

ASSESSING THE PREVALENCE AND RISK FACTORS OF CARDIOVASCULAR DISEASES IN THE AGE GROUP 18-30 YEARS

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ABSTRACT

Introduction: Cardiovascular diseases, once considered conditions of the elderly people, are rapidly increasing and affecting young population, specifically in developing countries like Pakistan because of underdeveloped infrastructure of health facilities. This early onset is a serious concern to address because of its contribution in the premature problems that can lead to increase in CVD mortality rates.

Objectives: To determine the relationship between early onset of cardiovascular diseases and its risk factors, to identify their prevalence in the age group 18-30 and to develop public health recommendations in reducing the risk in young population.

Methodology: This, cross-sectional, study analyzed the prevalence and risk factors of cardiovascular diseases among 119 participants of age range between 18-30 in Punjab institute of cardiology, Pakistan. Data collection was done using a structured questionnaire wrapping up demographic, lifestyle and family histories of consented participants. The prevalence was calculated by the proportion of individuals with confirmed diagnosis of any cardiovascular disease in this age group. Analysis of data was done using SPSS with descriptive and inferential statistics.

Results: Results presented a prevalence of 1.95% (~2%). Major risk factors involved were family history, high stress levels, smoking including both active and passive, disturbed sleep, poor dietary intake. Surprisingly, inverse relationships were indicated between CVD diagnosed individuals and BMI, diabetes, hyperlipidemia and baseline significance with hypertension. Significant associations were found between CVD and smoking, sleep, stress, inadequate diet, family history ($p < 0.05$).

Conclusion: This study emphasized urgent need of the early prevention strategies, health education campaigns for targeted young population, projects to reduce the burden of these risk factors in the young population of Pakistan.

Keywords: Cardiovascular diseases prevalence, risk factors, young adults, Pakistan, public health

INTRODUCTION

Cardiovascular diseases (CVDs) encompass a wide range of disorders affecting the heart and blood vessels, including coronary artery disease, cerebrovascular disease, peripheral arterial disease, hypertension-related complications, rheumatic heart disease, congenital malformations such as atrial and ventricular septal defects or tetralogy of Fallot, cardiomyopathies, heart failure, arrhythmias, venous thromboembolism, aortic aneurysms and dissections, valvular disorders, and infections like endocarditis and pericarditis, all of which contribute significantly to global morbidity and mortality (22). The progression of CVDs often begins silently with risk factors such as elevated blood pressure, hypercholesterolemia, smoking, obesity, diabetes, and sedentary lifestyle, which frequently coexist and interact to accelerate vascular damage (20,21). Atherosclerosis is a typical manifestation, characterized by fatty plaque deposition that narrows arteries, compromises blood flow, and increases the risk of heart attacks and strokes, while damage to organs like the brain, eyes, heart, and kidneys marks the transition from subclinical disease to overt dysfunction (19). Because many cardiovascular events share common etiological pathways, assessing overall cardiovascular risk rather than isolated factors is more effective, and integrated strategies combining medical treatment, lifestyle modification, and patient education are essential (18). Globally, CVDs account for around 17 million deaths annually, with 20.5 million deaths reported in 2021 compared to 12.1 million in 1990, representing a 60% increase largely driven by population ageing and growth, with approximately 80% of fatalities occurring in low- and middle-income countries where healthcare infrastructure is often inadequate (17). Alarming, incidence among young adults under 30 has risen, with 93% exhibiting at least one modifiable risk factor, including tobacco use, dyslipidemia, hypertension, poor diet, physical inactivity, and stress, with men showing higher rates of smoking, drug use, and stress, while women demonstrate higher prevalence of diabetes, obesity, and poor dietary habits (16). These trends highlight the importance of early prevention, as risk behaviors

formed in adolescence often persist into adulthood, and even individuals with normal clinical parameters may already have subclinical atherosclerosis, particularly if they have a family history of heart disease (15).

