REVIEW ARTICLE

IJPHY

Risk Factors Causing Myocardial Infarction Among Young and Middle-Aged Populations: A Literature Review

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ABSTRACT

Background: Myocardial infarction is the principal cause of morbidity and mortality on a global scale, increasingly affecting the young and middle-aged population. Through a comprehensive approach, the goal was to reduce the burden of myocardial infarction and enhance the life span of individuals. Hence, this literature review aims to analyze the global risk factors of myocardial infarction among the young and middle–aged population.

Methods: An analysis from major data repositories like PubMed, Google Scholar, and Science Direct was retrieved, which targeted publications from 2019 to 2023. Studies were selected based on predefined inclusion criteria and encompassing various study designs.

Results: Out of 400 articles, 19 articles met the inclusion criteria. Risk factors found from this review were classified into physical, psychological, social, genetic, and underlying health components. Each category was further divided into modifiable and non-modifiable risk factors.

Conclusion: This literature review provides an overview of the various global risk factors causing myocardial infarction in a young and middle-aged population. These risk factors are categorized into modifiable and non-modifiable risk factors. Thus, identifying modifiable risk factors is essential for preventive strategies, early detection, and treatment interventions, as well as to create awareness for improving life spans in the young and middle-aged population.

Keywords: Risk factors, myocardial infarction, young population, middle–age population, coronary artery disease, cardiovascular disease, heart attack, heart failure, cardiac arrest.

Received 12th November 2024, accepted 15th February 2025, published 09th March 2025

www.ijphy.com

10.15621/ijphy/2025/v12i1/1676

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INTRODUCTION

Cardiovascular disease continues to become a leading cause of morbidity and mortality among young individuals globally, even with significant advancements in diagnosis and therapeutics [1]. Myocardial infarction is one of the most frequent conditions in developing countries. Myocardial infarction occurs when the blood flow to the coronary arteries is obstructed, leading to deprivation of blood supply to the cardiac muscle and causing the death of myocardial cells. If the block is intense, it is defined as Myocardial infarction [2-5]. The global prevalence of myocardial infarction was 3.8% of individuals under 60 years old [4].

Myocardial infarction presents with the most prevalent symptoms being chest pain, excessive sweating, and pain radiating to both the arms. Chest pain was described as intense pressure on substernal areas such as a squeezing, sharp, aching, or burning sensation. In many instances, patients exhibit Levine's sign by clenching their fists over the sternum during chest pain. Other symptoms include anxiety, nausea, vomiting, lightheadedness (with or without syncope), diaphoresis, and absence of chest wall tenderness on palpation [6]. Myocardial infarction in young patients caused due to traditional cardiovascular risk factors can be treated by medical management and coronary revascularization [7].

This review provides a comprehensive analysis of the increasing risk factors of myocardial infarction, which is required to develop an effective preventive strategy and treatment interventions. Therefore, this study aims to identify the various global risk factors of myocardial infarction in the young and middle-aged population.

MATERIALS AND METHODS

In this literature review, researchers have identified articles from 3 databases (PubMed, Science Direct, and Google Scholar). Inclusion criteria included relevant published articles within the last 5 years (between 2019 to 2023), English as the primary language, outcomes included detailed history collection, hospitalization, mortality rates, heart failure, stroke, angiography, transient ischemic attack, hospital discharge, quality of life and cardiac revascularization, population were myocardial infarction patient, age group considered were below 60 years old, therapy included aspirin, anti-platelet, anti-coagulant therapy and angiotension converting enzyme inhibitors, percutaneous coronary intervention and coronary artery bypass grafting procedure, full text articles that were available with specific keywords such as myocardial infarction, risk factors, young and middle-aged population, coronary artery disease, cardiovascular disease, heart attack, heart failure, cardiac arrest. Exclusion criteria included case reports, case series, and case-control studies. The flow diagram of the articles included is depicted in Figure 1.

