Psychosocial Risk Factors of Myocardial Infarction: Turning Threat to Opportunity.

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Abstract

Myocardial infarction (MI) is a major cause of mortality in the developing world. Modifiable risk factors of MI such as obesity, diabetes, smoking, high blood pressure and dyslipidemia are well known but besides these, there are many psychosocial factors that are independently related to MI. There is a striking dearth of reviews in the literature that examine, collate and summarize the impact of psychological contributors to MI. Present work was done to cover such gaps in knowledge and emphasize the need for psychological risk factors of MI to be considered while devising prevention guidelines and policies. Original research studies, meta-analyses and systematic reviews focusing on psychological factors in the development of MI were retrieved from databases including PubMed, Google Scholar, ProQuest, Elsevier, and Ovid Medline. Psychological factors like depression, anxiety, type A personality, stress, anger, hostility, social isolation and occupational stress were shown to feature consistently as risk factors for MI. Mitigating lifetime psychological distress may help decrease the disease burden of MI.

Keywords: Anger; Anxiety; Depression; Hostility; Myocardial infarction.

Introduction

Cardiovascular diseases (CVDs) are a major cause of both morbidity and mortality in the developing world and myocardial infarction (MI) is the most routinely encountered emergency in hospitals.[1,2] Modifiable risk factors for MI like obesity, diabetes, smoking, high blood pressure and dyslipidemia are well established risk factors but apart from these, there are many psychosocial factors that are independently related to MI.[3] Chronic emotional disturbances, acting through biochemical and hormonal mechanisms, mediate arterial stiffness, atheromatous changes, coronary artery spasm and plaque rupture, all of which are implicated in the pathogenesis of MI.[4-6] The presence of potential psychosocial triggers or emotional factor is seen in almost half of the patients with MI. Patients have been shown to have had higher levels of mental stress during two to four weeks before presentation.[7] Many studies have demonstrated that the higher stress levels are associated with higher risk for acute MI even after accounting for the modifiable risk factors of MI.[8]

Multiple studies suggest that psychosocial risk factors are associated with high post-MI mortality. Patients with MI pass through negative psychosocial states both before and after the event causing significant worsening of their physical health. Psychologically distressed patients without pre-existing CVDs are at risk for developing MI.[9] Ample work has been done seeking association between psychological distress and MI, but only about half of the studies have reported a significant association in multivariate analyses after adjusting for other cardiovascular risk factors. Thus, only a heterogeneous link can be inferred between mental health issues and MI. Moreover, inconsistent outcomes have also distorted the knowledge base about psychological illness being a risk factor for MI.[10] An extensive literature search highlighted the

lack of reviews that examine, collate and summarize the impact of psychological influences in MI. Therefore, the current review was undertaken to fill the identified knowledge gaps in this area and highlight the psychological risk factors of MI such as depression, anxiety and stress. Original research studies including case-control studies and randomized clinical trials, systematic reviews and meta-analysis investigating psychological factors in the development of MI published between the years 1995 and 2020 were retrieved via a systematic search in multiple online databases including Pubmed, Google Scholar, ProQuest, Elsevier, and Ovid Medline. Only papers published in the English language were included while pilot or feasibility studies and conference presentations were excluded. The review was narrowed down to studies in adult patients with MI who had pre-existing psychological risk factors. The retrieved papers were grouped according to themes and data were then collected, summarized and reported for discussion. The present review implicated various psychosocial risk factors in the development and progression of MI including depression, anxiety, stress, social isolation, work environment, type A personality and hostile attitude.

