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Original Research Article

Myocardial infarction as a cause of sudden death in healthy young adults- A post mortem study

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ABSTRACT

Background: Sudden cardiac death (SCD) is death due to cardiovascular cause that occurs within 24 hours of onset of symptoms. Incidence of sudden cardiac death (SCD) has been steadily rising all over the world particularly in the urban population during last few decades.
Materials and Methods: The present study is a retrospective hospital-based study carried for a period of one year from August 2022 to July 2023 in the Department of Pathology, Gauhati Medical College and hospital.
Results: The age group affected with sudden death is 24-46 years with mean age group being 35±11 years. The Male:Female ratio of sudden death is 3.6:1 Out of 48 cases, 12 were histologically confirmed as myocardial infarction due to coronary insufficiency.
Conclusions: Autopsy investigation combined with genetic testing and family screening has a higher likelihood of identifying a possible cause of death among children and young adults who suffer a sudden cardiac death.

1. Introduction

The world health organization defines sudden cardiac death as any death due to cardiovascular cause that occurs within 24 hours of onset of symptoms.[1,2] The last few decades has seen a gradual rise in the number of sudden cardiac deaths all over the world, more so, in the urban areas.[3,4] Various post-mortem studies have established that myocardial infarction due to coronary artery disease (CAD) is the most common cause of sudden death.[5] Other causes include cardiomyopathies of various types. Sudden cardiac death among adolescent and young adult is a catastrophic event for the family as well as for the community in a broader perspective. But in one third of cases, even after rigorous post mortem examination and investigations including toxicology and histology; a cause cannot be found with certainty.[6–9] In this study we have evaluated the autopsy cases of sudden cardiac deaths received in the department of Pathology, Gauhati Medical college and hospital for a period of one year from August 2022 to July 2023.

2. Aims and Objectives

To study the cases of sudden death in apparently healthy young individuals and to assess the presence of histopathological evidence of Myocardial infarction if present.

3. Materials and Methods

The present study is a retrospective hospital-based study carried for a period of one year from August 2022 to July 2023 in the Department of Pathology, Gauhati Medical College and hospital. After the completion of police/

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magistrate inquest and conduction of Autopsy, specimen of heart along with great vessel was sent to department of Pathology for histopathological examination in 10% neutral buffer formalin. The cause of death was inferred on the basis of hospital records, circumstantial and police reports, gross examination and histopathological examination of the specimen. After receipt of the specimen along with the requisition form having proper medical history, grossing of the heart was done and representative sections from each chamber, wall, septum, great vessels, coronaries were processed for HPE examination. The sections were stained with hematoxylin and eosin and viewed under the microscope.

3.1. Inclusion criteria

1. Young adults having history of sudden death
2. Both gender

3.2. Exclusion criteria

All patients who died suffering prolonged known cause of cardiovascular diseases

4. Results

A total of 48 cases of sudden death were encountered in one year. The age group affected with sudden death is 24-46 years with mean age group being 35±11 years. The Male: Female ratio of sudden death is 3.6:1. Out of 48 cases, 12 were histologically confirmed as myocardial infarction due to coronary insufficiency. Among 36 cases 3 were of myocarditis, 16 cases were that of cardiomyopathy and 17 cases did not have any significant histopathological findings.

Table 1:

Age group	Male	Female
1. 26-30 years	15	3
2. 31-35 years	12	3
3. 36-40 years	6	0
4. 41-45 years	6	3
Total	39	9

Table 2: Age and sex distribution in cases of myocardial infarction

Age group	Male	Female
1. 26-30 years	3	3
2. 31-35 years	3	0
3. 36-40 years	0	0
4. 41-45 years	3	0
Total	9	3