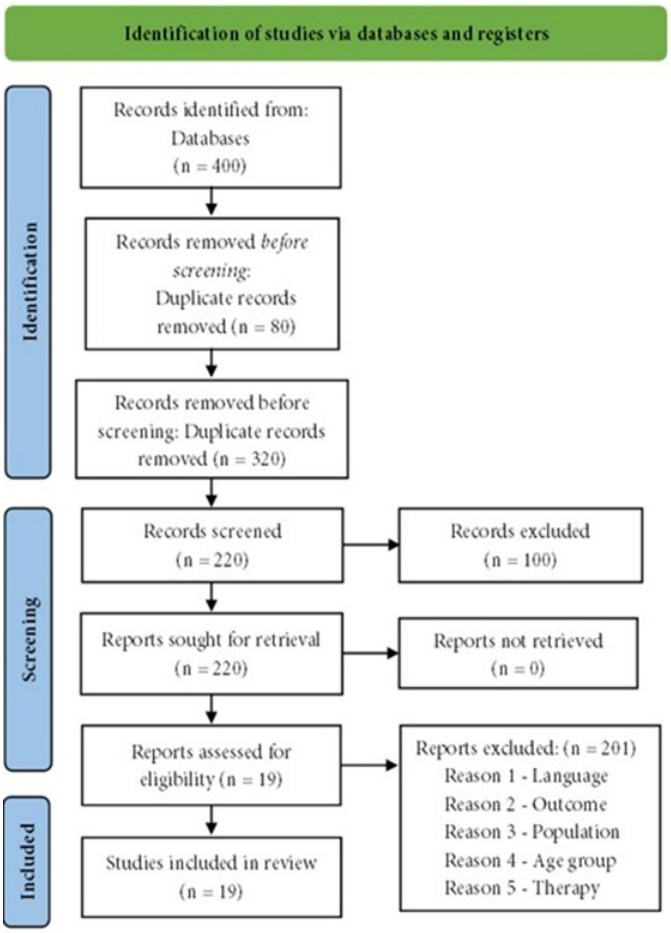

Figure 1: PRISMA 2020 flow diagram for new systematic reviews, including database and register searches only

REVIEW OF LITERATURE

AUTHOR and YEAR	STUDY DESIGN	NO. OF PARTICIPANTS	AVERAGE AGE OF PARTICIPANTS	METHODOLOGY	CONCLUSION
Haider et al., 2023 [8].	Observational prospective study	109 (101 were men and 8 were women)	39.98 ± 7.52 years Age range – 18 to 45 years	Risk factors identified were smoking, sedentary lifestyle, dyslipidemia, hypertension, family history of coronary artery disease, previous history of myocardial infarction, and history of previous percutaneous coronary intervention.	This study confirmed that there's a strong link between myocardial infarction and patients who were men smokers and women who led sedentary lifestyles.
Faresjo et al., 2023 [9].	Cross-sectional study	33 (23 were men and 10 were women)	Not mentioned Age range – below 50 years	Risk factors identified were age, obesity, cortisol concentration, previous history of myocardial infarction, hypertension, hyperlipidemia, diabetes, history of stroke, alcohol consumption, sedentary lifestyle, poor sleeping habits, and stress.	This study concluded that young people are primarily associated with high levels of stress, obesity, hypertension, physical inactivity, and elevated cortisol concentration. In young people, it is possible to prevent each of these risk factors.

