

## ORIGINAL ARTICLE

# Exploring the Relationship Between Insomnia Dimensions and Erectile Dysfunction in the Context of COVID-19

Lucky Saputra<sup>1</sup>, Hatta Sidi<sup>2</sup>, Rita Engellia<sup>3</sup>, Ritchie Orlando<sup>4</sup>, Rosliza Yahaya<sup>5</sup>

<sup>1</sup> Department of Psychiatry, Faculty of Medicine, Universitas Padjadjaran, Bandung, West Java, Indonesia.

<sup>2</sup> Academic Gig Lecturer, Dean's Office, Faculty of Medicine, Universiti Kebangsaan Malaysia, 56000 Cheras, Kuala Lumpur, Malaysia.

<sup>3</sup> Department of Psychiatry, Faculty of Medicine, Universitas Padjadjaran, Bandung, West Java, Indonesia.

<sup>4</sup> Department of Psychiatry, Faculty of Medicine, Universitas Padjadjaran, Bandung, West Java, Indonesia.

<sup>5</sup> Department of Psychiatry & Mental Health, Faculty of Medicine, Universiti Sultan Zainal Abidin (UnisZA), Terengganu, Malaysia.

## ABSTRACT

**Introduction:** The COVID-19 pandemic has intensified psychosocial stressors that disrupt sleep and impair sexual function. While erectile dysfunction (ED) and insomnia are both prevalent and interrelated, the role of specific insomnia dimensions in predicting ED, particularly within the Indonesian context, remains underexplored. **Objective:** This study aimed to examine the relationship between distinct insomnia dimensions and ED and assess whether these associations differ between individuals with and without a history of COVID-19 infection. **Methods:** A cross-sectional online survey was conducted among 337 married Indonesian men aged 17–73. Participants completed the Indonesian versions of the International Index of Erectile Function (IIEF-5) and Insomnia Severity Index (ISI). Multiple linear regression analyses assessed the potential impact of demographic variables and five ISI subcomponents—severity, satisfaction, interference, noticeability, and worry—on ED. A subgroup analysis was also conducted, stratified by COVID-19 infection status. **Results:** The regression model for all participants was significant ( $F(9, 319) = 8.12, p < 0.001, R^2 = 16.5\%$ ). Income was a significant demographic predictor ( $p < 0.05$ ). ED was associated with insomnia dimensions, for two significant predictors of insomnia—interference and worry, with standardised coefficients interference ( $\beta = -0.20, p < 0.01$ ), and worry ( $\beta = -0.23, p < 0.01$ ). In participants without COVID-19 infection, severity and worry were significant predictors. No insomnia dimension was significantly associated with ED among post-COVID-19 participants. **Conclusion:** Cognitive-emotional aspects of insomnia, particularly worry and functional interference, are significantly associated with ED in men without COVID-19 infection. These findings emphasise the need for integrated sleep and sexual health assessments, especially in psychosocially stressed populations. *Malaysian Journal of Medicine and Health Sciences* (2026) 22(SUPP4):23-31 doi:10.47836/mjmh.22.s4.5

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## Corresponding Author:

Dr Rosliza Yahaya, MD, MMed  
Email: roslizayahaya@unisza.edu.my  
Tel: +609-6275528

## INTRODUCTION

Erectile dysfunction (ED) refers to the inability to achieve or maintain a satisfactory penile erection for successful sexual intercourse (SI) (1). The prevalence of ED has been reported up to 30% (1). ED is causing considerable adverse effects, such as poor mental state and reduced quality of life (QoL), where patients with

ED have an almost threefold risk of clinical depression compared to their non-ED respondents (1). Disturbances in any biophysiological domains, such as relational or emotional effects, trigger ED. ED negatively affected the QoL, and numerous patients reported psychopathology of clinical depression and anxiety that are connected to sexual performance (2).