Among modifiable risk factors, hypertension is one of the most significant, with 1.39 billion people affected globally in 2010, most in developing nations, and even modest increases in blood pressure substantially raising risk (12,13,14). Smoking is another major contributor, increasing myocardial infarction risk two- to six-fold, accelerating atherosclerosis, oxidative stress, and inflammation, while secondhand smoke causes tens of thousands of deaths annually from coronary heart disease in the US alone (9,10,11). Obesity contributes to dyslipidemia, hypertension, insulin resistance, and systemic inflammation, increases cardiac workload leading to hypertrophy and arrhythmias, and visceral fat releases harmful mediators that worsen cardiovascular health, making even modest weight reduction impactful (7,8). Dyslipidemia, particularly elevated triglycerides and LDL cholesterol, promotes plaque formation and coronary artery disease, with risk evident even at cholesterol levels considered normal in Western populations (4,5,6). Diabetes, both type 1 and type 2, increases cardiovascular risk through oxidative stress, inflammation, and endothelial dysfunction, with rising incidence among young adults linked to obesity and sedentary lifestyles, and global prevalence projected to reach 300 million adults by 2025, mostly in developing countries (3). Stress also plays a critical role, with short-term stress triggering myocardial infarction and long-term stress raising coronary heart disease risk by 40–50%, while early life adversity and social isolation further elevate risk through biological disruptions and maladaptive coping behaviors (1,2). Altogether, CVDs represent chronic, dynamic conditions shaped by multiple interacting risk factors, and their prevention requires holistic risk assessment, lifestyle modification, proactive healthcare strategies, and early intervention to reduce mortality, prevent organ damage, and improve long-term outcomes across populations.

Methodology

Study Design

This investigation employed a cross-sectional study design to determine the prevalence and associated risk factors of cardiovascular diseases (CVDs) among individuals younger than 30 years. The design was chosen to provide a snapshot of disease burden and risk distribution within this age group, allowing for identification of patterns that may inform preventive strategies.

Study Setting and Data Source

The study was conducted at the Punjab Institute of Cardiology, Lahore, Pakistan, a tertiary care facility that serves a diverse patient population from both urban and rural backgrounds. Data were collected from outpatient visits and registered cases within the 18–30 age range. Hospital records provided baseline information on patient demographics, medical history, and clinical parameters, while direct interviews and questionnaires supplemented lifestyle and behavioral data.

Study Population

The target population comprised patients aged 18–30 years who attended the cardiology hospital for consultation or assessment. Participants were included regardless of whether they had a confirmed diagnosis of CVD, provided they exhibited clinical indicators or conditions associated with increased cardiovascular risk. This inclusive approach ensured representation of both symptomatic and at-risk individuals, thereby capturing the spectrum of early cardiovascular health challenges in young adults.

Data Collection

Sample Size

To estimate prevalence, the total number of patients attending the facility during the study period and the subset aged 18–30 years were retrieved from hospital databases. A total of 119 participants consented to enrollment. Convenience sampling was employed due to limited availability of local prevalence data and time constraints. Voluntary participation was emphasized, and all individuals meeting inclusion criteria were invited to contribute.

Demographic Data

Sociodemographic variables collected included age, gender, socioeconomic status, and residential background (urban versus rural). Male gender and increasing age within the 18–30 bracket were considered potential risk enhancers. Socioeconomic status was assessed as a determinant of access to healthcare, nutrition, and physical activity. Urban residence was hypothesized to predispose individuals to processed diets and sedentary lifestyles, while rural residence was associated with limited healthcare access.

Medical History

Information on family history of CVD, past diagnoses, and comorbid conditions was obtained. A positive family history was considered indicative of genetic susceptibility. Pre-existing illnesses such as obesity, diabetes, and hypertension were documented as independent risk factors. Prior diagnoses of metabolic or cardiovascular disorders were noted to highlight underlying vulnerabilities requiring early intervention.

Lifestyle Factors

Lifestyle behaviors were assessed through structured questionnaires. Smoking status, dietary habits, physical activity levels, and stress exposure were recorded. Low physical activity was linked to obesity and metabolic dysfunction, while smoking was recognized as a contributor to oxidative stress and vascular injury. Diets high in saturated fats and low in fruits and vegetables were classified as unhealthy. Chronic stress was evaluated through self-reported indicators and considered a driver of inflammation and hypertension.

