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Surveillance on prescribed cardiovascular drugs by generic names in Dhaka city of Bangladesh

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Abstract

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels and they include: coronary heart disease,cerebrovascular disease ,peripheral arterial disease,rheumatic heart disease,congenital heart disease,deep vein thrombosis and pulmonary embolism etc.CVDs are the number one cause of death globally: more people die annually from CVDs than from any other cause. An estimated 17.3 million people died from CVDs in 2008, representing 30% of all global deaths. Of these deaths, an estimated 7.3 million were due to coronary heart disease and 6.2 million were due to stroke.Low- and middle-income countries are disproportionally affected: over 80% of CVD deaths take place in low- and middle-income countries and occur almost equally in men and women. By 2030, almost 25 million people will die from CVDs, mainly from heart disease and stroke. These are projected to remain the single leading cause of death. Most cardiovascular diseases can be prevented by addressing risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, raised blood pressure, diabetes and raised lipids.7.5 million deaths each year, or 13% of all deaths can be attributed to raised blood pressure. This includes 51% of deaths due to strokes and 45% of deaths due to coronary heart disease. Prescriptions of Cardiac specialist and general physician of various renowned hospitals & medical college of Bangladesh were screened. About 1000 prescriptions were selected from randomly viewed 1200 prescriptions of National Heart Foundation & Dhaka Medical College Hospital outdoor. Finally, 700 prescriptions were selected for survey with proper supporting of patient. All of them were completely cardiac disease content which was prescribed by 99% specialist and 1% general physician. This Survey was carried out at the outdoor of National Heart Foundation & Dhaka Medical College Hospital, Dhaka, Bangladesh from Jan'12 to August'12. Out of the total patients with a male, female ratio was 57.14: 42.86 respectively, all patients were over 30 years and approximately 64.285 % the patients were the demographically urban area whereas 35.714% patients came from rural area. The percentage of prescribed Beta-adrenoceptor blocker, Organic nitrates, Anticoagulant, anti-platelet and thrombolytic drug, Calcium channel blocker, Diuretics, Renin-angiotensin system drugs, Lipid lowering drugs, Miscellaneous drugs were respectively 25.00%, 19.57%,22.00%,8.42%,10.42%,10.40% and 2.85% respectively. This data may be guidelines for optimizing rational use of cardiovascular drugs and also a new statistical approach for effective cardiovascular disease management in Bangladesh.

Key-Words: Chi-square test, Confidence interval, Standard statistical method, Surveillance, Prescription

Introduction

The cardiovascular system constitutes one of the major coordinating and integrating systems of the body. The function of cardiovascular system is to supply oxygen, nutrients and other essential substances to the tissues of the body and to remove carbon dioxide and other metabolic and products from the tissue.

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According to World Health Organization (WHO), cardiovascular disease (CVD) is a major health problem throughout the world and a common cause of premature morbidity and mortality. An estimated 17.3 million people died from CVDs in 2008, representing 30% of all global deaths. Of these deaths, an estimated 7.3 million were due to coronary heart disease and 6.2 million were due to stroke.Low- and middle-income countries are disproportionally affected: over 80% of CVD deaths take place in low- and middle-income countries and occur almost equally in men and women.

By 2030, almost 25 million people will die from CVDs, mainly from heart disease and stroke. These are projected to remain the single leading cause of death. Most cardiovascular diseases can be prevented by addressing risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, raised blood pressure, diabetes and raised lipids.7.5 million deaths each year, or 13% of all deaths can be attributed to raised blood pressure. This includes 51% of deaths due to strokes and 45% of deaths due to coronary heart disease. [10] Over 80% of the world's deaths from CVDs occur in low- and middle-income countries like Bangladesh. eople in low- and middle-income countries are more exposed to risk factors such as tobacco, leading to CVDs and other noncommunicable diseases. At the same time they often do not have the benefit of prevention programmes compared to people in high-income countries. 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. [5] The possible treatment options for the management of CVD's are Beta-adrenoceptor blocker, Organic nitrates, Anticoagulant, anti-platelet and thrombolytic drug, Calcium channel blocker, Diuretics, Renin-angiotensin system drugs, Lipid lowering drugs, Miscellaneous drugs etc. [11] This study pursue use of various cardiovascular drugs using pattern indicated for the treatment of CVDs among the outpatient visited at outdoor of National Heart Foundation & Dhaka Medical College Hospital. The objective of this study was to collect data on prescribed cardiovascular drugs by generic names for optimizing their rational use and effective cardiovascular disease management based on survey and applying statistical approach. [1,2,12]

