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Seasonal Predilection of Hospital Admissions for Myocardial Infarction- An Epidemiological Study

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Abstract: ***Background: Ischemic Heart Diseases (IHD) accounts for majority of Cardio Vascular Diseases (CVD) in India. Seasonal variation in the hospital admission of Myocardial infarction has been documented from various regions across the world. There is dearth of such evidence from India, this study aims to determine the association between seasonal predilection and hospital admission of cases of Myocardial Infarction. Methods: It is a retrospective study that has been carried out for 7 years on 3307 patients with STEMI. Results: On studying 3307 eligible patients 72.14% of patients were male and remaining 27.86% were female. Each year was divided into 4 seasons – Pre Monsoon (July – September), Monsoon (October – December), Winter (January – March) and Summer (April – June). Patients are divided into 5 age groups - <40, 40-50, 50-60, 60-70, >70. Among the 5 age groups patients aging between 50 – 60 has contributed 34.32% and patients aging between 40-50 and 60-70 contribute 23.13% and 22.83% to MI respectively. Among 3307 patients 61.89% of MI cases had AWMI and remaining 38.11% shows IWMI. Over the period of 4 years 26.09% cases have been recorded during winter (January – March). Conclusions: There is a higher incidence of MI cases during winter but there is no statistically significant variations in the occurrence of AWMI and IWMI with seasons. Further prospective studies need to be done to further explore the seasonal predilection of types of MI.***

1. Introduction

Cardiovascular diseases are the leading cause of disease burden and deaths globally. [1]CVDs accounts for 31% of all deaths worldwide and >75% of the deaths due to CVDs occurs in developing nations. [2]Cardiovascular diseases (CVDs) ranks top among the causes of mortality in India for several years. Epidemiological change over from the era of infectious diseases to a blooming period of non-communicable diseases has occurred over the recent past. Among the spectrum of CVDs, Ischemic heart disease (IHD) accounts for majority of CVD mortality in India. [3]Apart from the known risk factors of myocardial infarction, there are observations suggesting that there are seasonal variations in the pattern of MI. Climate variability and changes in atmospheric circulation patterns have a massive impact on the environment with contrary effects on health and potential consequences for life. [4]Understanding the spatial patterns of disease incidence and fatality provides opportunity to identify the high risk groups as well as to develop preventive strategies. [5]Seasonal variations in the incidence of myocardial infarction have been reported from various studies across the world. [6, 7, 8, 9]Most studies indicate that low temperatures are the direct causal factors. [10]Although it is known that short-term climatic changes can influence cardiovascular morbidity and mortality transiently, global evidences reveals that there is a seasonal pattern of deaths due to MI with more fatal events in winter than in summer. However, it is not known whether this finding is due to variation in the prevalence of MI or to other factors affecting the livelihood of disease in question. [11]Since MI is a disease with high mortality rate and specific features, a clear picture of the effects of temperature on MI helps in enhanced understanding of the trigger factors among high risk groups. [12]With this background and also with dearth of literature in seasonal predilection of MI in India, this study aims to determine the association between seasonal predilection and hospital admission for the Myocardial Infarction cases.

2. Objective

Among the patients attending a government hospital in south India from July 2011- July 2018

1) To determine the association between seasonal predilection and hospital admission for the type of Myocardial Infarction
2) To explore the relation between the seasonal variation and gender of MI cases.
3) To analyse the distribution of MI cases during the time of natural calamity

3. Methodology

The present study was a retrospective record-based study carried on a tertiary care hospital starting from July 2011-July 2018 for a period of seven years.

Study population: All patients admitted in the Stanley Hospital for Myocardial Infarction from the period of July 2011-July 2018.

Study area: The study area constitutes the present metropolitan city Chennai situated in the north eastern corner of Tamil Nadu, India along the Coramandel coast and bounded by Bay of Bengal on one border and Inlands such as Kancheepuram and Thiruvallur districts on the other border.

