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Study of Demography and Risk Factors Associated with Sudden Cardiac Deaths

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Abstract

Sudden cardiac death (SCD) is unexpected death due to cardiac causes that occurs within one hour from the start of symptoms and within 24 h of being seen alive. The prevalence of SCD is significant in India, but the awareness for routine health care screening for early diagnosis and prevention of the risk of SCD is still lacking in general population, particularly in the younger age group. Forensic Pathologists has a unique opportunity to study the SCDs in relating to different organic and functional causes. The authors have conducted this study of such Sudden Cardiac Deaths with the aim to study and analyze the demographic profile and associated risk factors. A total of 100 cases were studied. The age range of the cases included in the study was from 19 years to 68 years with average being 44.3 ± 12.4 years. The male: female ratio was found to be 6.14. 50 cases were smokers, 46 had history of alcohol consumption, 29 cases were hypertensive and 15 cases were diabetic. The non-modifiable risk factor like family history of cardiac arrest was seen in 19 % cases. 51% had evidence of prodromal symptoms and 40% deaths occurred at home. The authors conclude that regular follow up of blood pressure, blood sugar level, blood cholesterol level, changing of life style like cessation of smoking, moderate exercise, low carbohydrate and lipid diets, fruits and vegetable consumption, reducing obesity, and controlling the risk factors would be helpful to eliminate the risk of SCD, particularly in males, and will enhance the life expectancy even if primary atherosclerotic changes have started.

Keywords: Sudden Cardiac Death; Coronary Artery Disease; Atherosclerosis; Cardiac Risk Factors.

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Introduction

Sudden cardiac death (SCD) is unexpected death due to cardiac causes that occurs within one hour from the start of symptoms and within 24 h of being seen alive[1]. Coronary artery disease (CAD) is the main cause of Sudden Cardiac deaths (SCD)2. India is in a transitional phase of rapid urbanization along with economic improvement leading to changes in dietary habits, increase in substance abuse, and decreased physical activity, which increases the risk of SCD 3. The prevalence of SCD is significant in India, but the awareness for routine health care screening for early diagnosis and prevention of the risk of SCD is still lacking in general population, particularly in the younger age group. Due to this, such silent cardiac conditions often cause fatality in unsuspecting asymptomatic individuals which causes a huge emotional shock for the family members who are unaware about status of cardiac health of deceased. In Indian Medicolegal system such sudden deaths are often labelled as Medicolegal cases due to lack of proper history at the time of arrival in emergency department leading to Medicolegal Autopsies. So, the Forensic Pathologists has a unique opportunity to study the SCDs in relating to different organic and functional causes. The authors have conducted this study of such Sudden Cardiac Deaths with the aim to study and analyze the demographic profile and associated risk factors.

Material and Methods

The study was a cross sectional study which included 100 cases of sudden cardiac deaths brought for medicolegal Autopsy in Department of Forensic Medicine, All India Institute of Medical sciences, New Delhi. The time period of the study was from Sep 2017 to May 2019. The Ethical Approval was obtained from Institute ethics Committee before the

commencement of study. The cases of different age groups and sex were included in the study whose Autopsies were conducted within 48 hours of death. Only those cases were selected where there was no internal/external injury, other organ pathology and poisoning/intoxication contributing to cause of death. The cause of death was further confirmed by histopathology and postmortem analysis of cardiac enzymes. Data with regard to age, gender, previous medical history and medication/drug history were obtained from available inquest papers, treatment records and interview with the relatives. History regarding smoking, hypertension, diabetes, alcohol intake, drug abuse, family history of heart disease, history of chest pain, and prodromal symptoms were elicited from next of kin and investigating officer. The results were analyzed statistically using IBM SPSS statistics version 25 software. Descriptive statistics used to summarize the data value.

Observation and Result

The age range of the cases included in the study was from 19 years to 68 years with average being 44.3 ± 12.4 years. The average age for the male and female were 43.86± 12.10 years and 46.50± 14.60 years respectively. Forty percent cases were less than 40 years of old. The male: female ratio was found to be 6.14 (86 male: 14 female) (Figure-1).