Many individuals experiencing financial instability, psychological stress, and health-related challenges due to COVID-19 have also reported disruptions in their sexual and reproductive health (2). Those with persistent symptoms of insomnia have noted reduced sexual

activity and lower levels of sexual satisfaction during this period. The pandemic has affected intimate relationships, including aspects of sexual function. Among these concerns, erectile dysfunction (ED) has been recognised as a potential marker of cardiovascular and endothelial impairment. The association between ED and COVID-19 appears to be linked to underlying biological mechanisms involving vascular and endothelial dysfunction. Emerging literature has also suggested that both organic and psychogenic forms of ED may be associated with SARS-CoV-2 infection (3).

Psychological and mental health disturbances, including those affecting sleep regulation and homeostatic balance, have been implicated in the underlying mechanisms of erectile dysfunction (ED). Disruptions in sleep patterns are commonly observed in response to major stressors such as natural disasters (e.g., wildfires, earthquakes, and floods) or periods of armed conflict (4). However, unlike these typically localised events, the COVID-19 pandemic 2019 represented a global crisis that significantly altered daily routines across societies. For many, it introduced heightened stress levels and widespread uncertainty. Individuals across different regions have reported increased anxiety related to health concerns, social isolation, job security, financial strain, and the pressure of balancing work and personal responsibilities. These cumulative stressors may disrupt typical sleep architecture, including circadian rhythms, when restorative sleep is essential for coping effectively with prolonged uncertainty and psychological demands (5).

Difficulties in maintaining continuous sleep characterise insomnia and are frequently accompanied by daytime impairments, such as excessive sleepiness, fatigue, and somatic complaints like headaches or generalised body discomfort (6). Individuals with insomnia may also report mood disturbances, impaired cognitive performance, reduced work productivity, and persistent concerns or dissatisfaction about their sleep quality (6). In a study by Lin and colleagues, the immediate psychological and behavioural consequences of the COVID-19 outbreak on sleep and emotional well-being were examined in a large sample of Chinese adults ( $N = 5,641$ ) (7). During the peak period of COVID-19 transmission in early to mid-February 2020, both healthcare professionals and members of the general public participated in a survey assessing mental health symptoms, including insomnia, anxiety, depression, and acute stress. The study identified a notably high prevalence of clinically relevant sleep disturbances, with approximately 20% of participants reporting significant insomnia symptoms (7).

Insomnia assessment encompasses multiple dimensions and is most effectively approached using a combination of clinical evaluation, validated self-report instruments, and daily sleep logs. While structured clinical interviews remain the diagnostic gold standard, their practical use

is often limited by time constraints in routine healthcare settings. This limitation may lead to under-recognition or insufficient attention to sleep-related complaints during clinical consultations (8). One widely used tool for assessing insomnia is the Insomnia Severity Index (ISI), a brief self-report measure comprising seven items that evaluate the characteristics, severity, and functional impact of insomnia symptoms (9). The ISI assesses sleep patterns over the preceding month, including items that capture difficulties initiating sleep, maintaining sleep, and early morning awakenings. It also addresses the individual's level of satisfaction with sleep quality, the degree to which sleep issues interfere with daytime activities, the extent to which these difficulties are noticeable to others, and the personal distress associated with poor sleep (10).

Mental health challenges like anxiety, depression, trauma, and sleep disturbances can profoundly affect the emotional closeness between married partners. The COVID-19 pandemic has contributed to a rise in divorce cases, often stemming from breakdowns in intimacy. These disruptions are linked to issues within the home environment, such as financial strain, uneven quality time, domestic abuse, and shifts in how couples communicate (11,12). The study in Indonesia only reported the prevalence of insomnia in COVID-19 patients, without addressing the specific dimensions of insomnia or its association with ED. Insomnia is associated with optimism and discrimination, suggesting that physical care and psychological care should be prioritised for COVID-19 patients (13). To date, there appears to be no published research in Indonesia specifically exploring the relationship between distinct dimensions of insomnia and erectile dysfunction (ED) in the context of the COVID-19 pandemic. This study, therefore, aimed to examine how demographic variables and specific insomnia components are associated with ED and whether these associations differ between individuals who had been infected with COVID-19 and those who had not.

## MATERIALS AND METHODS

This study employed a cross-sectional design with a descriptive-analytic research approach. Data was collected based on an online cross-sectional survey of 337 male subjects. Respondents were recruited by non-probability purposive sampling, i.e., distributing electronic questionnaires online. The sample size estimation was extracted from a previous study in which 479 females and 217 males participated in this research (14).

