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Comparison of Sleep Quality, Anxiety and Depression in Patients with Obstructive and Non-Obstructive Myocardial Infarction: A Cross-Sectional Study

Arsalan Salari[1], Bahare Gholami Chaboki[2], Yasaman Borghei[3], Zahra Ahmadnia[3]*, Fatemeh Jalali[4], Azam Nourisaeed[5], Arezoo Javadzadeh-Moghtader[6], Hadis Akbarinezhad[7]

Abstract

Background: Myocardial infarction (MI) remains a major global health concern and is traditionally associated with obstructive coronary artery disease. However, non-obstructive MI (MINOCA) is also significant. MI patients often face anxiety, depression, and sleep problems, impacting recovery.

Aim: This study aimed to compare sleep quality, and psychological symptoms in the patients with obstructive and non-obstructive myocardial infarction.

Method: A total of 282 patients with obstructive and non-obstructive myocardial infarction (141 patients in each group) who were referred to Dr. Heshmat Hospital in Rasht, Iran, in 2023 were included in this cross-sectional study. Demographic data checklist and standard sleep quality questionnaire, patient health questionnaire, and general anxiety disorder were used.

Results: After adjustment for confounding variables, no statistically significant differences were observed between obstructive and non-obstructive myocardial infarction patients regarding sleep quality, depressive symptoms, or anxiety levels. However, female patients reported significantly greater odds of poor sleep quality, depression, and anxiety than male patients. In addition, rural residence was associated with higher depressive symptoms. These findings suggest that psychological and sleep-related challenges are common among MI patients regardless of coronary obstruction status.

Implications for Practice: Incorporating regular assessment and management of sleep and psychological symptoms into the routine care of MI patients can lead to better clinical outcomes and quality of life. These findings support the integration of psychosocial and behavioral health into cardiac rehabilitation and follow-up programs.

Keywords: Anxiety, Depression, MINOCA, Myocardial Infarction, Sleep Quality

1. Professor of Interventional Cardiology, Cardiovascular Diseases Research Center, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
2. Assistant Professor of Biostatistics, Cardiovascular Diseases Research Center, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
3. MSc of Nursing, Cardiovascular Diseases Research Centre, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
4. Assistant Professor of Nuclear Medicine, Cardiovascular Diseases Research Center, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
5. Ph.D of Psychology, Cardiovascular Diseases Research Centre, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
6. MSc of Psychology, Cardiovascular Diseases Research Center, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
7. Professional Doctorate, Cardiovascular Diseases Research Centre, Department of Cardiology, Heshmat Hospital, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran

* Corresponding Author Email: zahmadnia1365@gmail.com

Introduction

Myocardial infarction (MI) is a life-threatening cardiovascular condition and a major cause of sudden cardiac death (1). MI with non-obstructive coronary arteries (MINOCA) is a working diagnosis characterized by the acute presentation of MI with no significant stenosis of the coronary arteries after angiography (stenosis <50%) (2, 3). MINOCA accounts for approximately 6%−15% of all patients with acute MI (4-6).

Sleep is a complex physiological process that occupies approximately one-third of human life and plays a fundamental role in maintaining overall health. Increasing evidence suggests that both sleep duration and sleep quality are important determinants of health outcomes (7, 8). Many studies showed a relationship between sleep duration and its quality with the prevalence of cardiovascular diseases (CVDs) (9) and both are risk factors for CVDs (10, 11). Some studies suggest that poor sleep quality may be a potentially modifiable predictor of prognosis in the patients with coronary heart disease (CHD) (12, 13). In recent years, growing evidence suggests a strong association between myocardial infarction and depression, with each condition potentially influencing the onset and progression of the other (14, 15). Besides, depression has a significant negative impact on the prognosis of MI patients, whether the depression occurred before or after it (16). Anxiety is a widespread public health issue that has an impact on many patients' and their families' lives. According to some research, individuals with MINOCA may have higher levels of anxiety than those with obstructive MI (5, 6, 17). There are many theories about the correlation among anxiety, depression, and CHD, such as disturbances in the autonomic nervous system and hypothalamic-pituitary-adrenal axis that can increase sympathetic nerve activity and catecholamine secretion, causing inflammation and platelet activation (18).