Methodology

To perform this part of research protocol, the methodology, involved for the under taking of a number of steps. A randomized representative sample was determined before the required date was collected. Over the 07 months collection period we selected randomly ideal 1000 prescriptions from 1200 prescriptions from National Heart Foundation & Dhaka Medical College Hospital outdoor and finally 700 prescriptions selected that were completely cardiac disease drugs content which were prescribed by 99% specialist and 1% general physician. This was absolutely essential for the purpose of obtaining information that actually represented the real scenario. Among the 700 prescriptions 400 were male and 300 were female, all were adults of more than thirty years of age.Some confidential information was collected orally and some was collected in written form. Besides some information was collected observation. Two sources were basically used to collect the data. Here, all data was collected from the representative drug house, hospital and direct interview of patient.

Findings of the study

Seven hundred prescriptions were surveyed under this protocol. The doctor prescribed these prescriptions. Analyzing the prescription the findings that were obtained presented in this chapter in both tabular and graphical form. Here Standard statistical method and chi-square test were used to correlate the obtained results gathered from survey.

Table 1: Comprehensive list of all types of prescribed cardiovascular drugs alone (n=700)

Therapeutic class	No. of prescriptions	Percentage (%)
Organic nitrates	137	19.57
Beta-adrenoceptor blocker	175	25.00
Anticoagulant, antiplatelet and thrombolytic drug	154	22.00
Calcium channel blocker	59	8.42
Diuretics	73	10.42
Renin-angiotensin system drugs	73	10.40
Lipid lowering drugs	20	2.85
Miscellaneous	9	1.28

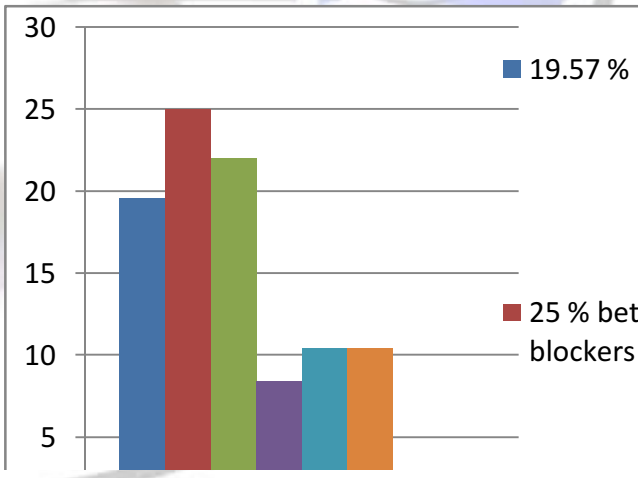

Fig. 1: Comprehensive list of different cardiovascular drugs with their classes

Table 2: Different cardiac disorder (n=700)

Disease name	No. of patients	Percentage (%)
Lipid disorder	293	41.86
Ischemic Heart Disorder	158	22.571
Hypertension	255	35.714
Heart failure	193	27.571
Stroke	150	21.428
Angina	60	8.571
Myocardial infarction	175	25.0

Table 3: Different therapeutic classes of prescribed combine drugs among cardiac disorder patients (n=700)

Therapeutic class with example	No. of prescription	Percentage (%)
Organic nitrates(Antianginal)	499	71.2857
Nitroglycerine	181	25.8571
Iso-Sorbide mononitrate		
Beta-adrenoceptor blocker:	210	30
Atenolol	101	14.42857
Metoprolol	179	25.57142
Propranolol	35	5
Carvedilol		
Anticoagulant,antiplatelet and thrombolytic drug:		
Aspirin	229	32.714
Clopidogrel	49	7
Warfarin	20	2.8571
Calcium channel blocker: Amlodipine	201	28.714
Diltiazem	99	14.1428
Verapamil	135	19.2857
Nifedipine	95	13.5714
Diuretics:		
Thiazide	65	9.2857
Loop diuretic	105	15
K^+- Sparing diuretics	20	2.8571
Renin-angiotensin system drugs: Captopril	200	28.5714
Lisinopril	105	15
Ramipril	45	6.4285
Enalapril	103	14.7142
Lipid lowering drugs:		
Fluvastatin	110	15.7142
Atorvastatin	293	418571
Simvastatin	98	14
Fenofibrate	105	15
Gemfibrozil	86	12.28571