We conducted the research from January 3 to April 2, 2022. The data analysis design utilised the Statistical Package for the Social Sciences (SPSS) version 25.0 program. The inclusion criteria included the adult population who suffered from ED, those who had both

COVID-19 infection and those without, as determined by self-report, and who agreed to participate in the study. They were asked to fill out an electronic informed consent form via the Google online platform and then complete sociodemographic information, including age, gender, education level, income, employment status, and a history of COVID-19, all within the same Google form for assessment. From the data gathered, we categorised demographic factors as Education (Senior high school, Bachelor level, Postgraduate level), Employment (Not working or Working), and Income described based on participants' perceptions of changes in income during the pandemic (Increased or decreased, Unchanged, No income), and History of Covid-19 infection (No, Yes).

### Measurement Tools

Various measurement tools were used to determine the correlation of insomnia with ED during the COVID-19 pandemic, i.e., (i) The International Index of Erectile Function (IIEF-5) Indonesian Version. (IIEF-5-I), (ii) Insomnia Severity Index (ISI) Indonesian Version (ISI-I).

### The International Index of Erectile Function (IIEF-5)

The IIEF-5-I is a brief version of the original 15-item IIEF questionnaire designed to assess ED, which was extensively used in clinical and research settings. The IIEF-5 focuses on erectile function (EF), making it a valuable diagnostic tool for evaluating ED and assessing treatment outcomes. The IIEF-5 verified sufficient structural validity in the Rasch model analysis. It has a confirming ability to measure EF effectively. However, more study is required to determine the one-dimensionality of the questionnaire to confirm that all items measure the same underlying construct. The IIEF-5 also revealed strong test-retest reliability, indicating that it consistently measures EF over time. Its internal consistency was indeterminate, as one-dimensionality has not been fully confirmed. It demonstrated high criterion validity, with a strong ability to discriminate between men with and without ED. Several studies have reported high sensitivity (0.85-0.98) and specificity (0.75-0.88) for different cutoff points, typically around 21, in detecting ED.

The IIEF-5 shows promise for its reliability and validity in diagnosing ED; however, additional research is needed to address areas such as internal consistency, measurement error, and responsiveness (15). The Indonesian version of the IIEF-5 demonstrated high validity, with Pearson correlation values ranging from 0.70 to 1.00, indicating strong positive correlations. Internal consistency was good, with a Cronbach's alpha value of 0.828. The inter-rater reliability was excellent, with a Cohen's kappa value of 0.879, showing strong agreement between patient self-assessments and physician evaluations. The Indonesian IIEF-5 was a valid and reliable tool for assessing ED in Indonesian men, mainly middle-aged and older adults. This version can be used in Indonesia for clinical and research purposes

(16).

### Insomnia Severity Index (ISI) Indonesian Version

The Insomnia Severity Index–Indonesia (ISI-I) is a tool used to assess the severity and clinical impact of insomnia, capturing both symptom intensity and functional consequences. Clinicians often focus on parameters such as sleep onset latency, duration and frequency of nocturnal awakenings, total sleep time, and sleep disturbances. Insomnia is highly prevalent, with approximately one-third of adults reporting at least one symptom indicative of the condition. According to Buysse et al. (2006), the two most widely used instruments for evaluating sleep quality and insomnia are the Pittsburgh Sleep Quality Index (PSQI) and the Insomnia Severity Index (ISI). While the PSQI offers a broad overview of various sleep-related difficulties, the ISI specifically assesses insomnia by focusing on the individual's subjective experience of sleep problems and their perceived severity (10).