Depression and anxiety

Depression and anxiety share common pathophysiological mechanisms with CVDs including genetic predisposition, biochemical aberrations, behavioral disturbances and physical effects (Figure 1). Potential risk reduction for CVDs and their associated mortality has been suggested following treatment of major recurrent depression with serotonin reuptake inhibitors (SSRIs) but conclusive evidence is lacking.[11] Depression is thought to be a significant risk factor of MI that increases both morbidity and mortality.[12] Many studies have demonstrated an increase in cardiovascular events, re-admission to hospital and mortality due to depression.[13] Moreover, depression is common in patients with MI and its prevalence is 20% higher in patients with MI as compared to healthy individuals.[14] The effect of anxiety on increasing the risk of MI is mired in ambiguity although anxiety in MI patients has been associated with worse prognosis independent of depression. In a large systematic review of 12 studies having several endpoints, such as myocardial infarction (MI) and cardiac death, five studies showed significant association, two studies demonstrated marginally significant associations, while five studies described that there was no significant association between anxious personality traits and the studied cardiac and mortality outcomes.[15]

Figure 1. Schematic representation of potential relationship between psychosocial and cardiovascular health
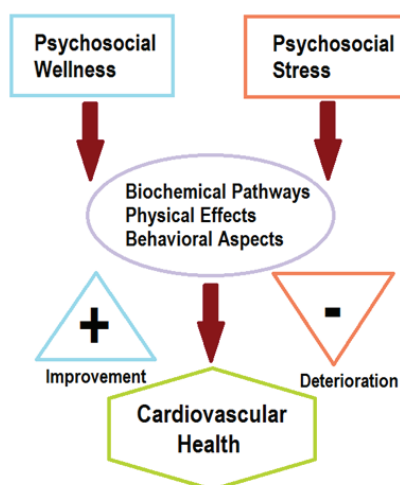
In a meta-analysis by Roest et al. exploring the association between anxious personality traits and the risk factors of myocardial infarction, anxiety was identified as an independent risk factor for MI and cardiac deaths. Anxiety was shown to increase the risk of MI by almost 26%.[9] However, the association between anxiety and MI was weaker than the association described between depression and MI. Somatic symptoms of anxiety have also been shown to be linked to a heightened risk of MI in women.[16] A prospective longitudinal research study conducted by Janszky et al. over a period of 37 years on 49321 young Swedish men (aged 18-20 years) studied anxiety and early depression and its association with coronary artery disease.[17] Their findings revealed both anxiety and depression to be significantly associated with physical inactivity and excessive smoking, which themselves are risk factor for MI. Depression was also significantly related to excessive alcohol consumption and anxiety had a connection with the development of hypertension. Anxiety was also identified as an independent predictor of morbidity and mortality in MI. In contrast, the study did not find any support for association between cardiac death and early onset of depression in men.[17] A recent study by Karlsen et al. with 12-years of follow-up showed significant association of anxiety and depression with Coronary Artery Disease (CAD) but anxiety was not linked to CAD independently.[18]

Stress, social isolation and lack of social support

The relationship between CVDs and stress is complex due to the challenges of ensuring objectivity in measurement of stress but empirical data indicate relationship between stress and heart health.[19] Chronic stress has been implicated in development and acceleration of atherosclerotic changes in the coronary arteries.[4] Variables that are commonly regarded as components of stress like depression and anxiety, social isolation and lack of social support, acute and chronic life events, psychosocial work characteristics, type A behavior and hostility have been suggested as independent risk factors for the development of CVDs including MI.[20]

Lack of social support has been shown as a predictor of early onset and poor prognosis of MI leading to mortality in both sexes, but the evidence is more consistent and uniform in males than in females.[14] The relationship between social isolation and social abandonment with MI exists in communities from different countries and in people of various age groups. A study investigating the role of social factors in recovery of patients post MI within 4 months after discharge showed that coping style, social network and social support caused these patients to be less fixated on their illness and feel less threatened or worried in comparison with those who lacked social support.[21] These patients were also less excited and had faster recovery rate. Moreover, patients with first MI sought more social support than those having past history of hospitalization due to ischemic heart disease. Similarly, a study in patients with chronic heart failure highlighted loneliness as an important psycho-social risk factor in worsening of heart failure.[22]