Liang et al., 2023 [9].	Retrospective	108 (106 were men and 2 were women)	39 ± 4.3 years Age range – below 45 years	Risk factors identified were age, hypertension, diabetes, current smokers, alcohol consumption, family history of ischemic heart disease, hyperuricemia, and dyslipidemia.	This study concluded that smoking is the primary risk factor, and hyperuricemia was the most common risk factor in young patients. Diabetes should be maintained to reduce the risk of myocardial infarction.
Kim et al., 2023 [11].	population-based cohort study	3,280,826 (2,062,189 were men and 1,218,637 were women)	32.0 ± 4.4 years Age range – 20 to 39 years	The risk factors identified were smoking, obesity, depression, alcohol consumption, hypertension, diabetes, hypercholesterolemia, and chronic kidney disease.	This study concluded that myocardial infarction was highest in current smokers, followed by starters, quitters, and non-smokers. People who have quit smoking are also at an increased risk of myocardial infarction.
Mani et al., 2022 [12].	Not mentioned	50 (42 were men and 8 were women)	37.4 ± 3.6 years Age range – 18 to 45 years	Risk factors identified were smoking, hypertension, dyslipidemia, diabetes, substance abuse, family history of coronary artery disease, and alcohol consumption.	This study concluded that smoking was the most significant modifiable risk factor. Young individuals with two to three separate risk factors were observed in this population.
Zhang et al.., 2022 [13].	Retrospective single center study	2739 (only men)	39 ± 5 years Age range – 18 to 44 years	The risk factors identified were obesity, hypertension, diabetes, hypercholesterol, smoking, and age.	This study concluded that effective preventative and treatment efforts must be taken into account about the risk factors associated with myocardial infarction in young men who are hospitalized .
Gao et al., 2021 [14].	Retrospective single center study	376 (only men)	42.4 ± 5.4 years Age range – below 50 years	Risk factors identified were smoking, obesity, high troponin levels, hypertension, alcohol consumption, diabetes, hyperlipidemia, sedentary lifestyle, chronic kidney disease, peripheral vascular disease, history of stroke, depression, anxiety, and pulmonary diseases.	This study concluded that young adults should be encouraged to have knowledge about quitting smoking and to engage more in physical activity.
Dikaiou et al., 2021 [15].	Prospective registry-based cohort study	1,495,499 (only women)	28.3 ± 5.1 years Age range – 18 to 45 years old	Results found to be that women with myocardial infarction had overweight, moderate and severe obesity, body mass index, diabetes, hypertension and smoking.	This study concluded that severely obese and moderately elevated body mass index is highly associated with early and increased risk of myocardial infarction and death.
Mansour et al., 2021 [16].	Cross-sectional single-center observational study	106 (101 were men and 5 were women)	39.32 ± 5.28 years Age range – 18 to 45 years	Risk factors identified were smokers and hashish (cannabis) smokers, tramadol, hypertension, diabetes, low and high density lipoprotein levels, poor sleeping habits, high stress levels, and family history of premature coronary artery disease.	This study concluded that cannabis and tramadol addiction pose significant risk factors for acute myocardial infarction.
Ladha et al., 2021 [17].	cross-sectional study	33173 (16747 were men and 16426 were women)	Not mentioned Age range – 18 to 44 years	Risk factors identified were cannabis usage along with history of myocardial infarction, tobacco smoking, hypertension, hypercholesterolemia, obesity, ethnicity, combustible cigarette use, E-cigarette use, alcohol consumption, sedentary lifestyle, kidney disease, diabetes, skin cancer and blindness.	This study concluded that the use of cannabis is directly associated with history of myocardial infarction in young individuals. Larger amount of cannabis leads to the individual risk of myocardial infarction.
Domanski et al., 2020 [18].	longitudinal cohort study	4958 (2218 were men and 2740 were women)	24.9 ± 3.7 years Age range – 18 to 30 years	Risk factors identified were age, race, obesity, diabetes, smoking, hypertension, sedentary lifestyle, family history of coronary artery disease, low educational status and hypercholesterolemia.	This study concluded that myocardial infarction is linked to low density lipoprotein concentration and not affected by duration of exposure.
Patil et al., 2020 [19].	descriptive observational study	681 (617 were men and 64 were women)	30.85 years Age range – below 35 years	Risk factors identified were smoking, diabetes, hypertension, alcohol consumption, obesity, dyslipidemia, and low educational status.	This study concluded that a poor rural lifestyle and lack of awareness may lead to the rising occurrence of risk factors causing myocardial infarction in young adults.
Lee et al., 2020 [20].	Population based cohort study	5,688,055 (3,458,182 were men and 2229873 were women)	30.3 ± 5.1 years Age range – 20 to 39 years	Risk factors identified were age, obesity, sedentary lifestyle, gender, history of smoking and alcohol, family history of premature cardiovascular disorder, hypertension, diabetes, dyslipidemia.	This study concluded that there's strong relationship between lipid components such as low and high density lipoprotein levels, higher levels of triglycerides and total cholesterol levels related to myocardial infarction and death.
Glinge et al., 2020 [21].	Cohort study	13810 (10344 were men, and 3466 were women)	Not mentioned Age range – 18 to 50 years	Risk factors identified were mainly sibling history (not parental history) and other risk factors like age, hypertension, diabetes, kidney disease, peripheral vascular disease, valve disease, and statin usage.	This study concluded that an increased risk of myocardial infarction was associated with having a sibling who had myocardial infarction, whether or not heart failure was present.

