

Magnitude, Distribution and Associated Socio-behavioral Risk Factors of Coronary Artery Disease: A Hospital Based Study from Desert Ecology in India

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ABSTRACT Coronary artery disease is among the leading causes of deaths and disease adjusted life years lost world wide. This is an emerging health threat in India too. Government of India has recently launched a pilot programme for prevention and control of non-communicable diseases. There is paucity of information on this disease in desert part of Rajasthan, India. Study aims to provide the initial baseline information on occurrence of this disease in district Jodhpur of Thar desert, India; an area unexplored hitherto. Retrospective descriptive epidemiological study was conducted at a tertiary care hospital in Jodhpur. There were 15,589 new patients admitted in hospital per 100,000 populations in year 2001 for district Jodhpur. The mortality rate was 152 deaths/1000 admitted patients for year 2001. Proportion of patients who died below 50 years of age was 11.91% and acute myocardial infarction cases <40 years of age was 6.88%. Consecutive years have shown increasing trend in number of patients admitted each year with major share of patients by acute myocardial infarction and deaths caused by this. There was significantly higher proportion of female ($p < 0.05$). Lack of information on socio-behavioural risk factors was major limitation. Coronary artery disease is an emerging problem in district Jodhpur. Patients with advanced stage of disease are reaching to the hospital with poor treatment outcome. Awareness exercises and prospective study on risk factors of coronary artery disease is required in this setting.

INTRODUCTION

Coronary artery disease (CAD), a non-communicable disease (NCD), is among the top ten leading specific causes of disease adjusted life years (DALYs) lost worldwide (Murray and Lopez 1997a). It ranked first among the leading causes of death in year 1990 worldwide (Murray and Lopez 1997b). Under the given scenario of magnitude and trend, the mortality associated with NCDs has projected to increase from 28.1 million in year 1990 to 49.7 million in year 2020 worldwide (Murray and Lopez 1997c). As a matter of fact, recently, cardiovascular diseases caused 16.7 million deaths globally in year 2002 (WHO 2002).

India is also facing emerging threat of NCDs. More than 2.4 million Indian died because either of heart disease, stroke or rheumatic heart disease in year 2002. A study estimated 22.37 million cases of Ischemic Heart Disease (IHD) as often called synonymously CAD, in year 2004 in India (Shah et al. 2006). The economic impact of NCDs study of Bloom et al. (2013) estimated that the cost of the five main NCDs (Cardiovascular disease, cancer, chronic respiratory disease, diabetes and mental health, in which cardiovascular disease turned out to be the most costly domain) will total USD 6.2 trillion (in 2010 USD) for the period 2012-2030 in India.

In response to the given magnitude of NCDs, Government of India has launched Pilot phase of the National Programme for Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke on 4th January 2008. The strategies for implementation under this programme are (a) health promotion for the general population and (b) disease prevention for the high risk groups (Government of India 2008).

To set policy, and plan programs, public health officials must assess the health of the population or community they serve. Knowledge

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of the disease burden in populations is essential for health authorities, which seek to use limited resources to the best possible effect for prevention and care (Bonita et al. 2006). Studies on burden of CAD in Thar desert of Rajasthan are scarcely available.

District Jodhpur, the gateway of Thar Desert, is one of the largest districts of Rajasthan representing dry and hot ecology. Jodhpur possesses 22850 square kilometers of geographical area and 2886505 total population as per 2001 census with very sparse population density of 126 persons per square kilometer area. It measures 197 kilometers from north to south and 208 kilometers from east to west. Administratively district is divided in 7 *tehsils* Jodhpur, Luni, Bilara, Bhopalgarh, Osian, Phalodi and Shergarh (Jodhpur 2013).

Objective

To describe the magnitude, distribution and associated socio-behavioural risk factors of CAD patients in desert ecology of district Jodhpur .

METHODOLOGY

Study Site

Mahatma Gandhi Hospital, Jodhpur was selected as study site to describe the CAD patients, admitted in past in intensive coronary unit of hospital. Hospital based study was chosen to overcome the problems associated with community study in desert climate with less human density and huge geographical area. Mahatma Gandhi Hospital was the only place in district Jodhpur for intensive coronary care in government sector during the study period.

Study Design

Retrospective secondary data based descriptive epidemiological study was conducted. The researchers decided to describe the new patients only, who admitted during period from year 2000

to 2002, because this was the oldest records available which can be used as benchmark in studying the trend of new coronary artery disease patients in study area.

Analysis

Descriptive analysis was carried out to describe the magnitude, distribution and risk factors of CAD in proportions and rates. Chi-square test was applied to test the differences in proportions.

