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Revista Sextante

ISSN : 2665-3923

Volume: 34 Issue: 01 (2026)

Psychological Distress, Physical Activity and Self-Rated Health among Young Adults with Working MINOCA versus Obstructive Myocardial Infarction in Multan District, Pakistan

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Article History
Received August 9th, 2026
Accepted October 14th, 2026
Published October 23rd, 2026

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Abstract
Myocardial infarction with non-obstructive coronary arteries (MINOCA) is an important presentation of acute myocardial infarction (AMI) among young adults. In previous studies. psychological distress, physical activity and self-rated health have been insufficiently studied among this population in Multan District, Pakistan. The present study aimed to compare these measures, alongside selected cardiovascular risk factors, between young adults with working MINOCA and those with obstructive myocardial infarction. The study tables provided are a description of a hospital-based cross-sectional analysis of 290 adults (aged 18 to 45 years) who presented with a working MINOCA (43 patients) and with an obstructive MI (247 patients). Cardiovascular risk factors, and questionnaire-based indicators were summarised and compared among the groups. The number of current smokers was less among those in the working-MINOCA group than the number among those in the obstructive-MI group (27.9% vs. 44.5%, p = 0.042). It was also recorded that 61.0% of the total sample reported moderate or high levels of perceived stress, 27.9% moderate or severe levels of anxiety symptoms, and 19.0% moderate or severe levels of depressive symptoms. Working-MINOCA group had higher median perceived stress score compared to the obstructive-MI group (21.0; P = 0.034). There was a categorical stress comparison and group comparisons that were not statistically significant for anxiety, depressive symptoms, physical activity and self-rated health. These reported results indicate that the cardiovascular risk factors and psychological symptoms are relevant to the two groups of angiographies.

Keywords: Anxiety symptoms, cardiovascular risk factors, depressive symptoms, MINOCA, perceived stress, smoking

1. Introduction

Myocardial infarction with non-obstructive coronary arteries (MINOCA) is a working diagnosis for a heart attack that happens without major blockages in the main heart arteries Myocardial Infarction with Non-Obstructive Coronary Arteries (MINOCA) accounts for roughly 5% to 15% of all acute myocardial infarction (AMI) presentations. It represents a unique clinical scenario where a patient fulfils the diagnostic criteria for a heart attack but has less than 50% blockage (stenosis) in their major epicardial coronary vessels during an angiogram (Gue et al., 2020; Yang et al., 2025). This condition disproportionately affects younger populations and females, with some large-scale registries showing that women represent up to 60% or more of total MINOCA cases (Ezhumalai et al., 2025). Because it lacks the

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classic, severe atherosclerotic blockages seen in typical heart attacks, diagnosing and managing MINOCA requires clinicians to look beyond routine angiograms (Dimitrova, 2023; Soussi et al., 2025). Its impact therefore extends beyond coronary anatomy and the immediate cardiac event. Psychological distress, physical activity and self-rated health provide complementary perspectives on patients' health that are not captured by angiographic classification alone. Considering these dimensions alongside clinical characteristics provides a broader foundation for understanding the experience of AMI in young adults.

Traditional cardiovascular risk factors like smoking, diabetes, high blood pressure (hypertension), and abnormal cholesterol levels (dyslipidaemia) significantly impact young adults, just as they do older populations. However, in younger individuals experiencing acute myocardial infarction (AMI/heart attack), these physical factors are increasingly compounded by psychosocial stress and the broader socio-environmental context (Cojocaru et al., 2025). Moreover, assessing a patient's perceived stress, anxiety, and depressive symptoms alongside their physical activity and self-rated health provides healthcare providers with a truly comprehensive view of a patient's overall well-being upon admission. This biopsychosocial approach moves beyond isolated clinical symptoms to capture how a patient's mind and body interact during a health crisis (Wrzeciono et al., 2021; Munro et al., 2026). These should be read in the context of their goal, symptom-screening does not make psychiatric diagnosis and psychiatric evaluation at admission does not indicate whether the distress came before the heart-related event.

In this background, little has been documented on psychological symptoms and self-rated health in young adults with AMI admitted to the hospital in Multan. More specifically, it remains uncertain how different these measures are between those patients who were a priori deemed to have working MINOCA and those who have obstructive MI. Comparing these groups could contribute to their characterization of their psychosocial and cardiovascular risk profile, recognizing that working MINOCA could involve patients who actually need additional diagnostic clarification. Th current study aimed to describe selected cardiovascular risk factors, perceived stress, anxiety and depressive symptoms, physical activity, and self-rated health among young adults admitted with acute myocardial infarction at a cardiac hospital in Multan, Pakistan, and to compare these measures between patients with working-MINOCA and those with obstructive myocardial infarction (Obstructive MI).