Sleep disorders are highly prevalent among patients with MI and may worsen clinical prognosis. In addition, psychological symptoms such as anxiety and depression can adversely affect sleep quality. Besides, the mechanisms of the relationship between sleep components and psychological symptoms with heart diseases are not yet known. Despite increasing evidence regarding psychological symptoms after MI, comparative evidence between obstructive MI and MINOCA remains limited and inconsistent, particularly regarding the coexistence of sleep disturbances, anxiety, and depression. Moreover, little is known about these relationships in Middle Eastern populations. Therefore, this study aimed to compare sleep quality, anxiety, and depression between patients with obstructive and non-obstructive myocardial infarction.

Methods

In this cross-sectional study, 282 of 302 eligible patients admitted to Dr. Heshmat Hospital in Rasht, Iran, in 2023 agreed to participate. Participants were equally allocated into two groups, including 141 patients with obstructive myocardial infarction and 141 patients with non-obstructive myocardial infarction (Figure1). The sample size was calculated a priori using G*Power software (version 3.1). The calculation was based on the objective of detecting a significant difference in the mean anxiety scores between the two independent groups (obstructive MI vs. non-obstructive MI). The primary input parameters were derived from a previous study by Daniel et al. (2018) (19), which reported mean anxiety scores of 5.5 ± 4.3 (Mean ± SD) for patients with non-obstructive MI and 4.2 ± 3.4 for those with coronary artery disease. Using the independent t-test (two-tailed) model, with a significance level (alpha) of 0.05 and a statistical power (1 - β) of 0.80**,** the calculated effect size (d) was approximately 0.34. The software indicated that a minimum of 141 participants per group (total N = 282) was required to achieve the desired power. Considering potential non-participation, all eligible patients during the study period (2023-2024) were invited, and the final sample met this calculated requirement.

According to the 2018 European Society of Cardiology (ESC) criteria, MI was defined as elevated cardiac troponin levels accompanied by at least one of the following: symptoms of myocardial ischemia, new ischemic electrocardiographic changes, pathological Q waves, imaging evidence of new loss of viable myocardium or regional wall motion abnormality consistent with ischemia, or identification of a coronary thrombus by angiography or autopsy (20). MINOCA disease according to the European Society of Cardiology included: (1) definite diagnosis of AMI, (2) coronary angiography without coronary occlusion (<50% stenosis) in any major vessel, and (3) no specific alternative diagnosis Other for acute manifestations (21). Patients <18 years, with dementia or cognitive impairment, with an incurable disease, with a life expectancy of <1 year, were excluded

