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A Study On 'Exploring The Rise Of Sudden Heart Attacks Among Different Group Of Patients- A Survey Based Study

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ABSTRACT

Background: - Heart disease is one of the leading causes of death in the globe. Non-fatal myocardial infractions or sudden deaths without any warning indications occur in around 25% of cardiac patients. Thus, silent myocardial infractions (SMI) are another name for silent heart attacks, which might be completely asymptomatic or have symptoms so mild that patients are unable to identify them. Nevertheless, the symptoms might not always be detectable by the ECG. On the other hand, sobbing, chest discomfort, and chilly chills are symptoms of a conventional heart attack. Despite their subtle look, they are equally harmful to the heart and provide significant long-term health risks. A survey-based study was conducted among 1,000 patients with diagnosed heart disease. Patients were divided into four groups based on their symptoms Group 1 (asymptomatic), Group 2 (mild symptoms), Group 3 (moderate symptoms), and Group 4 (severe symptoms). Electrocardiogram (ECG) and echocardiogram tests were performed to detect silent heart attacks. The prevalence of asymptomatic silent heart attacks was significantly higher in Group 1 (23.1%) compared to Group 2 (12.5%), Group 3 (8.3%), and Group 4 (4.2%). Multivariate analysis revealed that age, diabetes, and hypertension were significant predictors of asymptomatic silent heart attacks.We believed that the fundamental processes of SMI involved a reduction or obstruction in the heart's blood flow, up on forming plaques. The following patient groups are subjected here are like Hypertension and hyper lipidaemia, diabetic, elderly,women, and smoking, Increased awareness regularly screening and preventive measures are essential to mitigate the silent threat by these unrecognised heart attacks. This study highlights the importance of regular cardiac

screening for patients with heart disease, regardless of symptoms. Asymptomatic silent heart attacks are more common than expected, and early detection can prevent further cardiac damage.

Keywords: SMI – Silent Myocardial Infraction, HTN – Hypertension, SOB – shortness of breath, CVD – cardiovascular diseases, DM- Diabetes mellitus, CAD – coronary artery disease.

INTRODUCTION

Silent myocardial infractions (SMIs) are sometimes known as silent heart attacks. It is an important, little-known condition that presents a major challenge to the treatment of CVD. About 25% of coronary patients experience abrupt death (non-fatal myocardial infarction) without any warning signs [1]. Because these symptoms can be so mild, the patient might not even be aware of them. The lack of symptoms might result in delays in diagnosis and treatment, as well as other implications such as cardiac arrhythmias, which can induce cardiac arrest, even if the ECG may not always detect its signs.

Therefore, it is difficult to identify the specific cases of decreased MI perception in some patients, however, there may be impairments in cardiac receptor stimulation, impulse onset or conduction, or cerebral discomfort[2]. Information gathered from the aforementioned studies that track individuals from general populations who have a history of CVD, CAD risk, or HTN and have been assessed with the appropriate treatments.

Thus, this study investigates the whole prevalence, risk factors, and consequences of silent heart attacks in various patient populations. The coronary arteries branch off the aorta and supply oxygen-rich blood to the heart muscle (myocardium). The left coronary artery divides into 2 main branches: the left anterior descending and circumflex arteries. The left anterior descending artery supplies blood to the left ventricle's anterior wall and portions of the septum. The left circumflex artery provides blood to the left ventricle's lateral wall. The right coronary artery supplies the right atrium and ventricle and the left ventricle's inferior wall.

These coronary arteries provide oxygen and nutrients required to the heart's function by forming an arterial connection across the myocardium. Some disorders that affect blood flow across these arteries, such as CAD or atherosclerosis, may cause abnormalities in regional wall motion. The myocardium is specialized muscle tissue that causes the heart to contract and rest. Effective systemic circulation is ensured by a well-coordinated myocardial contraction[3].

Regional movement of the walls impairment observed on diagnostic methods like echocardiography may suggest dysfunction or damage to specific heart areas. By the blockage of coronary artieries that induce inadequate blood flow may be the origin of this dysfunction, which can lead to conditions like myocardial infarction or ischemic heart disease.

The sinoatrial node is the source of the heart's electrical physiology. Impulses from this node go to the atria and cause atrial depolarization, which is shown by the P wave on the ECG. The QRS complex on

the ECG represents ventricular depolarization, which results from the impulse passing through the bundle of His and Purkinje fibers following a brief delay at the atrioventricular node. and then ventricular repolarization, which is shown by the T wave on the ECG. [4]

Silent heart attacks are particularly tricky since they are typically identified after the event, during imaging tests, routine check-ups, or screenings for other ailments. SHAs are not benign events, despite the fact that they do not exhibit any overt symptoms. Like symptomatic heart attacks, they entail the same risks of mortality, heart failure, and future cardiovascular events. Lack of symptoms frequently leads to a delay in seeking medical attention, increasing the chance of long-term issues. Thus, SHAs are a quiet but powerful public health danger, underscoring the critical need for increased awareness, early identification, and focused preventative measures.

