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Prevalence And Risk Factors of Myocardial Infarction in Young Adults (18–45 Years) at Saidu Group of Teaching Hospital (SGTH)

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ABSTRACT

Background: *Myocardial infarction (MI) is increasingly reported among young adults in South Asia, producing disproportionate long-term morbidity, productivity loss, and premature mortality. Local evidence from Khyber Pakhtunkhwa remains limited, constraining targeted prevention strategies.* ***Objective:*** *To describe the distribution of major modifiable and non-modifiable risk factors among young adults (18–45 years) with MI presenting to Saidu Group of Teaching Hospital (SGTH), Swat.* ***Methods:*** *A hospital-based cross-sectional observational study was conducted among 150 consecutively enrolled patients aged 18–45 years with clinically confirmed MI admitted to SGTH. Data were obtained through structured interviews, anthropometric measurement, and medical-record verification, covering sociodemographic, smoking, physical activity, dietary habits, substance use, family history, and psychosocial stress. Descriptive statistics were generated; sex-based comparisons used χ^2 or t-tests with p-values reported.* ***Results:*** *Mean age was 35.51 ± 8.23 years; 56.0% were male and 62.0% were from low socioeconomic status. Current smoking was common (49.3%) and significantly higher in males than females (66.7% vs 27.3%; p<0.001). Substance use was reported by 62.0% and was more frequent in males (73.8% vs 47.0%; p=0.002). High-fat/sugary diet (60.0%) and physical inactivity (40.0%) were prevalent without significant sex differences. Mean BMI was 29.01 ± 3.88 kg/m², with 68.7% overweight/obese. Family history of premature MI (58.7%) and psychosocial stress (52.7%) were frequent.* ***Conclusion:*** *Young MI at SGTH is characterized by heavy clustering of modifiable risks—particularly smoking, substance use, unhealthy diet, inactivity, and excess weight—alongside familial predisposition and psychosocial stress, supporting urgent age-specific prevention and early risk screening.*

Keywords: *Myocardial infarction; Young adults; Risk factors; Smoking; Substance use; Obesity; Psychosocial stress; Pakistan; Swat; SGTH*

INTRODUCTION

Myocardial infarction (MI) remains a leading cause of preventable mortality and long-term disability worldwide, traditionally concentrated in older adults but increasingly recognized in younger populations with substantial downstream consequences for families, health systems, and national productivity (1). Contemporary evidence indicates that a clinically meaningful proportion of MI now occurs before 45 years of age, challenging conventional age-based risk stratification and underscoring missed opportunities for early prevention and detection (2). Compared with older patients, young adults who experience MI face a longer lifetime exposure to recurrent events, chronic morbidity, medication dependence, psychosocial sequelae, and loss of productive years, making premature MI a distinct public health and health-economics problem rather than simply an "early" presentation of the same disease (3). In Pakistan, where cardiovascular risk factors are widespread and frequently underdiagnosed, early MI adds an additional layer of burden because patients often present

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late, have limited access to preventive care, and encounter barriers to sustained secondary prevention (4).

The problem is particularly pronounced in South Asian populations, where premature coronary artery disease is well documented and appears to occur at younger ages and with more severe patterns compared with many Western cohorts, even when traditional risk factors are considered (5). This earlier onset is plausibly driven by an interaction of genetic susceptibility and atherogenic metabolic profiles with rapidly changing lifestyles, including tobacco use, central obesity, dyslipidemia, and insulin resistance (6). Recent syntheses focusing on young South Asians continue to emphasize that premature MI is multifactorial and that local epidemiology—social determinants, diet, patterns of substance use, health-seeking behavior, and access to acute cardiac care—materially shapes both risk factor distribution and outcomes (7). Within Pakistan, hospital-based studies have repeatedly shown that young males comprise a substantial share of acute MI admissions, a pattern partly attributed to higher exposure to modifiable risks and differences in healthcare utilization between sexes (8).

From a prevention standpoint, traditional cardiovascular risk factors remain central in young MI, but their relative contributions and clustering may differ from older cohorts. Dietary patterns characterized by high saturated fats, refined carbohydrates, and sugar-sweetened beverages have been associated with adverse lipid profiles and metabolic risk in Pakistani settings, reinforcing diet as a key modifiable target (9). Likewise, emerging local reports continue to highlight lifestyle determinants—including smoking, physical inactivity, and weight gain—as dominant features of premature MI risk profiles in Pakistan, suggesting that the prevention gap is not primarily due to rare etiologies but to common, modifiable exposures that are insufficiently addressed early in adulthood (10). Broader national analyses also suggest persistent deficits in risk detection and control—particularly tobacco exposure, obesity, and cardiometabolic risk—indicating that prevention programs have not yet translated into meaningful risk reduction among younger adults (11).