RESULTS

There were total 1412 new patients diagnosed as suffering with CAD, who were admitted from year 2000 to year 2002 in intensive coronary unit of Mahatma Gandhi Hospital. Each patient was assigned a unique code as described in ninth revision of International Classification of Diseases ICD IX (WHO 1978). All patients were grouped in two categories as ICD IX code 410 and 413. Angina pectoris group of patients were categorised as ICD IX code 413 whereas acute myocardial infarction group of patients were categorised as ICD IX code 410. Researchers have described the magnitude, distribution and risk factors of CAD category wise. The hospital admission rate of new CAD patients calculated for year 2001 for district Jodhpur was 15.589 cases per 100000 populations using total number of admitted new cases from district Jodhpur only as numerator and total population of district Jodhpur for year 2001 as denominator. Table 1 describes the yearly occurrence of CAD category wise. Although we could not find the records of patients of ICD IX code 410 and 413 for year 2000 and 2002 respectively, however, consecutive years have shown increasing trend in number of patients for both the categories. Proportion of patients admitted with severe grade of disease (that is, ICD IX code 410) was very high as compare to patients admitted with milder grade of disease (that is, ICD IX code 413). Code 410 cases were almost 9 times to that of code 413 cases in year 2001 and this difference was about 17 times among total cases.

Table 1: Frequency of CAD patients during years 2000-2002

ICD IX Code	Year 2000	Year 2001	Year 2002	Total
410	NA*	461 (89.8)	875 (100.0)	1336 (94.6)
413	24 (100.0)	52 (10.1)	NA	76 (5.38)
Total	24 (100.0)	513 (100.0)	875 (100.0)	1412 (100.0)

* - Information not available

Table 2: Frequency of treatment outcome stratified by ICD IX code and year

Treatment outcome	Year 2000		Year 2001		Year 2002		Total
	Code 410	Code 413	Code 410	Code 413	Code 410	Code 413	
Death	NA*	2 (8.3)	78 (16.9)	0 (0.0)	130 (14.8)	NA	210 (14.8)
Discharge	NA	22 (91.6)	373 (80.9)	49 (94.2)	716 (81.8)	NA	1160 (82.1)
LAMA [†]	NA	0 (0.0)	10 (2.1)	3 (5.7)	29 (3.3)	NA	42 (2.9)
Total	NA	24 (100)	461 (100)	52 (100)	875 (100)	NA	1412 (100.0)

*NA - Information not available [†] - LAMA- Left the hospital against medical advice

Table 2 describes the proportionate figures for treatment outcome. Out of the total 210 deaths occurred, 208 (99%) deaths were of patients with acute myocardial infarction, the severe form of CAD that is, code 410. Proportion of patients in ICD IX code 413 who succumbed to death was 8.3% in year 2000 and 0.0% in year 2001. Likewise proportion of patients in ICD IX code 410 who succumbed to death was 16.9% in year 2001 and 14.8% in year 2002. Overall proportion of patients who succumbed to death was 14.8%. Proportion of patients who left the hospital against medical advice was 0.0% and 5.7% in year 2000 and 2001 respectively in ICD IX

code 413 group. Likewise this was 2.1% and 3.3% in year 2001 and 2002 respectively in ICD IX code 410 group. Overall proportion of patients who left hospital against medical advice was 2.9%.

Distribution of CAD cases are described in Table 3. It is evident from the Table 3; proportion of cases in ICD code 410 who were female was 74.7% and similarly proportion of cases in ICD code 413 who were female was 64.47%. This gender wise difference in proportion of cases was statistically significant at $p < 0.05$. The distribution of both categories of CAD patients was statistically non-significant with respect to

Table 3: Distribution of CAD cases as per different studied variables

Variable	Categories	ICD IX code 410 (n=1336) No. (%)	ICD IX code 413 (n=76) No. (%)	Chi-square	p-value
Gender	Male	338 (25.29)	27 (35.52)	3.92	0.04
	Female	998 (74.7)	49 (64.47)		
	NA*	0 (0.0)	0 (0.0)		
Religion	Hindu	1115 (83.45)	63 (82.89)	0.09	0.75
	Muslim	209 (15.64)	13 (17.10)		
	Others	11 (0.82)	0 (0.0)		
	NA	1 (0.07)	0 (0.0)		
Residence	Rural	427 (31.96)	19 (25.0)	1.69	0.19
	Urban	901 (67.44)	57 (75.0)		
	NA	8 (0.59)	0 (0.0)		
Age Group	>59 years	680 (50.89)	41 (53.94)	0.89	0.34
	50-59 years	330 (24.70)	20 (26.31)		
	40-49 years	235 (17.59)	11 (14.47)		
	30-39 years	78 (5.91)	4 (5.26)		
	<30 years	13 (0.97)	0 (0.0)		
	NA	0 (0.0)	0 (0.0)		
Occupation	Sedentary	313 (23.42)	13 (17.10)	3.82	0.05044
	Moderate	538 (40.26)	10 (13.15)		
	Rigorous	156 (11.67)	2 (2.63)		
	NA	329 (24.62)	51 (67.10)		
Address	Jodhpur City	901 (67.44)	57 (75.0)	0.10	0.74
	Jodhpur other areas	287 (21.48)	7 (9.21)		
	Other districts	140 (10.47)	12 (15.78)		
	NA	8 (0.59)	0 (0.0)		

