Journal of Applied Pharmaceutical Science

Cardiovascular disease prevalence and prescription patterns at a tertiary level hospital in Bangladesh

Md. Abdul Muhit, Md. Obaidur Rahman, Sheikh Zahir Raihan, Muhammad Asaduzzaman, Mohammad Ahasanul Akbar, Nahid Sharmin and A. B. M. Faroque

Md. Abdul Muhit,
Sheikh Zahir Raihan,
Muhammad Asaduzzaman,
Mohammad Ahasanul Akbar
Department of Clinical Pharmacy
& Pharmacology, University of
Dhaka, Dhaka-1000, Bangladesh

Md. Obaidur Rahman
Department of Pharmaceutical
Chemistry, University of Dhaka,
Dhaka 1000, Bangladesh

Nahid Sharmin, A.B.M. Faroque
Department of Pharmaceutical
Technology, University of Dhaka,
Dhaka-1000, Bangladesh

ABSTRACT

Demographic study of cardiovascular diseases (CVDs) and drug utilization in population is the basis for assessment of cardiovascular disease management. Aim of this study was to analyze the prevalence of CVDs with drug utilization and current trends in Bangladesh. A cross-sectional type of descriptive study was carried out at the outdoor of National Institute of Cardiovascular Diseases (NICVD), Dhaka from July'09 to August'09. A total of 780 patients, who acquiesce with the inclusion and exclusion criteria, were interviewed with structured questionnaire and followed up by prescription monitoring. Out of the total patients with a male, female ratio of 5.3: 4.7, 45.90% patients were over 55 years and 69.62% patients had come from urban area. The patients had lipid level disorder (47.05%), hypertension (28.05%), heart failure (27.25%), ischaemic heart disease (21.55%) and 40.39% were associated with diabetes. Individual patient got 6.35 ± 1.56 no. of drug of different class of which most frequently prescribed drugs were antiatherogenic (97.67%), lipid lowering agents (95.35%), antianginal (79.07%), beta-blockers (51.16%), ACE inhibitors (30.23%), diuretics (37.21%), anxiolytics (81.4%) etc. This data may be propitious for the general physicians for optimizing rational use of cardiovascular drugs and also accessible in formulating strategy for effective cardiovascular disease management.

Keywords: Prevalence, NICVD, prescription, ischemic heart disease

For Correspondence
Md. Abdul Muhit
Department of Clinical Pharmacy &
Pharmacology, Faculty of Pharmacy,
University of Dhaka, Dhaka-1000,
Bangladesh. Tel: +88-02-9661920-73
(Ext-8156), Fax: +88-02-8615583,

INTRODUCTION

Cardiovascular disease (CVD) is a major health problem throughout the world and a common cause of premature morbidity and mortality. According to World Health Organization (WHO), CVDs are the number one cause of death globally. An estimated 17.5 million people died from CVDs in 2008, epitomizing 30% of all global deaths (WHO, 2009). Over 80% of CVD deaths take place each year in low- and middle-income countries like Bangladesh (BBS, 2009). By 2015, almost 20 million people may endure from death due to CVDs, mainly heart disease and stroke and they will remain the single leading causes of death (WHO, 2009).

CVD is a general category of diseases that affects the heart and the circulatory system. CVD is caused by disorders of the heart and blood vessels, and includes coronary heart disease (CHD), congestive heart failure (CHF), stroke, hypertension, peripheral artery disease, and rheumatic heart disease. CHD alludes to a reduction of blood flow due to thickening and hardening of the arteries that supply the heart muscle. A complete cut off of the blood supply results in the death of heart cells, and a heart attack (MI) occurs. CHF is a disorder where the heart loses its ability to pump blood efficiently. Finally stroke occurs when a blood vessel bringing oxygen and nutrients to the brain bursts or is clogged by a blood clot (Badiuzzaman *et al.,* 2009).

Important modifiable risk factors of CVDs are unhealthy diet, physical inactivity, tobacco use and the effects insinuate abnormal blood lipid profile and obesity. Less physical activity and excess fat rich diet are two major health concerns in affluent society. A study in Bangladesh revealed that 27.93%, 21.08% and 13.41% stroke patients with lipid disorder had high cholesterol, low density lipoprotein (LDL) and triglycerides (TG) level respectively. 42.67% patients had low high density lipoprotein (HDL) level showed in the same study (Comeau *et al.,* 1998).