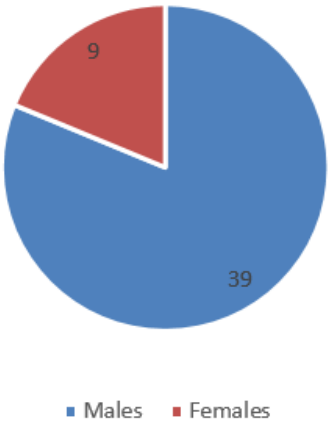

Figure 1: Proportion of males and females having sudden death

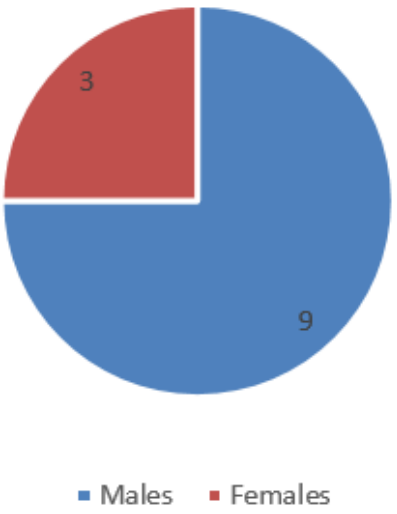

Figure 2: Proportion of male and females having myocardial infarction

4.1. Case photographs

5. Discussion

Myocardial infarction is caused by reduced blood flow in the coronary arteries due to atherosclerosis and occlusion of an artery by an embolus or thrombus. MI is the irreversible damage of myocardial tissue caused by prolonged hypoxia or ischemia. Long term studies have shown that the incidence of myocardial infarction as a cause of sudden death is more than a decade old in communities all over the world.[10,11] However, this incidence have been rising in young adults recently due to the detrimental lifestyle such as consumption of prepackaged fast foods and lack of physical activity. In our study the most common age group affected

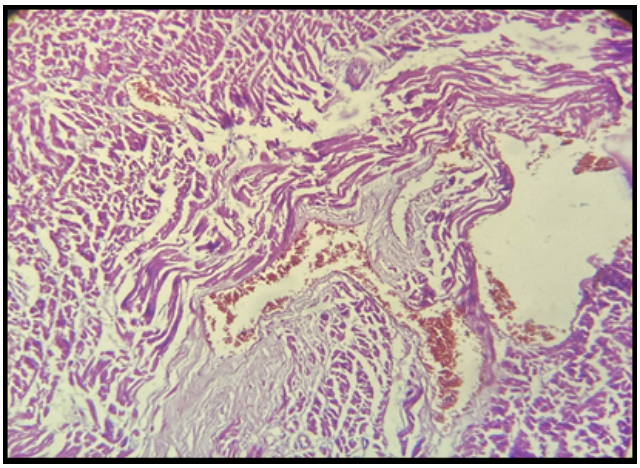

Figure 3: Early myocardial infarction showing waviness of myocardial fibres (4x, H & E stain)

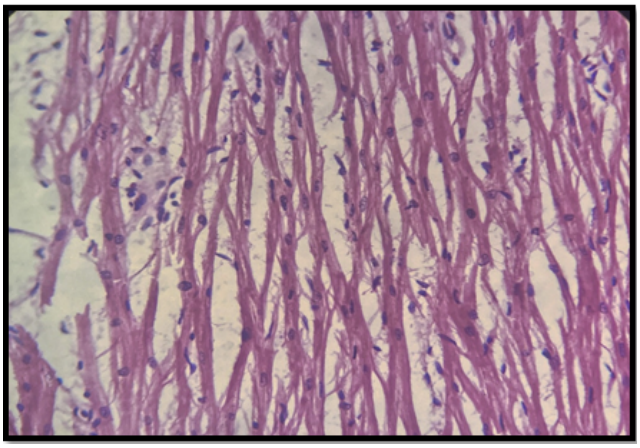

Figure 4: Early myocardial infarction showing inflammatory infiltrate in between the fibre (10x, H&E stain)