* NA- Information not available

Table 4: Socio-behavioural risk factors in CAD patients

<i>Socio-behavioural risk factor</i>	<i>Type</i>	<i>CD IX code 1410 (n=1336)</i> <i>No. (%)</i>	<i>CD IX code I 413 (n=76)</i> <i>No. (%)</i>	<i>Chi-square</i>	<i>p-value</i>
<i>Diet</i>	Vegetarian	121 (9.05)	1 (1.31)	NA*	-
	Non-vegetarian	68 (5.09)	3 (3.94)		
	NA	1147 (85.85)	72 (94.73)		
<i>Alcohol Use</i>	Yes	119 (8.90)	5 (6.57)	NA	-
	NO	460 (34.43)	6 (7.89)		
	Stopped	8 (0.59)	0 (0.0)		
<i>Opium Use</i>	NA	749 (56.06)	65 (85.52)	NA	-
	Yes	49 (3.66)	0 (0.0)		
	NO	235 (17.59)	2 (2.63)		
<i>Smoking</i>	Stopped	1 (0.07)	0 (0.0)	NA	-
	NA	1051 (78.66)	74 (97.36)		
	Yes	329 (24.62)	7 (9.21)		
<i>Tobacco</i>	NO	381 (28.51)	2 (2.63)	NA	-
	Stopped	28 (2.09)	1 (1.31)		
	NA	598 (44.76)	66 (86.84)		
	Yes	79 (5.91)	1 (1.31)	NA	-
	NO	186 (13.92)	1 (1.31)		
	Stopped	5 (0.37)	0 (0.0)		
	NA	1066 (79.79)	74 (97.36)		

*- Information not available

factors such as religion, residence, age group, and address. The linear trend in distribution of these two categories with respect to occupation categories was also found to be statistically insignificant albeit it was at margin of significance ($p=0.05044$). Major problem was the proportion of 'NA' in occupation categories that was 24.62% and 67.10% in code 410 and 413 respectively.

Table 4 details about the proportion of patients with exposure to known socio-behavioural risk factors in both the categories of CAD. Proportion of 'NA' with respect to the known socio-behavioural risk factors in both categories of CAD patients ranged from 44.76% in case of smoking in code 410 to 97.36% for use of tobacco in code 413. This was the main reason for not computing the Chi-square test.

However available data shows that proportion of cases as current users of alcohol, opium, tobacco and non-vegetarian diet was less than 10% in each. The proportion of cases as users of smoking was less than 25%. The proportion of cases who were users of alcohol, opium, smoking and tobacco were less than 5% in each.

DISCUSSION

CAD is an emerging disease in the population of Rajasthan state of India. Its prevalence had been estimated as 3.5% in rural adult popu-

lation in three villages of Parbatsar tehsil in Nagaur district of Rajasthan in early nineties (Gupta et al. 1994a). One other publication from rural adult population of three villages of Parbatsar tehsil of Nagaur district in Rajasthan report the prevalence of CAD as 4.4% based on ECG changes in early nineties (Gupta et al. 1994b). It is not clear that both publications are from single work, since the period of data collection has not been mentioned. Prevalence of CAD in an urban population of Jaipur district of Rajasthan was found out as 7.6% (Gupta et al. 1995). This publication also does not mention about the period of data collection. One other work published in 1997 reported the overall prevalence of CAD as 3.5% as determined by presence of clinical criteria or ECG changes. Study population in this study was residents of three villages of Parbatsar *tehsil* of Nagaur district in Rajasthan. Period of data collection under the study has not mentioned (Gupta et al. 1997). Gupta et al. reported in their separate publication the prevalence of CAD in urban population of Jaipur district of Rajasthan as 6.18% in males and 10.12% in females as determined by clinical criteria and/or electrocardiographic changes. This report also does not mention about the period of field work (Gupta et al. 2002).

So the researchers found that there is lack of period of data collection under study on CAD in Rajasthan. There is also a lack of agreement be-

tween reviews about the trend of CAD in Indian population. Sharma and Ganguly 2005 claims that there is about 10 times increase in prevalence of CAD in urban population from 1% in 1960 to 10.5% in 1998. On the contrary, Ahmad and Bhopal 2005 found little evidence of a rise in prevalence in urban areas, particularly in men and very limited evidence for a rise in prevalence of CAD in rural areas. They found shortage of good quality comparable epidemiological data from India too. More recently Gupta (2008) found about 5 times increase in prevalence of CAD from 2% in 1960 to 10.5% in 2000 from urban areas and about 2 times increase from 2% in 1970 to 4.5% in 2000 from rural areas.