The Insomnia Severity Index (ISI) has demonstrated strong psychometric properties, with high internal consistency reported across populations—Cronbach's alpha was 0.90 in community samples and 0.91 in clinical settings, indicating excellent reliability. Significant associations were found between ISI scores and other constructs, such as sleep quality, fatigue, anxiety, depression, and overall quality of life, supporting convergent validity. A cutoff score of 11 was identified as optimal for clinical use, yielding high sensitivity and specificity. The ISI also showed responsiveness to changes following treatment, with reductions of more than 7 points suggesting moderate improvement and decreases of over 8 points indicating substantial clinical progress. Item Response Theory (IRT) analysis further confirmed that several ISI items—particularly those addressing sleep continuity, satisfaction, functional interference, and distress—effectively distinguished insomnia severity levels. The ISI consists of seven self-reported items rated on a Likert scale, with total scores ranging from 0 to 28. Higher scores indicate more severe insomnia symptoms: scores of 0–7 reflect the absence of insomnia, 8–14 indicate subthreshold insomnia, 15–21 represent moderate clinical insomnia, and 22–28 correspond to severe clinical insomnia. The Indonesian version of the ISI has also shown good reliability, with a Cronbach's alpha of 0.88 (17).

### Procedure

The study was performed on the general population, specifically individuals who identified as married and had a history of COVID-19 infection. Ethical approval for the study was obtained under LB.02.01/X.6.5/337/2021. Participants who consented to participate in the research filled out an electronic informed consent form via Google Forms. Following this, data collection was carried out using an electronic questionnaire. The collected data were processed through descriptive data

analysis using the SPSS version 25.0 software to analyse and present the study's findings.

**Data Analysis**

Multiple regression analysis was used to address the study's aim. Before the analysis, standard classical assumption testing was performed, including assessments of linearity, multicollinearity, homoscedasticity, normality, and independent errors. A second regression model was conducted to address the secondary aim of the study by controlling for a history of COVID-19 infection.

Descriptive statistics were employed to summarise the dataset, including calculations of means, standard deviations, and frequency distributions for demographic variables, total insomnia scores, insomnia subcomponents, and erectile dysfunction (ED) classifications. Both insomnia and ED were analysed as continuous variables and categorised based on established clinical thresholds. Erectile dysfunction severity was classified into five categories: scores of 22–25 indicated no ED, 17–21 represented mild ED, 12–16 corresponded to mild to moderate ED, 8–11 to moderate ED, and 5–7 to severe ED. Insomnia levels were assessed using the Insomnia Severity Index (ISI), with the following cut-off scores: 0–7 denoting no clinically significant insomnia, 8–14 indicating subthreshold insomnia, 15–21 reflecting moderate clinical insomnia, and 22–28 representing severe clinical insomnia.

**RESULT**

Statistical analysis was conducted on data obtained from a sample of 337 married men, with a mean age of 42.62 years (SD = 10.84), see Table I. The frequency distribution of additional demographic variables—namely, educational background, employment status, income stability, and history of COVID-19 infection—is presented below. Most participants held a bachelor's degree, were employed, and reported no significant change in income during the COVID-19 pandemic. The distribution of COVID-19 infection history was relatively

**Table I. Demographic Data**

Demographic variable	Category	n(%)
Education	Senior high school	13(4)
	Bachelor level	192(57)
	Post graduate level	132(39)
Employment status	Not working	13(4)
	Work	324(96)
Income	Increased	47(14)
	Decreased	121(36)
	Unchanged	159(47)
	No income	10(3)
History of Covid-19 infection	No	185(55)
	Yes	152(45)

balanced between those who had been infected and those who had not.

**Regression analysis**

To address the first research objective, a multiple regression analysis was conducted involving all participants, using demographic variables (education, employment, income, and history of COVID-19 infection) and the five dimensions of insomnia as predictor variables (see Table II). All demographic variables were categorical, while the insomnia dimensions were continuous. The outcome variable was erectile dysfunction (ED).