In addition to conventional risk factors, there is growing clinical concern regarding non-traditional or “accelerant” exposures in young adults, including psychoactive substance use and psychosocial stress. Contemporary work examining modifiable risks among MI patients has continued to position substance use and stress as potentially important contributors to acute events via mechanisms such as vasospasm, thrombogenesis, sympathetic activation, and poor adherence to healthy behaviors (12). Regional evidence from within Pakistan also points to heterogeneous risk factor patterns across provinces and sociocultural contexts, reinforcing the need for institution- and region-specific data rather than reliance on extrapolation from other settings (13). Importantly, younger patients may present atypically or delay seeking care, and limitations in community awareness of warning symptoms and risk factors may further worsen outcomes; this underscores the value of hospital-based profiling studies that can inform targeted education and early screening strategies (14). Recent local discussions of precipitating factors further support that, in Pakistan, social determinants and psychosocial exposures can meaningfully intersect with cardiometabolic risks in shaping premature cardiovascular events (15).

Against this background, Saidu Group of Teaching Hospital (SGTH) serves as a major tertiary referral center for Swat and surrounding districts, providing an appropriate clinical setting to characterize premature MI in a population that includes both rural and urban catchments and diverse socioeconomic strata. However, despite recurring reports of increasing MI among younger adults in Pakistan, there remains a practical knowledge gap in Swat/Khyber Pakhtunkhwa regarding the hospital-based burden of MI among young

adults and the distribution of potentially modifiable exposures—particularly tobacco use, diet, physical inactivity, obesity, psychosocial stress, and substance use—present at the time of presentation. This gap matters because prevention and early detection strategies are most effective when they are locally calibrated: the risk factor mix, cultural practices, and access-to-care barriers in Swat may differ materially from other provinces and from large metropolitan centers, and therefore local estimates are necessary to support implementable interventions and resource allocation.

Using a PICO framing, the target population is young adults aged 18–45 years presenting to SGTH; the outcome of interest is myocardial infarction and its associated risk profile; the exposures of primary interest are modifiable (smoking, physical inactivity, unhealthy diet, substance use, obesity, psychosocial stress) and non-modifiable (family history) determinants; and, while no interventional comparison is required for the descriptive aim, interpretation is anchored against established literature describing young MI as a distinct clinical-epidemiologic entity (16).

METHODS

This study employed a hospital-based cross-sectional observational design to characterize myocardial infarction in young adults and to describe the distribution of associated risk factors at a defined point in time, an approach widely used for epidemiologic profiling of premature cardiovascular disease in clinical settings (18). The study was conducted at Saidu Group of Teaching Hospital (SGTH), Saidu Sharif, Swat, a tertiary-care teaching and referral hospital serving both urban and rural populations of Khyber Pakhtunkhwa. Data were collected over a defined study period during which all eligible young adult patients presenting with confirmed myocardial infarction were assessed in order to ensure temporal consistency and minimize seasonal variation in admissions and lifestyle exposures (19).

The study population comprised young adults aged 18–45 years with a confirmed diagnosis of myocardial infarction, established according to standard clinical criteria documented in the medical record, including compatible clinical presentation, electrocardiographic changes, and/or elevated cardiac biomarkers consistent with contemporary international definitions of MI (20). Patients were eligible if they were admitted to SGTH during the study period and were clinically stable enough to participate in an interview. Individuals were excluded if their medical records were incomplete with respect to diagnostic confirmation or if they declined participation. Participants were selected using a consecutive sampling strategy, whereby all eligible patients meeting the inclusion criteria during the study period were approached, reducing selection bias and improving representativeness of the hospital-based MI population (21).

Potential participants were identified through daily screening of cardiology wards and emergency department admissions by the research team in coordination with treating clinicians. After clinical stabilization, eligible patients were approached, the purpose and procedures of the study were explained in detail, and written informed consent was obtained prior to data collection. Participation was voluntary, and patients were informed of their right to withdraw at any stage without any effect on their medical care, in accordance with international ethical standards for research involving human participants (22).