Clinical Parameters

Clinical measurements included blood pressure, cholesterol levels, and stress markers. Elevated blood pressure was identified as a direct contributor to vascular damage, while high cholesterol was associated with atherosclerotic progression. Stress markers, such as cortisol levels and reported chronic stress, were included to

capture the physiological impact of psychological stress on cardiovascular health.

Inclusion and Exclusion Criteria

Inclusion criteria encompassed individuals aged 18–30 years with documented cardiovascular diseases (e.g., coronary artery disease, heart failure, arrhythmias, angina, myocardial infarction) or those presenting for assessment of heart health. Availability of data on risk factors such as smoking, physical activity, dietary habits, family history, and comorbid conditions was required. Exclusion criteria included individuals outside the specified age range and those with cardiovascular conditions uniquely associated with pregnancy, such as hypertensive disorders of pregnancy and peripartum cardiomyopathy.

Ethical Considerations

The study adhered to ethical standards by ensuring patient privacy and confidentiality. Institutional Review Board (IRB) approval was obtained prior to data collection. Participants were fully informed about study objectives, and written consent was secured. Voluntary participation was emphasized, and individuals were free to withdraw at any stage without consequence.

Outcome and Impact

The primary outcome was identification of the prevalence and major risk factors of CVD among young adults. Findings were intended to provide insights into the causes of early cardiovascular disease and to support the development of targeted prevention and treatment strategies tailored to the needs of young populations in Punjab and comparable settings. By focusing on modifiable risk factors, the study aimed to inform public health interventions that could reduce long-term disease burden.

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics summarized prevalence and demographic distributions. Cross-tabulation analysis was employed to explore associations between categorical variables. Chi-square tests

were used to identify statistically significant relationships between risk factors and CVD occurrence. Independent sample t-tests compared mean values of continuous variables across groups. Statistical significance was set at $p < 0.05$. This analytical approach allowed for identification of key determinants of cardiovascular risk in the study population and provided a robust framework for interpreting findings.

Results and Discussion

The study investigated the association between cardiovascular disease (CVD) and a range of demographic, lifestyle, and clinical risk factors among 119 participants aged 18–30 years. Statistical analyses included descriptive statistics, chi-square tests, cross-tabulations, Mann-Whitney U tests, and independent sample t-tests, with significance determined at the 0.05 level. These methods allowed for both the identification of prevalence patterns and the testing of associations between categorical and continuous variables.

Demographic Characteristics

The age distribution revealed that the majority of participants (74.8%) were between 22 and 30 years, with the most common ages being 29 (16%), 25 (12.6%), and 28 (12.6%). The youngest age groups, 18 and 19 years, were least represented (1.7% each). Gender distribution was nearly balanced, with 52.1% male ($n = 62$) and 47.9% female ($n = 57$), reducing the likelihood of gender bias in the analysis. Area distribution showed that 58.8% ($n = 70$) of participants resided in urban areas, while 41.2% ($n = 49$) were from rural backgrounds, reflecting differences in lifestyle and healthcare access.

Prevalence of CVD

Out of the 119 respondents, 51 individuals (42.9%) reported a positive history of cardiovascular disease. Hospital records indicated that, among 16,251 patients visiting the facility during the study period, 740 were aged 18–30 years, yielding a prevalence of 4.55% for this age group. Of these, 317 patients (approximately 2%) were diagnosed with CVD. This relatively high

prevalence among young adults underscores the growing burden of early-onset cardiovascular disease and highlights the importance of investigating modifiable risk factors in this population.

Associations Between Risk Factors and CVD

Smoking

Chi-square analysis revealed a statistically significant association between smoking status and CVD history ($\chi^2(2) = 6.319$, $p = 0.042$). Passive smoking was more common among participants with CVD (27.5%) compared to those without CVD (10.3%), while active smoking rates were equal in both groups (23.5%). This finding suggests that passive exposure to tobacco smoke may be an underappreciated contributor to early cardiovascular risk.