Table 4: List of organic nitrates

Drugs	No. of prescription for Organic nitrates (137)	Percentage (%)
Nitroglycerine	82	59.8540
Iso-Sorbide mononitrate	55	40.1459

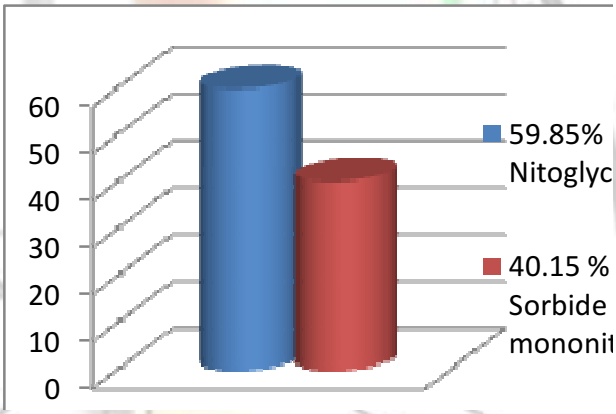

Fig. 2: Most used nitrate drugs according to generic name

Table 5: Various Generics of Beta blockers

Generic name of Drugs	No. of prescription for Beta-adrenoceptor blocker alone (175)	Percentage (%)
Atenolol	65	36.8571
Metoprolol	44	25.4285
Propranolol	38	21.7142
Carvedilol	28	16

Table 6: Various generics of Anticoagulant, antiplatelet and Fibrinolytic agents

Generic name of Drugs	No. of prescription for Anticoagulant, antiplatelet and thrombolytic drug alone (154)	Percentage (%)
Aspirin	123	80.00
Clopidogrel	29	19.00
Warfarin	2	1.00

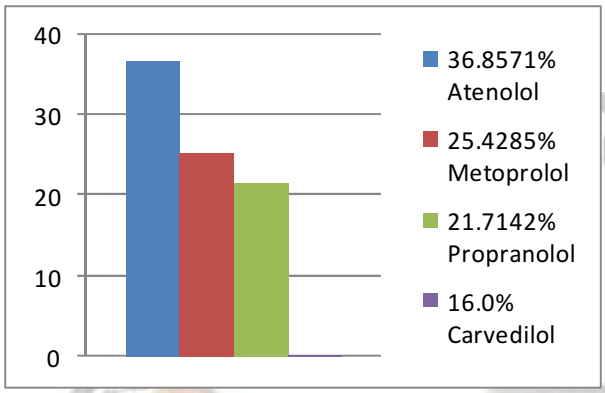

Fig. 3: Comparison of various Beta blockers according their generic name

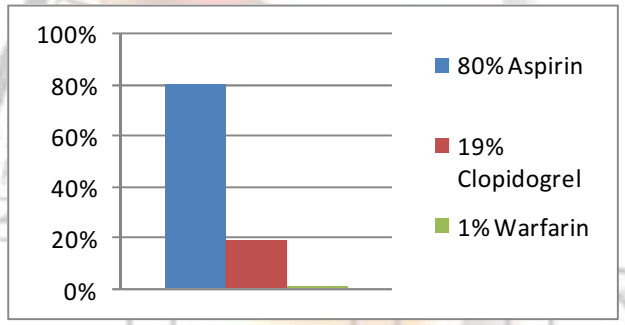

Fig. 4: Widely used Anticoagulant, antiplatelet and Fibrinolytic drugs

Table 7: Various generics of Calcium channel blockers

Generic name of Drugs	No. of prescription Calcium channel blocker (59)	Percentage (%)
Amlodipine	29	50.00
Diltiazem	24	40.00
Verapamil	2	4.00
Nifedipine	4	6.00

Table 8: Various diuretic groups according to their class

Generic name of Drugs	No. of prescription for Diuretics alone (73)	Percentage (%)
Thiazide, Loop diuretic K^+- Sparing diuretics	30	40.81
	21	28.57
	22	30.62