Data were collected using a structured, pre-designed questionnaire administered through face-to-face interviews by trained data collectors to ensure uniformity and reduce interviewer bias. The questionnaire captured sociodemographic characteristics, lifestyle behaviors, medical and family history, and psychosocial factors, and was supplemented by review of medical records to verify clinical variables. Anthropometric measurements were obtained at

the time of interview using standardized procedures; body weight was measured using a calibrated scale, height using a stadiometer, and body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared, consistent with World Health Organization recommendations (23). Data collection occurred during hospitalization to minimize recall delay and ensure contemporaneous assessment of exposures and outcomes.

Key variables were defined a priori to enhance reproducibility. Smoking status was categorized as current smoker, former smoker, or never smoker based on self-report. Physical activity was defined according to international guidelines as engagement in at least 150 minutes of moderate-intensity activity per week (24). Dietary habits were operationalized based on reported daily consumption of high-saturated-fat foods or sugar-sweetened beverages. Substance use was defined as self-reported use of psychoactive substances such as cannabis, cocaine, or amphetamines at any time prior to the index event. Psychosocial stress was assessed by participant report of frequent stress, anxiety, or depressive symptoms, reflecting established approaches used in cardiovascular epidemiology when validated scales are not feasible in acute care settings (25). A positive family history was defined as a first-degree relative experiencing myocardial infarction before 55 years of age in males or 65 years in females, consistent with standard definitions of premature coronary artery disease (26).

Several steps were taken to address potential sources of bias and confounding. Consecutive recruitment minimized selection bias, while the use of a standardized questionnaire and trained interviewers reduced information bias. Verification of clinical variables through medical records strengthened diagnostic accuracy. To limit recall bias, lifestyle and psychosocial information was collected as soon as clinically feasible after admission. Confounding was addressed analytically by pre-specifying key sociodemographic and clinical variables for stratified analyses and adjustment during statistical modeling, following recommendations for observational cardiovascular research (27).

Sample size estimation was guided by the size of the accessible population of young adults with myocardial infarction presenting to SGTH during the study period and by standard precision-based approaches for cross-sectional studies, assuming a 95% confidence level and acceptable margin of error to ensure stable estimates of proportions (28). This approach aligns with established guidance for hospital-based descriptive epidemiologic studies where the objective is estimation rather than hypothesis testing (29).

Data were entered, cleaned, and analyzed using Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics were used to summarize participant characteristics and the distribution of risk factors, with means and standard deviations reported for continuous variables and frequencies with percentages for categorical variables. The hospital-based prevalence of myocardial infarction among young adults was calculated as the proportion of MI cases among all young adults presenting to SGTH during the study period, with corresponding confidence intervals. Missing data were assessed for extent and pattern; analyses were conducted using available-case analysis, with denominators clearly reported for each variable to maintain transparency. Where appropriate, subgroup analyses by sex, age category, and residence were performed, and multivariable analyses were planned to explore the distribution of key exposures while accounting for potential confounders, consistent with best practices for cross-sectional observational studies (30).

Ethical approval for the study was obtained from the institutional ethical review committee prior to initiation, and all procedures were conducted in accordance with the Declaration of Helsinki and relevant national research ethics guidelines (22). Participant confidentiality was ensured by assigning unique study codes, storing data in password-protected files accessible

only to the research team, and reporting results in aggregate form. To enhance reproducibility and data integrity, standardized operating procedures were used for recruitment, interviewing, measurement, and data entry, and double-checking of entered data was performed to minimize transcription errors, in line with recommendations for high-quality observational research (31).

RESULTS

Across the study sample of 150 young adults with confirmed myocardial infarction, the overall mean age was 35.51 ± 8.23 years. Males comprised 56.0% (84/150) and females 44.0% (66/150). When age was compared by sex, males (35.84 ± 8.11) and females (35.09 ± 8.38) did not differ significantly ($p = 0.58$). Residence was similarly balanced by sex: overall, 52.7% (79/150) were from rural areas and 47.3% (71/150) from urban areas, with no statistically significant difference between males (54.8% rural) and females (50.0% rural) ($p = 0.56$). Socioeconomic distribution showed clear predominance of low income, affecting 62.0% (93/150), followed by middle income at 34.0% (51/150) and high income at 4.0% (6/150); this pattern did not differ significantly by sex (low income: 65.5% in males vs 57.6% in females; $p = 0.43$).