While overt heart attacks are generally marked by dramatic and identifiable symptoms such as chest discomfort, shortness of breath, and sweating, the silent heart attack (SHA) is a lesser-known but equally frightening event. Due to their lack of obvious symptoms, silent heart attacks usually go undetected, which delays diagnosis and treatment. Silent heart attacks are a significant source of worry in modern cardiovascular care because of their clinical uncertainty.

Silent myocardial ischemia is primarily caused by coronary artery blockage, which prevents sufficient blood supply to the myocardium while presenting no symptoms. When assessing and choosing treatment plans for individuals with silent myocardial ischemia, it is essential to comprehend the complex interaction between the heart's and coronary arteries' structure and myocardial function.

Almost Cardiovascular diseases (CVDs) accounts for 31% of global mortality, with sudden heart attacks as a major contribution. These major occurrences are unexpected, making them extremely frightening. Despite advancement in medical research, the unpredictable nature of heart attacks remains a major concern.[5]

This study looks at demographic, behavioral, and genetic variables affect the risk of sudden heart attacks in different groups. It investigates about the interactions of lifestyle choices, pre-existing

medical illnesses, healthcare access, and genetic predispositions.

This research makes to improve preventative methods and lessen the worldwide incidence of sudden heart attacks by better understanding these variables.

Causes:-

1. Lifestyle Factors

A. Smoking

1. **Vascular Damage**
    - Chemicals in cigarette smoke, such as nicotine and carbon monoxide, damage the **endothelium**, making arteries more prone to plaque buildup.
    - Smoking also promotes **arterial stiffness**, which worsens blood pressure and increases cardiovascular risk.
2. **Clot Formation**
    - Smoking increases **platelet aggregation**, making the blood more likely to form clots.
    - It also reduces the activity of enzymes that break down clots, leading to prolonged blockages in blood vessels.
3. **Oxygen Deprivation**
    - Carbon monoxide in cigarette smoke binds to **hemoglobin** in the blood, reducing its ability to carry oxygen.
    - This deprives the heart of the oxygen it needs, increasing the likelihood of ischemia during a heart attack.

B. Metabolic Syndrome

1. Central Obesity: Visceral fat around the belly is metabolically active and produces pro-inflammatory cytokines like TNF-α. These cytokines help to promote resistance to insulin and endothelial dysfunction.

2. **Hypertension and dyslipidemia**:- High blood pressure, high triglyceride levels, and low HDL cholesterol all contribute to atherosclerosis and silent myocardial infarction.

3. Insulin Resistance: Elevated blood sugar levels and increased vascular inflammation can accelerate the course of CAD.

2. Lifestyle Factors.

A. Smoking.

1. Cigarette smoke contains chemicals like nicotine and carbon monoxide that harm the endothelium, increasing the risk of plaque development in the arteries. Tobacco use also causes arterial stiffness, which raises blood pressure and increases cardiovascular risk.

2. Smoking enhances the aggregate of platelets, leading to an increased risk of blood clot formation. It also decreases the action of enzymes that break down clots, resulting in extended blockages in blood arteries.

B. Physical Inactivity.

1. Sedentary Lifestyle – Prolonged inactivity is connected to obesity, which raises the risk of metabolic syndrome and coronary artery disease. People who sit for hours on end without moving about have higher levels of inflammatory indicators such as CRP.

2. **Poor Heart Conditioning**: Frequent exercise helps the heart pump blood more effectively, which lessens the burden on the heart. Exercise deficiency weakens the heart muscle, increasing its vulnerability to ischemia and stress.

C. Poor diet.

1. Unhealthy Fats- Consuming saturated fats (e.g., fatty meats, butter) and trans fats (e.g., processed snacks) increases LDL cholesterol levels and promotes plaque formation.

2. High sugar and salt intake can lead to insulin resistance and obesity, both of which are risk factors for silent myocardial infarctions. Water retention brought on by salt puts stress on the cardiovascular system, raising blood pressure.

3. Nutritional Deficiencies: The body is deprived of anti-inflammatory and antioxidant substances such as vitamins A, C, and E when diets are poor in fruits, vegetables, and whole grains. These deficits lead to more oxidative stress and harm to blood vessels

Additional Risk Factors

• Chronic Stress: Extended stress causes increases in both adrenaline and cortisol, which decrease endothelial function and elevate blood pressure.

•Excess Alcohol Consumption: Moderate alcohol consumption may have beneficial advantages, but excessive consumption elevates blood pressure and lipid levels.

•Genetic Predisposition: Having a family history of heart disease raises the chance of silent myocardial infarction.

To lower the risk of silent myocardial infarction, it is essential to address these variables by changes in lifestyle (such as stopping smoking, exercising often, and adopting a healthy diet) and medical care (such as managing diabetes, hypertension, and hyperlipidemia).

