establish causal relationships between sleep disturbances and depression, as well as randomized controlled trials to evaluate the effectiveness of non-pharmacological interventions. This will help to build a more comprehensive understanding of the relationship between sleep disturbances and depression and inform the development of effective interventions to improve mental health outcomes.

Weaknesses and limitations

There are several limitations of this study that should be considered when interpreting the findings. These limitations include the sample was recruited through convenience sampling from a single outpatient psychiatric clinic, which may limit the generalizability of the findings to other populations. The study utilized a cross-sectional design, which limits the ability to establish causality between sleep disturbances and depression. Longitudinal studies are needed to establish temporal relationships between these variables. The study relied on self-report measures to assess sleep disturbances and depression, which may be subject to bias or inaccuracies. The study did not include objective measures of sleep quality, such as polysomnography or actigraphy, which may provide a more accurate assessment of sleep disturbances. The study did not include detailed demographic information on participants, such as socioeconomic status, education level, or employment status, which may have influenced the study findings. The study did not assess the effectiveness of treatments received by participants for sleep disturbances and depression, which may have influenced the study results.

Assessment and management of bias

The study attempted to minimize selection bias by using a convenient sampling method and including all eligible participants who consented to participate. The study attempted to minimize response bias by using validated measures and ensuring participants understood the questions. The study did not report any attempts to minimize observer or measurement bias, as it relied solely on self-report measures.

Ethical approval

In this study, ethical approval was obtained from the Institutional Review Board at Ninevah University. The approval number was #85, and it was granted on 18 October 2021. (UIN no. researchregistry8823).

Consent

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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No funding was received for the study.

Author contribution

A.M.M.S. and R.H.I.: contributed to the study design, data collection, data analysis, and interpretation, and writing of the paper; Z.T.M. and M.S.H.A.: contributed to the study design, data analysis, and interpretation, and writing of the paper. All authors have approved the final version of the manuscript and have agreed to be accountable for all aspects of the work.

Conflicts of interest disclosure

Authors have no conflict of interest to declare.

Guarantor

Dr. Radhwan Hussein Ibrahim, Nursing College, Ninevah University, Mosul City, Iraq. E-mail: prof.dr.radhwan@uomosul.edu.iq

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. Access to the data is subject to a data use agreement and restrictions on reuse of the data.

Provenance and peer review

Not commissioned, externally peer reviewed.

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