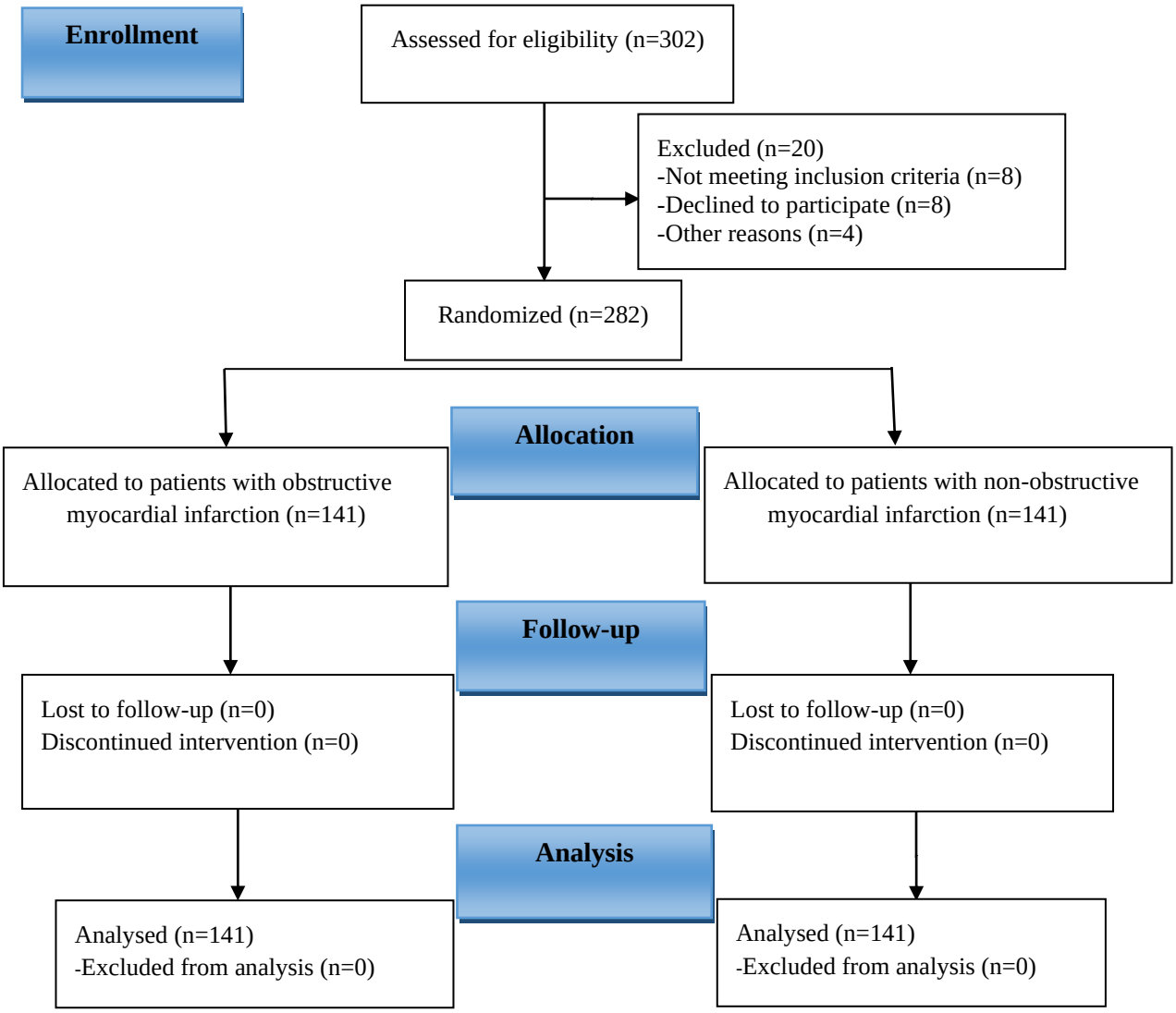

Figure 1. Flowchart of comparing sleep quality and psychological symptoms in patients with obstructive and non-obstructive myocardial infarction

Patients' demographic data including age, sex, education level, marital status was collected. The Pittsburgh Sleep Quality Index (PSQI), patient health questionnaire-9 (PHQ-9) and generalized anxiety disorder-7 (GAD-7) were used to assess patients.

PSQI includes 9 questions in 7 dimensions: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction with 4 open questions and 5 multiple-response items. The total score of the 7 dimensions of the questionnaire forms the total score of the questionnaire, which ranges from 0 to 21. In addition, each questionnaire has a score between 0 and 3. Higher score represents lower sleep quality (22).

The PSQI is well validated in both clinical and community populations, making it a reliable tool in sleep research and clinical practice for assessing sleep disturbances and overall sleep quality (23, 24).

PHQ-9 is a questionnaire that measures the presence and severity of symptoms related to depression. This instrument consists of nine questions that ask about the frequency and severity of things such as sadness, low mood, and loss of interest or pleasure in activities, feelings of worthlessness or guilt, and thoughts of self-harm. Each question is scored on a scale from 0 to 3 based on frequency and severity, with higher scores indicating more severe symptoms. A score of 5 or lower indicates mild depression, while a score of 10 or higher indicates moderate to severe depression. The Persian version of PHQ-9 has demonstrated good psychometric properties among different population (25). In this study, the Cronbach's alpha coefficient of PHQ-9 was 0.847.