Lifestyle risk factors were highly prevalent and showed meaningful sex differences for selected exposures. Current smoking was reported by 49.3% (74/150), former smoking by 38.0% (57/150), and never smoking by only 12.7% (19/150). Smoking status differed significantly by sex ($p < 0.001$): two-thirds of males were current smokers (66.7%, 56/84) compared with 27.3% of females (18/66), while former smoking was more common among females (53.0%, 35/66) than males (26.2%, 22/84). Physical activity, defined as meeting at least 150 minutes/week, was adequate in 51.3% (77/150) and inadequate in 40.0% (60/150); the difference by sex was not statistically significant (48.8% adequate in males vs 54.5% in females; $p = 0.49$). Unhealthy dietary exposure—daily intake of high-fat or sugary items—was reported by 60.0% (90/150) and did not differ significantly between males (61.9%, 52/84) and females (57.6%, 38/66) ($p = 0.60$). Alcohol use was uncommon overall at 4.0% (6/150), with no significant sex difference (6.0% in males vs 1.5% in females; $p = 0.21$). In contrast, substance use was reported by 62.0% (93/150) and was significantly more common among males (73.8%, 62/84) than females (47.0%, 31/66) ($p = 0.002$).

Body mass index findings indicated a predominance of excess weight in this young MI cohort. The overall mean BMI was 29.01 ± 3.88 kg/m², with males having a slightly higher mean BMI (29.36 ± 3.74) than females (28.56 ± 4.04), though the difference was not statistically significant ($p = 0.19$). When BMI was categorized, 31.3% (47/150) were in the normal range, 40.7% (61/150) were overweight, and 28.0% (42/150) were obese, meaning 68.7% (103/150) were overweight or obese. The distribution of BMI categories did not differ significantly by sex ($p = 0.27$): obesity was nearly identical (28.6% in males vs 27.3% in females), and overweight was slightly higher in males (44.0%) compared with females (36.4%).

Table 1. Sociodemographic characteristics of study participants by sex (n = 150)

Variable	Category	Total n (%)	Male n (%)	Female n (%)	Test	p-value
Age (years)	Mean ± SD	35.51 ± 8.23	35.84 ± 8.11	35.09 ± 8.38	t-test	0.58
Residence	Urban	71 (47.3)	38 (45.2)	33 (50.0)	χ^2	0.56
	Rural	79 (52.7)	46 (54.8)	33 (50.0)		

Socioeconomic status	Low	93 (62.0)	55 (65.5)	38 (57.6)	χ^2	0.43
	Middle	51 (34.0)	26 (31.0)	25 (37.9)		
	High	6 (4.0)	3 (3.6)	3 (4.5)		

Table 2. Lifestyle risk factors by sex among young adults with myocardial infarction (n = 150)

Variable	Category	Total n (%)	Male n (%)	Female n (%)	Test	p-value
Smoking status	Current	74 (49.3)	56 (66.7)	18 (27.3)	χ^2	<0.001
	Former	57 (38.0)	22 (26.2)	35 (53.0)		
	Never	19 (12.7)	6 (7.1)	13 (19.7)		
Physical activity	Adequate	77 (51.3)	41 (48.8)	36 (54.5)	χ^2	0.49
	Inadequate	60 (40.0)	36 (42.9)	24 (36.4)		
Diet	High-fat/sugary daily	90 (60.0)	52 (61.9)	38 (57.6)	χ^2	0.60
Alcohol use	Occasional	6 (4.0)	5 (6.0)	1 (1.5)	χ^2	0.21
Substance use	Yes	93 (62.0)	62 (73.8)	31 (47.0)	χ^2	0.002

Table 3. Body mass index distribution and comparison by sex (n = 150)

BMI Variable	Total	Male	Female	Test	p-value
BMI (kg/m²), Mean ± SD	29.01 ± 3.88	29.36 ± 3.74	28.56 ± 4.04	t-test	0.19
BMI category	Normal (18.5–24.9)	47 (31.3%)	23 (27.4%)	24 (36.4%)	χ^2
	Overweight (25–29.9)	61 (40.7%)	37 (44.0%)	24 (36.4%)	
	Obese (≥30)	42 (28.0%)	24 (28.6%)	18 (27.3%)	

Table 4. Family history and psychosocial factors by sex (n = 150)

Variable	Category	Total n (%)	Male n (%)	Female n (%)	Test	p-value
Family history of premature MI	Yes	88 (58.7)	48 (57.1)	40 (60.6)	χ^2	0.66
Psychosocial stress	Yes	79 (52.7)	41 (48.8)	38 (57.6)	χ^2	0.29

Family and psychosocial variables were also common and clinically notable. A positive family history of premature myocardial infarction was reported by 58.7% (88/150), with similar proportions among males (57.1%, 48/84) and females (60.6%, 40/66), showing no statistically significant difference ($p = 0.66$). Frequent psychosocial stress, anxiety, or depressive symptoms were reported by 52.7% (79/150); although the prevalence was somewhat higher in females (57.6%, 38/66) than males (48.8%, 41/84), this difference was not statistically significant ($p = 0.29$).