**Table II. Standardised regression coefficients**

Predictor	Group	Standardized coefficient (β)	Standard Error	95% Confidence Interval for B		t	p-value
				Lower	Upper		
<b>Demographic Factors</b>							
Education	All participants	-0.02	0.40	-0.93	0.63	-0.38	0.71
	No infected	-0.00	0.45	-1.12	0.91	-0.05	0.96
	Infected	0.02	0.73	-1.29	1.59	0.21	0.84
Employment	All participants	0.06	1.16	-0.97	3.61	1.07	0.29
	No infected	-0.17*	1.71	-7.74	-0.98	-2.55	0.01
	Infected	0.20*	1.67	0.76	7.38	2.43	0.02
Income	All participants	0.11*	0.30	0.01	1.19	2.05	0.04
	No infected	0.08	0.38	-0.30	1.18	1.17	0.24
	Infected	0.09	0.48	-0.46	1.46	1.04	0.30
History of Covid-19 infection	All participant	-0.01	0.42	-0.9	0.76	-0.17	0.87
<b>Insomnia Severity Score Dimension</b>							
Insomnia severity	All participants	-0.08	0.17	-0.49	0.14	-1.11	0.27
	No infected	-0.20*	0.20	-0.80	-0.01	-2.01	0.04
	Infected	0.05	0.27	-0.40	0.65	0.48	0.64
Insomnia satisfaction	All participants	0.08	0.29	-0.21	0.95	1.26	0.21
	No infected	0.07	0.37	-0.45	1.01	0.75	0.45
	Infected	0.04	0.48	0.76	1.12	0.38	0.70
Insomnia interference	All participants	-0.20*	0.36	-1.45	-0.05	-2.65	0.04
	No infected	-0.18	0.44	-1.71	0.04	-1.89	0.06
	Infected	-0.21	0.59	-2.25	0.09	-1.82	0.07
Insomnia notice	All participants	0.10	0.29	-0.13	1.00	1.53	0.13
	No infected	0.14	0.36	-0.07	1.34	1.77	0.08
	Infected	0.05	0.49	-0.74	1.19	0.45	0.65

CONTINUE

**Table II. Standardised regression coefficients (Cont.)**

Predictor	Group	Standardized coefficient (β)	Standard Error	95% Confidence Interval for B		t	p-value
				Lower	Upper		
Insomnia worried	All participants	-0.23**	0.45	-2.12	-0.43	-2.79	0.00
	No infected	-0.24*	0.59	-2.60	-0.25	-2.38	0.02
	Infected	-0.17	0.69	-2.24	0.48	-1.27	0.21

\* refers to significant potential predictors (\*p < 0.05; \*\*p < 0.001)

β means standardized regression coefficient

t refers to the test significance of the regression coefficient

The results indicated that the regression model was statistically significant and well-fitted:  $F(9, 319) = 8.12$ ,  $p < 0.001$ , with an explained variance ( $R^2$ ) of 16.5%. Only income emerged as a significant predictor of ED among the four demographic factors, with a standardised coefficient of 0.11 ( $t = 2.05$ ,  $p < 0.05$ ). Two dimensions of insomnia—interference and worry—were also significant predictors, with standardised coefficients of -0.20 ( $t = -2.65$ ,  $p < 0.05$ ) and -0.23 ( $t = -2.79$ ,  $p < 0.01$ ), respectively. Among these, the worry dimension showed the strongest negative association with ED.

For the second research objective, separate regression analyses were conducted for participants with no COVID-19 infection ( $n = 186$ ) and those with a history of infection ( $n = 151$ ). The demographic variables included in both models were education, employment, and income. The regression model was significant for both groups: adjusted  $R^2 = 27.1\%$  for the non-infected group [ $F(8, 173) = 9.42$ ,  $p < 0.01$ ] and  $R^2 = 12.2\%$  for the infected group [ $F(8, 138) = 3.55$ ,  $p < 0.01$ ].

In terms of partial effects, employment was a significant predictor in both groups, with a standardised coefficient of -0.17 ( $t = -2.55$ ,  $p < 0.05$ ) for the non-infected group and 0.20 ( $t = 2.43$ ,  $p < 0.05$ ) for the infected group. Among the non-infected participants, two insomnia dimensions—severity and worry—significantly predicted ED, with standardised coefficients of -0.20 ( $t = -2.01$ ,  $p < 0.05$ ) and -0.24 ( $t = -2.38$ ,  $p < 0.05$ ), respectively. In contrast, no insomnia dimensions significantly predicted ED in the group with a history of COVID-19 infection.