DeFilippis et al., 2020 [22].	Retrospective cohort study	2097 (1693 were men and 404 were women)	44 ± 5.1 years Age range – below 50 years	Risk factors identified were diabetes, rheumatological conditions and depression in women. Conversely, men were more prone to dyslipidemia and illicit substance use.	This study concluded that women who experienced their first myocardial infarction had to contend with more risk factors than men did.
Singh et al., 2019 [23].	Retrospective cohort study	1,996 (1614 were men and 382 were women)	45.0 years Age range – below 50 years	Risk factors identified were familial hypercholesterolemia, age, race, diabetes, hypertension, obesity, current smokers, family history of premature coronary artery disease.	This study concluded that about one in ten patients with myocardial infarction had familial hypercholesterolemia when they were younger .
Yandrapalli et al., 2019 [24].	Retrospective cohort study	1,462,168 (71.5% were men)	50 ± 7 years Age range – 18 to 59 years	Results revealed that in 18 to 44 years of age group, smoking, diabetes, obesity, dyslipidemia, substance abuse and hypertension were the most significant risk factors in this age group. Among 45 to 59 years of age group, hypertension, diabetes, obesity, dyslipidemia, substance abuse and smoking were the most significant risk factors in this particular age group.	This study concluded that women showed higher proportion of diabetes, hypertension and obesity whereas men showed higher proportion of dyslipidemia, substance abuse and smoking. Young myocardial infarction patients for whom preventative actions have been shown to be beneficial.
Venkatason et al., 2019 [25].	Retrospective nationwide analysis	292 (only women)	39.0 ± 4.68 years Age range – below 45 years	Risk factors identified were ethnicity, smoking, dyslipidemia, hypertension, diabetes, family history of coronary artery disease, and comorbidities such as cerebrovascular disease, peripheral vascular disease, chronic lung disease, congestive heart failure, and chronic renal failure.	This study concluded that young women are more likely to be associated with a family history of premature coronary artery disease and ethnicity of myocardial infarction. Preventive strategies are necessary to reduce the risk of myocardial infarction.
Allan et al., 2019 [26].	observational cohort study	608 (464 were men and 144 were women)	35.4 ± 8.9 years Age range – 2 to 45 years	Risk factors identified were gender, hypertension, lipid disorders, diabetes, obesity, smoking, history of cardiovascular disorder, arrhythmia, intercoastal drainage/ pacemaker, alcohol abuse, seizure disorder, mood disorder, psychosis, any psychiatric disorder, and illicit drug usage.	This study concluded that men are primarily affected. Meanwhile, structural diseases of the myocardium were most commonly seen in women with comparison to men.

Table 1: Different studies that are reviewed for identifying various risk factors of Myocardial infarction.

RESULTS

In this review, there are several risk factors associated with the increased rise of myocardial infarction among young and middle-aged populations. Based on several studies, the most predominant risk factors among this population were smoking [8,10,11,13,17,19,20,25,26], hypertension [8–10,15,16,19,20,23,25], diabetes [8,13–15,18–21,23], alcohol consumption [9,10,12,14,17,19,20,26], dyslipidemia [8,10,12,19,24,25,27], sedentary lifestyle [8,9,14,17,18,20], Age [9,10,13,18,20,23], genetic predisposition [10,12,16,18,23,25], stress [9,16] and depression [11,14,27]. Understanding the effect of various factors of the onset of myocardial infarction is essential for designing comprehensive treatment and prevention strategies in the young and middle-aged population [13,25].