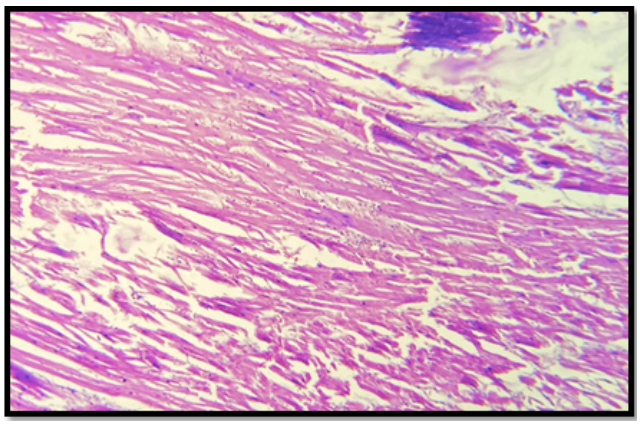

Figure 5: Myocardial infarction showing chronic inflammatory infiltrate in the myocardial fibres(10x, H&E stain)

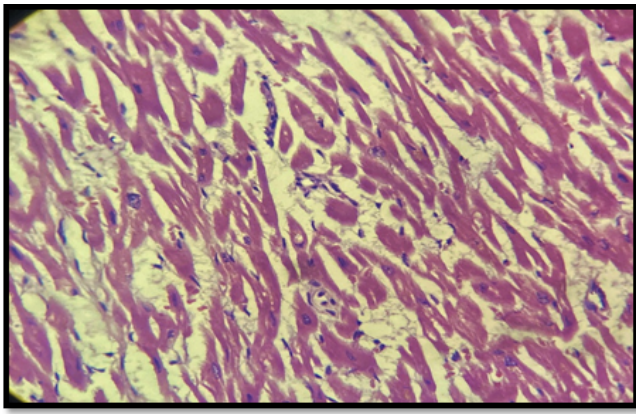

Figure 6: Coagulative necrosis and inflammation in case of myocardial infarction (40x, H&E stain)

with cardiac related sudden death is 35±11 years which is similar to other study conducted by Rao D, Sood D, Pathak P, Dongre SD.[12]

Males suffer from cardiovascular disease more commonly than females which is why the incidence of MI is also common in males. The reason behind is the fact that women are somewhat protected by estrogen and progesterone until they pass menopause.

To establish the cause of sudden death, gathering information about the deceased is primary facet of the initial investigation. The investigation should include a premorbid medical history, past family history, recent pharmacological therapies, previous ECGs, echocardiography etc. It is also important to investigate the circumstances of sudden death such as the level of physical activity at the time of death, and symptoms immediately preceding the death. This can be obtained from police reports or paramedical staff of the ambulance.

Preferably, a full postmortem examination by a trained cardiac pathologist should be undertaken in all cases of sudden death in the young.[13–15] This includes detailed gross and histological evaluation of the heart, as well as other key organs such as the brain to rule out the non-cardiac causes, such as e.g. pulmonary embolism before designating a definitive cardiac cause. According to HRS/EHRA guidelines[14] obtaining a postmortem blood sample in cases of sudden death is mandatory in few countries such as Australia and New Zealand.[15] The availability of the postmortem blood samples furnishes a possibility to carry out genetic studies and elevated cardiac biomarkers.

The use of standardized questions for police and other authorities have been established in some countries which may provide precise premorbid details[15] in cases of sudden cardiac death. Few recent studies suggest that postmortem examinations may reveal some non-specific changes of uncertain clinical significance, e.g cardiomegaly

or histopathological changes. Regardless of the efforts, the cause of SCD in a young individual sometimes remain unclear.

The diagnosis, management, and ongoing care of families in which Sudden Cardiac Death has occurred in a young relative are amongst the most challenging scenarios in medicine. Since the death is sudden, it is always unexpected, and typically occurs in an apparently healthy person.

The limitation of this study is that the data represented in this article however, does not represent a particular region and community as it is a single centric data and not multicentric study. Also, genetic testing could not be performed due to resource restricted hospital setting.