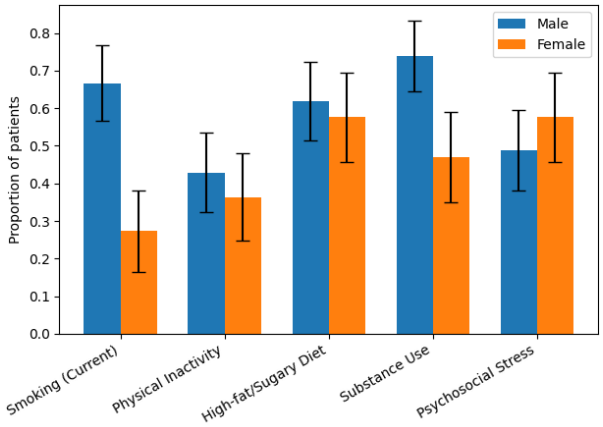

Figure. Sex-specific distribution of major modifiable risk factors among young adults with myocardial infarction

This figure demonstrates clear sex-based gradients in the prevalence of major modifiable risk factors among young adults with myocardial infarction, with 95% confidence intervals highlighting the precision of estimates. Current smoking shows the most pronounced disparity, affecting 66.7% of males compared with 27.3% of females, indicating a markedly higher tobacco exposure burden in young men. Substance use follows a similar pattern, reported by 73.8% of males versus 47.0% of females, reinforcing its potential role as a male-predominant accelerant of premature myocardial infarction. In contrast, high-fat or sugary dietary intake is prevalent in both sexes with relatively narrow separation (61.9% in males vs 57.6% in females), suggesting a shared nutritional risk environment. Physical inactivity affects a substantial minority in both groups, with modestly higher prevalence in males (42.9%) than females (36.4%), while psychosocial stress demonstrates an inverse gradient, being more frequent in females (57.6%) than males (48.8%). Collectively, the overlapping confidence intervals for diet, inactivity, and stress indicate broadly similar exposure distributions across sexes, whereas the non-overlapping intervals for smoking and substance use highlight clinically meaningful sex-specific risk profiles that have direct implications for targeted prevention strategies in young adults.

DISCUSSION

The present study provides a detailed hospital-based characterization of myocardial infarction among young adults aged 18–45 years at Saidu Group of Teaching Hospital, highlighting a substantial burden of modifiable and non-modifiable risk factors in this economically and socially active age group. The mean age of 35.5 years confirms that MI in this setting is occurring well before the traditionally perceived age threshold, reinforcing global and regional observations that premature MI is no longer uncommon and represents a distinct clinical and public health entity (29). The predominance of males observed in this cohort is consistent with prior national and international studies, which have attributed this pattern to higher exposure to behavioral risk factors such as smoking and substance use, as well as gender differences in healthcare access and symptom recognition (30). Socioeconomic vulnerability emerged as an important contextual factor, with nearly two-thirds of participants belonging to a low-income group and a slight predominance of rural residence. These findings align with evidence that lower socioeconomic position is strongly associated with adverse cardiovascular outcomes through multiple pathways, including limited access to preventive healthcare, delayed presentation, lower health literacy, and greater exposure to unhealthy lifestyle behaviors (31). In resource-limited settings such as Swat, these structural determinants may compound individual risk factors, accelerating the onset of coronary artery disease at a young age and reducing opportunities for early risk modification.