## DISCUSSION

The present findings indicate a significant association between the absence of insomnia and the absence of erectile dysfunction (ED) among men during the COVID-19 pandemic. This aligns with a growing body of evidence suggesting that sleep quality plays a pivotal role in maintaining sexual health (2,18). Prior research has shown that even a modest extension in sleep duration—such as one additional hour—can lead to a measurable increase in sexual activity, with one study reporting a 14% rise in sexual engagement (2015). The

psychological consequences of poor sleep, including heightened levels of anxiety and depression, have long been recognised as contributing factors to ED and other forms of sexual dysfunction. However, beyond psychological pathways, physiological disturbances such as fragmented sleep and altered sleep architecture may also impair sexual function. These disruptions can result in homeostatic imbalance and hormonal dysregulation, including changes in cortisol levels, which are integral to circadian rhythm regulation. Reduced production of sex-related hormones as a result of these neuroendocrine alterations may further explain the link between sleep disturbances and ED (2,18).

In addition to its psychological consequences, inadequate sleep is also implicated in the development of endothelial dysfunction, which, along with hormonal imbalance, may contribute to impaired erectile function. Evidence suggests that short sleep duration adversely affects vascular endothelial health by reducing nitric oxide (NO) bioavailability and disrupting the NO-cGMP signalling pathway (19,20).

In this study, no significant association was identified between a history of COVID-19 infection and the presence of erectile dysfunction (ED). Ma et al align with recent Mendelian Randomisation (MR) analyses that show no causal link between COVID-19 infection, hospitalisation, or severity and ED. These findings suggest that psychological factors related to insomnia, rather than the infection itself, may play a more prominent role in ED during the pandemic (21). The potential link between SARS-CoV-2 infection and ED remains a subject of ongoing research. From a biological perspective, the infection may contribute to ED through mechanisms such as elevated systemic inflammation and increased viral burden, both recognised consequences of COVID-19. SARS-CoV-2 affects male reproductive organs due to the high expression of angiotensin-converting enzyme 2 (ACE2) receptors in several cell types, including those in the testes. However, the exact impact of the virus on testosterone production remains uncertain.

One study reported that 65.2% of asymptomatic men infected with SARS-CoV-2 experienced diminished sexual desire and libido, with more severe cases of COVID-19 showing a significant reduction in serum total testosterone levels (22). The findings of the Japanese cohort study provide critical context for understanding the emerging pattern of erectile dysfunction (ED) among male patients following COVID-19 infection. In this cohort, 19% of men reported developing ED one to two years after recovering from COVID-19, despite the absence of significant associations with conventional organic risk factors such as age, diabetes, or hypertension (19). Instead, the study highlights a strong link between ED symptoms and psychological distress, particularly depression, anxiety, and sleep disturbances. These findings align with our research conducted among

Indonesian men during the COVID-19 pandemic, which identified a significant relationship between insomnia and erectile dysfunction (23). It is essential to acknowledge the limitations of the present study, including the exclusion of participants with a history of severe COVID-19 infection and the absence of assessment for psychological conditions such as major depressive disorder, which are known to influence sexual function and could confound the findings (24,25). Income is also associated with Insomnia and Erectile Dysfunction. The results indicated that the regression model was statistically significant and well-fitted. Only income emerged as a significant predictor of ED among the four demographic factors. The finding is that income plays a vital role in erectile dysfunction. Macdonald et al in 2022 have done a cross-sectional study that offers preliminary evidence that low socioeconomic status (SES) may be independently linked to erectile dysfunction (ED). Their findings indicate that respondents with lower income levels were nearly twice as likely to report ED as those with higher incomes. This suggests that SES may interact with biological risk factors that contribute to the development of ED (25).

SES is already recognised as a risk factor for various diseases, including heart disease and stroke. However, the underlying mechanisms for these associations remain unclear, likely involving multiple factors, which makes them challenging to investigate. One possible explanation for our results is that the stress associated with low SES could negatively impact erectile function. Additionally, low SES is often linked to poor nutrition, another factor known to increase the risk of ED. Furthermore, individuals with lower SES may face greater barriers to accessing healthcare, making them less likely to seek treatment for ED. In contrast, those with higher SES may experience improved erectile function due to better access to medical interventions (24).