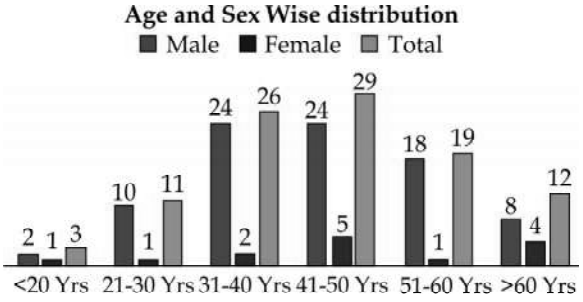


Fig. 1: Age and sex distribution of cases.

The mean BMI was 26.26 ± 5.08. Majority of the cases belonged to 4th decade of life (29%) followed by 3rd decade (26%) and least cases belongs to <20 years of age (Figure-1). 84 % cases were married, while number of unmarried cases were 14% and only 2 cases were living separately from their spouse (Figure-2).

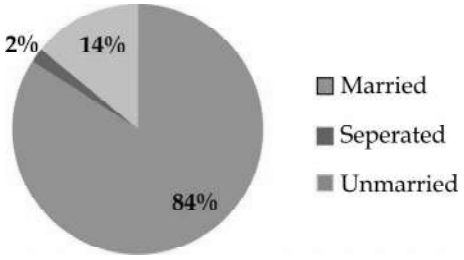


Fig. 2: Marital status of cases.

In dietary habit, 80% of individual were non-vegetarian and twenty per cent were vegetarian (Figure-3).

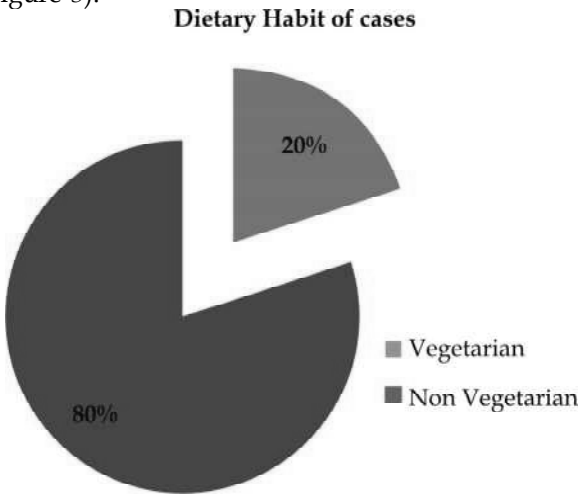
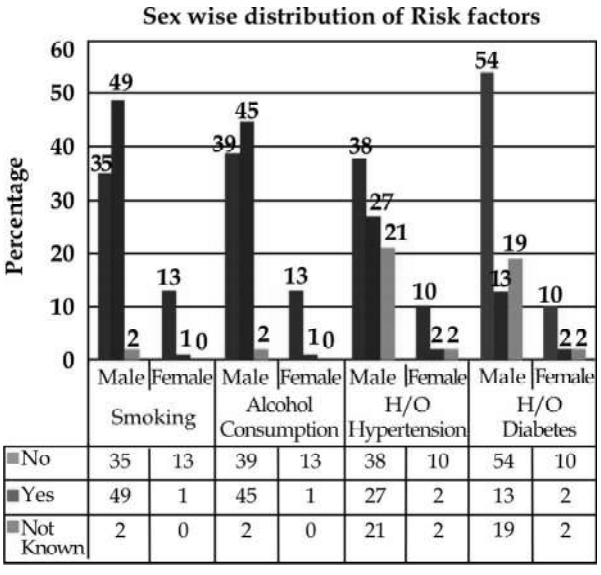


Fig. 3: Dietary habit of cases..

The modifiable risk factors of cardiac disease like history of smoking, alcohol consumption, hypertension and diabetes were seen in majority of cases. Out of 100 cases, 50 cases were smokers, 46 had history of alcohol consumption, 29 cases were hypertensive and 15 cases were diabetic (Figure-4).



	Male	Female	Male	Female	Male	Female	Male	Female
	Smoking		Alcohol Consumption		H/O Hypertension		H/O Diabetes	
No	35	13	39	13	38	10	54	10
Yes	49	1	45	1	27	2	13	2
Not Known	2	0	2	0	21	2	19	2

Fig. 4: Sex wise distribution of modifiable risk factors.

All these risk factors were more commonly seen in male then female. The non-modifiable risk factor like family history of cardiac arrest was seen in 19 (19%) cases and in one (1%) cases it was not known (Figure-5).