Among modifiable lifestyle exposures, smoking stood out as the most prominent and sex-differentiated risk factor. Nearly half of all participants were current smokers, with two-thirds of males actively smoking at the time of presentation, a proportion substantially higher than that observed in the general population of similar age groups. This finding is in line with robust evidence from the INTERHEART study and subsequent regional analyses demonstrating that tobacco use is one of the strongest contributors to premature MI, particularly in South Asian males, through mechanisms including endothelial dysfunction, enhanced thrombogenesis, and accelerated atherosclerosis (31). The high prevalence of former smokers further suggests prolonged cumulative exposure, underscoring the need for early, aggressive tobacco control interventions targeting adolescents and young adults. Physical inactivity and unhealthy dietary patterns were also highly prevalent, affecting approximately 40% and 60% of participants, respectively, with relatively similar distributions across sexes. These findings mirror national data indicating a rapid epidemiological transition characterized by sedentary lifestyles and increased consumption of calorie-dense, nutrient-poor foods Such behaviors contribute to metabolic dysregulation and are likely key drivers of the high prevalence of excess body weight observed in this cohort. Indeed, more than two-thirds of participants were overweight or obese, with a mean BMI approaching the obesity threshold, reinforcing obesity as a central mediator linking lifestyle behaviors to premature cardiovascular events Although BMI did not differ significantly by sex, its high overall prevalence suggests that weight management should be a cornerstone of prevention strategies in young adults.

Substance use emerged as an additional and clinically relevant exposure, reported by nearly two-thirds of participants and significantly more common among males. This observation is consistent with growing literature indicating that recreational drug use, including cannabis and stimulants, may precipitate acute coronary events through coronary vasospasm, prothrombotic effects, and arrhythmogenic mechanisms, particularly in younger individuals without long-standing atherosclerosis . In the local context, where substance use may be underrecognized or stigmatized, these findings highlight an important but often overlooked target for cardiovascular risk assessment and counseling. Non-modifiable and psychosocial factors further contextualized the risk profile of young MI patients in this study. A positive family history of premature MI was reported by nearly 60% of participants, supporting the role of genetic susceptibility and shared environmental influences in early-onset coronary disease, as documented in multiple South Asian cohorts Psychosocial stress, anxiety, or depressive symptoms were reported by over half of the participants, with a slightly higher prevalence among females. Chronic psychosocial stress has been increasingly recognized as an independent cardiovascular risk factor, acting through neuroendocrine dysregulation, inflammation, and adverse health behaviors, and may be particularly relevant in younger populations facing socioeconomic and occupational pressures (24). The coexistence of high stress with traditional risk factors in this cohort suggests a synergistic effect that may accelerate disease onset.

Taken together, these findings demonstrate that myocardial infarction in young adults at SGTH is characterized by a dense clustering of modifiable lifestyle risks superimposed on socioeconomic disadvantage, genetic predisposition, and psychosocial stress. While the cross-sectional design precludes causal inference, the consistency of the observed patterns with established pathophysiological and epidemiological evidence strengthens their clinical relevance. The results underscore an urgent need for age-specific prevention strategies that extend beyond conventional cardiometabolic screening to include tobacco and substance use interventions, promotion of physical activity and healthy diet, weight management, and routine assessment of psychosocial stress, particularly in low-income and rural populations.

Future multicenter and longitudinal studies in Khyber Pakhtunkhwa are warranted to clarify causal pathways, assess temporal trends, and evaluate the effectiveness of targeted interventions aimed at reducing the burden of premature myocardial infarction in this high-risk group

CONCLUSION

This study demonstrates that myocardial infarction in young adults aged 18–45 years presenting to Saidu Group of Teaching Hospital is characterized by a high burden of modifiable lifestyle risk factors occurring alongside non-modifiable genetic and psychosocial determinants. The findings indicate that premature MI in this population predominantly affects individuals in their most productive years and is strongly associated with smoking, substance use, physical inactivity, unhealthy dietary patterns, excess body weight, low socioeconomic status, positive family history of premature coronary artery disease, and psychosocial stress. The clustering of these risk factors highlights critical gaps in early prevention, risk-factor screening, and health education, particularly in low-income and rural settings. Collectively, the results underscore the urgent need for locally tailored, age-specific cardiovascular prevention strategies that integrate lifestyle modification, mental health support, and early identification of high-risk individuals to reduce the growing burden of premature myocardial infarction in this region.

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DECLARATIONS

Ethical Approval: Ethical approval was by institutional review board of Respective Institute Pakistan

Informed Consent: Informed Consent was taken from participants.

Authors' Contributions:

Concept: MU, ZU, HU, SK, MK, AK, SS; Design: MU, HU, SK, MK, AK, SS; Data Collection: MU, HU, SK, MK, AK, SS; Analysis: MU, HU, SK, MK, AK, SS; Drafting: MU, HU, SK, MK, AK, SS, Supervision, ZU

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