3. Genetic and demographic factors

A. Age - As people age, their chance of having a myocardial infarction increases owing to cumulative damage to blood arteries and the heart.

B. Gender-Men are more likely than women to have myocardial infarctions, however, postmenopausal women are also at an increased risk due to diminishing estrogen levels. Women may have unusual symptoms, making SMIs more difficult to identify.

C. Family History: The risk of silent myocardial infarctions is increased in families with a high history of coronary artery disease.

4. Psychological and environmental variables.

A. Stress: Long-term stress raises cortisol and other stress hormone levels, which can raise blood pressure and cause plaque instability.

B. Depression- Depression has been linked to worse cardiovascular health, lower adherence to healthy behaviors, and increased inflammatory reactions.

High-Risk Groups:

1. Diabetics:-Due to neuropathy and endothelial dysfunction, diabetics often experience SMIs. Regular ECGs and biomarker tests are recommended.

2. Hypertensive Patients:-Routine imaging studies (e.g., echocardiography, CTA) can detect structural changes or coronary artery disease.

3. Family History of Cardiovascular Disease:-Those with a strong genetic predisposition to heart disease may undergo periodic nuclear imaging or stress testing to identify ischemia early.

4. Other At-Risk Individuals:-Smokers, sedentary individuals, and those with metabolic syndrome are also candidates for routine screening.

Treatment of Silent Myocardial Infarction (SMI):

Inorder to treat Silent Myocardial Infarction (SMI), the first step is to minimize myocardial damage, restore blood flow, and stabilize the patient's condition. The treatment options that are included are

1. Antiplatelet Therapy includes- Aspirin that inhibits cyclooxygenase-1 (COX-1) and prevents the formation of thromboxane A2, a molecule that promotes platelet aggregation. This reduces platelet aggregation.

b) P2Y12 Inhibitors (e.g., Clopidogrel, Ticagrelor):- preferred along with spirin as dual antiplatelet therapy (DAPT). These drugs block the P2Y12 receptor on platelets, further reducing platelet activation and aggregation.

2. Statins:- Statins basically lowers low-density lipoprotein (LDL) cholesterol, reducing the progression of atherosclerotic plaques. They also stabilize plaques, reducing the risk of rupture and further infarctions.

Examples include atorvastatin and rosuvastatin.

3. Beta-Blockers: -These drugs reduce myocardial oxygen demand by lowering heart rate and blood pressure. Beta-blockers also help prevent arrhythmias and provide cardioprotective effects.

Examples: Metoprolol, carvedilol**.**

4. ACE Inhibitors or ARBs:-Angiotensin-converting enzyme (ACE) inhibitors (e.g., ramipril) and angiotensin receptor blockers (ARBs, e.g., losartan) that improve blood pressure control and reduce afterload.They also help in preventing adverse cardiac remodeling, a process where the heart's structure and function deteriorate after a myocardial infarction.

5. Nitroglycerin:- Nitroglycerin is a vasodilator that helps relieve ischemic symptoms, such as chest tightness, by improving coronary blood flow. It works by releasing nitric oxide, which relaxes vascular smooth muscle.

METHODOLOGY

Thepresent study follows a **prospective cross-sectional** design and was conducted in the **Cardiology Department of Government General Hospital, Chittoor, Andhra Pradesh, India**. A cross-sectional survey-based approach was chosen to assess the health status, risk factors, and clinical characteristics of heart patients at a specific point in time. This design is advantageous in identifying prevalent health conditions and associated risk factors within a given population.

Study Setting:-

The research was carried out at **Government General Hospital, Chittoor**, which serves as a major healthcare center in the region, catering to a diverse group of cardiac patients. The hospital provides both outpatient and inpatient services, making it an ideal location for conducting a study on heart disease prevalence and associated risk factors.

Inclusion Criteria:

- Patients meeting diagnostic criteria for Asymptomatic heart attacks as per ICD-10 (International Classification of Diseases)
- Patients who have a long duration of illness ≥ 7 months.
- Age above 25years and below 70 years.

- Patients who are willing to participate in the study

Exclusion Criteria:

- Presence of serious physical illness such as psychosis, etc., at early age groups.
- Age groups of below 25 years and above 70 years.
- Patients who are not willing to participate in the study.

Source of data: -

Surveys were distributed through offline questionnaire format and multiple channelsincluding online platforms, telephone interviews, and in-person visits to ensure maximum reach and inclusivity. Community health centers and local organizations assisted in recruiting participants from underrepresented area.

Instruments like

- Patient data collection proforma.
- Survey based Questionarre
- Quality of life scale (QOL-5D)

Method of study: -

The study was begun with the selection of the subjects based on inclusion criteria and exclusion criteria followed by collection of required parameters of the patients using a self-prepared structural patient data collection proforma which includes patient demographic details, past medical history, chief complaints, past medication history, personal habits, family history, diagnosis.Patients were divided into four groups based on their symptoms: Group 1 (asymptomatic), Group 2 (mild symptoms), Group 3 (moderate symptoms), and

Group 4 (severe symptoms). Electrocardiogram (ECG) and echocardiogram tests were performed to detect silent heart attacks.