GAD-7 tool has seven main questions and one additional question that measures the presence of generalized anxiety disorder and the degree of interference of the disorder in the person's functioning. Questions are graded on a Likert scale from 0 to 3. The scores obtained in each of the seven main questions are added together to obtain the total anxiety score for the scale, which ranges from 0 to 21. The Persian version of GAD-7 has demonstrated good psychometric properties (26). The GAD-7 was selected due to its brevity, ease of administration in medically ill populations, and previously established validity and reliability of the Persian version in Iranian populations. In this study, the Cronbach's alpha coefficient of GAD-7 was 0.83.

In this study, continuous variables were expressed as mean (standard deviation (SD)) and categorical variables as n (%). The relationships between PSQI, PHQ, GAD scores and the likelihood of having obstructive myocardial infarction were analyzed using logistic regression, with a series of models applied to adjust for potential confounding variables. Variables included in the multivariable logistic regression models were selected based on clinical relevance and potential associations identified in preliminary analyses. Age, sex, and residential location were included as potential confounding variables. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported. Statistical analyses were performed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA) .A P-value < 0.05 was considered statistically significant.

Ethical Consideration

This article is the result of a research project approved by Guilan University of Medical Sciences. To ensure the protection of participants' rights, the researcher obtained approval from the research ethics committee of Guilan University of Medical Sciences (IR.GUMS.REC.1402.204), and informed consent was obtained from each participant.

Results

The mean age of participants in the obstructive MI group was 60.46 ± 10.30 years, compared with 56.36 ± 11.07 years in the non-obstructive MI group.

As shown in Table 1, significant differences were observed between the two groups regarding sex distribution (p=0.001), Job status (p=0.018) and residential location (urban/rural) (p=0.007). The obstructive MI group included a higher proportion of male patients, whereas the non-obstructive MI group had a greater proportion of female patients. No statistically significant differences were found between the groups in marital status, comorbidities, employment status, educational level, sleep quality (PSQI), or depressive symptoms (PHQ-9). However, anxiety levels (GAD-7) differed significantly between the groups (p=0.024).

Multivariable logistic regression analyses were conducted to examine the independent association between MI type and psychological outcomes after adjustment for potential confounders (Table 2). After adjustment, no statistically significant association was observed between MI type (obstructive vs. non-obstructive) and poor sleep quality, depressive symptoms, or anxiety levels. Patients with obstructive MI had similar odds of poor sleep quality (OR = 1.19, 95% CI: 0.69–2.05; p=0.520), depression (OR = 1.36, 95% CI: 0.85–2.15; p=0.190), and anxiety (OR = 1.20, 95% CI: 0.75–1.93; p=0.432) compared with patients with non-obstructive MI.

However, sex differences were consistently observed across all adjusted models. Male patients had significantly lower odds of poor sleep quality, depressive symptoms, and anxiety than female patients. In addition, residential location showed a significant association with depressive symptoms, as urban residence was associated with lower odds of depression compared with rural residence. No significant relationship was observed between age and any of the studied psychological outcomes.

Table 1. Baseline Characteristics of the Study Population

Variables	Myocardial Infarction		P-value
	Obstructive	Non-obstructive	
Age, years	60.46 (10.3)	56.36 (11.07)	0.001**
Sex			
Male	107(75.9)	66(46.8)	0.001*
Female	34(24.1)	75(53.2)	
Marital status			
Single	15(16.6)	13(9.2)	0.69*
Married	126(89.4)	128(90.8)	
Location			
Urban	74(52.5)	96(68.1)	0.007*
Rural	68(47.5)	45(31.9)	
Comorbidities			
Diabetes mellitus	41(29.1)	49(34.8)	0.3*
Hypertension	54(38.3)	60(42.6)	0.53*
Hyperlipidemia	46(32.6)	47(33.3)	0.89*
Job status			
Unemployed	6(4.3)	6(4.3)	0.61*
Employment	135(95.7)	135(95.7)	
Education			
Illiterate	47(52.8)	42(47.2)	
Under Diploma	63(51.2)	60(48.8)	0.53*
Diploma	26(18.4)	34(24.1)	
University	5(3.5)	5 (3.5)	
PSQI			
≤7	94 (66.7)	91 (64.5)	0.71*
>7	47 (33.3)	50 (35.5)	
PHQ			
Mild	55 (39)	52 (36.9)	
Moderate	38 (27)	45 (31.9)	0.65*
Severe	48 (34)	44 (31.2)	
GAD			
Mild	47 (33.6)	57 (40.4)	
Moderate	30 (21.4)	24 (17)	0.024*
Partly severe	42 (30)	25 (17.7)	
Severe	21 (15)	35 (24.8)	