Related to the study by Okey-Ewurum et al. (2020). In their studies, men in more stressful or less secure forms of employment, such as self-employment, might experience higher rates of ED. This could be due to these jobs' financial pressures and physical demands. On the other hand, those in more stable employment, such as civil servants, were found to have a lower prevalence of ED (26).

Beyond demonstrating strong psychometric validity, the Insomnia Severity Index (ISI) offers several advantages for clinical application. The ISI enables clinicians to quantify the severity of insomnia, apply cutoff scores to assess clinical significance and identify the specific type of sleep disturbance (e.g., difficulty initiating vs maintaining sleep) based on its particular dimensions scale (9).

In our study, it is evident that the Insomnia Severity Index (ISI) dimensions most significantly associated with

the occurrence of erectile dysfunction are worry and the causal relation of interference. Among these, the worry dimension showed the strongest negative association with ED. The study by Zhang et al. (2024) found no direct causal relationship between the worry component (without insomnia) and erectile dysfunction (ED) ( $p > 0.05$ ). However, it tested causality, using genetic variants (SNPs) as instrumental variables to estimate whether worry is a causal risk factor for ED. It concluded that no causal relationship was found between worry and ED. This suggests that worry may be correlated with ED (as our study found), but not causally responsible for it, at least not in a genetically mediated or biologically hardwired sense (27).

Interestingly, according to Zhu et al, the result shown in another study showed that insomnia had a significant causal effect on ED risk (OR = 1.70, 95% CI: 1.14–2.51,  $p = 8.57e-3$ ). It provides compelling evidence supporting a causal relationship between frequent insomnia and increased risk of erectile dysfunction (ED). Using large-scale genome-wide association data and robust Mendelian randomisation techniques, frequent insomnia was found to significantly elevate the likelihood of developing ED, even after adjusting for known confounders such as depression, BMI, smoking, alcohol consumption, and type 2 diabetes. The multivariable MR analyses revealed that frequent insomnia retained its causal association with ED, underscoring its independent effect (28). Moreover, a study has shown that psychological factors—including fatigue—can influence erection. Fatigue is not explicitly listed as an individual item in the Insomnia Severity Index (ISI), but it is inherently represented within the interference with the daytime functioning component. This dimension captures how insomnia-related symptoms impair daily activities, encompassing reduced energy, diminished cognitive performance, and functional exhaustion (9).

Regarding partial effects, employment was a significant predictor in both groups (26). In a cross-sectional study conducted among 330 adult males in Port Harcourt, Nigeria, erectile dysfunction (ED) was reported by 63.64% of respondents. Analysis of employment status revealed that ED prevalence varied across occupational categories. The highest proportion of individuals reporting ED were self-employed (32.12%), followed by those employed in the private sector (13.33%) and individuals in undefined occupational categories (11.82%). Fewer cases were reported among civil servants (3.64%) and peasants (2.73%) (26).

Two insomnia dimensions—severity and worry—significantly predicted ED, respectively, in the group without a history of COVID-19 infection. In contrast, no insomnia dimensions significantly predicted ED in the group with a history of COVID-19 infection. In a survey on Relationships between sexual function and sleep, insomnia severity is linked substantially to

sexual dysfunction, suggesting that clinicians should routinely assess both areas for dysfunction (28). A 2023 observational study on the relationship of insomnia to sexual function and sexual satisfaction showed that insomnia severity negatively impacts sexual satisfaction and is associated with higher rates of sexual dysfunction in both women and men (29).

Align with the previous explanation that sleep disorders may contribute to erectile dysfunction (ED) through disruption of the hypothalamic-pituitary-gonadal axis and circadian cortisol rhythm. An extensive cohort study showed that men with insomnia, sleep apnea, or circadian rhythm dysfunction had higher risks of testosterone deficiency and ED (30, 31, 32).

### **Strength of the study**

The study has a comprehensive dataset. Based on a large sample size of 337 male respondents, the study ensures robustness in its findings. The sample included a diverse age range (17 to 73 years), covering a broad spectrum of individuals who experienced both insomnia and erectile dysfunction (ED). The study was conducted during the COVID-19 pandemic, which provided an essential and timely context for exploring how pandemic-related stressors (e.g., health concerns, social isolation, financial pressures) impacted ED, making the research highly relevant.