The possible treatment options for the management of CVD's are lipid lowering agents, vasodilators, beta-blockers, ACE inhibitors, diuretics, calcium channel blockers etc. This study examines prevalence and trends of drug using pattern indicated for the treatment of CVDs among the outpatient visited at NICVD. Population-based trends in drug use have important implications for patient health outcomes, drug treatment and other health services (Psaty *et al.,* 1993). Several population-based studies have probed the trends in the drug use; however few of these studies have pondered the appropriateness of trends (Shaila *et al.,* 2007). To do so requires sufficient information on patient level characteristics that are expedient for determining appropriateness of treatment.

METHOD

Objective of the study was to find out the prevalence of cardiovascular diseases and prescribing patterns of the physicians among the patient who attended the outdoor of NICVD, a tertiary hospital in Dhaka, Bangladesh. The present study aimed at come up with the prevalence of CVD among the patients who came to seek treatment at a tertiary level hospital and usual trend of the molecule of different therapeutic group of drugs prescribed to them. This center receives a mixture of affluent and low-middle income patients and serves the entire country as a referral center for patients requiring high-intensity tertiary care. Other objective was to disclose the variation of prevalence of CVD among different age groups, between rural and urban populations and also to get an assumption about the prescribing pattern & behavior of the physicians. This cross sectional type of descriptive study was carried out in the medicine outdoor of NICVD during the whole month of July 2009 to August 2009. The first twenty patients attending outdoor of NICVD each day were included in the study. Patients who denied facing the questionnaire or those who were

non-cooperative for the follow up monitoring of his/her prescription were excluded from the study.

A total of 780 patients were enquired with the self-developed questionnaire and their prescriptions were monitored to explore the diagnosis of clinical examinations like lipid profile, echocardiogram, blood pressure, blood glucose level, electrocardiogram (ECG), other blood profiles etc. All the data were fed to the computer and were analyzed by modified Wald method in GraphPad prism software package in the computer for statistical significance.

RESULTS

Socio-demographic characteristics

Out of 780 patients who came to visit the NICVD outdoor unit, 52.95% (95%CI: 49.44 to 56.43%) patients were male and 47.05% (95%CI: 43.57 to 50.56%) were female. Approximately 66 % the patients (95%CI: 62.50 to 69.14%) were from the demographically developed area whereas 34.10% (95%CI: 30.86 to 37.50%) patients came from rural area and the difference was found to be statically significant (p<0.05). The patients were divided in different age groups: between 13-34 yrs (18.97%), 35-54 yrs (35.13%), and above 55 yrs (45.9%). (Table 1)

Table. 1: Age, sex and demographic distribution of the cardiac disorder patients (n=780).

Age	No. of patients	Percentages (%)	CI* (%)	Male	Female
13-34 years	148	18.97	16.37 to 21.88	76	72
35-54 years	274	35.13	31.86 to 38.54	148	126
>55 years	358	45.9	42.43 to 49.41	189	169
Sex					
Male	413	52.95	49.44 to 56.43		
Female	367	47.05	43.57 to 50.56		
Demography				Fisher's exact test	
Rural	266	34.10	30.86 to 37.50	P<0.05	
Urban	514	65.90	62.50 to 69.14		

CI*= Confidence interval calculated by modified Wald method at 95% confidence level

Different medical disorders

Extensive diagnosis made by the physician's revealed different clinical conditions prevailing among the patients. Above 47% (95%CI: 43.57 to 50.56%) patients were reported to have disordered lipid profile whereas 28.05% (95%CI: 25.03 to 31.33%) patients were diagnosed with hypertension and the difference was statistically significant (p<0.05). Almost 16% (95%CI: 13.26 to 18.36%) CVD patients were reported with stroke. Ischaemic heart diseases (IHDs) were reported in 21.55% patients, heart failure in 27.25%, and myocardial infarction in 23.78% patients. (Table 2)

Table 2: Different medical conditions among the cardiac disorder patients (n=780).

