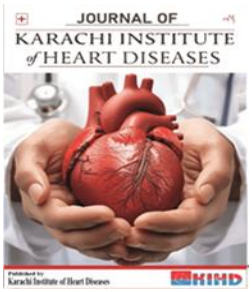

PREVALENCE OF ANXIETY AND DEPRESSION AMONG PATIENTS WITH ACUTE CARDIAC EVENTS: A CROSS SECTIONAL STUDY

Raheela Rahmat Zohra[1], Shah Ali Ul Qader[2]
Department of Biotechnology, University of Karachi, Karachi, Pakistan [1]
Department of Biochemistry, University of Karachi, Karachi, Pakistan [2]

ABSTRACT:

Background Acute cardiac events, include myocardial infarction (MI) and unstable angina (USA), are recurrently accompanied by psychological distress. Anxiety and depression have negative influence on recovery, prognosis, and overall quality of life (QOL).

Objective: To examine the frequency of anxiety and depression among patients after an acute cardiac event (ACE).

Methods: A descriptive cross-sectional study was conducted involved 360 patients admitted with ACE at a tertiary care hospital. Psychological assessment was completed using the Hospital Anxiety and Depression Scale (HADS). Data analyzed through descriptive statistics to determine frequency distributions across different variables.

Results: Post assessment of 380 patients, 62.8% demonstrated significant anxiety, whereas 24.7% revealed symptoms of depression. The frequency of anxiety was higher among females (70%) as compared to males (59%). Depression was found to be more prevalent among patient's older than 60 years.

Conclusions: Anxiety is a common psychological response to ACE, while depression is less frequently observed. Routine screening and timely psychological support may enhance recovery and improve rehabilitation outcomes.

Keywords: Anxiety, depression, acute cardiac events

Submitted: 19-01-2026, Revised: 28-01-2026, Accepted: 30-02-2026

INTRODUCTION

Cardiovascular diseases (CVDs) remain the leading cause of morbidity and mortality globally, accountable for approximately 17.9 million annual deaths[1]. Among these, acute cardiac events (ACE) such as acute myocardial infarction (AMI) and unstable angina (USA) are major medical emergencies with significant mortality and long-term disability.[2-4] These events not only have physiological consequences but also have major psychological responses, particularly anxiety and depression, both can adversely affect disease prognosis and quality of life.[2,5,6] Epidemiological evidences consistently showed that the prevalence of anxiety and depression among patients with acute coronary syndrome (ACS) is substantially higher than in the general populations.[6-8] A recent meta-analysis found that 30-63% of patients with ACS experienced significant anxiety, while 15-40% reported depression[4,9]. Anxiety often develops due to uncertainty about survival, pain, discomfort and invasive or even non-invasive procedures during the acute phase of hospitalization, usually within the first 24 to 72 hours after an ACE.[5,10,11] In contrary depression, develop later mostly post-acute recovery phase, when cardiac patients have to adjust with physical limitations, altered self-image, and fear of recurrence of event [2,5,9], both conditions can persist for months or even years if remain unrecognized and untreated.[4,6] Because anxiety increases sympathetic nervous system activation and catecholamine release, which in turn raise myocardial oxygen demand and the risk of arrhythmias, psycho-physiological mechanisms demonstrated a strong correlation between psychological distress and cardiac outcomes.[12,13] Whereas depression is associated with inflammation, platelet activation, and endothelial dysfunction, all of them are not only atherogenic but also contribute to recurrent ischemic events [10,14]. These biological pathways may somewhat enlighten how anxiety and

depression associated with higher mortality and recurrent cardiac events even after controlling cardio metabolic risk factors.[2,10,15] Psychological screening in cardiac care settings, predominantly in lower and middle income countries, remains neglected despite extensive evidence. Acute cardiac management usually involve hemodynamic stabilization, revascularization, and pharmacotherapy, but often overlook emotional well-being.[3,5] Post ACS psychological distress has major prognostic implications which ultimately delay diseases recovery and worsen long-term adherence to secondary prevention.[2,6] Because both conditions are independently associated with poor medication adherence, reduced participation interest in cardiac rehabilitation, and increased hospital readmissions.[5] Addressing these conditions can therefore will not only improve emotional well-being but also cardiovascular outcome . [2, 10, 14]