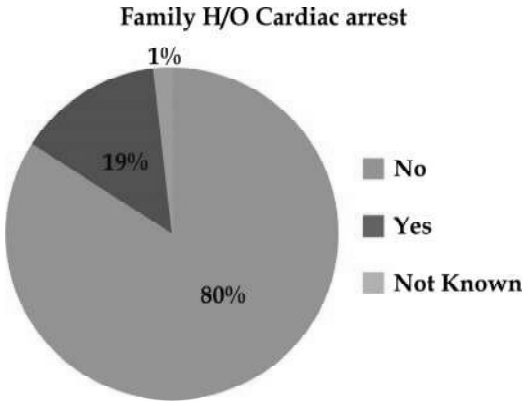


Fig. 5 : Family history of cardiac arrest.

51 cases (51%) had evidence of symptoms like chest pain, breathlessness, sweating or palpitation however 34 (34%) cases had no symptoms prior to their death, and 15 (15%) cases were un-witnessed deaths (Figure-6).

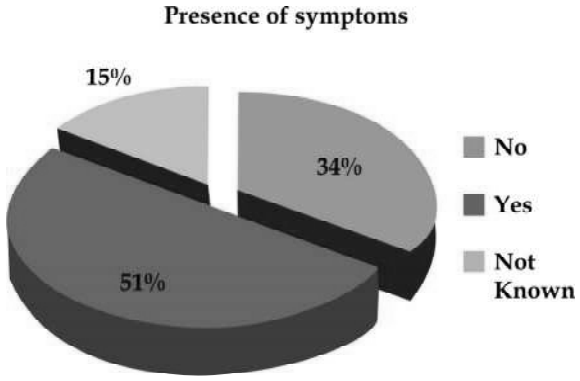


Fig. 6 : Presence of Clinical Symptoms prior to SCD.

40 deaths (40%) occurred at home, followed by death occurred outside home (30%), death occurred in hospital (23%) and only in 7% cases death occurred at work place (Figure-7).

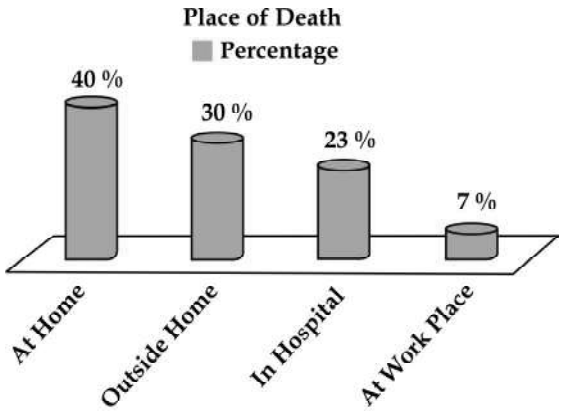


Fig. 7 : Place of Death.

Discussion

SCD is a major public health problem accounting about 50% of cardiovascular death[4]. With increasing age, the incidence of SCD increases in both men and women. Moreover there is four fold greater risk of SCD in middle-aged men if compared with women of the same age group, reflecting a sex difference in the incidence of CAD as well [1,5]. Older age, male sex, cigarette smoking, hypertension, diabetes mellitus, obesity, hypercholesterolemia, and family history of CAD have all been associated with an increased risk of SCD [1,6,7]. A parental history of early onset sudden death (age <65 years) has been found associated with an increased risk of primary cardiac arrest.[8]

India is experiencing higher prevalence of SCD and the Indian population are affected a decade earlier then the European population in their mid-productive life[9-13]; it is due to transitional evolution of urbanization leading to rapid change in dietary habit and decrease in physical activity [3]. SCD may occurs even below <18 years of age but about 97% of SCD occurs at age more than 18 years [14,15]. Alexanddros S et al [16] found the mean age of the individuals were 37 ± 14 years in sudden death cases having a prolapsed mitral valve. In addition to this, our data also correspond with Srivatsa et al[17] who evaluated the Medical records of 200 patients who presented with unexplained sudden death (USD) in a tertiary care centre with mean age 55 years (±10 years).

The average age of risk factor for sudden cardiac death found by study of Jayaraman R et al was seen 25.9 ± 6.8 years, the difference could be due to comparative younger age of cases (less than 35 years).[14] The overall mean age was seen 62 ± 20 years by Madhavan SR et al in their study on epidemiology of sudden cardiac death in rural South India.[18] The mean age of their study is higher than our study, since they included not only cardiac related deaths but cases with other causes of death also had been taken in consideration.