Medical conditions	No. of patients	Percentages (%)	CI* (%)
Hypertension	219	28.05	25.03 to 31.33
Ischaemic heart disease	168	21.55	18.79 to 24.56
Heart failure	212	27.25	24.17 to 30.41
Myocardial infarction	185	23.78	20.86 to 26.83
Stroke	122	15.60	13.26 to 18.36
Lipid level disorder	367	47.05	43.57 to 50.56
Angina	97	12.47	10.30 to 14.94

CI*= Confidence interval calculated by modified Wald method at 95% confidence level

Other associated conditions

The physicians also diagnosed several different medical conditions in the patients. For example, 24.11% (95%CI: 21.23 to 27.23%) CVD patients were diabetic and type-I diabetes was more prevalent (16.67%). Above 14% (95%CI: 12.18 to 17.14%) patients were suffering from night-time anxiety with various symptoms such as sweating, palpitation, nightmare, chest pain etc. Other associated medical conditions included gastric disorder (9.74%), eye disease (2.56%) and bronchial asthma (3.33%). (Table 3)

Table 3: Associated other medical conditions among the cardiac disorder patients (n=780).

Medical conditions	No. of patients	Percentages (%)	CI* (%)
Diabetes type-I	130	16.67	14.21 to 19.45
Diabetes type-II	58	7.44	5.78 to 9.50
Anxiety	113	14.49	12.18 to 17.14
Gastric disorder	76	9.74	7.85 to 12.04
Eye disease	20	2.56	1.64 to 3.95
Bronchial asthma	26	3.33	2.26 to 4.86
None	357	45.77	42.30 to 49.28

CI*= Confidence interval calculated by modified Wald method at 95% confidence level

Drugs prescribed in different conditions

Total 6.35±1.56 drugs per prescription were prescribed by the physicians, which belong to different pharmacological therapeutics class. We have categorized all the drugs prescribed to the patients in different groups. Most of the patients got advice to take lipid lowering agent (95.35%, 95%CI: 93.36 to 96.66%) and antiatherogenic drugs (97.6%, 95%CI: 96.20 to 98.46%). Several antihypertensive drugs were prescribed to the patients such as beta adrenoreceptor blockers (51.16%, 95%CI: 47.65 to 54.65%), ACE inhibitors (30.23%, 95%CI: 27.31 to 33.57%), angiotensin receptor blockers (13.95%, 95%CI: 11.71 to 16.59%), and diuretics (37.21%, 95%CI: 33.86 to 40.63%). The physicians prescribed 81.41% (95%CI: 78.52 to 83.99%) anxiolytic drugs for the patients with or without anxiety. (Table 4, Figure 1)
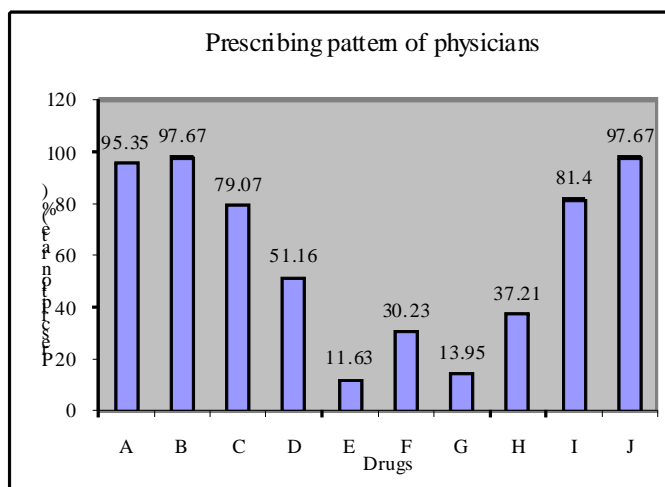

Fig. 1: Prescribing pattern of the physicians among the cardiac disorder patients (n=780). A = Lipid lowering agents, B = Antiatherogenic agents, C = Antianginal drugs, D = Beta-blockers, E = Calcium channel blockers, F = ACE inhibitors, G = Angiotensin receptor blockers, H = Diuretics, I = Anxiolytics, J = Others

Table. 4: Drugs prescribed among the cardiac disorder patients (n=780).