The psychological effects of cardiovascular disease have been the subject of numerous studies, but the majority of these have been carried out in wealthy nations where psychosocial screening is a standard part of cardiac care.[4,6,9] In contrast, in many developing and lower middle-income countries, including South Asia, where mental health screening among cardiac patient's remains largely unnoticed.[8] This gap limits the local prevalence patterns and the specific socio-demographic or clinical factors influence anxiety and depression during acute cardiac related hospitalization. Further, the pattern and timing of psychological symptoms may differ due to diverse factors including culture, environment, and healthcare system.[2,16] Additionally, recent evidences suggested that patients who remain untreated for anxiety and depression in between acute phase of ACS, found to have a prolong hospital stays, increase healthcare services, and their early complications was higher.[17,18] Understanding whether anxiety or depression predominates early in hospitalization can guide clinicians in prioritizing early psychological interventions. Incorporating psychological health screening into standard cardiac care protocol was also emphasised in global CVD guidelines. Early identification of high-risk patients who might benefit from immediate mental support is supported by the use of brief, validated instruments like the Hospital Anxiety and Depression Scale (HADS) during hospitalisation.[10,17,19] Most of the time accurate screening of anxiety and depression become overlap with somatic symptoms such as fatigue, sleep disturbance and palpitations. The HADS is widely recommended tool because it excludes somatic objects and focus on psychological domains, clearly identify emotional distress present in ill populations.[5] The HADS has proved good reliability and validity through diverse languages and culture.[8,9]

There is limited data available on South Asian countries where healthcare setups are resource deprived, there is an abrupt constraint to examine the prevalence of depression and anxiety during hospital admission related to ACE. The main aim of conducting this study was to examine the frequency of anxiety and depression after cardiac event.

METHODS

Participants

This was a hospital-based, descriptive cross-sectional study carried out in the Karachi Institute of heart diseases a tertiary care teaching hospital. The data collection period spanned eight months 1st May 2023 to 31st December 2023. All adult patients (≥30 years) admitted with a confirmed diagnosis of ACS were approach though a consecutive non-probability sampling technique, every eligible patient Age ≥ 30 years, admitted with MI (STEMI or NSTEMI) or USA, hemo-dynamically stable for interview within 24-72 hours of admission, able to understand the questionnaire language and provide written informed consent and admitted during the study period was screened and invited to participate until the target sample size was reached. In contrary patients who had documented history of major psychiatric disorder (schizophrenia, bipolar disorder) or have use of psychotropic medication (antidepressants, antipsychotics, benzodiazepines) prior to admission and refusal to provide informed consent. The study protocol was approved by the Institutional Review Board / Ethics Committee (approval number and date to be specified). Written informed consent was obtained from all participants.

Study Tools

Two research students were trained in standardized data collection, anthropometric measurement techniques, and administration HADS. A pilot test on 15 patients (who were not a part of final sample) was done, average interview duration was 10-15 minutes; minor wording adjustments and timing constraints were resolved prior to full data collection. Eligible patients were identified from routine hospital admission. After patient stabilization, the research team approached the patient, explained the study, and obtained consent. The interview and measurements were performed in a private area of the ward bedside to ensure confidentiality. Clinical data from the medical record (diagnosis, troponin result, ECG findings, treatment received) were extracted by the researcher. Anxiety and depression were measured by using the HADS, it is a 14-item self-report scale with two subscales (HADS-A for anxiety7-item, HADS-D for depression7-item). Each item is scored 0–3, subscale scores range 0–21. For this study, a cut-off score ≥8 on a subscale was used to indicate significant anxiety or depression. Age (years), sex (male/female), marital status, highest education level (no formal schooling / primary / secondary / higher), occupation (categorized), monthly household income (local currency bands), and urban/rural residence. Socioeconomic status (SES) was categorized using a locally appropriate SES index (e.g., modified Kuppu-swamy or income tertiles). Anthropometric measurements were included height measured to nearest 0.1 centimeter using a stadio-meter, without shoes and weight measured to nearest 0.1 pounds using a calibrated digital scale, with light clothing. Body mass index (BMI) was calculated as (weight (kg)/height (m)2) categorized using WHO Asian adult cut-offs.