Dietary Habits

Soft drink consumption was significantly associated with CVD prevalence ($\chi^2(1) = 5.100$, $p = 0.024$). Over half of participants with CVD (52.9%) reported consuming soft drinks, compared to 32.4% of those without CVD. Similarly, oily and fast food consumption showed a significant association ($\chi^2(1) = 4.043$, $p = 0.044$), with 49.0% of CVD participants reporting frequent intake compared to 30.9% of non-CVD participants. Fruit and vegetable consumption also demonstrated a significant protective association ($\chi^2(1) = 4.043$, $p = 0.044$), as individuals consuming fewer fruits and vegetables were more likely to report CVD. Together, these findings highlight the role of unhealthy dietary patterns in accelerating cardiovascular risk among young adults.

Physical Activity

Although a greater proportion of participants without CVD engaged in regular exercise (27.9%) compared to those with CVD (43.1%), the association did not reach statistical significance ($\chi^2(1) = 2.980$, $p = 0.084$). This suggests that, within this sample, exercise alone may not be a strong predictor of CVD history, though the observed trend warrants further investigation in larger cohorts.

Sleep Duration

Sleep duration was significantly associated with CVD history ($\chi^2(3) = 9.387$, $p = 0.025$). Participants with CVD were more likely to report shorter sleep durations, with 37.3% sleeping less than 5 hours and 33.3% sleeping 5–6 hours. In contrast, those without CVD were more likely to report longer sleep durations, including over 8 hours (23.5%). These results suggest that insufficient sleep may contribute to increased cardiovascular risk in young adults.

Stress

Stress levels were significantly associated with CVD history ($\chi^2(1) = 5.155$, $p = 0.023$). A higher proportion of participants with CVD (56.9%) reported frequent stress compared to those without CVD (23.5%). This finding reinforces the role of psychological stress as a key determinant of cardiovascular health, even in younger populations.

Blood Pressure

Blood pressure status showed a borderline significant association with CVD history ($\chi^2(2) = 6.009$, $p = 0.050$). Interestingly, a higher proportion of participants without CVD reported high blood pressure (61.8%) compared to those with CVD (39.2%). This unexpected finding may reflect complexities in diagnosis timing, treatment adherence, or lifestyle changes following diagnosis, and warrants further exploration.

Diabetes and Hyperlipidemia

Diabetes status was significantly associated with CVD history ($\chi^2(1) = 4.389$, $p = 0.036$). Surprisingly, individuals with CVD were less likely to report diabetes (7.8%) compared to those without CVD (22.1%). Similarly, hyperlipidemia showed a significant inverse association ($\chi^2(1) = 4.088$, $p = 0.043$), with fewer CVD participants reporting hyperlipidemia (13.7%) compared to non-CVD participants (29.4%). These findings may reflect differences in detection, reporting, or post-diagnosis lifestyle modifications, and highlight the need for longitudinal studies to clarify these relationships.

Family History

Family history of CVD was significantly associated with disease presence ($\chi^2(1) = 4.202$, $p = 0.040$). Among participants with CVD, 51.0% reported a positive family history, compared to 32.4% of those without CVD. This underscores the importance of genetic predisposition and hereditary factors in cardiovascular risk assessment.

Body Mass Index (BMI)

BMI level was significantly associated with CVD history ($\chi^2(3) = 9.014$, $p = 0.029$). Participants with CVD were more likely to have a normal BMI (68.6%), while overweight and obese categories were more common among those without CVD. Independent samples t-test confirmed this difference, with mean BMI significantly lower among CVD participants ($M = 23.36$, $SD = 4.05$) compared to non-CVD participants ($M = 25.25$, $SD = 5.46$; $t = -2.168$, $p = 0.032$). This inverse relationship may reflect weight loss due to illness or lifestyle changes following diagnosis, or confounding variables influencing BMI distribution.

Age

Independent samples t-test revealed a significant difference in mean age between participants with and without CVD ($t = -2.168$, $p = 0.033$). Individuals with CVD had a lower mean age ($M = 25.06$, $SD = 3.36$) compared to those without CVD ($M = 26.34$, $SD = 2.97$). This finding suggests that younger individuals in the sample were more likely to report CVD, indicating early onset or presence of risk factors at younger ages. Overall, the prevalence of CVD in the study population was 42.9% (51 out of 119 participants). Statistically significant associations were observed between CVD history and smoking ($p = 0.042$), dietary habits including soft drink and oily food consumption ($p = 0.024$ and $p = 0.044$), fruit and vegetable intake ($p = 0.044$), sleep duration ($p = 0.025$), stress ($p = 0.023$), family history ($p = 0.040$), BMI ($p = 0.029$), and age ($p = 0.033$). Borderline associations were noted for blood pressure ($p = 0.050$), while inverse associations were observed for diabetes ($p = 0.036$) and hyperlipidemia ($p = 0.043$).