*Chi-square test, ** Independent t-test. Pittsburgh Sleep Quality Index (PSQI), patient health questionnaire (PHQ) and generalized anxiety disorder (GAD)

Table 2. Multivariable logistic regression analysis of the association between type of MI and sleep and psychological outcomes (N=282)

Variables	PSQI>7		PHQ-9		GAD-7	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Type of MI (obstructive vs. non-obstructive)	1.19 (0.69-2.05)	0.520	1.36 (0.85-2.15)	0.19	1.20 (0.75-1.93)	0.432
Gender (male vs female)	0.52 (0.30-0.90)	0.019	0.49 (0.30-0.78)	0.003	0.54 (0.33-0.87)	0.011
Location (urban vs rural)	0.99 (0.97-1.02)	0.903	0.97 (0.95-0.99)	0.012	1.12 (0.71-1.76)	0.853
Age (years)	1.64 (0.96-2.79)	0.068	0.81 (0.78-1.91)	0.364	0.99 (0.97-1.019)	0.610

MI (myocardial infarction) Pittsburgh Sleep Quality Index (PSQI), patient health questionnaire (PHQ) and generalized anxiety disorder (GAD)

Discussion

In this study, sleep quality, depressive symptoms, and anxiety levels were evaluated in obstructive MI versus MINOCA patients. The findings revealed that no statistically significant association between MI classification (obstructive vs. non-obstructive) and concurrent sleep quality, depression, or anxiety, following adjustment for key confounders. The comparable odds of impaired sleep and heightened psychological symptoms across both groups indicate that the specific anatomical nature of the MI might not be a critical factor in shaping these acute patient-reported outcomes. These results were contrary to previous studies (27-34). This discrepancy may be attributed to differences in study timing, cultural contexts, assessment tools, or the specific confounding variables adjusted for in the analysis. Our findings imply that during the acute post-MI period, the psychological and sleep challenges faced by patients are considerable and pervasive, regardless of the obstructive nature of their coronary arteries. This underscores the necessity of routine, universal screening for sleep disturbances, anxiety, and depression in all MI patients, not just those perceived to be at higher risk based on coronary anatomy. Another possible explanation for the lack of observed differences between groups is that the emotional impact of receiving a diagnosis of myocardial infarction may itself overshadow distinctions related to coronary obstruction status. Regardless of angiographic findings, patients with MI commonly experience fear of recurrence, uncertainty about prognosis, physical limitations, and concerns about mortality, all of which can contribute substantially to anxiety, depressive symptoms, and sleep disturbances. Therefore, it is plausible that the shared psychological consequences of MI outweigh differences attributable to obstructive versus non-obstructive pathology (28, 31, 33).

An important finding of this study was the strong and consistent association between female sex and poorer psychological and sleep outcomes. Women had significantly higher odds of depression, anxiety, and poor sleep quality compared with men across adjusted models. This finding aligns with previous evidence indicating greater psychological vulnerability among women following cardiovascular events (27, 28, 35).

Several mechanisms may explain this disparity. Biologically, hormonal fluctuations and sex-related neuroendocrine responses may influence emotional regulation and stress adaptation. Psychosocially, women often report higher caregiving burdens, lower perceived social support, and greater emotional distress after major illness. Additionally, women with cardiovascular disease may experience delays in diagnosis or under-recognition of symptoms, potentially contributing to heightened psychological burden. These findings emphasize the importance of adopting gender-sensitive approaches in post-MI care and rehabilitation programs (28, 31, 33, 36).