Statistical Analysis

The required sample size was estimated using the OpenEpi sample size calculator (version 3.01) for cross-sectional studies. Based on previous literature, an expected prevalence of 40% for anxiety and/or depression among patients with acute cardiac events was assumed. With a 95% confidence level (Z = 1.96) and 5% absolute precision (d = 0.05), the standard formula for a single proportion yielded a required sample of approximately 369; to allow for rounding and potential exclusions, the OpenEpi calculation was conservatively rounded to 380 participants. All analyses were performed using SPSS v.27. Statistical significance was set at $p < 0.05$ (two-sided). Results were presented with 95% confidence intervals (CIs) where appropriate. For continuous variables, mean ± standard deviation (SD) applied for normally distributed variables. For categorical variables, frequencies and percentages were applied in descriptive statistic. Bi-variate analyses done to compare socio-demographic, anthropometric, and clinical variables between participants with and without anxiety/depression using: Chi-square tests applied for categorical variables and Independent t-tests for continuous variables.

RESULTS

Table 1. Baseline Characteristics of the Study Participants (N = 380)

Variable	Category	Number	Percentage
Age (years)	Mean ± SD	59.9 ± 11.68	-
	Range	30-93	-
Sex	Male	203	53.40
	Female	177	46.60
Education	Unable to read	138	36.30
	Primary	34	8.90
	Matric	125	32.90
	Intermediate	27	7.10
	Graduate	47	12.40
	Postgraduate	9	2.40
Employment Status	Non-working	168	44.20
	Working	136	35.80
	Retired	76	20.00
BMI Category	Underweight	69	18.20
	Normal weight	188	49.50
	Overweight	84	22.10
	Obese	39	10.30
Type of Cardiac Event	ACS/USA	269	70.80
	MI	120	31.60
Co-morbidities	Diabetes (DM)	135	35.50
	Hypertension (HTN)	134	35.30
	Both DM + HTN	83	21.80
	None	18	4.70

The study population's baseline characteristics are defined in **Table** 1, where the subjects' mean age was 59.9 ± 11.68. There were more men than women among the participants. The majority of subjects are in the normal weight, non-working group. The number of MI patients admitted was lower than in the USA. Co-morbid conditions such as diabetes mellitus and hypertension were also prevalent.

Table 2: Association of different variables with Anxiety and Depression

Variable	Category	Anxiety	Depression	p-value
Age (years)	< 40	28	20	
	41–50	23	8	
	51–60	19	15	
	61–70	16	20	
	> 70	25	17	0.275
Gender	Female	58	25	
	Male	25	12	0.008
Education	Unable to read/write	22	17	
	Primary	20	17	
	Matric	19	16	
	Intermediate	18	18	
	Graduate	12	19	
	Postgraduate	44	44	0.846
Occupation	Non-working	42	26	
	Working	36	30	
	Retired	20	35	0.017
BMI Categories	Underweight	27	20	
	Normal weight	20	17	
	Overweight	20	14	
	Obese	20	17	0.037
Diagnosis	ACS	47	32	
	MI	39	23	0.029
Associated Diseases	DM	41	34	
	HTN	38	29	
	Both DM/HTN	22	20	0.66
Marital Statu	Unmarried	46	61	
	Married	19	10	
	Widow/Widowe	31	26	0.031
Smoking	Yes	33	23	
	No	19	14	0.045

Table 2 demonstrated that the prevalence of anxiety and depression was the same across all age groups. Compared to male participants, females experienced higher levels of anxiety

and depression. In contrast to the normal and overweight groups, underweight and obese people were found to exhibit both symptoms.