2. Research Methodology

This was an analytical cross-sectional study of young adults aged 18–45 years that were hospitalized for the first time, with a diagnosis of acute myocardial infarction (AMI) and who underwent coronary angiography on the same admission. The study was conducted in Chaudhary Parvaiz Ellahi Institute of Cardiology, Multan, Pakistan. A patient was not excluded from the study site if AMI and angiographic classification was possible given the information available. Exclusions included duplicate admissions, myocardial injury in the absence of evidence of acute ischaemia and cases with no interpretable angiography. 290 patients were analyzed: 43 were considered working MINOCA and 247 were obstructive myocardial infarction.

Participants entered the working MINOCA group if all major epicardial coronary arteries had less than 50% stenosis. Obstructive myocardial infarction was defined as a stenosis ≥ 50% that occurred in one of the major epicardial vessels. The term working MINOCA was kept as the condition could be another non-ischaemic condition or the mechanism could be better defined with further research.

Cardiovascular risk factors which were included in the selected factors were hypertension, diabetes mellitus, dyslipidaemia, smoking, family history of premature coronary artery disease, overweight or obesity, autoimmune disease and recreational drug exposure. Data was collected from patient interviews and clinical records and study proformas, as appropriate. These variables and the sources used, and body mass index (BMI) thresholds should be validated with the study record.

The 10-item Perceived Stress Scale (PSS-10) (range 0–40) was used to assess perceived stress, with a score of 14-40 being considered moderate to high stress. The Generalized Anxiety Disorder scale (GAD-7) ranged from 0 to 21 (moderate or greater = 10) and the Patient Health Questionnaire (PHQ-9) ranged from 0 to 27 (moderate or worse = 10). Physical activity was assessed using the International Physical Activity Questionnaire-Short Form and classified according to its scoring rules. Self-rated health was measured using the EQ visual analogue scale, ranging from 0 to 100; scores below 70 were also reported.

Categorical variables were summarized as frequencies and percentages, and questionnaire and self-rated health scores as medians and interquartile ranges. The categorical variables were compared in the two groups, working-MINOCA and obstructive-MI, by using Pearson's chi-square or Fisher's exact test, depending on the nature of the

variables. Mann-Whitney U test was used for score distributions. Two-tailed tests were performed, and a p value of < 0.05 was deemed as statistically significant.

3. Results

It was found in present study that out of 290 young adults admitted with AMI, 43 (14.8%; 95% CI: 11.2%–19.4%) were classified as having a working-MINOCA, while the remaining 247 patients (85.2%) had obstructive myocardial infarction (obstructive MI). Thus, approximately one in seven participants entered the working-MINOCA category, requiring further evaluation to establish the underlying diagnosis (Table 1).

Table 1. Frequency of MINOCA among young adults presenting with AMI

Angiographic classification	Frequency	Percentage	95% confidence interval
Working diagnosis of MINOCA	43	14.8%	11.2%-19.4%
Obstructive myocardial infarction	247	85.2%	--
Total	290	100.0%	--

Of the 290 that participated in this survey, 122 (42.1%) were current smokers and 122 (42.1%) were overweight or obese. Of these, 96 (33.1%) had hypertension, 88 (30.3%) dyslipidaemia and 77 (26.6%) diabetes mellitus. Family history of premature coronary artery disease was reported by 63 participants (21.7%), autoimmune disease was reported by 10 (3.4%) and recreational drug exposure was reported by nine (3.1%) as demonstrated in Table 2. Participants who had working MINOCA were more likely not to be current smokers (12/43 [27.9%] versus 110/247 [44.5%]; p = 0.042). On the other hand, autoimmune disease was more common in working-MINOCA (4/43 [9.3%]) vs. non-working-MINOCA (6/247 [2.4%]); p = 0.045). Even though there was numerically less hypertension (25.6% vs. 34.4%, p = 0.256), diabetes (16.3% vs. 28.3%, p = 0.098), dyslipidaemia (23.3% vs. 31.6%, p = 0.273), and overweight or obesity (32.6% vs. 43.7%, p = 0.171) in the working-MINOCA group, the reported comparisons did not achieve the conventional threshold for statistical significance. Differences in the groups regarding family history of premature coronary artery disease and to the use of recreational drugs were not significant (Table 2).