### Psycho-social work environment and Type A behavior

Psycho-social work environment refers to the characteristics and nature of the work environment. Studies have shown increased risk of MI in high intensity jobs or in jobs with low decision latitude. Sustained stress at work is associated with twice the risk of developing MI and similarly unhealthy habits like extreme mental exertion and negative emotions like anger, anxiety and hostility have also been linked to MI.[23-25] People with low job control have been shown to have an increased risk for significant coronary event as compared to subjects who had high job control. Moreover, the association between psycho-social environment at work and MI has been reported to be largely independent from other social risk factors like personal education, paternal education and social class.[26]

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Type A behavior pattern that primarily consists of hostility, ambition, drive, pre-occupation with deadlines, and a sense of time urgency is related to an increased risk of MI. However, some recent studies do not back this association between type A behavior and CVDs.[27,28] High levels of anger and hostility have been significantly associated with a heightened risk of mortality due to MI.[29] A Japanese study demonstrated that excessive cynical hostility increased the risk of MI and that anger management strategies could potentially be beneficial in reducing the risk of MI in middle-aged Japanese men.[30] Further evidence is required to establish or disprove any relationship between MI and anger.

Discussion

MI occurs due to insufficient blood and oxygen flow to the heart muscle and is the predominant cause of cardiovascular death in the world. The risk factors of MI are divided into non-modifiable/ unchangeable factors (age and genetic factors) and changeable/ modifiable factors (smoking, obesity and psychosocial factors).[31] Rising expenses for the treatment of CVDs and their complications necessitates the adoption of appropriate scientific approach that could help in prevention of these disorders which would result in decreasing mortality and morbidity and reduce the financial burden. In this regard, it seems absolutely crucial to concentrate scientific inquires towards the changeable risk factors of MI.[32] Although most of such work is concentrated on the biological and life style risk factors, evidence suggests that psychosocial factors also have a role in the development, onset, progression and complications of MI (Figure 2). Many psychological factors are considered to be independent risk factors in the development and prognosis of MI.[33]

Figure 2. Epidemiological and clinical outcomes of MI associated with adverse psychosocial factors.
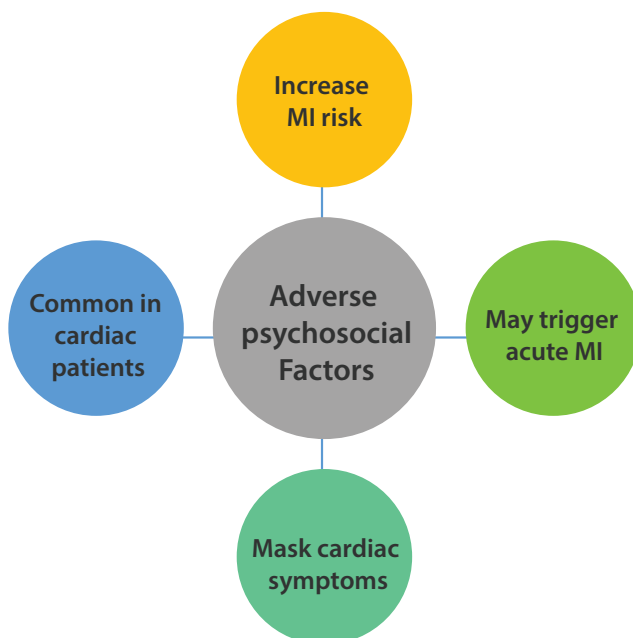
Psychosocial factors are infrequently recognized and treated in routine clinical practice due to the somewhat ambiguous nature of psychosocial factors. Moreover, psychological factors feature inconsistently and insignificantly in risk assessment models for CVDs.[34] There is also considerable variability in the psychological assessment tools available to researchers and clinicians alike. Moreover, most of the tools lack objectivity which does not allow effective comparisons.[35] Furthermore, psychological parameters such as hostility are typically manifested only under certain circumstances which are unlikely to be encountered in routine cardiology consultations. Also, many clinicians only consider psychosocial factors when other risk factors such as hypertension, dyslipidemia, obesity and smoking are absent. It is important to recognize that psychosocial factors may be associated with other risk factors as well.[36]