Table 3: Distribution of anxiety and depression based on HADS scores (n = 380)

HADS Categories	Anxiety n (%	Depression n (%)
Normal (0–7)	206 (54.2)	257 (67.6)
Borderline (8–10)	95 (25.0)	61 (16.1)
Abnormal (≥11)	79 (20.8)	62 (16.3)

More than half of the participants (54.2%) had normal anxiety scores, according to **Table 3** based on the HADS, whereas 25.0% were categorised as borderline and 20.8% displayed abnormal anxiety levels. In terms of depression, 67.6% of patients scored normal, while 16.1% and 16.3% were classified as borderline and abnormal, respectively. Overall, among study participants, clinically significant anxiety was more common than depression.

DISCUSSION

This cross-sectional study done on hospitalized cardiac patients, we found that anxiety symptoms were more prevalent than depressive symptoms, with approximately 40% exhibiting abnormal or borderline anxiety compared with 32% showing depressive symptoms. This trend is consistent with prior research indicating that acute cardiac events often provoke strong immediate anxiety responses, whereas depressive symptoms tend to develop more gradually during the recovery phase.[3,20]Anxiety prevalence ranges has been widely reported among ACS and MI populations, which is closely aligning with our study findings.[4] Significantly, growing evidence directs that anxiety probably be more prevalent rather than depression during the acute phase of ACS. A recent systematic review and meta-analysis highlighted that prevalence of anxiety present half of the ACS groups, specifically during hospitalization, where symptoms of depression are comparatively lower.[21] In a similar manner by applying HADs, it was noted that anxiety percentage was higher in comparison to depression within admitted patients.[22] It has been reported that more than half of the MI patients have symptoms of anxiety as compared to depressive symptoms in South Asian population.[23] Similarly, a recent meta-analysis also found that patients with ACS experience significantly higher rate of anxiety, when compared to depressive symptoms.[4,9] Numerous systematic reviews have reported global estimates of the increased odds of psychological distress following an ACE in Western, Asian, and Middle Eastern populations.[6,8,10] In contrast, research from South Asia shows comparable or even greater rates of psychological distress.[8]

It has been identified that variations in several studies results are relatively due to differences in screening instruments used, cut-off scores, and timings of assessments. [9,10] Nevertheless, most researches consistently identified higher anxiety levels among younger patients and women, while depression becomes more prominent with age and co-morbid illness burden.[4,6,8] Recognizing these demographic patterns is essential for early psychological screening and intervention.[2,6,16] Our study findings replicated with same pattern that women report higher anxiety following cardiac events. In contrast in general population women generally exhibit higher rates of depression.[24] This may show the timing of screening as symptoms of depression often become evident after weeks to months' post ACE rather than during hospitalization.[25]

Socioeconomic variables demonstrated strong associations with emotional distress. Patients with lower education levels and those who were unemployed or non-working exhibited significantly higher anxiety and depression scores. Limited health literacy, financial insecurity, reduced access to healthcare, and uncertainty regarding prognosis likely contribute to this association.[12]

Latest proof from low- and middle-income nations directs that poor socioeconomic distress increases mental health issues which is followed by ACS due to lagged presentation and not up to the mark mental health related services.[26]

BMI categories also revealed notable trends. Underweight patients demonstrated higher anxiety, while overweight and obese individuals showed slightly higher depressive tendencies. These associations are influenced by chronic illness burden, metabolic dysregulation, inflammatory processes, and perceived physical limitations.[27, 28]

Increased weight related depressive symptoms has been associated with inflammation and low physical activity, whereas anxiety in underweight patients may reflect frailty and fear of severe outcomes.[29, 30]

Clinical variables were strong determinants of psychological outcomes. Patients with ACS exhibited significantly higher anxiety level because of sudden events, unpredictable, and often associated with intense symptom onset and fear of death, all contributing to heightened anxiety.[31] Longitudinal studies explain that anxiety followed by ACS independently directs towards recurrent ischemic events and high mortality even after controlling depression.[10]

Additionally, patients with combined hypertension and diabetes exhibited higher anxiety and depression levels, consistent with evidence that multi-morbidity have greater odds of psychological burden.[32]