Data Analysis:

Data were processed using advanced statistical software. Descriptive statistics summarized participant characteristics, while inferential tests like Chi-square and logistic regression identified significant associations between variables. Multivariate analysis was conducted to control for confounding factors.

RESULTS

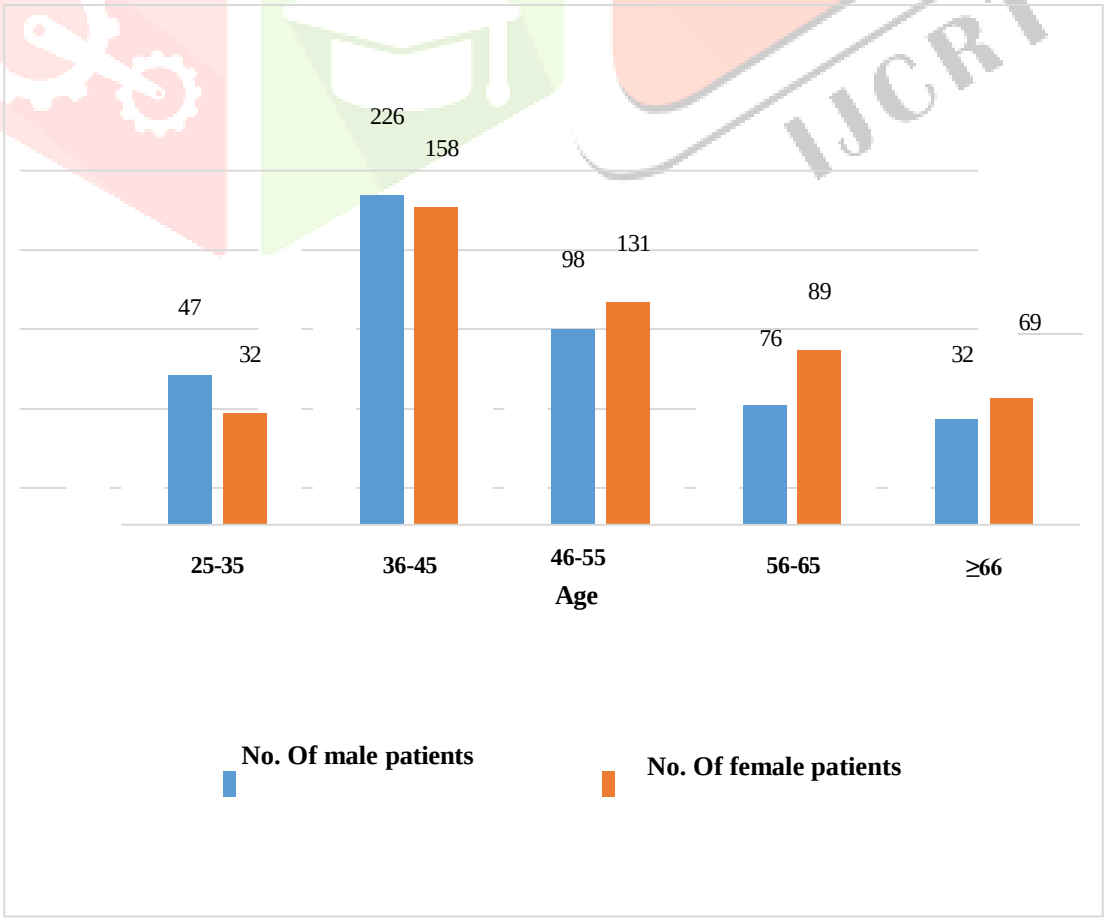
Table 1 shows the distribution of total study subjects based on gender

