A Cross-Sectional Study of Coronary Heart Disease, Its Associated Co-Morbidities and Pharmacoeconomic Burden in Delhi-NCR

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Abstract

Introduction: Coronary Heart Disease (CHD) is already established as a prominent cause of morbidity and mortality in India. Deaths due to cardiovascular diseases especially CHD accounts for about 30.9% of total Indian deaths caused by non-communicable diseases.

Objectives: To determine the prevalence of CHD and other associated co-morbidities in Delhi-NCR population and furthermore to study the prescription pattern and pharmacoeconomic burden of CHD patients in Delhi-NCR hospitals.

Methodology: A cross sectional study was conducted on total of 980 patients taking treatment from hospitals in Delhi. The study utilized a pre designed questionnaire. Informed oral consent was obtained from every patient prior to getting their information relevant to the study.

Results: Among 980 CHD patients studied, 643 were males and 337 were females. The disease showed to be more prevalent in the age group of 40-50 years in males and 50-60 years in females. Hypertension (HTN) was found to be most common co-morbidity in CHD patients with 51.42 % followed by diabetes with 32.44 % prevalence.

Medication: Aspirin (84.48 %) and atorvastatin (81.12 %) were observed to be most frequently prescribed drug for management of CHD. Metoprolol was the most preferred beta blocker. The most widely used anti-diabetic drug was metformin (19.89 %) and glimepiride (15%).

The pharmacoeconomic burden on a CHD patient taking treatment in Delhi-NCR was estimated to be INR 1733 only per month.

Conclusion: CHD was reasonably correlated with HTN and diabetes. Multiple medicines were used to manage CHD. The study also suggested the high probability of smoking to be a significant risk factor in males and sedentary life styles in females.

Keywords: Coronary Heart Disease; Co-Morbidities; Risk Factors; Prescription Pattern; Pharmacoeconomic Disease Burden

Abbreviations: CHD: Coronary Heart Disease; CVDs: Cardiovascular Diseases; ADRs: Adverse Drug Reactions.

Introduction

Coronary Heart Disease (CHD) is a circulatory system disease that occurs due to atherosclerosis caused by plaque build-up within the coronary arteries. CHD is otherwise called Ischaemic Heart Disease and Coronary Artery Disease. Individuals utilize these phrasings reciprocally. Cardiovascular diseases (CVDs), especially coronary heart disease (CHD), have assumed epidemic proportions worldwide [1]. 3.8 million men and 3.4 million women worldwide die each year from coronary heart disease [2]. Globally, CVD led to 17.5 million deaths in 2012 [3]. More than 75% of these deaths occurred in developing countries. India accounts for about a fifth of cardiovascular deaths globally [4]. Cardiovascular disease caused more than 2·1 million deaths in India in 2015 at all ages that is more than a quarter of all deaths [5]. At ages 30–69 years, of 1·3 million cardiovascular deaths, 0·9 million (68·4%) were caused by Coronary (ischaemic) heart disease [5]. Starting from the deep rooted, large-scale Framingham Heart Study till date, many studies have been performed that demonstrate how factors such as smoking, alcoholism, hypertension, diabetes, hyperlipidaemia, obesity, family history and physical inactivity play an important role in the development and progression of Coronary Heart Disease in humans. Several studies carried out in developing countries suggest the probability of some relation present between the coronary risk factors and the socioeconomic status and urbanisation [6]. The prevalence of CHD, diabetes, hypertension and obesity has increased ten folds among urban occupants in India [7]. The increasing incidence of CVD deaths can be attributed to the rapid globalisation, urbanisation and lifestyle related changes. Delhi-NCR in India is a large metropolitan city and the fifth most populous city in the world. It is ranked as the world's sixth fastest growing metro city by a Brooking's economic study titled Global Metro Monitor in 2018 [8]. Hence our study was directed to investigate the prevalence of CHD and its associated comorbidities, current trends of CHD risk factors, its prescription pattern and to approximate the economic burden of the disease among CHD patients of Delhi-NCR.

Objective

The objectives of the study were:

Primary Objective

- To determine the degree of correlation between various established risk factors and comorbidities associated with CHD in Delhi-NCR patients.

Secondary Objectives

- To study the prescription pattern being followed for treatment of CHD in hospitals.
- To evaluate the pharmacoeconomic burden of CHD along with its comorbidities on a patient taking treatment from any health care centre of Delhi-NCR.

Methodology

A survey based cross-sectional study was carried out at various hospitals, dispensaries and local regions of New Delhi. The survey was conducted for a period of 4 months that is from Jan 2019 date to April 2019. A sum total of n= 980 patients constituted the sample size of the study.