Table 2. Cardiovascular risk factors by angiographic classification

Risk factor	Total (n = 290)	Working MINOCA (n = 43)	Obstructive MI (n = 247)	*p*-value
Hypertension	96 (33.1%)	11 (25.6%)	85 (34.4%)	0.256
Diabetes mellitus	77 (26.6%)	7 (16.3%)	70 (28.3%)	0.098
Dyslipidaemia	88 (30.3%)	10 (23.3%)	78 (31.6%)	0.273
Current smoking	122 (42.1%)	12 (27.9%)	110 (44.5%)	0.042
Family history of premature coronary artery disease	63 (21.7%)	11 (25.6%)	52 (21.1%)	0.506
Overweight or obese	122 (42.1%)	14 (32.6%)	108 (43.7%)	0.171
Autoimmune disease	10 (3.4%)	4 (9.3%)	6 (2.4%)	0.045
Recreational drug exposure	9 (3.1%)	2 (4.7%)	7 (2.8%)	0.626

The most common of the three reported psychological symptom categories was moderate or high perceived stress was reported by 177 participants (61.0%). Eighty-one participants (27.9%) had moderate or severe anxiety symptoms, and 55 participants (19.0%) had moderate or severe depressive symptoms. A total of 157 participants (54.1%) reported low physical activity and 105 (36.2%) one or more EQ visual analogue score below 70. Across the full sample, the median PSS-10 score was 17.0 (IQR: 10.0–26.0), the median GAD-7 score was 6.0 (IQR: 3.0–11.0), the median PHQ-9 score was 5.0 (IQR: 2.0–8.0), and the median EQ visual analogue score was 76.0 (IQR: 61.0–85.0) as shown in Table 3.

The score for the obstructive-MI group was significantly different from the score for the working-MINOCA group: a median of 17.0 (IQR 10.0–26.0) versus 21.0 (IQR 12.0–29.5), respectively; p-value 0.034 would be reported. The categorical comparison was moderate or high stress in 30 of 43 (69.8%) with working MINOCA compared to 147 of 247 (59.5%) with obstructive MI which was not statistically significant (p = 0.203). Median GAD-7 scores were 8.0 (IQR: 3.5–13.5) in the working-MINOCA group and 6.0 (IQR: 3.0–10.5) in the obstructive-MI group (p = 0.159). 37.2% experienced moderate or severe symptom levels of anxiety, while 26.3% experienced severe symptoms. There were 37.2% having moderate or severe anxiety symptoms, and 26.3% severe anxiety (p=0.142). Similarly, median

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PHQ-9 scores were 6.0 (IQR: 3.0–10.5) and 5.0 (IQR: 2.0–8.0; p = 0.225), while moderate or severe depressive symptoms were reported in 27.9% and 17.4% (p = 0.105).

Table 3. Psychological distress, physical activity and self-rated health by angiographic classification

Indicator	Total (n = 290)	Working MINOCA (n = 43)	Obstructive MI (n = 247)	*p*-value
Moderate/high perceived stress, n (%)	177 (61.0%)	30 (69.8%)	147 (59.5%)	0.203
Moderate/severe anxiety symptoms, n (%)	81 (27.9%)	16 (37.2%)	65 (26.3%)	0.142
Moderate/severe depressive symptoms, n (%)	55 (19.0%)	12 (27.9%)	43 (17.4%)	0.105
Low physical activity, n (%)	157 (54.1%)	23 (53.5%)	134 (54.3%)	0.926
EQ visual analogue score below 70, n (%)	105 (36.2%)	14 (32.6%)	91 (36.8%)	0.590
PSS-10 score, median (IQR)	17.0 (10.0–26.0)	21.0 (12.0–29.5)	17.0 (10.0–26.0)	0.034
GAD-7 score, median (IQR)	6.0 (3.0–11.0)	8.0 (3.5–13.5)	6.0 (3.0–10.5)	0.159
PHQ-9 score, median (IQR)	5.0 (2.0–8.0)	6.0 (3.0–10.5)	5.0 (2.0–8.0)	0.225
EQ visual analogue score, median (IQR)	76.0 (61.0–85.0)	77.0 (64.0–84.5)	76.0 (60.5–85.0)	0.921

The rates of low physical activity levels were roughly equal in both groups (working MINOCA and obstructive MI: 53.5% compared to 54.3%, p = 0.926). Median EQ visual analogue scores were also similar; 77.0 (IQR: 64.0–84.5) and 76.0 (IQR: 60.5–85.0), respectively (p = 0.921) as were the proportions scoring below 70 (32.6% vs. 36.8%; p = 0.590) (Table 3). There were also several comparisons reported, including most notably the PSS-10 comparison, with which the p-value should be interpreted. The symptom categories are not made after a psychiatric diagnosis but are based on the scores in the questionnaire. Since the assessments took place at the time of admission, conclusions cannot be inferred whether distress was present before the infarction or developed after, because of the infarction, their stay in hospital, or other factors.