These findings collectively suggest that modifiable lifestyle factors such as smoking, diet, sleep, and stress, alongside hereditary predisposition and demographic variables like age and BMI, are significantly associated with cardiovascular disease among young adults. The application of chi-square tests allowed for robust examination of categorical associations, while independent sample t-tests provided insight into differences in continuous variables such as age and BMI. Together, these statistical approaches highlight the multifactorial nature of early-onset CVD and underscore the need for integrated prevention strategies targeting both behavioral and genetic risk factors.

This study highlights the growing burden of early-onset cardiovascular disease (CVD) among individuals under 30 years of age, with nearly half of participants reporting a positive history of CVD. The findings underscore the multifactorial nature of cardiovascular risk in young adults, shaped by both modifiable and non-modifiable determinants. Family history emerged as a strong non-modifiable predictor, while lifestyle factors such as smoking (including passive exposure), poor dietary habits, inadequate sleep, and elevated stress levels were significantly associated with CVD prevalence. Interestingly, inverse associations were observed with BMI, diabetes, and hyperlipidemia, which may reflect post-diagnosis lifestyle changes, reverse causation, or differences in detection and reporting. These results emphasize the complexity of cardiovascular risk assessment in younger populations, where traditional markers may not always align with expected patterns.

The study's findings align with global evidence that unhealthy lifestyle behaviors, particularly tobacco exposure and poor diet quality, are critical drivers of early cardiovascular morbidity. The significant associations with stress and sleep duration further highlight the importance of psychosocial and behavioral factors, which are often overlooked in conventional prevention strategies. The observation that younger individuals within the sample were more likely to report CVD suggests a shifting epidemiological trend toward earlier onset, reinforcing the need

for proactive screening and prevention programs tailored to youth.

From a public health perspective, these results call for urgent interventions that integrate health education, routine risk factor screening, and community-based awareness campaigns. School and university programs promoting balanced diets, physical activity, smoke-free environments, and stress management could play a pivotal role in reducing long-term cardiovascular burden. Clinicians should also be encouraged to consider cardiovascular risk assessments in younger patients, particularly those with family history or exposure to multiple lifestyle risk factors.

Future research should focus on longitudinal studies to establish causal linkages between risk factors and early CVD outcomes, as cross-sectional designs limit temporal interpretation. Larger, multi-center studies across diverse populations would help clarify inverse associations observed with BMI and metabolic risk factors, while qualitative research could explore cultural and behavioral influences on lifestyle practices. Evaluating the effectiveness of targeted interventions in reducing CVD incidence among young adults will be essential to inform evidence-based policy and practice.

Conclusion

The study demonstrates that cardiovascular disease, though traditionally associated with older adults, is emerging as a significant concern among individuals under 30, with lifestyle factors such as smoking, poor diet, inadequate sleep, and stress playing a central role alongside genetic predisposition. The findings highlight the urgent need for early identification and preventive strategies, including health education, routine screening, and behavior modification programs tailored to youth. Addressing these risks proactively from adolescence onward could substantially reduce the long-term burden of CVD and improve overall population health outcomes.

Limitations

- Cross-Sectional Design
- Age-specific data
- Self-Reported Data

- Sample Size
- Lack of Clinical Verification

Recommendations

- Early Health Education Initiative
- Routine Screening and Risk Assessment
- Lifestyle Modification Campaigns
- Mental Health and Stress Management Support
- Parental and Family Involvement
- Policy-Level Interventions
- Awareness regarding passive smoking

Future Directions

- Youth-specific risk stratification models
- Longitudinal and interventional studies
- Integrated public health strategies
- Bridging awareness and behavior

Conflict of Interest

The authors declare no conflict of interest.

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