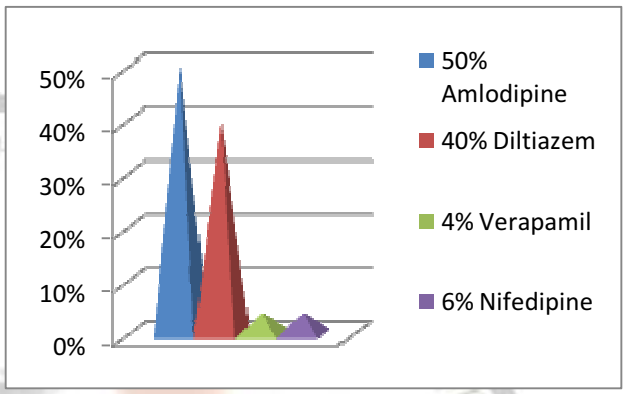

Fig. 5: Calcium channel blocker according to their generic name

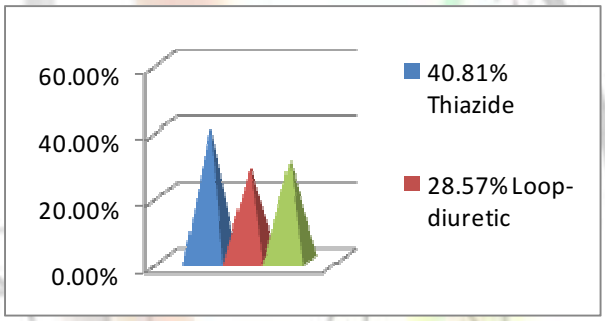

Fig. 6: Various diuretic groups according to their class.

Table 9: Comparison of available Thiazide diuretics

Generic name of drugs	No. of prescription for Thiazide (30)	Percentage (%)
Hydrochlorothiazide	19	62.00
Indapamide	11	38.00

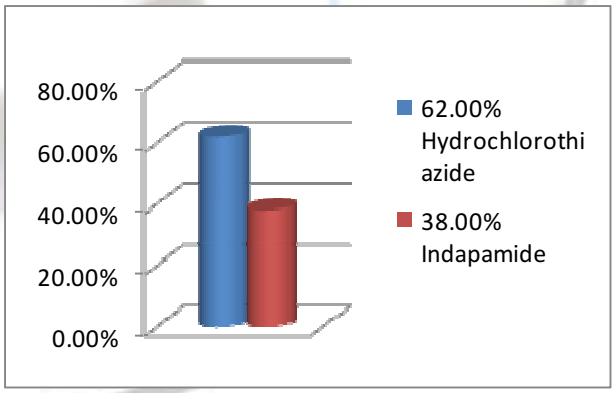

Fig. 7: Comparison of available Thiazide diuretics

Table 10: comparison of available K^+- sparing diuretics

Generic name of drugs	No. of prescription for available K^+-sparing diuretics(22)	Percentage (%)
Spironolactone	10	46.66
Triamterene	6	26.67
Amiloride	6	26.67

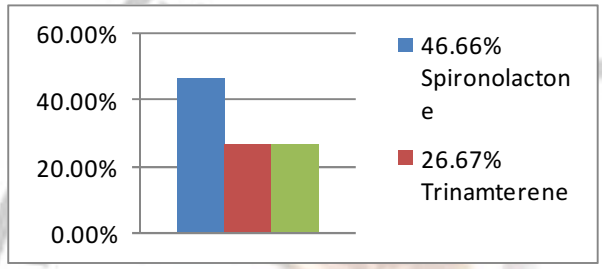

Fig. 8: Presentation of available K^+ sparing diuretics

Table-11: Comparison of available loop diuretics

Generic name of drugs	No. of prescription for loop diuretics (21)	Percentage (%)
Frusemide	12	55.42
Torsemide	9	44.58

Table 12: Various generics name of angiotensin converting enzyme inhibitor

Generic name of drugs	No of prescriptions for Renin-angiotensin system drugs alone (73)	Percentage (%)
Captopril	9	12.5
Lisinopril	2	3.125
Ramipril	60	81.25
Enalapril	2	3.125

Table 13: Various generics of Lipid lowering drugs

Generic name of drugs	No of prescriptions for Lipid lowering drugs alone(20)	Percentage (%)
Fluvastatin	6	32.02
Atorvastatin	9	45.38
Simvastatin	2	7.7
Fenofibrate	2	7.7%
Gemfibrozil	1	7.2%