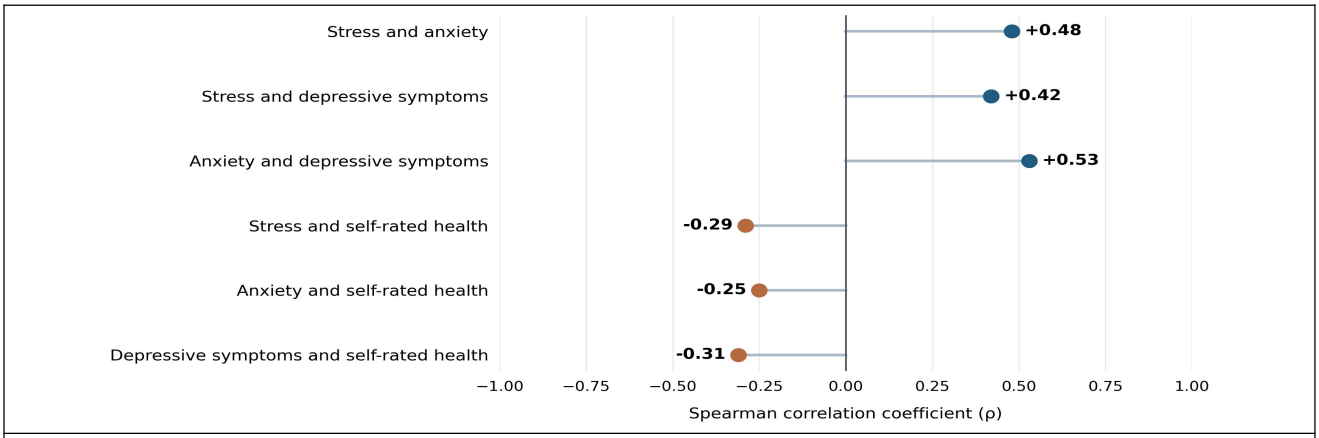


Figure 1. Correlations between psychological symptom scores and self-rated health. Points represent Spearman's correlation coefficients. Positive values indicate that higher scores tend to occur together; negative values indicate that higher symptom scores tend to occur with lower self-rated health scores.

Perceived stress was found to have positive correlations with anxiety symptoms (Spearman's ρ = 0.48) as well as depressive symptoms (Spearman's ρ = 0.42) (Figure 1). Positive relationships were also found between anxiety and depressive symptoms (ρ = 0.53). Self-rated health was negatively correlated with both general perceived stress (ρ = −0.29) and anxiety symptoms (ρ = −0.25), and depressive symptoms (ρ = −0.31). The study thus shows that psychological symptom scores cluster together and are correlated with a decrease in self-rated health (Figure 1).

4. Discussion

The findings of the present study highlight the importance of considering cardiovascular risk factors alongside psychological distress, physical activity and self-rated health among young adults with working-MINOCA, while recognizing that these dimensions are also relevant to those with obstructive myocardial infarction. Rallidis et al. (2022) reported that patients with a working diagnosis of MINOCA (Myocardial Infarction with Non-Obstructive Coronary

Arteries) generally have a lower prevalence of traditional cardiovascular risk factors including smoking, dyslipidaemia, and diabetes compared to patients with traditional AMI-CAD (AMI with obstructive coronary artery disease). This comparison should not be misinterpreted as demonstrating protection from MINOCA to smoking as it is a comparison of those patients who had already suffered AMI rather than a group who did not have infarction.

Psychological distress and perceived stress play important roles in young patients experiencing myocardial infarction with non-obstructive coronary arteries (MINOCA) and acute myocardial infarction (AMI), though study findings remain inconsistent. While some research points to higher median perceived stress scores or psychological burdens in specific working-age or MINOCA cohorts, comparative studies often show mixed results. For instance, evaluations such as the VIRGO study found no significant differences in perceived stress or depression levels between younger patients with MINOCA and those with obstructive coronary artery disease (AMI-CAD) when controlling for specific subgroups (Leissner et al., 2025). Hausvater et al. (2023) identified that women had less high stress level than women with obstructive myocardial infarction if they were diagnosed with MINOCA. They had statistical differences in the ages of their participants and used a different and shorter stress scale for assessing their participants, thus, comparisons with the present study are limited.