Health delivery systems all over the world and particularly in the developing countries are geared towards curative care rather than preventive care. Also, interventions at individual level are preferred over community-based interventions. Such imbalance invariably results in neglect of mental health issues.[37] Furthermore, the age of first MI event has decreased considerably and is now encroaching the teenagers. This undesirable change can mainly be attributed to psychological and life style factors which necessitates evaluation of the existing psychological perspective of MI.[38] One of the main aims of the emerging field of health psychology is the prevention of somatic features in psychological disorders like depression for improving health and quality of life (QoL).[39] Concomitant treatment of co-morbid psychological disorders in patients with CVDs is likely to enhance QoL of the patients and improve clinical outcomes.[11] Prevention and control of MI can be better performed by mitigating the psychological risk factors of MI.

The present work highlighted the adverse psychosocial parameters associated with an elevated risk for MI and discussed the pitfalls that need resolution for healthier outcomes. Understanding, identifying and curtailing the psychosocial risk factors of MI can go a long way in controlling the growing disease burden. Being a narrative review, the work misses out on providing statistically driven recommendations which only a systematic review or meta-analysis could deliver. However, it can be safely stated that there is a strong need for future comprehensive studies employing cross-disciplinary prospective designs and using psychosocial interventions and uniform objective psychological assessment tools to inform preventive health measures for CVDs including MI.

Conclusion

The present work evaluated the recent evidence on psychological risk factors in MI. The findings reinforce that most psychological factors are independent risk factors for MI and therefore screening for such factors must be carried out routinely as part of cardiac health assessment. Recognition and concomitant management of psychological influences through close collaboration between cardiologists and psychiatrists may help decrease the prevalence of MI.

Conflict of interest

The authors have no conflict of interest to declare.

References

1. Gregory AR, Huffman MD, Moran AE, et al. Global and regional patterns in cardiovascular mortality from 1990 to 2013. Circulation 2015;132(17):1667-78. doi: https://doi.org/10.1161/CIRCULATIONAHA.114.008720

2. Violán C, Bejarano-Rivera N, Foguet-Boreu Q, et al. The burden of cardiovascular morbidity in a European Mediterranean population with multimorbidity: a cross-sectional study. BMC Family Practice 2016;17(1):150. doi: https://doi.org/10.1186/s12875-016-0546-4

3. Lanas F, Seron P, Lanas A. Coronary heart disease and risk factors in Latin America. Glob Heart 2013;3(4):341-8. doi: https://doi.org/10.1016/j.gheart.2013.11.005

4. Yao BC, Meng LB, Hao ML, et al. Chronic stress: a critical risk factor for atherosclerosis. J Int Med Res 2019;47(4):1429-40. doi: https://doi.org/10.1177/0300060519826820

5. Ginsberg JP, Pietrabissa G, Manzoni GM, et al. Treating the mind to improve the heart: the summon to cardiac psychology. Front Psychol 2015;6:1101. doi: https://doi.org/10.3389/fpsyg.2015.01101

6. Oikonomou E, Vogiatzi G, Lazaros G, et al. Relationship of depressive symptoms with arterial stiffness and carotid atherosclerotic burden in the Corinthia study. QJM 2020. doi: https://doi.org/10.1093/qjmed/hcaa079

7. Chockalingam A, Venkatesan S, Dorairajan S, et al. Estimation of subjective stress in acute myocardial infarction. J Postgrad Med 2003;49:207-10

8. Biyik I, Yagtu V, Ergene O. Acute myocardial infarction triggered by acute intense stress in a patient with panic disorder. Turk Kardiyol Dern Ars 2008;36:111-5