Drugs	No. of prescriptions	Prescription rate (%)	CI* (%)
Lipid lowering agents	744	95.35	93.66 to 96.66
Antiatherogenic	761	97.6	96.20 to 98.46
Antianginal	617	79.07	76.11 to 81.81
Beta-blockers	399	51.16	47.65 to 54.65
Calcium channel blockers	91	11.63	09.59 to 14.12
ACE inhibitors	236	30.23	27.13 to 33.57
Angiotensin receptor blocker	109	13.95	11.71 to 16.59
Diuretics	290	37.21	33.86 to 40.63
Anxiolytics	635	81.41	78.52 to 83.99
Others	762	97.67	96.36 to 98.56

CI*= Confidence interval calculated by modified Wald method at 95% confidence level

Lipid lowering agents

Among the lipid lowering agents, atorvastatin was given to most of the patients (75.4%, 95%CI: 72.18 to 78.36%) whereas the second choice was rosuvastatin (19.62%) (Table 5). Clopidogrel and aspirin combination was given to 48.36% (95%CI: 44.82 to 51.91%) patients for reducing clotting for obtaining synergistic antiplatelet effect of the both compounds whereas 37.21% (95%CI: 33.83 to 40.68%) patients were treated with only clopidogrel. Aspirin and warfarin were prescribed to only 10.12% and 4.33% patients, respectively. (Table 5)

Table 5: Different classes of drugs prescribed among the cardiac disorder patients (n=780).

Drugs	No. of prescriptions	Prescription rate (%)	CI* (%)
Lipid lowering agents			
Atorvastatin	561	75.4	72.18 to 78.36
Rosuvastatin	146	19.62	16.92 to 22.63
Simvastatin	37	4.97	3.61 to 6.80
Antiatherogenic			
Clopidogrel	283	37.21	33.83 to 40.68
Clopidogrel + Aspirin	368	48.36	44.82 to 51.91
Aspirin	77	10.12	8.16 to 12.47
Warfarin	33	4.33	3.09 to 6.05
Antianginal			
Nitroglycerine	485	78.61	75.19 to 81.66
Isosorbide mononitrate	25	4.05	2.73 to 5.94
Nitroglycerine + Isosorbide	107	17.34	14.55 to 20.54
Beta-blockers			
Metoprolol	181	45.36	40.55 to 50.27
Carvedilol	179	44.86	40.07 to 49.77
Ramipril + Carvedilol	39	9.77	7.21 to 13.11
Diuretics			
Frusemide + Spironolactone	272	93.79	90.35 to 96.09
Indapamide	18	6.21	3.91 to 9.65
Anxiolytics			
Bromazepam	397	62.52	58.69 to 66.20
Clonazepam	157	24.72	21.52 to 28.23
Diazepam	66	10.39	8.24 to 13.02
Clobazam	15	2.36	1.40 to 3.89

CI*= Confidence interval calculated by modified Wald method at 95% confidence level

Antianginal agents

Antianginal agents such as direct vasodilators were used commonly. Nitroglycerine was prescribed in 78.61% (95%CI: 75.19 to 81.66%) patients whereas combination of isosorbide mononitrate with nitroglycerine was prescribed in 17.34% patients. (Table 5).

Antihypertensive agents

Antihypertensive agents were predominantly used among the patients. The most preferred options were beta-blockers, diuretics, and ACE inhibitors. Adrenergic receptor blockers such as beta-blockers are given to the patients with hypertension. Most of the physician's opted to prescribe single product rather than combinations. Metoprolol (45.36%, 95%CI: 40.55 to 50.27%) and carvedilol (44.86, 95%CI: 40.07 to 49.77%) were the preferred options for the patients. On the other hand combination of ramipril and carvedilol was given to the minority (9.77%) of the patients. (Table 5).
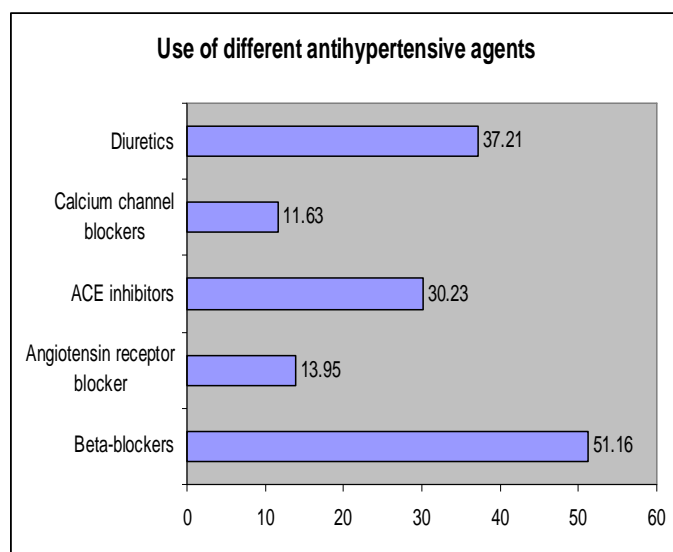

Fig. 2: Use of different antihypertensive agents among the CVD patients (n=780).