- **Inclusion criteria**
1. All patients diagnosed with CHD with or without concomitant disease
2. Patients aged 18years and above
3. Residents of Delhi-NCR region
- **Exclusion criteria**
1. Patients undiagnosed with CHD were not considered
2. Pregnant and lactating women were excluded from the study
3. Non- residents of the Delhi and NCR regions

Information on each individual patient was drawn using a pre-designed questionnaire by a direct face-to-face interaction with the patient or his/her guardian. Informed oral consent was obtained from each patient or his/her guardian before acquiring the information on their demographic features, their lifestyle (smoking, drinking habits, exercise, etc.), health condition, prescribed medicines, direct & indirect medical costs borne and family history of disease. The demographic characteristics of the CHD patients were studied and the classification of the subjects was done according to their age and gender.

Results

The gathered data were analysed to obtain the information considering the following parameters:

Age-Gender Distribution

The mean age of the studied population was 49.37 ± 12 years. Out of the 980 CHD patients surveyed, 643 (65.61%) were males and 337 (34.38%) were females. The disease showed to be more prevalent in the age group of 40-50 years in males and 50-60 years in females (Figure 1).
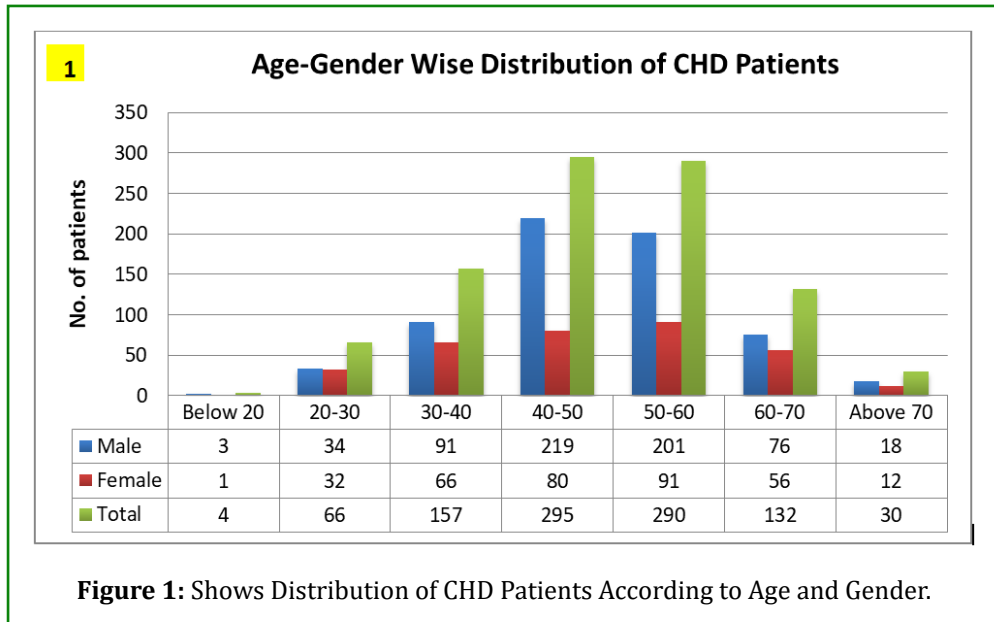
Figure 1: Shows Distribution of CHD Patients According to Age and Gender.

o-Morbidities

Among the co-morbidities reported, hypertension was found to be the predominant co-morbidity of CHD followed by diabetes with 51.42% and 32.44% respectively. Other frequently observed co-morbidities with CHD were hypothyroidism (8.97%), asthma (11.83%), chronic kidney disease (10.20%), osteoarthritis (7.95%) and gout (12.24%). The proportion of individuals who had CHD only and were free from any other concomitant disease was 32.04% (Figure 2).
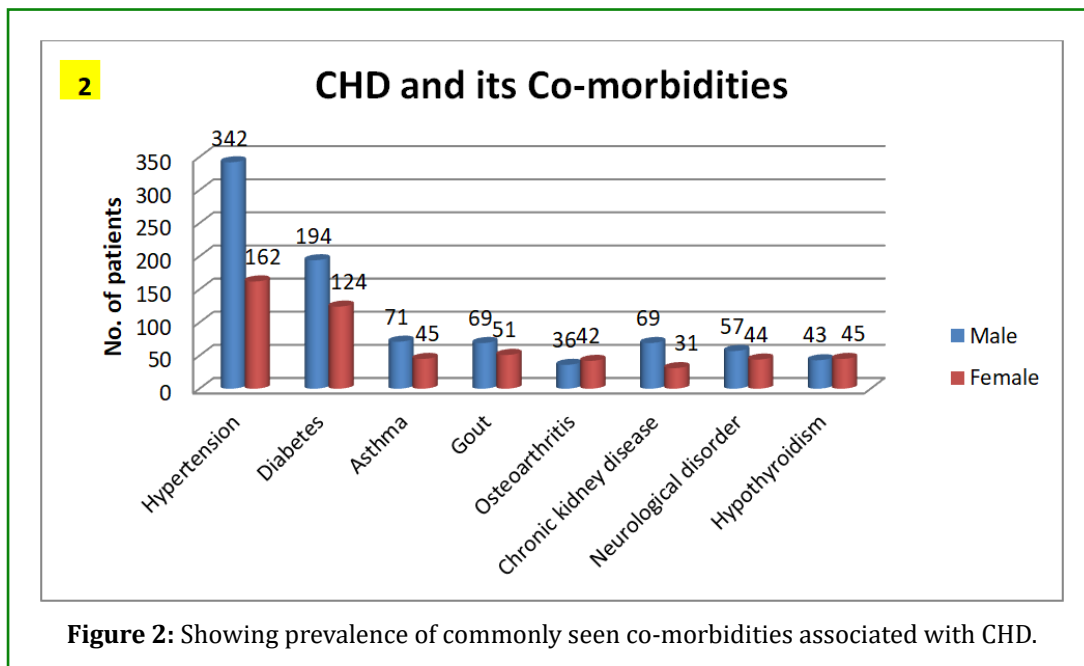