There are other risk factors that contribute to the occurrence of myocardial infarction in young and middle aged population such as gender [20,26], ethnicity [17,18,23,25], drug abuse [12,24,26,27], hypercholesterolemia 11,13,17,18,23, previous history of myocardial infarction [8,9,17], poor sleeping habits [9,16], cannabis use [16,17], chronic kidney disease [11,14,17,21,25], peripheral vascular disease [14,25], pulmonary diseases [14,25], low educational status [18,19], psychiatric disorders [26] and previous history of stroke [9,14].

The identified risk factors found from these reviews were classified into physical, psychological, social, genetic, and underlying health components, in which each category was further divided into modifiable and non-modifiable risk factors.

	MODIFIABLE RISK FACTORS	NON-MODIFIABLE RISK FACTORS
PHYSICAL	• Smoking • Sedentary lifestyle • Alcohol consumption • Drug abuse • Poor sleeping habits • Cannabis use • Tramadol addiction • Poor diet • Poor sleeping habits • Statins usage	• Age • Gender
PSYCHOLOGICAL	• Depression • Anxiety • Stress • Mood disorder • Psychosis	
SOCIAL	• Low educational status	• Ethnicity • Race
GENETICS		• Family history of cardiovascular disease, coronary artery disease, ischemic heart disease • Previous history of myocardial infarction • Previous history of percutaneous coronary intervention • Previous history of stroke • Sibling history

HEALTH CONDITIONS	• Hypertension • Diabetes • Obesity • Dyslipidemia / Hyperlipidemia • Hypercholesterolemia • Hypoalphalipoproteinemia • Hyperuricemia • Seizure disorders • Infertility • Chronic kidney disease • Blindness • Pulmonary disease	• Peripheral vascular disease • Rheumatological conditions • Cerebrovascular disease • Valve disease

Table 2: Various global risk factors of Myocardial infarction categorized into modifiable and non-modifiable risk factors

DISCUSSION

Studies confirmed that smoking had a notable relation between myocardial infarction in men followed by dyslipidemia, drug abuse, and women with diabetes, hypertension, obesity [23], and sedentary lifestyle [8]. A study done by Allan KS et al., 2019 also found that men are significantly more impacted than women [26] but women who had their first myocardial infarction had a more significant amount of risk elements compared to men [27].

A study done by Gao H et al. (2021 revealed that over three-quarters of young patients were smoking. Regular exposure to cigarette smoke damages arterial cells, which may result in endothelial dysfunction, particularly if smoking started early in life [14]. Smoking in different forms, like tobacco smoking, combustible cigarettes, e-cigarettes, and cannabis, directs to the risk of myocardial infarction [17]. Rates of myocardial infarction were highest among persistent smokers, followed by beginners, quitters, and non-smokers. If compared to non-smokers, the risk of myocardial infarction stayed high in those who quit smoking [11].

Another study done by Dikaiou P et al., 2021, found that women who were considered overweight had a greater risk of myocardial infarction than lean women; the risk nearly doubled in those with a body mass index of over 30 kg/m2 and increased nearly thrice in those with severe obesity [15]. More significant proportions of risk factors for myocardial infarction were linked to age more than 25 compared to younger age groups such as less than 25 [26].

Numerous studies have examined the correlation between diabetes mellitus and the risk of myocardial infarction in young and middle-aged population. While some research indicated that diabetes is less common in young individuals when compared to older individuals [10,13,14], other studies demonstrated that diabetes is more common in women, who are also more likely to be receiving insulin therapy [27]. Type 1 diabetes is frequently associated with an increased risk of myocardial infarction [9].

Excessive alcohol consumption is related to chest pain, resulting in coronary occlusion due to endothelial disorder, leading to the risk of myocardial infarction [14].

The finding of a greater probability of a family history of premature coronary artery disease in young women with myocardial infarction could be correlated with racial predisposition [25].

According to the study conducted by Faresjo A et al., 2023 showed that young patients with myocardial infarction had significantly higher levels of blood pressure (both systolic and diastolic) with systolic blood pressure of 124 to 131 mmHg, diastolic blood pressure of 78 to 84 mmHg and mean arterial blood pressure of 93 to 100 mmHg [9].