Seasons were classified as Summer, Pre-Monsoon, Monsoon and Winter. As the state of Tamil Nadu experience the North-

east monsoon, the months from October to December is considered as Monsoon. Winter is from January to March, summers are from April to June. July to September is taken as Pre-monsoon. The MI cases were divided into Anterior Wall Myocardial Infarction (AWMI) and Inferior Wall Myocardial Infarction (IWMI).

Data Analysis and Processing: A total data of 3307 eligible patients were recovered from the hospital database. The Data was entered using epidata v3.0 and was analysed using STATA 12 software. Frequency and Percentages were used to summarize the categorical variables and Chi- square was applied to test the significance of association between the variables and season. A p value of <0.05 is considered as significant.

4. Results

Among the 3307 patients majority of the cases (72.14%) were males, whereas 27.86% of the recorded cases were females (Table 1, Fig 1). Among the age groups, persons between 50-60 years of age were the major proportion (34.32%) admitted with MI, followed by the age groups 40-50 years and 60-70 years which had a similar proportion of 23.13% and 22.83%, respectively (Table 1, Fig 2).

More than half of the (61.89%) Myocardial infarction cases were AWMI, while 38.11% were IWMI, showing a predominance of AWMI in the incidence of myocardial infarction (Table 1, Fig 3).

Over the period of 7 years under study, most of the cases (26.09%) were reported during the winter months taken from January to March. The least proportion of cases was noted during the summer season, from April to June (Table 1, Fig 4).

The number of MI cases increases from summer to winter season among the age groups 40- 50 years, 50-60 years and >70 years, while it showed an opposite trend in age groups <40 years and 60-70 years i.e the MI cases were more in number during summer than winter.

In the association between the type of MI i.e AWMI or IWMI and seasons turned out to be not significantly associated (p=0.142) and similarly the association between gender of the MI cases

Male or female was not significantly associated (p=0.286) with the any season of the year (Table 2).

Among the males, the trend of increasing incidence of cases from summer to winter season is present, whereas the female cases showed a small dip in number from summer to winter months (Fig 5), which is an interesting finding.

Natural calamity of floods happened in the region under study during December 2015, December 2016 and October November 2017. The cases were analysed for their differential incidence during calamity and non-calamity months. The 90 days normalized incidence of MI cases was calculated by dividing the total number of cases during a period by the total number of days in that period and multiplied by 90. It revealed that non-calamity months showed a higher case rate than the calamity months (Fig 6).

5. Discussion

The present study showed that the number of MI cases were high during the winter season and were least during the summer season, this can be compared with the study by Nasiri et al in 2016 conducted in Iran, to find the association between the seasonal variation and admissions of Myocardial infarction, and found that the higher number of admissions for MI were in summer and also concluded that there is a seasonal rhythm in the occurrence of MI. Iran being located in west Asia with Gulf of Oman, Caspian Sea and Persian Gulf as borders it has extremes of temperature, it is severely dry and hot during summer and snow falls during winters. [13, 14]On the other hand India being a tropical country with a wide geographical area has a varied climatic conditions on different parts, the study setting Chennai is located at a latitude of 13.067439 and longitude of 80.237617 with an average low temperature of 21.2C recorded in January and the average highest temperature being 37.1 recorded in May. [15]The city lies on the coast of Bay of Bengal and the thermal equator thus preventing it from extremes of temperature which explains the wide variation of results in our study and the Iranian study.

On exploring the relation between seasonal variations and the gender of MI cases, in our study found an interesting finding that the trend of MI increases from summer to winter in Males while among Females there is a small fall of cases in winter. On comparison with the study done by Jia et al in 2012 among the Chinese population to explore the time distribution of onset of Chest pain with acute ST elevation MI and found that among Males maximum cases were recorded during the month of November and minimum were recorded in March and May, among females no statistically significant distribution was found[16].

6. Conclusion

Seasonal Variation with predominance over winter months was observed but there was no statistically significant observations among the occurrence of AWMI and IWMI with seasons and there is a trend of increasing cases towards winter among males. We also discovered that the number of cases were high during the months of non-calamity than the calamity months. Thus we conclude that more prospective studies need to be done to further explore the seasonal predilection of types of Myocardial Infarction and gender distribution.