Anxiolytic drugs

Most common anxiolytic drugs reported in our study was benzodiazepine groups. Bromazepam (62.52, 95%CI: 58.69 to 66.20%) was preferred by most of the physicians. Clonazepam (24.72%) and diazepam (10.39%) were also prescribed to the patients. (Table 5)

DISCUSSION

This cross sectional study was conducted in a tertiary level hospital situated at the capital of the country. Clinical studies on the cardiovascular disease patients are quite unknown in this country. It allowed in-depth exploration of the health problems related with cardiovascular diseases, different patterns of diagnosis with treatment choice of the specialists.

No. of male patients attended the outdoor at NICVD was slightly higher than the female patients as the male patients usually get privileges for the treatment in the social structure of our country. Moreover significant number of patients came to visit the physicians from urban area. That is complied with the previous report on daily habitual fact of urbanization that raises the risk of cardiovascular disease (Kabiruzzaman *et al.,* 2010). About half of the population was suffering with the high cholesterol level, which increases the risk of coronary heart diseases (CHDs). These may be

due to our food habit, less exercise, poor health hygiene and urbanization. One Study revealed that hypertension is the second leading cardiovascular disease, which is the major cause of other diseases such as heart failure, stroke, myocardial infarction, and angina pectoris etc. (Epstein and Sowers, 1992). Other population based studies suggest that elevated insulin levels, which often occurs in type II diabetes mellitus, is an independent risk factor and co-exist with cardiovascular disease. Other cardiovascular risk factors in diabetic individuals include abnormalities of lipid metabolism, platelet function, and clotting factors (Science Daily, 2008). It was found in the present study that 14.49% patients suffered from anxiety related disorders. Previously published work revealed that anxiety co-existed with 26% patients with cardiovascular disease (Bloomfield *et al.,* 2006).

With a view to manage various complications of cardiovascular disease, the patients were prescribed 6.35 drugs on an average. Most of them were advised to take a little exercise on daily basis in the morning with blood pressure monitoring. The drugs that were mostly prescribed by the specialist doctors (cardiologists and heart specialists) will add value for the general practitioners. The study reveals that most of the patients with lipid profile disorder should to take lipid lowering agent. To circumvent this, physician's prescribed world's mostly prescribed and mostly vended drug, namely atorvastatin. It decreases blood LDL cholesterol level effectively with increasing the HDL level. It also reduces the risk of coronary heart diseases, myocardial infarction and stroke effectively with fewer side effects (Esposti *et al.,* 2004). The patients with coronary heart diseases were treated with anti-atherogenic agents to prevent clotting at the coronary vessels that may be fatal for them ultimately. This type of narrowing of the blood vessels may cause of sudden myocardial infarction or stroke. In order to prevent this, physician preferred clopidogrel and aspirin combination rather than individual agent. Nitroglycerine sustained release (SR) dosage form was the preferred option for the relief of stable and unstable angina. It dilates the blood vessels and supply adequate oxygen to the heart muscle within few minutes. Nitrates were the second choice for this purpose.

Beta-adrenergic receptor blockers include a class of cardiovascular drugs, which are used mostly to treat hypertension. Cardio-protective and antihypertensive effects of this class of drugs justify much larger use as observed in our study. Beta-blockers reduce mortality rate when used for primary and secondary prevention of myocardial infarction and chronic heart insufficiency (Heaton *et al.,* 2004 and European Society of Hypertension, 2003). Cardio-selective beta-blockers, metoprolol and carvedilol were the mostly prescribed drugs in the population in our study, which was a rational approach to the therapy. The outpatients took ACE inhibitors and diuretics with same frequency. This could be explained by widening of the indications for their use in hypertension, diabetic nephropathy, heart failure, etc. In the last decade ACE inhibitors became almost the most important drugs in cardiology, taking into consideration their cardio-protective and renoprotective effects. Many clinical studies confirmed reduction in morbidity and mortality in patients with acute myocardial