Interestingly, residential location emerged as another relevant factor, with urban residence associated with lower odds of depressive symptoms compared with rural living. This association may reflect differences in access to healthcare services, mental health resources, socioeconomic opportunities, transportation infrastructure, and social support systems (36, 37). Rural populations may face greater barriers to specialized cardiac follow-up and psychological care, potentially increasing emotional distress after MI. However, the absence of a similar association with anxiety or sleep quality suggests that geographical influences may affect psychological domains differently. Future studies should further investigate environmental and socioeconomic determinants of psychological recovery following myocardial infarction.

Although sleep quality, anxiety, and depression did not significantly differ according to MI subtype in the present study, these outcomes remain clinically important in patients recovering from myocardial infarction. Previous evidence suggests that sleep disturbances and psychological symptoms are highly prevalent after MI and may adversely affect recovery, quality of life, and long-term cardiovascular prognosis (12, 13, 34). Therefore, the absence of statistically significant differences between obstructive MI and MINOCA in our study should not diminish the importance of routine screening and management of these symptoms. Instead, our findings support the need for comprehensive psychosocial assessment in all MI patients, regardless of coronary obstruction status.

Several limitations should be acknowledged. First, the cross-sectional nature of this study precludes causal inference and prevents evaluation of temporal relationships between myocardial infarction type and psychological outcomes. Second, the use of self-report questionnaires introduces the possibility of recall bias and reporting bias, despite the use of validated instruments. Third, participants were recruited from a single referral center in northern Iran, which may limit external validity and

generalizability to other healthcare systems or sociocultural settings. Fourth, although several demographic variables were adjusted for, residual confounding related to factors such as prior psychiatric history, medication use, severity of cardiac dysfunction, social support, and socioeconomic status could not be fully excluded. Finally, psychological symptoms may evolve over time; therefore, longitudinal studies are needed to examine trajectories of sleep quality, anxiety, and depression during different phases of MI recovery.

Implications for practice

The findings of this study support the integration of routine psychosocial assessment into post-myocardial infarction care for both obstructive MI and MINOCA patients. Since sleep disturbances, anxiety, and depressive symptoms were observed regardless of MI subtype, clinicians should avoid limiting psychological screening to patients with severe coronary obstruction. The use of brief validated tools such as the PSQI, PHQ-9, and GAD-7 during hospitalization or early outpatient follow-up may facilitate timely identification of vulnerable patients. Particular attention should be given to female patients and individuals living in rural areas, who may be at greater risk of adverse psychological outcomes. Integrating mental health support, sleep counseling, and referral pathways into cardiac rehabilitation programs may improve recovery, treatment adherence, and quality of life following myocardial infarction.

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Conflicts of interest

The authors declare that they have no competing interests.

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Authors' Contributions

Arsalan Salari designed and supervised the study protocol. Bahare Gholami Chaboki, Yasaman Borghei, Zahra Ahmadnia contributed to data interpretation and statistical analysis. Bahare Gholami Chaboki, Yasaman Borghei, Zahra Ahmadnia prepared the manuscript and Fatemeh Jalali, Azam Nourisaeed, Arezoo Javadzadeh-Moghtader, Hadis Akbarinezhad collected the data. All authors have read and agreed to the published version of the manuscript.

Artificial Intelligence statement

The authors have not used any AI tools or technologies to prepare this manuscript.

References

1.Saito Y, Oyama K, Tsujita K, Yasuda S, Kobayashi Y. Treatment strategies of acute myocardial infarction: updates on revascularization, pharmacological therapy, and beyond. Journal of Cardiology. 2023;81(2):168-178.

2.Lindahl B, Baron T, Albertucci M, Prati F. Myocardial infarction with non-obstructive coronary artery disease. EuroIntervention. 2021;17(11): e875-e887.