Majority of the SCD occur at 20 to 40 years of age and incidence decreases after 75 years of age[14]. In this study we also found the maximum cases of 4th decade (29%) of life that correspond with Al-Khatib S M et al study[14]. In the study by Madhavan SR et al.[17] age group of 40-60 yrs (p=0.029) was significantly associated with SCD which also corresponds with our observations.

In various studies males were found predominantly involved (7 folds) than females [14,15,17,18]. The reason for this difference is possibly due to protective role of oestrogen in females [18]. In our study we also found that 86% of cases were male

(approximate 6 folds) that supports these findings. The prevalence among females is more in advanced age group; it is possibly due to smaller coronaries and reduced oestrogen level in postmenopausal female that leads to decrease production of endothelial NO, which is a vasodilator and analgesic agent, compromising blood supply to the myocardium and increase pain perception in angina causing SCD [19].

Relation of sudden death with strenuous physical activity or work can't be neglected. There are many un-witnessed sudden death cases although maximum death occurred at home mostly at bed, only 2 to 5% sudden death have been found during vigorous activity like strenuous exercise, heavy weight lifting etc., and 8 to 12% have occurred at work place [20-22]. In our study we also found the maximum death occurred at home (40%) followed by outside the home, hospital and work place. Many of the deaths occurred outside of home like on the way to the hospital, inside the bus, at bus stops, railway stations and one case also seen in the court while he went for attending court for giving the evidence.

Family history of early-onset Sudden Death (age <65 years) is associated with an increased risk of Primary Cardiac Arrest.[23, 24] Kaikkonen's et al [24] in their study found SCD among first degree relatives of victim of SCD are significantly higher (5.2%) than the SCD among the relatives of acute MI survivors (3.3%). Jouven's et al. [23] in their study found two fold higher risk of SCD if one parent had history of SCD and nine fold higher risk if both parents had history of SCD. In our study, 19% cases had family history of SCD that also supports the Jouven's and Kaikkonen's studies.

Over 200 risk factors for CAD have been found or hypothesized, of which dyslipidemia, hypertension, smoking and diabetes are considered as most important risk factors [7,17,25] of SCD. Our study also showed history of hypertension and diabetes in 29% and 15% of cases respectively that also supports the finding of Lukas RC et al. [26] . Joshi et al found that daily intake of fruits and vegetables are protective factor against acute MI. [27] In our study we found 20% cases were of vegetarians and the rest of cases were non vegetarians.

Smoking cigarette or tobacco is associated with multiple metabolic factors that promote coronary plaque disruption, thrombosis, vasospasm and arrhythmias [17]. The younger populations of India are more habitual of smoking that leads to high prevalence of CAD in younger age group [12]. In our study, the history of smoking was seen in 50% of cases, these values could be less than the original value because the history given by relatives is not always exactly correct and reliable. Regular consumption of alcohol was found protective in other countries but in south Asian population it was not protective [13]. Alcohol consumption is another risk factor for development of coronary atherosclerosis revealed from Joshi P et al and Kaikkonen K S et al studies which is most common risk factor of SCD. [6,9,28] Our study showed history of alcohol consumption in 46% of cases, similar findings were observed by Joshi's and Kaikkonen's study.

The signs and symptoms prior to SCD were seen in about 60% of cases; the most common symptoms are syncope/presyncope (30%), chest pain, palpitation or dyspnea[29]. ECG abnormality are seen in 82% of the victims of sudden death[30] the common abnormality are like T wave abnormalities, ST segment changes, long QT segment and conduction defects are also seen in the victims of sudden death [21,26,29,30]. In our study, the perusal of inquest papers and recall from next to kin, the symptoms prior to death like syncope, chest pain, sweating, palpitation, dyspnea and dizziness are found in 51% of cases which corresponds to the Yang's study. In 15% cases the symptoms were not known which is because of the death was un-witnessed. In 34% of cases no symptoms are appreciated by relatives, the possible reason might be peripheral neuropathy in cases of diabetes mellitus that leads to silent cardiac arrest.

Conclusion

Sudden Cardiac deaths are unfortunate but preventable. Regular follow up of blood pressure, blood sugar level, blood cholesterol level, changing of life style like cessation of smoking, moderate exercise, low carbohydrate and lipid diets, fruits and vegetable consumption, reducing obesity and controlling the risk factors would be helpful to eliminate the risk of SCD, particularly in males and will enhance the life expectancy even if primary atherosclerotic changes have started.

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