infarction and congestive heart failure with use of ACE inhibitors (European Society of Hypertension, 2003). Thiazide diuretics are fundamentals of antihypertensive therapy whereas loop diuretics or the high ceiling diuretics are used as potent antihypertensive agents when used alone. Combination of frusemide ad spirinolactone was mostly prescribed in order to overcome the side effects (viz. severe hypotension) of the former one. Diuretics are recommended as initial monotherapy in older patients with stage I or II of hypertension, or in combination with other antihypertensives in patients with severe hypertension (Esposti *et al.,* 2004). Our study showed the significant negative trends of using angiotensin receptor blockers (ARBs) and calcium channel blockers (CCBs).

CONCLUSION

Analysis divulges that statins and antiatherogenic agents are dominant cardiovascular drugs as compared to others. Beta-blockers, ACE inhibitors and diuretics are predominant in antihypertensive group. The study has some restrains such as the patient did not co-operate with the surveyors and some time it was intricate to monitor prescription effectively. Besides the sample size does not reflect the actual population and prescription pattern in the whole country. Moreover, the study based on a tertiary level hospital, may not accord with the data to other generalized hospitals. Despite these, analysis of cardiovascular drugs use offers insight into the actual prescribing practice in our country. Under-use of ARBs and CCBs should be changed by undertaking educative interventions to change the prescribing practice. This study will also ascertain the further evaluation of cardiovascular drugs utilization in Bangladesh.

REFERENCES

American Heart Association. Heart and Stroke Statistical Update. Dallas, Tex.: American Heart Association, 2001.

Badiuzzaman M, Mohammed FR, Chowdhury FR, Bari MS, Alam MB Ahasan HAMN. Prevalence of modifiable risk factors among stroke patients in a tertiary care hospital in dhaka. Journal of Medicine. 2009; 10(1): 18-21

Bangladesh Bureau of Statistics. Available at: http://www.bbs.gov.bd/. Accessed January, 2009.

Bloomfield P, Bradbury A, Grubb NR, Newby DE. Cardiovascular disease. In: Boon NA, Colledge NR,Walker BR, Hunter JAA (eds). Davidson Principles and Practice of Medicine, 20th ed. Churchill Livingstone, Edinburgh, 2006, pp. 519-644

Comeau DG, Sketris L, Kephart G. et al. The change in composition and cost of antihypertensive drug treatment between 1985 and 1995 in the Halifax county MONICA area. [Abstract] Circulation. 1998; 97(8):826

Epstein M and Sowers JR. Diabetes mellitus and hypertension. Hypertension. 1992; 19: 403-418

Esposti LD, Di Marrino M, Saragoni S, et al. Pharmacoeconomics of antyhipertensive drug treatment: an analysis of how long patients remain on various antihypertensive therapies. J. Clin Hypetens. 2004; 6: 76-82

European Society of Hypertension – European Society of Cardiology guidelines for the management of arterial hypertension, Guidelines Committee. J Hypertens. 2003; 21:1011-1053.

Heaton PMJ and Cluxton RJ Jr. Beta-blocker underused in secondary prevention of myocardial infarction. Ann Pharmacother. 2004; 38: 286-293

Kabiruzzaman *et al.,* Burden of heart failure patients in a tertiary level cardiac hospital. Journal of Bangladesh College of Physicians and Surgeons. 2010; 28:24-29

Psaty BM. Savage PJ, Tell GS, Polak JF. Hirsch CH. Gardin JM, McDonald RH. Temporal patterns of antihypertensive medication use among elderly patients. JAMA. I993; 270(15): 1837-41

Science Daily, Depression and anxiety can double chances of heart ailments. January 19, 2008.

Shaila A, Sonia S, Masuda M, Nargis P, Niru S, Samia S, Rishad M, Masuma A, Abu MS. Geriatric health problems in a rural community of Bangladesh. Ibrahim Med. Coll. J. 2007; 1(2): 17-20

World Health Organization. Cardiovascular diseases. Available at: http://www.who.int/ mediacentre/factsheets/fs317/en/index.html. Accessed February, 2009.