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Annexure (Tables and figures)

Table 1: Distribution of Acute Myocardial Infarction cases according to demographic and seasons (N=3307)

Variable	Frequency	Percentage
Gender		
Male	2386	72.14
Female	921	27.86
Age groups		
<40 years	328	9.91
40-50 years	765	23.13
50-60 years	1135	34.32
60-70 years	755	22.83
>70 years	324	9.79
Type of MI		
AWMI	2047	61.89
IWMI	1260	38.11
Seasons		
Summer	827	25
Pre-Monsoon	803	24.29
Monsoon	814	24.62
Winters	863	26.09

Table 2

	Males (%)	Females (%)	Chi – square	p value
Summer	593 (71.70)	234 (28.30)	3.779	0.286
Pre Monsoon	565 (70.36)	238 (29.64)		
Monsoon	585 (71.86)	229 (28.14)		
Winter	643 (74.50)	220 (25.50)		

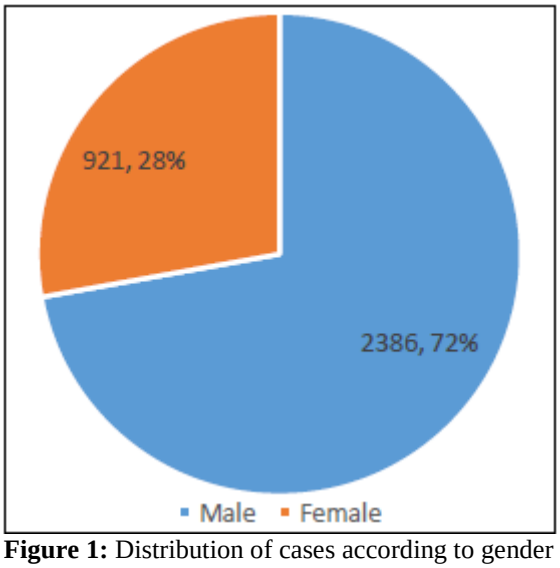

Figure 1: Distribution of cases according to gender (N=3307)

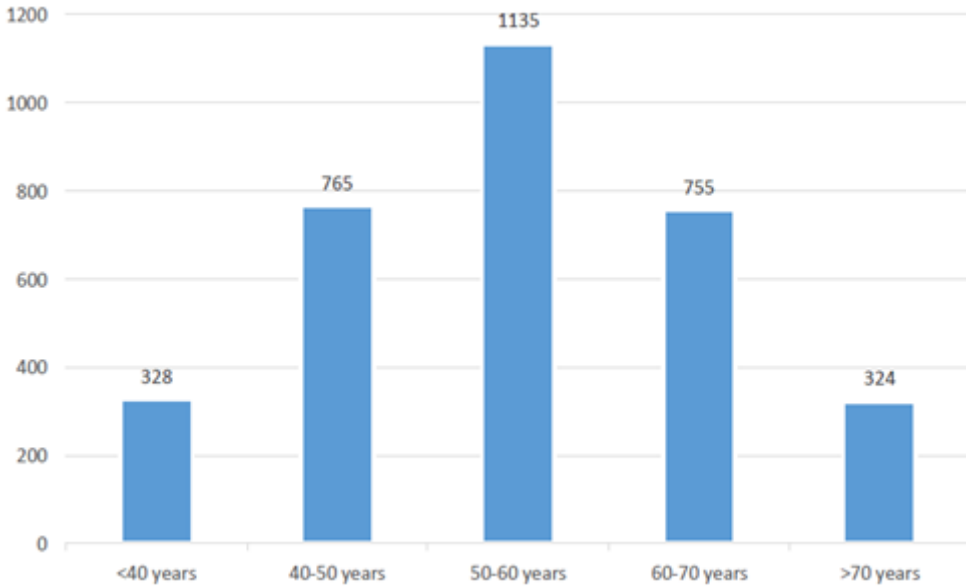

Figure 2: Distribution of cases according to age groups (N=3307)