It is commonly recognized that abnormal lipid levels raise the risk of myocardial infarction. The most common type of lipid abnormality is dyslipidemia in young people living in remote regions. It was high triglyceride and low levels of high density lipoprotein cholesterol. Only a small number had high total cholesterol and low-density lipoprotein cholesterol levels [19].

A study conducted by Allan KS et al., 2019, found that mood disorder was substantially higher in women compared to men. Patients under 45 years old were identified with both prior psychological history and a cardiac history. An episode of psychosis and depression was more common than what was predicted. There is distinct proof connecting a higher prevalence of myocardial infarction to depression and other serious psychiatric diseases like schizophrenia. Furthermore, in this study, psychotropic drugs (described as opioids, benzodiazepines, antidepressants, and non-benzodiazepine hypnotics) were prescribed to one-third of the patients with myocardial infarction, which might have also led to the issue [26].

Another study conducted by Tweet MS., 2020 has found that illicit drug usage was more prevalent in men compared to women [20]. These illicit drugs include cannabis, cocaine, amphetamines, hallucinogens, opioids, sedatives, antidepressants, or combinations of these in a dependent or non-dependent manner [24].

Lastly, A study conducted by Glinge C et al., 2020 observed that a family history of parents who had myocardial infarction was not associated with the risk of myocardial infarction, but having a sibling with myocardial infarction suggests that shared environmental variables are the main determinant for the risk of myocardial infarction [21].

In this review, we have identified the various global risk factors of myocardial infarction among the young and middle-aged population. Understanding the common risk factors in men and women has major implications for healthcare in terms of implementing effective primary preventive measures. Majorly, risk factors like smoking, diabetes, hypertension, obesity, alcohol consumption, hypercholesterolemia, sedentary lifestyle, stress and poor sleeping habits should receive special care and attention for preventing the incidence of myocardial infarction.

IMPLICATIONS FOR FUTURE RESEARCH

Future research studies can be focused on the interplay between traditional risk factors such as hypertension, diabetes, dyslipidemia, smoking and sedentary lifestyle

alongside with emerging factors. These includes genetic predisposition, psychological factors and environmental influences. Researchers could also focus on gender differences, early-life exposure and the impact of socioeconomic pressures. Understanding these multi-dimensional elements can lead to the improvement in prevention strategies and treatment interventions.

LIMITATIONS

There are some limitations for this review. Firstly, different studies focuses on various age limits and medical histories which can limit the comparability of the findings of risk factors. Secondly, few studies included are specific to a particular region which indeed limits the generalized ability to wider populations. Third, short follow up periods may miss the cumulative effect of risk factors over time causing lack of longitudinal data which is considered to be important in young and middle-aged population. Fourth, different studies defines risk factors like smoking, obesity or hypertension differently complicating comparisons and conclusions. Fifth, over time, advancements in technology and diagnostic criteria for myocardial infarction could affect the comparability of older studies with recent studies.

CONCLUSION

This literature review concludes the various global risk factors highlighting the physical, psychological, genetical, social components and underlying health conditions causing myocardial infarction. Each risk factors are categorized into modifiable and non-modifiable risk factors of myocardial infarction. Modifiable risk factor includes smoking, diabetes, poor diet, obesity, hypertension, alcohol consumption, hypercholesteremia, stress, sedentary lifestyle, poor sleeping habits and so on. Non – modifiable risk factors include age, ethnicity, race, genetic predisposition, gender and so on. Younger patients have an excellent short and long-term prognosis compared to the old age group. Therefore, understanding these risk factors is crucial for prevention strategies, early detection, treatment interventions and to create awareness for promoting life span in young and middle-aged individuals.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude towards NITTE Institute of Physiotherapy for offering me valuable guidance and encouragement throughout the entire course of this literature review. I would also like to extend my gratitude towards Ms Kalavathi Naik, Librarian of Nitte Institute of Physiotherapy, NITTE (Deemed to be University) for assessing the content authenticity verification for this literature review. Her dedication has been instrumental in ensuring that the resources used were both relevant and credible.

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