6. Conclusion

Sudden cardiac death in young adults is rare but catastrophic outcome of cardiovascular diseases and its incidence is rising slowly. Myocardial infarction due to coronary insufficiency is one of the important causes of sudden death. The sedentary lifestyle and food habits among youth is one of the primary contributing factors for SCD apart from certain genetic disorders. Detailed premorbid history and postmortem examination is essential. The chief goal is to prevent adverse clinical outcome in surviving relatives of the deceased. Therefore, genetic and newer imaging techniques should be implemented for a better outcome in patients at risk. Thus, to conclude autopsy investigation combined with genetic testing and family screening has a higher probability of identifying a possible cause of death among children and young adults who suffer a sudden cardiac death.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Reddy KS. Cardiovascular disease in non-Western countries. *N Engl J Med*. 2004;350:2438–510.
2. Pouleur AC, Barkoudah E, Uno H. Pathogenesis of sudden unexpected death in a clinical trial of patients with myocardial infarction and left ventricular dysfunction, heart failure, or both clinical perspective. *Circulation*. 2010;122(6):597–602.
3. Goldberger JJ, Basu A, Boineau R. Risk stratification for sudden cardiac death a plan for the future. *Circulation*. 2014;129(4):516–542.
4. Harmon KG, Asif IM, Klossner D, Drezner JA. Incidence of sudden cardiac death in national collegiate athletic association athletes. *Circulation*. 2011;123(15):1594–600.
5. Hurt RD, Weston SA, Ebbert JO. Myocardial infarction and sudden cardiac death in olmsted county, minnesota, before and after smoke-free workplace lawsmi and cardiac death with smoke-free workplace law. *Arch Intern Med*. 2012;172(21):1635–76.
6. Doolan A, Langlois N, Semsarian C. Causes of sudden cardiac death in young Australians. *Med J Aust*. 2004;180:110–2.
7. Winkel BG, Holst AG, Theilade J. Nationwide study of sudden cardiac death in persons aged 1-35 years. *Eur Heart J*. 2011;32:983–990.
8. Corrado D, Basso C, Thiene G. Sudden cardiac death in young people with apparently normal heart. *Cardiovasc Res*. 2001;50:399–408.
9. De Noronha S, Sharma S, Papadakis M, Desai S, Whyte G, Sheppard MN, et al. Aetiology of sudden cardiac death in athletes in the United Kingdom: a pathological study. *Heart*. 2009;95:1409–14.
10. Group MPR. Risk stratification and survival after myocardial infarction. *N Engl J Med*. 1983;309(6):331–6.
11. Mukharji J, Rude RE, Poole WK. Risk factors for sudden death after acute myocardial infarction: two-year follow-up. *Am J Cardiol*. 1984;54(1):31–6.
12. Rao D, Sood D, Pathak P, Dongre SD. A cause of Sudden Cardiac Deaths on Autopsy Findings; a Four-Year Report. Emerg (Tehran). *Winter*. 2014;2(1):4614613.
13. Priori SG, Wilde, Horie M, Cho Y, Behr ER, Berul C, et al. HRS/EHRA/APHRS expert consensus statement on the diagnosis and management of patients with inherited primary arrhythmia syndromes: document endorsed by HRS, EHRA, and APHRS in May. *Heart Rhythm*. 2013;10:1932–63.
14. Ackerman MJ, Priori, Willems S, Berul C, Calkins HBR, Camm AJ, et al. HRS/EHRA expert consensus statement on the state of genetic testing for the channelopathies and cardiomyopathies this document was developed as a partnership between the Heart Rhythm Society (HRS) and the European Heart Rhythm Association (EHRA). *Heart Rhythm*. 2011;8:1308–39.
15. Skinner JR, Duflou JA, Semsarian C. Reducing sudden death in young people in Australia and New Zealand: the TRAGADY initiative. *Med J Aust*. 2008;189:539–40.

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