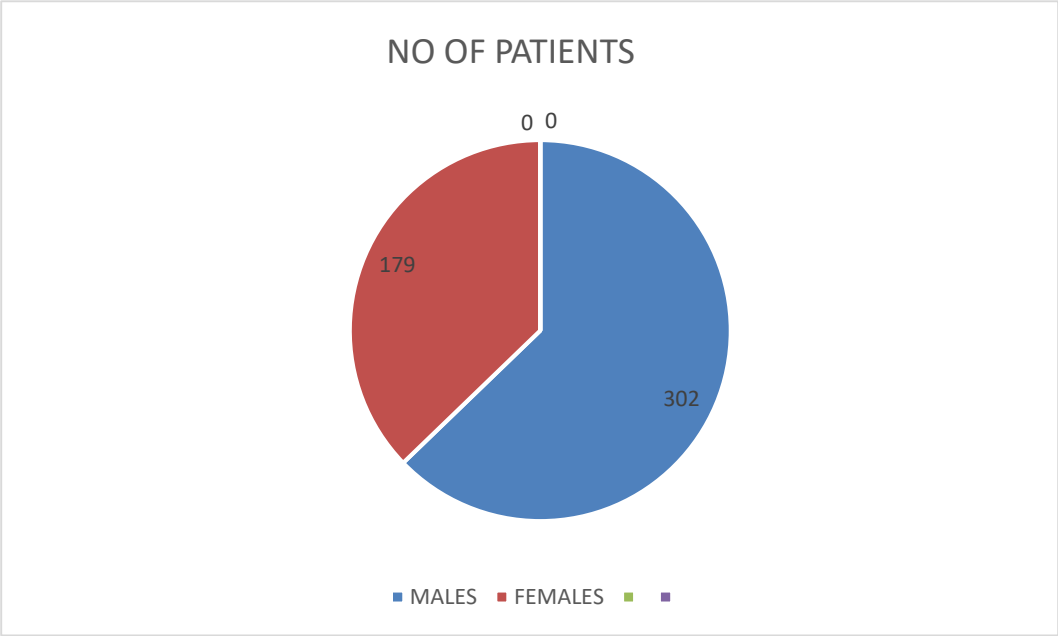
Distributionof total studysubjectsbasedongender

Gender	Total no of patientsn (n%)
Male	302 (63%)
Female	177 (36%)
Total	479

A total of 479 patients were presented to the cardiac in-patient ward, among them males were 302 (63%)and females 177 (36%). We found that male patients were more when compared to the female patients. In this study we come to know that cardiac male patients (63%) were more than depressive male patients (36%).

Graphical representation on Distribution of Patients age based on the disease:





In age wise distribution of subjects, major age group involved was 36-45 years followed by 46-55 age group next followed by 56-65, followed by 25-35 and followed by finally > 66 years.

Comparison of Socio-economics tatus among the Cardiac patients:

Socio-economic status	Total no.of patients		P-value
	No of cardiac patients with symptoms n(n%)	No. of Cardiac patients with out symptoms n(n%)	
Poorclass	106 (22.1%)	89(18.5%)	0.021
Lower-middle class	235 (49.6%)	269(56.1%)	
Upper-middle class	89(18.5%)	82(17.11%)	
High class	49 (10.2%)	39(8.14%)	
Total	479 (100%)		

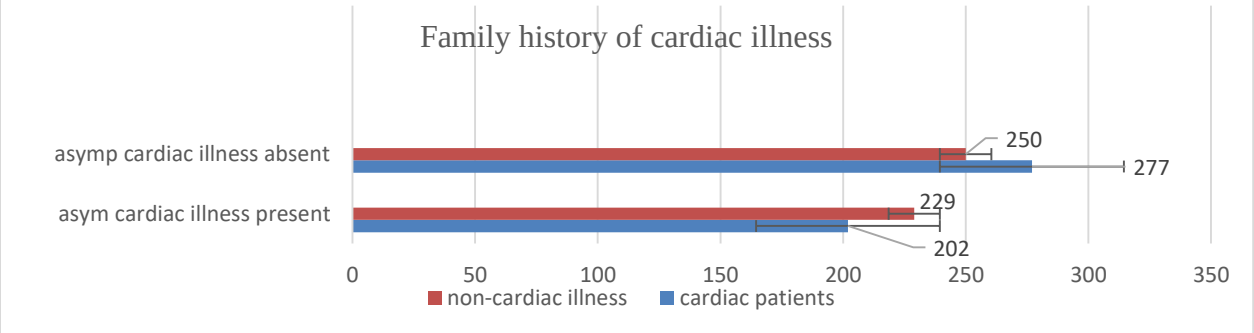
P value=0.021 (p value<0.05 means statistically significant, p value>0.05 means not statistically significant.