Marital status appeared protective, with married participants reporting lower depression scores. Emotional support from spouse may reduce psychological distress. Social support is also a well-established protective factor in cardiac populations.[33, 34] It is identified that social isolation is a direct predictor of

depression and anxiety later to MI.[35] This well-known pattern highlighted the need of proactive mental assessments for admitted cardiac patients. Anxiety symptoms at this stage are not a minimal duration of emotional impulse but can predict poor prognosis and late recovery if not addressed earlier. [36, 37] Similar study aligns with this evidence showed that acute stress and anxiety can escalate cardiac ischemia and metabolic homeostasis which leads to further episodes of events.[26] Therefore, incorporating screening with the validated tools during admitted time can identify high risk population. Anxiety and depression are associated with poor recovery, reduced medication adherence, increased hospital readmissions, impaired QOL, and higher mortality rate. This study also identified the importance of routine psychological screening in cardiac units.

Higher percentage of anxiety in ACS patients indicate the need of psycho-education, cognitive behavioral therapy and intervention align with cardiac rehabilitation.[27] For that, cardiac based awareness programs should be designed, which are emphasized upon interrelation between mental health and cardiac diseases are needed when planning early screening of such patients. These interventions not only reduce psychological burden but also improve treatment adherence and self-care behaviors, which are vital for long-term cardiac prognosis (5). In this domain cardiac nurses and other staff can be train for basic psychological services to ensure continuity of care.[27] In future, further research is required to understand the temporal relation of anxiety and depression from admission through recovery and to examine the effect of initial stage of admission psychological interventions on expanded duration of CVD outcomes. Such projects can assist in establishing psychological systems as standard care in cardiology.

Strength of this study include a large sample size and validated measurement tools, but its cross-sectional design limits causal inference cannot capture incidence of developing anxiety and self-report measures may be subject to reporting bias and its only emphasizes acute-phase prevalence.

CONCLUSION

The study demonstrates that anxiety is more common than depression among patients hospitalized with ACE. Socio-demographic vulnerabilities and clinical complexities significantly influence psychological burden. Integrating routine mental health screening and targeted interventions into cardiac care pathways is critically needed..

Conflict of interest

Authors declare no conflict of interest.