In present study, there was no significant difference between groups in terms of anxiety and depressive symptoms. Similarly, using a different instrument, Coronel et al. (2024) reported that they did not detect any differences in anxiety between patients with MINOCA and patients with obstructive coronary disease. Hausvater et al. (2023) found no significant difference between groups in terms of higher levels of depression symptoms. These results support a general assessment of psychology post-AMI and indicate a non-significant between-group comparison does not imply that the groups' experiences match one another.

The timing of assessment is important when interpreting these findings. Psychological symptoms recorded during admission may reflect pre-existing distress, a response to the acute cardiac event and hospitalization, or a combination of both. Hausvater et al. (2023) found decreases in symptoms of depression and stress in the two-month period after AMI, highlighting the merits of post-AMI assessment. The present cross-sectional findings cannot tell us whether we could see similar changes in this population.

Low physical activity and poor self-rated health was reported in both groups, highlighting the importance of non-angiographic factors and consequences of AMI. When studies note that both patient groups report low physical activity and poor self-rated health, it underscores a critical medical truth that a patient's recovery and quality of life are heavily influenced by non-angiographic factors which means the hidden daily struggles that an angiogram (an X-ray of the heart's blood vessels) cannot capture (Čulić et al., 2023). Also, Chander et al. (2024) found that the identification of potential underlying causes in patients with MINOCA is more likely when they have undergone an advanced diagnostic workup. Ambiguity in the conditions occurring within working-MINOCA, in the current investigation, may also remain due to incomplete investigation. The results are limited in magnitude and applicability by the single centre design, the small number of working-MINOCA (Working Minimal Neuroprosthesis) sample and the multiple comparison analysis.

The psychological symptoms may contain one of the other relationships observed as a different view. Positive correlations between all the stress/Anxiety and depressive symptom dimensions would indicate that the scores on one dimension tended to be higher when the scores on the other dimension were higher (Shao et al., 2020). Negative scores with self-rated health are likely to show that higher levels of distress were related to worse perceived health, which is assumed with higher scores to be an indicator of worse health. The relationships would allow for the possibility of them being grouped together whilst acknowledging the need to differentiate between direction and cause of a correlation.

Psychological symptoms were noted at admission may have preceded the infarction, represented reaction to the acute infarction or may have been present both before and during admission. In the post-AMI period, there were declines in stress and depressive symptoms at the 2-month follow-up as reported by Hausvater et al. (2023) implying that the results of assessing during recovery would be different. These cross-sectional analyses do not allow one to determine if similar changes took place or if there was distress before lower perceived health. Low physical activity levels and poor perceived health experienced by both populations are also highlighted, emphasizing that not everything that is diagnosed by angiography can be represented by these measures (Čulić et al., 2023). If a patient has a working MINOCA then the cause of their CAM syndrome may not be identified if the investigations are not completed. About their advanced diagnostic workup, Chander et al. (2024) also demonstrated that employing an advanced diagnostic workup significantly increases the success rate of identifying possible underlying causes (aetiologies) in complex clinical presentations. These findings support an approach to working-MINOCA that combines clarification of the underlying cardiac diagnosis with assessment of psychological symptoms, physical activity and self-related health, rather than allowing a non-obstructive angiogram to mark the end of evaluation.

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5. Conclusion

The findings of the present study describe a broad combination of cardiovascular risk factors and psychological symptoms among young adults admitted with AMI. In all the angiographic groups, cardiovascular risk factors such as smoking, overweight and obesity, hypertension, diabetes and dyslipidaemia occurred, highlighting the importance of having risk factors for cardiovascular disease even when the coronary arteries are not obstructing. The difference in smoking in the working-MINOCA cohort should be interpreted as comparison between two cohorts of AMI patients and should not be interpreted as smoking being a protective factor against MINOCA. The condition was perceived stress that was widespread within the sample and that there was a higher stress score among participants with working MINOCA. But the categorical stress comparison was not significant. Symptoms of anxiety and depression also were reported in both groups, though not to a significantly different degree, in available comparisons. The results can be used to support attention to psychological symptoms amongst the various categories of angiography, and the results of the questionnaires should not be used to diagnose psychiatric disorders. There were also reports of low levels of physical activity and poor self-rated health. Such actions can help raise awareness of patients' needs for them during a stay in the hospital and after. The results available in the literature do not provide a conclusion as to whether the infarctions were preceded by some kind of psychological reactions or symptoms or caused by them, and whether the pattern of activity or self-rated health was influenced by the infarction in the individual. The study is limited to a single small working-MINOCA group, and single centre study with restriction to patients who underwent angiography restricting the generalizability and interpretation. Using and analysing verified participant-level data and conducting repeated assessment over time as well as using full diagnostic assessment could shed light on these patterns and their connection to recovery.

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