Figure 2: Showing prevalence of commonly seen co-morbidities associated with CHD.

Risk factors

The study estimates show that more than half of the CHD patients had smoking propensities or utilised tobacco in one or the other form. Clearly higher percentage of smokers were men (46.39%) while only a 6.25% of female CHD patients were found to be smokers.

Figure 3 delineates the percent prevalence of all risk factors observed in the examined CHD patients' data.

Figure 3: Prevalence of risk factors contributing to CHD.
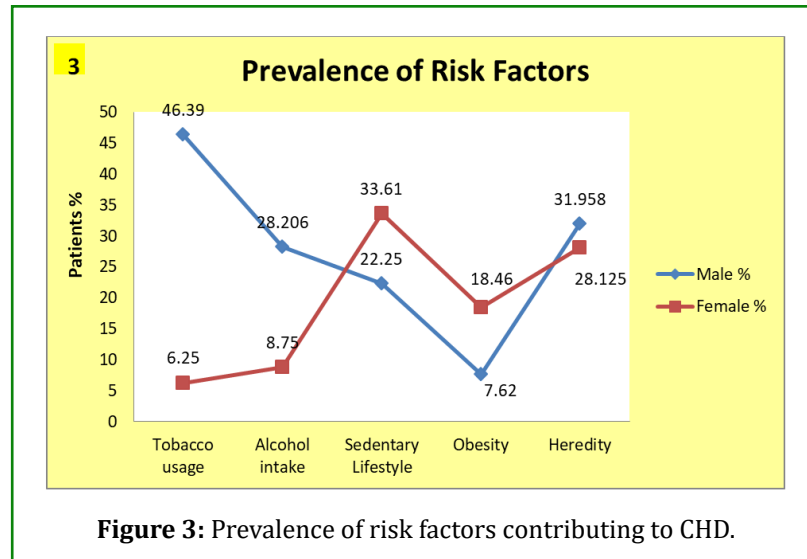
Prescription Pattern

The average number of drugs per prescription was 7± 23. The drugs found most frequently in the prescriptions of the patients were ecospirin and atorvastatin having a percentage prescription frequency of 84.48% and 81.12% respectively in CHD patients. In addition to ecospirin, other anti-platelets like clopidogrel, ticagrelor and prasugrel were also being given to the patients but at a lower rate. In many prescriptions a combination of ecospirin-atorvastatin and ecospirin-clopidogrel were seen 53.77% of the prescriptions contained beta-blockers namely metoprolol, atenolol, carvedilol, bisoprolol, nebivolol and esmolol. Nitrates constituted 44.48% of the total prescription analysed. Angiotension receptor blockers (telmisartan, losartan, olmesartan) and thiazide diuretics (hydrochlorthiazide and chlorthalidone) were being prescribed both individually or in combination for treating hypertensive CHD patients (Table 1).