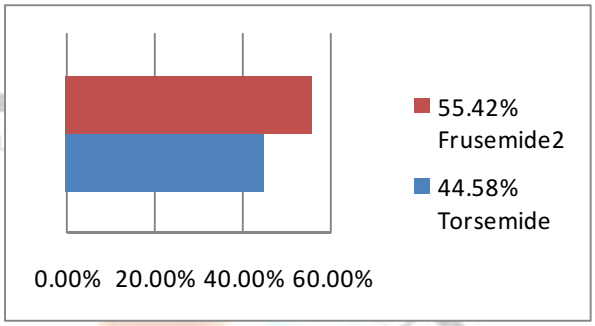

Fig. 9: Presentation of available loop diuretics

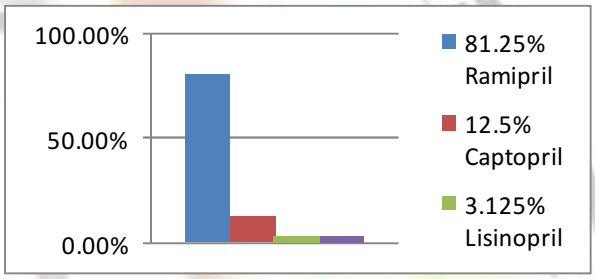

Fig. 10: Comparison of available ACE-Inhibitor

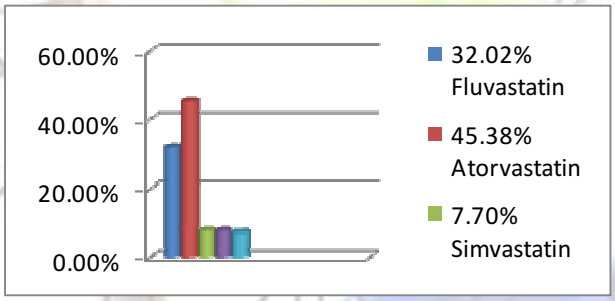

Fig. 11: Comparison between various generic classes of lipid lowering drugs

Results and Discussion

Out of 700 patients who came to visit National Heart Foundation and the Dhaka Medical College Hospital, patients were male 57.14% and female were 42.86%. Approximately 64.285 % (CI*:58.92 % to 69.64 %) the patients were urban area whereas 35.714% (CI*:28.53 % to 42.87 %) patients came from rural area and the difference was found to be statically insignificant (P>0.05 by Chi-square method). The patients above thirty years of age were 100%.

Medical disorders

From the diagnosis by the cardiac specialists and physicians different cardiac disorder prescriptions were prevailing among the patients. Above 41.86% (CI*:38.24 % to 45.55 %) patients were related to lipid disorder whereas 35.714 % (CI*:32.15 % to 39.25 %) patients were diagnosed with hypertension. Almost 22.517% (CI*:25.66% to 19.47%) cardiovascular

patients were reported with Ischemic Heart Disease (IHDs), Stroke was reported in 21.428% (CI*:18.38 % to 24.46 %) , heart failure in 27.571% (CI*:24.25 % to 30.88 %) and myocardial infarction (MI) in 25.0% (CI*:21.79 % to 28.21 %) patients Shown in Table 15

Table 14: Age, sex and demographic distribution of the cardiac disorder patients (n=700)

	No. of patients	Percentage (%)	CI* (%)	Male	Female
Age					
>30 years	700	100	99.91 % to 100.06 %	400	300
Demography: P>0.05 by Chi-square method					
Urban	450	64.285	58.92 % to 69.64 %	283	167
Rural	250	35.714	28.53 % to 42.87 %	157	93

CI*= Confidence interval calculated by standard statistical method at 95% confidence level

Table 15: Different cardiac disorder (n=700)

Disease name	Percentage (%)	CI* (%)
Lipid disorder	41.86	38.24 % to 45.55 %
Hypertension	35.714	32.15 % to 39.25 %
Heart failure	27.571	24.25 % to 30.88 %
Myocardial infarction	25.0	21.79 % to 28.21 %
Ischemic Heart Disorder	22.571	25.66% to 19.47%
Stroke	21.428	18.38 % to 24.46 %
Angina	8.571	38.24 % to 45.55 %