REFERENCES

1. World Health Organization. (2023) Tracking Universal Health Coverage: 2023 Global monitoring report.
2. Lichtman, J. H., Bigger Jr, J. T., Blumenthal, J. A., Frasure-Smith, N., Kaufmann, P. G., Lespérance, F. *et al.* (2008) Depression and coronary heart disease: recommendations for screening, referral, and treatment: a science advisory from the American Heart Association Prevention Committee of the Council on Cardiovascular Nursing, Council on Clinical Cardiology, Council on Epidemiology and Prevention, and Interdisciplinary Council on Quality of Care and Outcomes Research: endorsed by the American Psychiatric Association. *Circulation*, 118, 1768-1775.
3. Thombs, B. D., Bass, E. B., Ford, D. E., Stewart, K. J., Tsilidis, K. K., Patel, U., Fauerbach, J. A., Bush, D. E. and Ziegelstein, R. C. (2006) Prevalence of depression in survivors of acute myocardial infarction. *J. Gen. Intern. Med.* 21, 30-38.
4. Mejía, P. J. C., Cassano, P. D., Morón, P. D., Reátegui, M. D., Navarrete, K. M. and Córdova-Mendoza, P. (2023) Prevalence of anxiety and depression in patients with acute coronary syndrome: systematic review and meta-analysis. *Pan Afr. Med. J.* 46, Article 91.
5. Huffman, J. C., Celano, C. M., Beach, S. R., Motiwala, S. R. and Januzzi, J. L. (2013) Depression and cardiac disease: epidemiology, mechanisms, and diagnosis. *Cardiovasc. Psychiatry. Neurol.* Volume 2013, Article ID 695925, 14 pages.
6. Singh, D., Mittal, S., Dhulipudi, S., Uppugandla, D., Sharma, A., Muniyal, H. and Jheetay, S. (2025) Understanding the Burden of Depression and Anxiety in Myocardial Infarction (MI) Patients: Findings From a Systematic Review and Meta-Analysis. *Cureus*, 17, e93200.
7. Nicola, M., Nicola, M., Zarif, B., El-Ghalid, A., Abdelrahim, M. E. A, and El Hadidi, S. (2024) Prevalence of anxiety and depression and the influence of correlates in acute coronary syndrome patients: a cross-sectional analysis. *Futur. J. Pharm. Sci*. 10, 155-164.
8. Kertmen, Ö., Çoksevim, M., Çakmak, A., Kertmen, T. and İliş, D. (2025) Gender-based distribution of depression and anxiety following acute coronary syndrome in the Turkish population: are women at higher risk? *BMC Cardiovasc. Disord*. 25,593-602.
9. Dong, Z, Yang, Q. and Chen, H. (2024) Estimating the prevalence of depression in people with acute coronary syndromes: A systematic review and meta-analysis. Medicine. 103, e37906.
10. Leissner, P., Held, C., Humphries, S., Rondung, E. and Olsson, E. M. G. (2024) Association of anxiety and recurrent cardiovascular events: investigating different aspects of anxiety. *Eur J Cardiovasc Nurs*., 23, 720–727.
11. Moser, D. K, Dracup, K., Evangelista, L. S., Zambroski, C. H., Lennie, T. A., Chung, M. L., Doering, L. V., Westlake C. and Heo, S. (2010) Comparison of prevalence of symptoms of depression, anxiety, and hostility in elderly patients with heart failure, myocardial infarction, and a coronary artery bypass graft. *Heart Lung*. 39, 378-385.
12. Steptoe, A. and Kivimäki, M. (2012) Stress and cardiovascular disease. *Nat. Rev. Cardiol*. 9, 360-370.
13. Rezaee, M., Darroudi, H., Etemad, L., Shad, A. N., Zardast, Z., Kohansal, H., *et al*. (2024) Anxiety, a significant risk factor for coronary artery disease: what is the best index. *BMC Psychiatry*, 24, 443-451.
14. Bai, B., Yin, H., Wang, H., Liu, F., Liang, Y., Liu, A., Guo, L., Ma, H. and Geng, Q. (2024) The combined effects of depression or anxiety with high-sensitivity C-reactive protein in predicting the prognosis of coronary heart disease patients. *BMC Psychiatry*. 24, 717-725.
15. Huffman, J. C., Celano, C. M., Beach, S. R., Motiwala, S. R. and Januzzi, J. L. (2013) Depression and cardiac disease: epidemiology, mechanisms, and diagnosis. *Cardiovasc. Psychiatry Neurol*., Volume 2013, Article ID 695925.