Drug Class	Drugs Prescribed (Generic names)	Frequency	Percentage (%)
Antiplatelets	Ecospirin	828	84.48
	Clopidogrel	403	41.12
	brillinta(ticagrelor), Prasugrel	71	7.2
Statins	Atorvastatin, Rosuvastatin	795	81.12
Nitrates	Nitroglycerin, Isosorbide dinitrate, Isosorbide mononitrate, Amyl nitrate	437	44.48
Beta blockers	Metoprolol, Atenolol, Carvedilol, Bisoprolol, Nebivolol,Esmolol	527	53.77
Calcium Channel openers	Amlodipine, Verapamil, Diltiazem	111	11.32
AT1 antagonists	Telmisartan, Losartan, Olmesartan, Azlesartan	219	22.35
Potassium channel openers	Nicorandil	109	11.12
ACE inhibitor	Ramipril, Lisinopril, Enalapril	318	32.44
Biguanide	Metformin	195	19.9
Sulfonylurea	Glimepiride, Gliclazide	147	15
Gliptins	Teneligliptin, Vildagliptin, Sitagliptin, Linagliptin,	64	6.53
Diuretic	Furosemide, Hydrochlorthiazide, Spiranolactone, Torsemide, chlorthalidone	270	27.55
PPIs	Pantoprazole, Rabeprazole, Omeprazole	512	52.24
Others	Others	604	61.63

Table1: Prescription pattern of CHD and its Co-morbidities.

Pharmacoeconomic Burden

For pharmacoeconomic burden evaluation of CHD (including its co-morbidities), only direct medical costs (consultation charges, costs of diagnostic tests and medicines) and direct non-medical costs (travelling costs) were considered. Estimates revealed that the financial burden of CHD along with the associated co-morbidities on a patient taking treatment from the hospitals of Delhi-NCR was approximately INR 1733 per month.

Discussion

It is apparent that CHD is remarkably associated with HTN, tobacco use, unhealthy diet, obesity, diabetes and genetic predisposition. CHD can be controlled by concentrating on efforts that would reduce the risk factors associated with it. Therefore there is a need for novel strategies and approaches that could identify the risk factor(s) in each individual modify it in a way that would minimize the risk of CHD incidence. As per WHO action plan 2008-2013, policies and plans should be incorporated in government departments for the prevention and control of CVDs, esp. CHD as it remains to be the leading cause of mortality in India. This requires studies to be done at national, regional and local levels to determine the prevalence of CHD co-morbidities, risk factors and the progression of the disease with respect to the identified risk factors. Nowadays a new concept of "HTN and Diabetes Reversal" is coming into light [9]. Although not much information about it is available in articles or publications but it can certainly help reverse the conditions just by some appropriate dietary and lifestyle modifications.

Robust analysis is needed to acquire all other types of costs like indirect non-medical costs and intangible costs to enhance the quality of pharmacoeconomic evaluation. However, in our study only direct medical and direct non-medical costs were considered. Furthermore similar studies should be conducted with large sample size in order to get a closer view over the health policies in the country. Such studies will aid to a more judicious use of the economic resources allocated and will ultimately lead to better patient care and improvement in quality of life in government as well as private health care centres.

Conclusion

These studies highlighted that the females are more prone to develop CHD in the post-menopausal phase that is in age group of 50-60 years. Majority of the CHD patients surveyed showed to have one or more of the CHD causative risk factors present in them. The study also suggested the high probability of smoking to be a significant risk factor in males and sedentary lifestyle in females. A higher percentage of females falling prey to a sedentary lifestyle also explains why rate of obesity is higher in females. A family history of CHD was found to be almost equally prevalent in both males and females. About three fourth of the CHD patients suffer from one or more chronic diseases. This indicates the existence of a significant relationship between CHD and the co-morbid diseases shown above in Figure 2. It was clearly evident that CHD has an association with many co-morbidities importantly HTN, diabetes, gout, hypothyroidism, etc. As these CHD linked co-morbidities increased, the number of drugs per prescription rises as well. This results in polypharmacy which not only increase the probability of Adverse Drug Reactions (ADRs) occurrence but also raises the pharmacoeconomic burden of the disease on patients.

References

1. Gupta R, Mohan I, Narula J (2016) Trends in Coronary Heart Disease Epidemiology in India. Ann Glob Health 82(2): 307-315.

2. Cardiovascular Disease (2002) The Atlas of Heart Disease and Stroke. Number of deaths from coronary heart disease.

3. World Health Organization (2014) Attaining the Nine Global Non-Communicable Diseases Targets; a Shared Responsibility Global Status Report on Non-Communicable Diseases.

4. WHO Global Health Estimates (2015) Deaths by Cause, Age, Sex, by Country and by Region, 2000-2015.

5. Ke C, Gupta R, Xavier D (2018) Divergent trends in ischaemic heart disease and stroke mortality in India from 2000 to 2015: a nationally representative mortality study. Lancet Glob Heal 6(8): e914-e923.

6. Gupta R, Gupta VP (2018) Lessons for prevention from a coronary heart disease epidemiological study in western India. Current Science 74(12): 1074-1077.

7. Max B, Sifan L, Joseph P, Kabbani N (2018) Global Metro Monitor 2018. Washington.

8. WHO (2013) Global Action Plan for Prevention of Non-communicable diseases.

9. Sanctuary for Health and Reconnection to Animals and Nature (SHARAN).