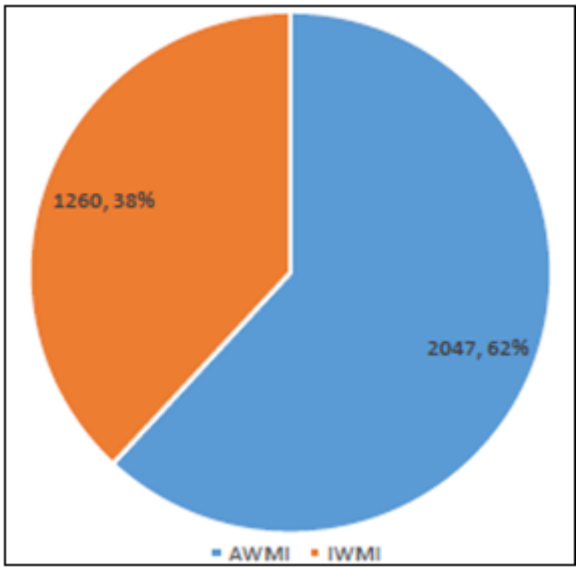

Figure 3: Distribution of Acute MI cases according to type of MI (N=3307)

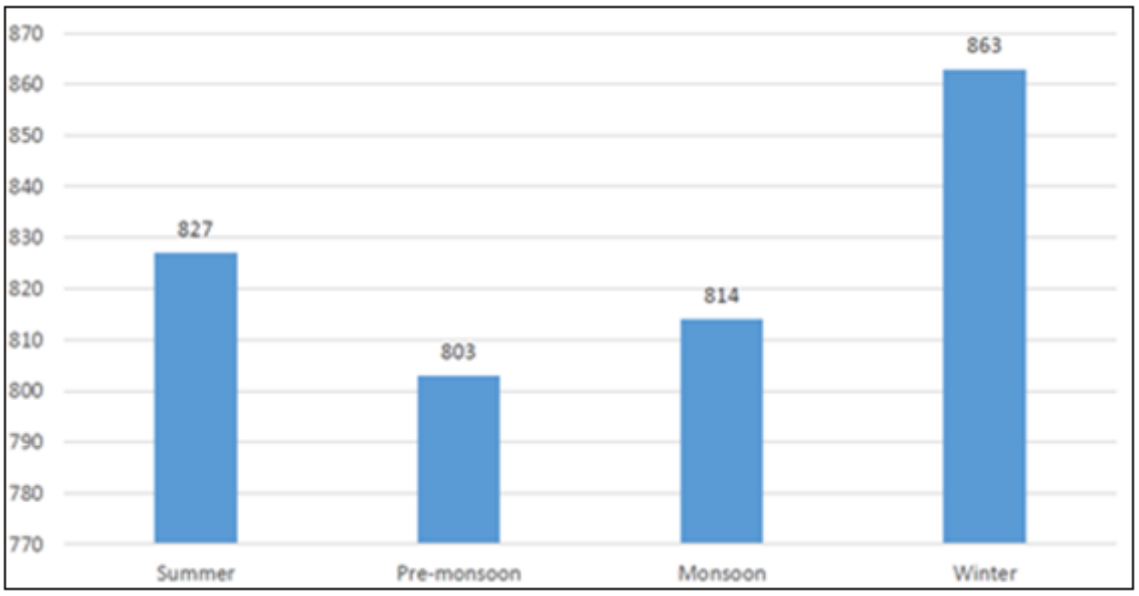

Figure 4: Seasonal Distribution of cases (N=3307)