In this scenario of different opinions about the trend of CAD in India, this study was performed to yield the basic information about the occurrence of CAD in population of Thar Desert of Rajasthan, an area unexplored for coronary artery disease hitherto.

The hospital admission rate of new CAD patients was 15.589 cases per 100000 populations from district Jodhpur for year 2001. Study revealed increasing trend in number of patients admitted for both the categories in two consecutive years. Maximum proportion of cases belonged to severe grade of disease that is, ICD IX Code 410 or Acute Myocardial Infarction group. ICD IX Code 410 cases were almost 9 times to that of code 413 cases in year 2001 and this difference was about 17 times among total cases. This may be because the milder forms of disease getting treated at sub-district hospitals and at peripheral health centres as out-patient care. Out of the total deaths that occurred in CAD admitted patients, 99% were after acute myocardial infarction. This can be because of the admission of patients with severe grade or advanced stage in hospital with poor prognosis. If we have a look on yearly treatment outcome, category wise, proportion of patients in ICD IX code 413 who succumbed to death was 8.3% in year 2000 which reduced to 0.0% in year 2001. Likewise proportion of patients in ICD IX code 410 who succumbed to death was 16.9% in year 2001 which reduced to 14.8% in year 2002. So there is a decline in proportional treatment outcome as death in both the categories of CAD patients. However proportion of patients who succumbed to death was 14.8% in overall. The mortality rate amongst CAD patients per year was 152 deaths/1000 (or 15200/100000) admitted patients of CAD for year 2001. This rate is very high than the rate reported in range from 20/100000 to 135/100000 in India by Ahmad and Bhopal 2005. Proportion of

CAD patients who died below 50 years of age was 11.91%. It is comparatively lower than the figure 52% of cardiovascular diseases related deaths below age 50 years in India (Sharma and Ganguly 2005).

Proportion of patients who left the hospital against medical advice was 0.0% and 5.7% in year 2000 and 2001 respectively in ICD IX code 413 group. Likewise this was 2.1% and 3.3% in year 2001 and 2002 respectively in ICD IX code 410 group. We saw an increase in proportion of cases leaving hospital against medical advice. However proportion of patients who left hospital against medical advice was less than that is, 2.9% in overall.

Proportion of cases in ICD IX code 410 who were female was 74.7% and similarly proportion of cases in ICD IX code 413 who were female was 64.47%. So CAD affected females were admitted significantly more than the male in both the categories of CAD. This gender wise difference in proportion of cases was statistically significant ($p < 0.05$). Different studies have reported different gender differentials in CAD patients. Gupta et al. (2002) also reported the same gender wise difference. The prevalence of CAD was 10.12% in females and 6.18% in males. Ahmad and Bhopal 2005 also reported higher rates among females. Data from Asia Pacific cohort studies found excess risk of IHD in men compared with women from Australia and New Zealand (ANZ) and Asia (Peters et al. 2013). DEMAT registry from India analyzed 1565 admitted patients of acute coronary syndrome comprising STEMI and NSTEMI myocardial infarction as well as unstable angina patients. This study found about 1 female in 5 cases of acute coronary syndrome (Pagidipati et al. 2013). However our study also included angina pectoris patients.

CAD patients did not differ significantly in its two categories with respect to variables such as religion, residence, age-group, occupation and addresses.

Proportion of acute myocardial infarction cases whose age was below 40 years of age was 6.88% in this study. This proportion is much lower than the figure of 25% which is the proportion of acute myocardial infarction in India that occurs under the age of 40 years (Sharma and Ganguly 2005).

CONCLUSION

Coronary artery disease is an emerging health problem in district Jodhpur; the gateway

of Thar Desert, with 15.589 cases per 100000 populations of hospital admission rate and 152 deaths/1000 (or 15200/100000) admitted patients of mortality rate for year 2001 with 11.91%. coronary artery disease patients dying below 50 years of age and 6.88% of acute myocardial infarction cases below 40 years of age. Hospital admitted patients predominantly belonged to severe grade of disease that is, acute myocardial infarction that was the reason for about 99% of total deaths those occurred in admitted patients. Study showed gradual decline in number of deaths and gradual increase in proportion of patients who left hospital against medical advice in both the categories of coronary artery disease in two consecutive years. Disease affected females in statistically significantly higher proportion than males. Difference with respect to religion, residence, age-group, address, occupation and socio-behavioural risk factors such as use of alcohol, opium, non-vegetarian diet, smoking and tobacco remain statistically insignificant between two categories of coronary artery disease patients.

RECOMMENDATIONS

Unavailability of information related to socio-behavioural risk factors was the major limitation in this retrospective study. Awareness exercises and prospective study on risk factors of coronary artery disease is required in this setting.

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