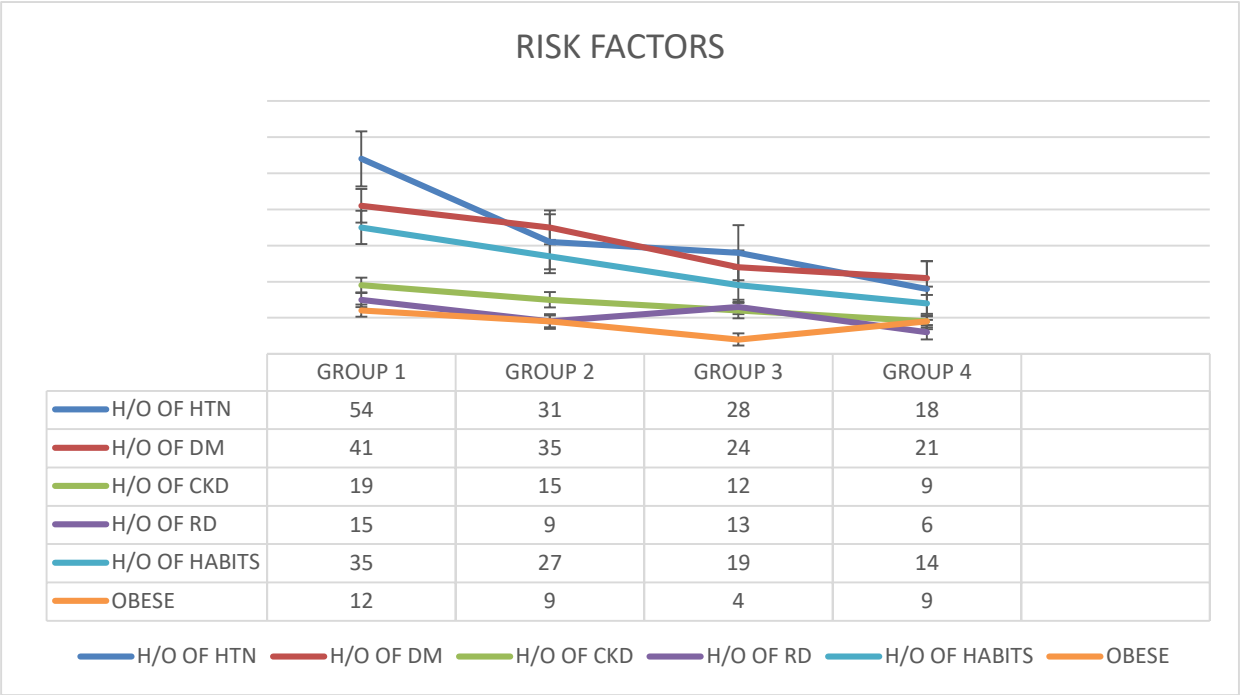
In this study, most of the patients were Lower middle class 235 (49.6%), followed by upper middle class 89(18.5%), followed by poor class 106 (22.1%) and high class 49 (10.2%) in the cardiac group. And similarly in non-cardiac group lower middle class were 269(56.1%) followed by upper middle class 82(17.11%) followed by high class 39(8.14%) and poor class were 89(18.5%) . We found that statistical difference ($p<0.02$) between the socio-economic status of cardiac groups.

Tableno 2 ComparisonoffamilyhistorybetweenCardiac patients

Family History	Total no. of patients	
	Cardiac patients n (n%)	Non cardiac patient n (n%)
Family history of Asymptomatic cardiac illness present	202(42.1%)	229(47.8%)
Family history of Asymptomatic cardiac illness Absent	277(57.8%)	250(52.1%)
Total	479(100%)	

In this study, family history of cardiac illness was present in 202 (42.1%) members and remaining 277(57.8%) members have absence of family history in cardiac group. similarly, family history of Asymptomatic cardiac illness was present in229(47.8%) patients followed by absenceoffamilyhistorywere250(52.1%) in non cardiac patients. In this study family history of cardiac illness were more in absent cases of both cardiac and non cardiac patients.





HTN	131
DM	121
CKD	55
RD	43
S/A	95
OB	34

Table 3 denotes about overall Risk factors observed in cardiac patients

Variables	G-1 (Asy)	G-2 (mil.symptoms)	G-3 Mod. symptoms	G-4 (severe symptoms).	P-Value
H/o of substance abuse	36 (32.7%)	17(28.4%)	13(33%)	5(24.8%)	
H/o of stress & Anxiety	27(24.5%)	25(41.8%)	14(35.2%)	6(29.8%)	**0.015**
H/o of medical co-morbidties(HTN, DM, CKD, RTI)	48(43.6%)	17(28.4%)	12(30.2%)	9(44.1%)	
Sub total	110	59.8	39.7	20.1	
TOTAL	**N=479 patients**				

In this study History of Hypertension as a risk factor is more in group-1 followed by group-2, group-3 and group-4. History of Diabetes is also more in group-1 followed by remaining groups. And similarly History of CKD, RD, and Habits were more in group-1 followed by remaining groups. This indicates that Asymptomatic heart attacks were more predominant in all different populations.

Table Comparison of Clinical profile between the cardiac patients

P value=0.015 (p value<0.05 means statistically significant, p value>0.05 means not statistically significant).

In this study, clinical profiles are compared between the cardiac patients for knowing

of their symptoms. The prevalence of asymptomatic silent heart attacks was significantly higher in Group 1 (23.1%) compared to Group 2 (12.5%), Group 3 (8.3%), and Group 4 (4.2%).We found that statistical difference ($p<0.015$) for clinical profiles between schizophrenia and depression patients.

DISCUSSION

The findings of this study highlight the significance of asymptomatic silent heart attacks among patients with heart disease. The prevalence of silent heart attacks was higher in patients with diabetes, hypertension, and hyperlipidemia, which is in similar with previous studies[12].The study also found that age was a significant predictor of silent heart attacks, which may be due to the increased burden of cardiovascular risk factors with advancing age[13]. The findings of this study emphasize the critical role of asymptomatic (silent) heart attacks among patients diagnosed with heart disease. Silent heart attacks, which occur without noticeable symptoms, were found to be highly prevalent in individuals with specific cardiovascular risk factors.