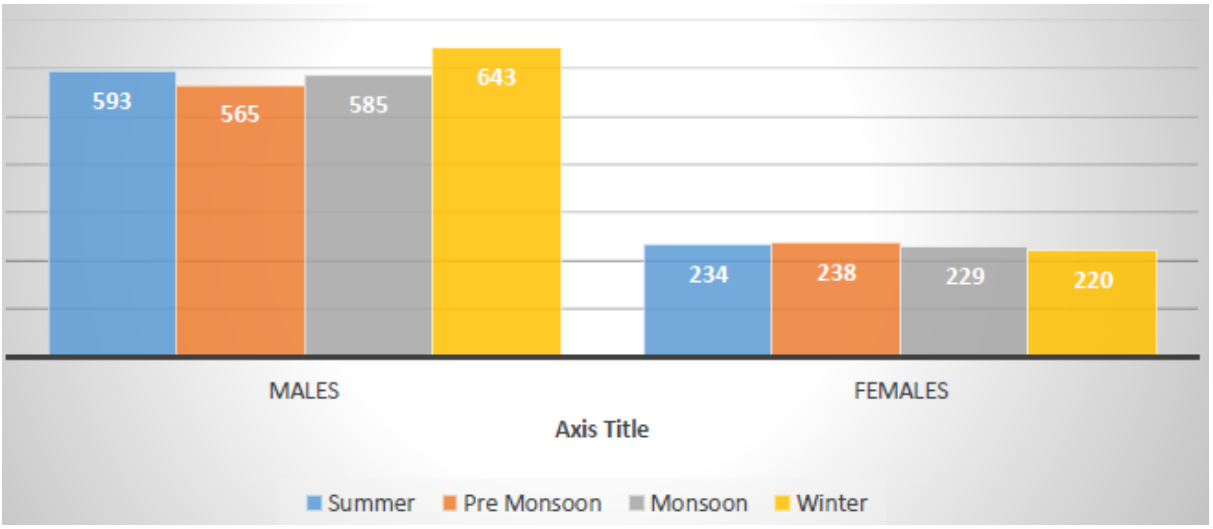

Figure 5: Seasonal distribution of cases according to gender (N=3307)

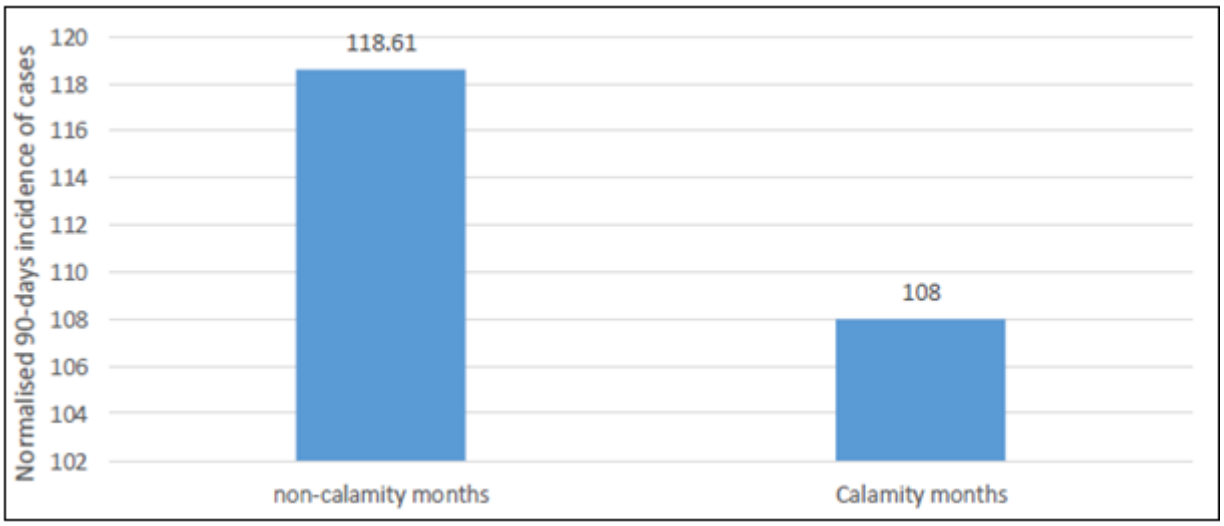

Figure 6: Distribution of cases according to the calamity and non-calamity months