CI*= Confidence interval calculated by standard statistical method at 95% confidence level

Prescribed drugs in different disorders alone

Physicians prescribed different drugs according to the therapeutic class. Confidence Interval for various drug classes were calculated by standard statistical method which reveals that the values are closely related with true value. From that survey physician advice to take organic nitrates 19.57% (95%CI*:16.25 % to 22.65 %) and Beta adrenoceptor blockers 25.0% (95%CI*:21.79 % to 28.21 %). Other antihypertensive drugs include Calcium channel blocker 8.42%(95%CI*:6.36 % to 10.47 %), Diuretics 10.42%(95%CI*:8.16 % to 12.69 %), Renin-angiotensin system drugs 10.40%(95%CI*:1.62 % to 4.08 %), Lipid lowering drugs 2.85%(95%CI*:0.44 % to 2.11 %), Anticoagulant, antiplatelet and thrombolytic drug 22.0%(95%CI*:21.79 % to 28.21 %)., Miscellaneous 1.28%(95%CI*:21.79 % to 28.21 %). alone in prescription (Table. 16 & Figure 1).

Table 16: Most widely used Drugs prescribed in cardiac diseases (n=700)

Drugs	Percentage (%)	CI*%
Organic nitrates	19.57	16.25 % to 22.65 %
Beta-adrenoceptor blocker	25.00	21.79 % to 28.21 %
Anticoagulant, antiplatelet and thrombolytic drug	22.00	18.93 % to 25.07 %
Calcium channel blocker	8.42	6.36 % to 10.47 %
Diuretics	10.42	8.16 % to 12.69 %
Renin-angiotensin system drugs	10.40	1.62 % to 4.08 %
Lipid lowering drugs	2.85	0.44 % to 2.11 %

CI*= Confidence interval calculated by standard statistical method at 95% confidence level

Table 17: Therapeutic classes of Drug prescribed in cardiac diseases (n=700)

Therapeutic class	Percentage (%)	CI*(%)
Organic nitrates(Antianginal) Nitroglycerine Iso-Sorbide mononitrate	71.2857 25.8571	67.95 % to 74.65 % 22.65% to 29.14%

Beta-adrenoceptor blocker: Atenolol Metoprolol Propranolol Carvedilol	30 14.42857 25.57142 5	26.61% to 33.39 % 11.79 % to 17.00 % 22.37 % to 28.83 % 3.38% to 6.61 %
Anticoagulant,antiplatelet and thrombolytic drug: Aspirin Clopidogrel Warfarin	32.714 7 2.8571	29.22 % to 36.17 % 5.10 % to 8.89 % 1.62% to 4.09 %
Calcium channel blocker: Amlodipine Diltiazem Verapamil Nifedipine	28.714 14.1428 19.2857 13.5714	25.34% to 32.05 % 11.52 % to 16.67 % 16.28 % to 22.11 % 11.06% to 16.14 %
Diuretics: Thiazide Loop diuretic K^+- Sparing diuretics	9.2857 15 2.8571	7.15 % to 11.45 % 12.35 % to 28.83 % 1.63% to 4.09 %
Renin-angiotensin system drugs: Captopril Lisinopril Ramipril Enalapril	28.5714 15 6.4285 14.7142	25.25% to 31.94 % 12.35 % to 17.64 % 4.59 % to 8.21 %
Lipid lowering drugs: Fluvastatin Atorvastatin Simvastatin Fenofibrate Gemfibrozil	15.7142 418571 14 15 12.28571	13.01% to 18.39 % 38.24 % to 45.55 % 11.43 % to 16.57 % 12.35% to 17.65 % 9.86% to 14.73 %

CI*= Confidence interval calculated by standard statistical method at 95% confidence level

Antianginal agents

Antianginal agents were used extensively among the patients. Most antianginal agents used were Nitroglycerine (n=499, 95%CI*:71.29%,67.95 % to 74.65 %) whereas Iso-Sorbide mononitrate were prescribed 25.86 %,95% CI*:22.65% to 29.14%). Some Physicians choose combination of both Nitroglycerine and Iso-Sorbide mononitrate .