A total of 479 patients were presented to the cardiac in patient ward, among them males were 302 (63%)and females were 177 (36%). we found that male patients were more when compared to the female patients. In this study, we come to know that cardiac male patients (63%) were more than cardiac female patients (36%)and it was in accordance with Zujie Gao describes that males were more predominant than females as per his findings [14].These findings indicate that male patients were more prevalent than female patients in the study population. This trend aligns with previous research, including the findings of which also reported a higher prevalence of heart disease in males compared to females.

These findings align with previous research, including Stevan Ilic et al., which identified middle-aged adults (30-50 years) as being at higher risk for cardiovascular diseases. The increased prevalence of heart disease in middle-aged individuals can be attributed to a combination of lifestyle factors, occupational stress, and metabolic disorders such as hypertension, diabetes, and hyperlipidemia. While older adults are naturally at risk due to age-related cardiovascular changes, the rising incidence in younger populations is a growing concern.[15]Further information on education status, findings shown that Lower middle class 235 (49.6%), followed by upper middle class 89(18.5%), followed by poor class 106 (22.1%) and high class 49 (10.2%) in cardiac group. And similarly in non-cardiac group lower middle class were 269(56.1%) more followed by upper middle class 82(17.11%) followed by high class 39(8.14%) and poor class were 89(18.5%).

This study demonstrates a statistically significant relationship ($p < 0.02$) between socioeconomic status and the prevalence of heart disease. The findings highlight that lower middle-class and poor individuals are disproportionately affected, likely due to limited healthcare access, poor diet, and

higher stress levels. To reduce the burden of cardiovascular disease, healthcare policies must focus on socioeconomic disparities, ensuring that preventive care and treatment options are accessible to all economic groups.

In this study History of Hypertension as a risk factor is more in group-1 followed by group-2, group-3 and group-4. History of Diabetes is also more in group-1 followed by remaining groups. And similarly History of CKD, RD, and Habits were more in group-1 followed by remaining groups. This indicates that Asymptomatic heart attacks were more predominant in all different populations. [17]. This study reinforces the fact that asymptomatic heart attacks are significantly associated with major cardiovascular risk factors, particularly hypertension, diabetes, CKD, respiratory diseases, and unhealthy habits. The highest prevalence was observed in Group-1, indicating that individuals with multiple comorbidities are at the greatest risk.

Since silent myocardial infarctions often go unnoticed and can lead to severe complications or sudden cardiac death, early identification of high-risk individuals through screening, lifestyle changes, and medical intervention is crucial. Healthcare policies should prioritize preventive measures and awareness programs to mitigate the impact of silent heart disease in vulnerable populations.

This study provides crucial insights into the influence of family history on heart disease development. The findings show that while a significant proportion (42.1%) of cardiac patients had a family history of heart disease, the majority (57.8%) did not. This indicates that genetic predisposition alone is not the sole determinant of cardiovascular disease. Instead, lifestyle and environmental factors play a dominant role in heart disease onset.

Similarly, 47.8% of non-cardiac patients had a family history of asymptomatic heart disease, suggesting that silent cardiovascular conditions may go undiagnosed within families. This emphasizes the importance of early screening and proactive health monitoring, even among individuals without apparent symptoms.

Cardiac patients in accordance with Hikita H, EtsudaH.[19]. This study highlights the significant prevalence of asymptomatic (silent) heart attacks among cardiac patients, with Group 1 (23.1%) experiencing the highest occurrence.

The prevalence of silent heart attacks was notably lower in Group 2 (12.5%), Group 3 (8.3%), and Group 4 (4.2%), showing a statistically significant difference ($p<0.015$) between groups. These findings align with previous research by Hikita H and Etsuda H, further supporting the correlation between psychosocial stress, substance use, and underlying medical conditions with the occurrence of silent myocardial infarctions.

The diagnostic modalities used in this study, including Base line-ECG, echocardiogram, were effective in detecting silent heart attacks. However, the study highlights the need for regular cardiac screening in high-risk populations to detect silent heart attacks early.

The treatment of silent heart attacks typically involves a combination of lifestyle modifications and medications. The study found that patients who received early treatment had better outcomes than those who did not receive treatment until symptoms appeared.

Conclusion

Silent myocardial infarction is a concealed and deadly kind of heart illness that disproportionately affects women, diabetics, the elderly, hypertensives, and those with hyperlipidemia. SMIs frequently have worse outcomes than symptomatic heart attacks, despite the fact that they produce no symptoms. They also pose a major long-term health danger. The study looks at the overall prevalence, risk factors, and outcomes of silent heart attacks.
Routine screenings, especially for high-risk persons, are critical for improving outcomes, as is encouraging proactive cardiac care via lifestyle changes, medication adherence, and regular follow-up visits. Early identification and quick care can greatly minimize complications and increase survival rates in those suffering from silent myocardial infarctions.