9. Roest AM, Martens EJ, DeJonge P, et al. Anxiety and risk of incident coronary heart disease: a meta-analysis. J Am Coll Cardiol 2010;56(1):38-46. doi: https://doi.org/10.1016/j.jacc.2010.03.034

10. 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. doi: https://doi.org/10.1097/MD.0000000000002815

11. Paz-Filho G, Licinio J, Wong M. Pathophysiological basis of cardiovascular disease and depression: a chicken-and-egg dilemma. Rev Bras Psiquiatr;32(2):181-91. doi: https://doi.org/10.1590/S1516-44462010000200015

12. Stapelberg NJ, Hamilton-Craig I, Neumann DL, et al. Mind and heart: Heart rate variability in major depressive disorder and coronary heart disease - a review and recommendations. Aust New Zealand J Psychiatry 2012;46:946-57. doi: https://doi.org/10.1177/0004867412444624

13. Jiang W, Krishnan RRK, O'Connor CM. Depression and heart disease: evidence of a link, and its therapeutic implications. CNS Drugs 2002;16:111-27. doi: https://doi.org/10.2165/00023210-200216020-00004

14. Bunker SJ, Colquhoun DM, Esler MD, et al. "Stress" and coronary heart disease: psychosocial risk factors. Med J Aust 2003;178:272-6. doi: https://doi.org/10.5694/j.1326-5377.2003.tb05193.x

15. Grace SL, Abbey SE, Irvine J, et al. Prospective examination of anxiety persistence and its relationship to cardiac symptoms and recurrent cardiac events. Psychother Psychosomatics 2004;73:344-52. doi: https://doi.org/10.1159/000080387

16. Nabi H, Hall M, Koskenvuo M, et al. Psychological and somatic symptoms of anxiety and risk of coronary heart disease: the health and social support prospective cohort study. Biol Psychiatry 2010;67:378-85. doi: https://doi.org/10.1016/j.biopsych.2009.07.040

17. Janszky I, Ahnve S, Lundberg I, et al. Early-onset depression, anxiety, and risk of subsequent coronary heart disease: 37-year follow-up of 49,321 young Swedish men. J Am Coll Cardiol 2010;56:31-7. doi: https://doi.org/10.1016/j.jacc.2010.03.033

18. Karlsen HR, Saksvik-Lehouillier I, Stone KL, et al. Anxiety as a risk factor for cardiovascular disease independent of depression: a prospective examination of community-dwelling men (the MrOS study). Psychol Health 2020:1-16. doi: https://doi.org/10.1080/08870446.2020.1779273

19. Rozanski A, Blumenthal JA, Davidson KW, et al. The epidemiology, pathophysiology, and management of psychosocial risk factors in cardiac practice: the emerging field of behavioral cardiology. J Am Coll Cardiol 2005;45:637-51. doi: https://doi.org/10.1016/j.jacc.2004.12.005

20. Kubzansky LD, Kawachi I. Going to the heart of the matter: do negative emotions cause coronary heart disease? J Psychosomatic Res 2000;48:323-37. doi: https://doi.org/10.1016/s0022-3999(99)00091-4

21. Frasure-Smith N, Lespérance F, Gravel G, et al. Social support, depression, and mortality during the first year after myocardial infarction. Circulation 2000;101:1919-24. doi: https://doi.org/10.1161/01.cir.101.16.1919

22. Löfvenmark C, Mattiasson A, Billing E, et al. Perceived loneliness and social support in patients with chronic heart failure. Eur J Cardiovascular Nursing 2009;8:251-8. doi: https://doi.org/10.1016/j.ejcnurse.2009.05.001

23. Vaccarino V, Sullivan S, Hammadah M, et al. Mental stress induced-myocardial ischemia in young patients with recent myocardial infarction. Circulation 2018;137(8):794-805. doi: https://doi.org/10.1161/CIRCULATIONAHA.117.030849