16. Smolderen, K. G., Buchanan, D. M., Gosch, K, Whooley, M., Chan, P. S., Vaccarino, V., Parasharet, S., Shah, A. J., Ho, P. M. and Spertus J. A. (2017) Depression Treatment and 1-Year Mortality After Acute Myocardial Infarction: Insights From the TRIUMPH Registry (Translational Research Investigating Underlying Disparities in Acute Myocardial Infarction Patients' Health Status) Circulation.135, 1681-1689.
17. Whooley, M. A. and Wong, J. M. (2013) Depression and cardiovascular disorders. *Annu. Rev. Clin. Psychol*. 9, 327-354.
18. Nikolaus, M., Federici, M., Schütt, K., Müller-Wieland, D. *et al*. Group ESCSD. (2023) 2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes. *Eur. Heart J*. 44, 4043-4140.
19. Lichtman, J. H., Froelicher, E. S., Blumenthal, J. A., Carney, R. M., Doering, L. V., Frasure-Smith, N., *et al*. (2014) Depression as a risk factor for poor prognosis among patients with acute coronary syndrome: Systematic review and recommendations: A scientific statement from the American Heart Association. Circulation. 129,1350–1369.
20. Celano, C. M. and Huffman, J. C. (2011) Depression and cardiac disease: a review. *Cardiol. Rev*. 19,130-142.
21. Meneghetti, C. C., Guidolin, B. L., Zimmermann, P. R.and Sfoggia, A, (2017) Screening for symptoms of anxiety and depression in patients admitted to a university hospital with acute coronary syndrome. *Trends Psychiatry Psychother*, 39, 12-18.
22. Dastgeer, S., Saad, A. A., Fatima, S., Javaid, I. and Amin, R. (2020) Incidence of depression and anxiety among patients with acute myocardial infarction during COVID-19 pandemic. *Pak. J. Neurol. Ssurg*. 24, 428-433.
23. Nigg, E. A., Čajánek, L. and Arquint, C. (2014) The centrosome duplication cycle in health and disease. *FEBS Lett*. 588, 2366-2372.
24. Frasure-Smith, N. and Lesperance, F. (2008) Depression and anxiety as predictors of 2-year cardiac events in patients with stable coronary artery disease. *Arch. Gen. Psychiatry*. 65, 62-71.
25. Albus, C., Waller, C., Fritzsche, K., Gunold, H., Haass, M., Hamann, B., *et al*.(2019) Significance of psychosocial factors in cardiology: update 2018: Position paper of the German Cardiac Society. *Clin. Re.s Cardiol*. 108,1175-1196.
26. Martin, C. J. H., Patterson, J., Paterson, C., Welsh, N., Dougall, N., Karatzias, T. and Williams, B. (2021) ICD-11 complex Post Traumatic Stress Disorder (CPTSD) in parents with perinatal bereavement: Implications for treatment and care. *Midwifery*. 96, 102947.
27. Costantini, A. and Mäkitie, O. (2016) Value of rare low bone mass diseases for osteoporosis genetics. *Bonekey Rep*. 5, Article number: 773.
28. Oracz, A. J., Zwierz, M., Naumowicz, M., Suprunowicz, M., and Waszkiewicz, N. (2025) Relationship between obesity and depression considering the inflammatory theory. *Int. J. Mol. Sci.* 26, 4966.
29. Tan, M., Bhanu, C. and Frost, R. (2023) The association between frailty and anxiety: A systematic review. *Int. J. Geriatr. Psychiatry*. 38, e5918.
30. Brugnon, F., Bilan, F., Heraud, M-C., Grizard, G., Janny, L. and Creveaux, I. (2008) Outcome of intracytoplasmic sperm injection for a couple in which the man is carrier of CFTR p.[R74W; V201M; D1270N] and p. P841R mutations and his spouse a heterozygous carrier of p. F508del mutation of the cystic fibrosis transmembrane conductance regulator gene. *Fertil Steril*. 90, 23-26.
31. Agerbo, E. (2007) High income, employment, postgraduate education, and marriage: a suicidal cocktail among psychiatric patients. *Arch. Gen. Psychiatry*. 64, 1377-1384.
32. Barth, J., Schneider, S. and Von Känel, R. (2010) Lack of social support in the etiology and the prognosis of coronary heart disease: A systematic review and meta-analysis. *Psychosom. Med*.72, 229-238.
33. Rutledge, T., Linke, S. E., Johnson, B. D., Bittner, V., Krantz, D.S., Cornell, C. E., *et al*. (2012) Relationships between cardiovascular disease risk factors and depressive symptoms as predictors of cardiovascular disease events in women. *J Womens Health (Larchmt)*, 21, 133-139.
34. Murphy, B., Le Grande, M., Alvarenga, M., Worcester, M. and Jackson, A. (2020) Anxiety and depression after a cardiac event: prevalence and predictors. *Front Psychol*. 10, Article 3010.
35. de Souza, F. H. C., de Araújo, D. B., Vilela, V. S., Simões, R. S., Bernardo, W. M., Frank, T. A., da Cunha B. M.and Shinjo S. K. (2019)The Brazilian Society of Rheumatology recommendations on investigation and diagnosis of systemic autoimmune myopathies. *Adv Rheumatol*. 59, 42-52.
36. Perel, P. and Grobbee, D. E. (2020) The heart in the time of the Coronavirus.' *Glob. Heart*.15, 24-26.
37. Bjelland, I., Dahl, A. A., Haug, T. T. and Neckelmann, D. (2002) The validity of the Hospital Anxiety and Depression Scale: an updated literature review. *J. Psychosom. Res*. 52, 69-77.

Corresponding Author
Shah Ali Ul Qader
Department of Biochemistry,
University of Karachi, Karachi, Pakistan
E.mail: saqader@uok.edu.pk