3.Shen BJ, Tan JJL, Xu Y, Tay HY. Poor sleep quality predicts decline in physical health functioning in patients with coronary heart disease and moderating role of social support. Behavioral Medicine. 2021;47(1):1-17.

4.Dreyer RP, Tavella R, Curtis JP, Wang Y, Pasupathy S, Messenger J, et al. Myocardial infarction with non-obstructive coronary arteries as compared with myocardial infarction and obstructive coronary disease: outcomes in a Medicare population. European Heart Journal. 2020;41(7):870-878.

5.Pasupathy S, Lindahl B, Litwin P, Tavella R, Williams MJA, Air T, et al. Survival in patients with suspected myocardial infarction with nonobstructive coronary arteries: a comprehensive systematic review and meta-analysis from the MINOCA global collaboration. Circulation: Cardiovascular Quality and Outcomes. 2021;14(11): e007880.

6.Reynolds HR, Smilowitz NR. Myocardial infarction with nonobstructive coronary arteries. Annual Review of Medicine. 2023; 74:171-188.
7.Abbott SM, Knutson KL, Zee PC. Health implications of sleep and circadian rhythm research in 2017. The Lancet Neurology. 2018;17(1):17-18.
8.Pavlova MK, Latreille V. Sleep disorders. The American Journal of Medicine. 2019;132(3):292-299.
9.Zheng B, Yu C, Lv J, Guo Y, Bian Z, Zhou M, et al. Insomnia symptoms and risk of cardiovascular diseases among 0.5 million adults: a 10-year cohort. Neurology. 2019;93(23): e2110-e2120.
10.Kwok CS, Kontopantelis E, Kuligowski G, Gray M, Muhyaldeen A, Gale CP, et al. Self-reported sleep duration and quality and cardiovascular disease and mortality: a dose-response meta-analysis. Journal of the American Heart Association. 2018;7(15): e008552.
11.Matsubayashi H, Nagai M, Dote K, Turana Y, Siddique S, Chia YC, et al. Long sleep duration and cardiovascular disease: associations with arterial stiffness and blood pressure variability. The Journal of Clinical Hypertension. 2021;23(3):496-503.
12.Bertisch SM, Pollock BD, Mittleman MA, Buysse DJ, Bazzano LA, Gottlieb DJ, et al. Insomnia with objective short sleep duration and risk of incident cardiovascular disease and all-cause mortality: Sleep Heart Health Study. Sleep. 2018;41(6): zsy047.
13.Clark A, Lange T, Hallqvist J, Jennum P, Rod NH. Sleep impairment and prognosis of acute myocardial infarction: a prospective cohort study. Sleep. 2014;37(5):851-858.
14.Feng L, Li L, Liu W, Yang J, Wang Q, Shi L, et al. Prevalence of depression in myocardial infarction: a PRISMA-compliant meta-analysis. Medicine. 2019;98(8): e14596.
15.Wu Q, Kling JM. Depression and the risk of myocardial infarction and coronary death: a meta-analysis of prospective cohort studies. Medicine. 2016;95(6): e2815.
16.Wang M, Cheng L, Gao Z, Li J, Ding Y, Shi R, et al. Investigation of the shared molecular mechanisms and hub genes between myocardial infarction and depression. Frontiers in Cardiovascular Medicine. 2023;10: 1203168.
17.Borzillo I, De Filippo O, Manai R, Bruno F, Ravetti E, Galanti AA, et al. Role of intracoronary imaging in myocardial infarction with non-obstructive coronary disease (MINOCA): a review. Journal of Clinical Medicine. 2023;12(6):2129.
18.Xu J, Chen Y, Gu L, Liu X, Yang J, Li M, et al. Hypothalamic-pituitary-adrenal axis activity and its relationship to the autonomic nervous system in patients with psychogenic erectile dysfunction. Frontiers in Endocrinology. 2023;14: 1103621.
19.Daniel M, Agewall S, Berglund F, Caidahl K, Collste O, Ekenbäck C, et al. Prevalence of anxiety and depression symptoms in patients with myocardial infarction with non-obstructive coronary arteries. The American Journal of Medicine. 2018;131(9):1118-1124.
20.Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Fourth universal definition of myocardial infarction (2018). European Heart Journal. 2019;40(3):237-269.
21.Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: the task force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). European Heart Journal. 2018;39(2):119-177.
22.Buysse DJ, Reynolds CF III, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Research. 1989;28(2):193-213.
23.Farrahi J, Nakhaee N, Sheibani V, Garrusi B, Amirkafi A. Psychometric properties of the Persian version of the Pittsburgh Sleep Quality Index addendum for PTSD (PSQI-A). Sleep and Breathing. 2009;13(3):259-262.
24.Shariati A, Jahani S, Hooshmand M, Khalili N. The effect of acupressure on sleep quality in hemodialysis patients. Complementary Therapies in Medicine. 2012;20(6):417-423.
25.Farrahi H, Gharraee B, Oghabian MA, Zare R, Pirmoradi MR, Najibi SM, et al. Psychometric properties of the Persian version of Patient Health Questionnaire-9. Iranian Journal of Psychiatry and Clinical Psychology. 2021;27(2):248-263.
26.Naeinian M, Shaeiri M, Sharif M, Hadian M. Reliability and validity of a brief measure for assessing generalized anxiety disorder (GAD-7). Clinical Psychology and Personality. 2011;9(1):41-