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24. Rosengren A, Hawken S, Ounpuu S, et al. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (the INTERHEART study): case-control study. Lancet 2004;364(9438):953-62.
doi: https://doi.org/10.1016/S0140-6736(04)17019-0

25. Gullette ECD, Blumenthal JA, Babyak M, et al. Effects of mental stress on myocardial ischemia during daily life. J Am Med Assoc 1997;277:1521-6.
doi: https://doi.org/10.1001/jama.1997.03540430033029

26. Bosma H, Marmot MG, Hemingway H, et al. Low job control and risk of coronary heart disease in Whitehall II (prospective cohort) study. British Med J 1997;314:558-65.
doi: https://doi.org/10.1136/bmj.314.7080.558

27. Kuper H, Marmot MG, Hemingway H. Systematic review of prospective cohort studies of psychosocial factors in the etiology and prognosis of coronary heart disease. Seminars Vascular Med 2002;2:267-314.
doi: https://doi.org/10.1055/s-2002-35401

28. Brotman DJ, Golden SJ, Wittstein IS. The cardiovascular toll of stress. Lancet 2007;370:1089-100.
doi: https://doi.org/10.1016/S0140-6736(07)61305-1

29. Sundquist K, Lindström M, Malmström M, et al. Social participation and coronary heart disease: a follow-up study of 6900 women and men in Sweden. Social Sci Med 2004;58:615-22.
doi: https://doi.org/10.1016/s0277-9536(03)00229-6

30. Izawa S, Eto Y, Yamada KC, et al. Cynical hostility, anger expression style, and acute myocardial infarction in middle-aged Japanese men. Behavioral Med 2011;37:81-6.
doi: https://doi.org/10.1080/08964289.2011.585547

31. Jiang W, Glassman A, Krishnan RRK, et al. Depression and ischemic heart disease: what have we learned so far and what must we do in the future ? Am Heart J 2005;150:54-78.
doi: https://doi.org/10.1016/j.ahj.2005.04.012

32. Strik JMH, Denollet J, Lousberg R, et al. Comparing symptoms of depression and anxiety as predictors of cardiac events and increased health care consumption after myocardial infarction. J Am Coll Cardiol 2003;42:1801-7.
doi: https://doi.org/10.1016/j.jacc.2003.07.007

33. Khayyam-Nekouei Z, Neshatdoost H, Yousefy A, Sadeghi M, Manshaee G. Psychological factors and coronary heart disease. ARYA Atheroscler 2013;9(1):102-11

34. Abidov A, Chehab O. Cardiovascular risk assessment models: Have we found the perfect solution yet? J Nucl Cardiol 2019.
doi: https://doi.org/10.1007/s12350-019-01642-x

35. Gierlaszynska K, Pudlo R, Jaworska I, et al, Tools for assessing quality of life in cardiology and cardiac surgery. Kardiochir Torakochirurgia Pol 2016;13(1):78-82.
doi: https://doi.org/10.5114/kitp.2016.58974

36. Perk J, De Backer G, Gohlke H, et al. European guidelines on cardiovascular disease prevention in clinical practice (version 2012). Eur Heart J 2012;33(13):1635-701.
doi: https://doi.org/10.1093/eurheartj/ehs092

37. Tabish SA. Mental health : Neglected for far too long. JK Practitioner 2005;12(1):34-8

38. Stoll DP, Csaszar N, Szoke H, et al. The importance of psychological assessment and support in patients suffering from cardiovascular disease or undergoing cardiac treatment. J Cardiovas Dis Diagn 2014;2:4.
doi: https://doi.org/10.4172/2329-9517.1000161

39. Yousefy AR, Ghassemi GR, Sarrafzadegan N, et al. Psychometric properties of the WHOQOL-BREF in an Iranian adult sample. Comm Mental Health J 2010;46:139-47.
doi: https://doi.org/10.1007/s10597-009-9282-8