The research used well-established instruments like the International Index of Erectile Function (IIEF-5) and the Insomnia Severity Index (ISI) to measure ED and insomnia, respectively. These validated tools contribute to the reliability and consistency of the results. Demographic factors such as income and COVID-19 infection history provide a more comprehensive understanding of how these variables interact with ED—education as a demographic factor found to be related to Insomnia prevalence that would contribute to Erectile Dysfunction. Instead of relying on global insomnia scores, the study examines specific ISI dimensions (e.g., worry, interference, severity), allowing for a more nuanced understanding of which aspects of insomnia are most closely associated with ED.

The study employed multiple regression analysis, incorporating stratification by COVID-19 infection history, which enabled the exploration of differential effects across subgroups and controlled for key demographic variables. Findings provide clinically actionable insights, suggesting that insomnia-related cognitive-emotional factors (e.g., worry) are particularly relevant in men with ED, especially those not infected by COVID-19.

### **Limitations of the study**

Our study has a few notable limitations. First, the study's cross-sectional nature limits the ability to establish a causal relationship between insomnia and erectile

dysfunction. It captures associations at a single point in time, making it difficult to determine the direction of causality. Second, the data on insomnia and erectile dysfunction were collected through self-reported questionnaires, which can introduce biases such as recall bias or social desirability bias. Participants may underreport or overreport their symptoms, affecting the accuracy of the results. Third, potential confounders: Although the study adjusted for several demographic factors, other potential confounding variables, such as the lack of control for key confounders (e.g., depression, anxiety, physical illness, medication use) and lifestyle factors like alcohol consumption or physical activity, were not controlled for, which could influence the results. Fourth, the study's short data collection period from January to April 2022 may not capture the long-term effects of insomnia or erectile dysfunction, especially in the context of chronic sleep disorders. Fifth, the study relied on subjective measures of sleep quality (via the Insomnia Severity Index) without using objective tools like polysomnography, which could provide more accurate assessments of sleep disorders. We also acknowledge potential selection bias due to online recruitment. These limitations suggest that further longitudinal studies with objective measures and a broader population are needed to better understand the relationship between insomnia and ED.

### **CONCLUSION**

This study demonstrates that specific dimensions of insomnia—particularly worry and interference with daytime functioning—are significantly associated with erectile dysfunction (ED) among adult males, especially those without a history of COVID-19 infection. These findings suggest that insomnia-related cognitive and psychosocial disturbances may contribute to the development or persistence of ED, reinforcing the importance of a psychosomatic approach in clinical assessment and intervention. In contrast, no insomnia dimensions were significantly associated with ED in participants who had recovered from COVID-19, indicating possible differences in underlying mechanisms between infected and non-infected groups.

Income and employment status also emerged as significant predictors of ED, highlighting the role of socioeconomic stressors during the pandemic. Taken together, these results emphasise the need for a comprehensive evaluation of sleep quality, emotional distress, and contextual stress in the management of ED, particularly in post-pandemic populations. Clinicians are encouraged to consider targeted interventions for insomnia symptoms, such as cognitive-behavioural therapy for insomnia (CBT-I), as part of an integrated treatment plan for ED.

Further longitudinal and biomarker-based research is warranted to clarify causal pathways and to inform more

personalised treatment strategies.

### Suggestion

Future studies should delve deeper into the role of psychological and emotional factors, especially depression, in mediating the relationship between insomnia and ED. This could involve examining how pandemic-related stress or isolation influences both conditions and whether interventions targeting mental health can alleviate symptoms, conducting longitudinal studies to establish causality between insomnia and erectile dysfunction (ED) during and beyond the COVID-19 pandemic. Tracking changes over time would clarify whether insomnia directly contributes to the onset or severity of ED or vice versa. Integrated treatment approaches that address both sleep and sexual dysfunction, such as combined cognitive-behavioural therapy for insomnia (CBT-I) and sexual health counselling, would be valuable for developing comprehensive care models.

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