REFERENCES

1. Myerburg RJ, Kessler KM, Castellanos A. Sudden cardiac death: epidemiology, transient risk, and intervention assessment. Ann Intern Med. 1993 Dec 15;119(12):1187-97.
2. Aronow WS. Silent MI. Prevalence and prognosis in older patients diagnosed by routine electrocardiograms. Geriatrics. 2003 Jan;58(1):24-6, 36-8, 40.
3. Nakamura S, Uzu T, Inenaga T, Kimura G. Prediction of coronary artery disease and cardiac events using electrocardiographic changes during hemodialysis. Am J Kidney Dis. 2000 Sep;36(3):592-9.
4. Davey JA, Barrett EJ Silent MI. Prevalence and prognosis in older patients diagnosed by routine electrocardiograms. Geriatrics. 2003 Jan;58(1):24-6, 36-8, 40.

5. Deanfield JE, Shea M, Ribiero P, de Landseer CM, Wilson RA, Horlock P, Selwyn AP. Transient ST-segment depression as a marker of myocardial ischemia during daily life. Am J Cardiol. 1984 Dec 1;54(10):1195-200.
6. Gottlieb SO, Weisfeldt ML, Ouyang P, Mellits ED, Gerstenblith G. Silent ischemia as a marker for early unfavorable outcomes in patients with unstable angina. N Engl J Med. 1986 May 08;314(19):1214-9.
7. Deedwania PC, Carbajal EV. Prevalence and patterns of silent myocardial ischemia during daily life in stable angina patients receiving conventional antianginal drug therapy. Am J Cardiol. 1990 May 01;65(16):1090-6.
8. Sharaf BL, Williams DO, Miele NJ, McMahon RP, Stone PH, Bjerregaard P, Davies R, Goldberg AD, Parks M, Pepine CJ, Sopko G, Conti CR. A detailed angiographic analysis of patients with ambulatory
9. Huffman MD, Berry JD, Ning H, Dyer AR, Garside DB, Cai X, Daviglus ML, Lloyd-Jones DM. Lifetime risk for heart failure among white and black Americans: cardiovascular lifetime risk pooling project. J Am Coll Cardiol. 2013 Apr 9;61(14):1510-7.
10. Gottlieb SO, Weisfeldt ML, Ouyang P, Mellits ED, Gerstenblith G. Silent ischemia as a marker for early unfavorable outcomes in patients with unstable angina. N Engl J Med. 1986 May 08;314(19):1214-9.
11. Aziz F. Coronary artery disease in women: an unsolved dilemma. J Clin Med Res. 2014 Apr;6(2):86-90.
12. Anderson KL, Shah NA, Gallegos M, Chiang IH. Asymptomatic ST elevation myocardial infarction. Heart Lung. 2018 Jul-Aug;47(4):363-365.
13. Silent myocardial ischemia ; diagnosis , treatment and prognosis, consultant 360.2011(cited 2023 oct 31)
14. Njølstad I, Arnesen E. Preinfarction blood pressure and smoking are determinants for a fatal outcome of myocardial infarction: a prospective analysis from the Finnmark Study. Arch Intern Med. 1998 Jun 22;158(12):1326-32.

15. Wackers FJ, Young LH, Inzucchi SE, Chyun DA, Davey JA, Barrett EJ, Taillefer R, Wittlin SD, Heller GV. Detection of Ischemia in Asymptomatic Diabetics Investigators. Detection of silent myocardial ischemia in asymptomatic diabetic subjects: the DIAD study. Diabetes Care. 2004 Aug;27(8):1954-61.

16. Fleg JL, Gerstenblith G, Zonderman AB, Becker LC, Weisfeldt ML, Costa PT Jr, prevalence and prognostic significance of exercise induced silent myocardial ischekia.1990;81(2) ;428-436

17. S., Deljanin-Ilić, M. Ž., Petrović, D., Tasic, I., Đorđević, D., & Ilic, B. (2004). Silent myocardial ischemia in asymptomatic patients with multiple coronary risk factors. 11(3), 107–112. http://facta.junis.ni.ac.rs/mab/mab200403/mab200403-01.pdf

18. Wenger NK. Women and coronary heart disease: a century after Herrick: understudied, underdiagnosed, and undertreated. Circulation. 2012 Jul 31;126(5):604-11.

19. Hikita H, Etsuda H, Takase B, Satomura K, Kurita A, Nakamura H. Extent of ischemic stimulus and plasma beta-endorphin levels in silent myocardial ischemia. Am Heart J. 1998 May;135(5 Pt 1):813-8

20. Mazzone A, Cusa C, Mazzucchelli I, Vezzoli M, Ottini E, Pacifici R, Zuccaro P, Falcone C. Increased production of inflammatory cytokines in patients with silent myocardial ischemia. J Am Coll Cardiol. 2001 Dec;38(7):1895-901.