50.
27.Rørholm Pedersen L, Frestad D, Michelsen MM, Mygind ND, Rasmusen H, Suhrs HE, et al. Risk factors for myocardial infarction in women and men: a review of the current literature. Current Pharmaceutical Design. 2016;22(25):3835-3852.
28.Kerola AM, Palomäki A, Rautava P, Nuotio M, Kytö V. Sex differences in cardiovascular outcomes of older adults after myocardial infarction. Journal of the American Heart Association. 2021;10(23): e022883.
29.Matsuda R, Kohno T, Kohsaka S, Shiraishi Y, Katsumata Y, Hayashida K, et al. Psychological disturbances and their association with sleep disturbances in patients admitted for cardiovascular diseases. PLoS One. 2021;16(1): e0244484.
30.Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, et al. Heart disease and stroke statistics—2021 update: a report from the American Heart Association. Circulation. 2021;143(8): e254-e743.
31.Yandrapalli S, Malik A, Pemmasani G, Aronow W, Shah F, Lanier G, et al. Sex differences in heart failure hospitalisation risk following acute myocardial infarction. Heart. 2021;107(20):1657-1663.
32.He Y, Sun LY, Peng KW, Luo MJ, Deng L, Tang T, et al. Sleep quality, anxiety and depression in advanced lung cancer: patients and caregivers. BMJ supportive & palliative care. 2022;12(e2):e194-e200.
33.Lu Y, Li S-X, Liu Y, Rodriguez F, Watson KE, Dreyer RP, et al. Sex-specific risk factors associated with first acute myocardial infarction in young adults. JAMA Network Open. 2022;5(5):e229953-e.
34.Zheng D, Tan R-J, Liu W, Song P-C, Li F-D. Sleep disturbances are associated with anxiety, depression, and decreased quality of life in patients with coronary heart disease. World journal of psychiatry. 2023;13(10):732-742.
35.Celano CM, Daunis DJ, Lokko HN, Campbell KA, Huffman JC. Anxiety Disorders and Cardiovascular Disease. Current psychiatry reports. 2016;18(11):101-121.
36.Adisasmito W, Amir V, Atin A, Megraini A, Kusuma D. Geographic and socioeconomic disparity in cardiovascular risk factors in Indonesia: analysis of the Basic Health Research 2018. BMC public health. 2020;20(1):1004-1017.
37.Valero-Elizondo J, Hong JC, Spatz ES, Salami JA, Desai NR, Rana JS, et al. Persistent socioeconomic disparities in cardiovascular risk factors and health in the United States: Medical Expenditure Panel Survey 2002-2013. Atherosclerosis. 2018;269:301-305.