Lipid lowering agent

Among the lipid lowering agent prescribed, atorvastatin (n=293,41.86 %,95%CI*: 38.24 % to 45.55 %) was used in most of the patients whereas Fluvastatin (n=110, 15.71, 95%CI*:13.01% to 18.39 %) used alternatively. In the class of Anticoagulant, antiplatelet and thrombolytic drug: Aspirin(229, 32.71 %,95%CI*: 29.22 % to 36.17 %) was used in patients for reducing blood clotting and clopidogrel (n=49,7 %,95% CI*: 5.10 % to 8.89 %), Warfarin (n=20,2.85%,95% CI*: 1.62% to 4.09 %) used alone in the patients.

Antihypertensive drugs

Antihypertensive agents were used extensively among the patients. Most used antihypertensive drugs are diuretics, renin angiotensin inhibitors, beta blockers and calcium channel blockers in the patients. Physicians mostly choose beta blockers and anticoagulant classes of drug. Sometimes, single form of this drug rather than combinations are given preference by different specialists and physicians. Among diuretics Loop diuretic (n=105, 15%,95% CI*: 12.35 % to 28.83 %) were used in highest number of prescriptions prescribed by the physician whereas

thiazide diuretics were used (n=70, 9.29%, 95% CI*: 7.15 % to 11.45 %).In case of Beta adrenoreceptor blockers Atenolol (n=210,30 %, 95% CI*: 26.61% to 33.39 %),Propranolol (n=179,25.57%, 95% CI*: 22.37 % to 28.83 %) were prescribed by specialist and physicians.Furthermore, Calcium channel blocker: Amlodipine (n=201,28.7 1%, 95% CI*: 25.34% to 32.05 %),Verapamil (n=135,19.28%, 95%CI*: 16.28 % to 22.11 %) were prescribed than other drugs of this class.

The aim of this survey protocol has undertaken for assessing variable types of cardiovascular drugs and matter relating to about near future to other new cardiovascular agents. To fruitful cardiovascular disease management and to know the most widely used cardiovascular drugs in Bangladesh this study will be helpful. After completion the survey we discuss with prescribed doctors and showed them Table-17 they completely comply with results. They informed us that aforementioned table class of drugs they use to prescribe for less side effect, rapid onset of action, minimum drugs are require, cost effective, easily available in the market and patient compliance. In most of the classes in cardiovascular therapy combination therapy is applied so there is no sharp rise of a particular class. Beta blocker and anticoagulant, antiplatelet and thrombolytic class possess the approximate value indicate till they have high application in therapy. [6,9] Nitrates also take place a prominent position and indicate increasing rate of antianginal drugs use. Diuretics and renin-angiotensin blockers possess near to same percentage of prescription generation. They are choice widely as supportive element in the cardiovascular therapy. [8,21] Calcium channel blockers hold a moderate position. The recent trend in therapy is much more preventive so it is coming in practice the use of lipid lowering drug. Their use is increasing day by day.

In Organic nitrate and nitrite class, nitroglycerine is widely used. Till now beta blocker is a prime choice in maintaining blood pressure in elderly person. Atenolol is the popular antihypertensive among the beta blocker for its selectivity, less side effects and cheaper than other beta blockers. Recently, Aspirin the famous NSAID plays an important role as a prophylactic agent at a dose of 75 mg because of their effectiveness, availability and low cost.

In calcium channel blocker amlodipine prescribed at a rate of 50% and diltiazem 40%. Amlodipine preparations are more available and more clinically effective than other calcium channel blockers. Single uses of diuretic produce various side effects like electrolyte imbalance, nephrotoxicity, hypovolaemia impotency etc. To reduce the side effects, diuretics are combinedly used. Commonly the thiazide diuretics are combined with k+ -sparing diuretics. In markets combined diuretics are more available so the individual market share detection is very difficult task. Among the diuretics class thiazide is used in high quantity 40.81% and potassium sparing takes 30.62% indapamide possess 38% and hydrochlorothiazide 62%. In potassium-sparing class spironolactone possesses 46.66% and triamterene and amiloride possess 26.67%.Loop diuretic frusemide found in 55.42% quantity. In ACE generic class ramipril from the 81.25% market and then captopril 12.50%.Ramipril preparation are mostly prescribed. In Lipid lowering class atorvastatin is used in high quantity 41.85% and then fluvastatin takes 15.71%.Atorvastatins are more effective more available than other lipid lowering drugs. [7]

Conclusion

Statistical analysis reveals that Beta-adrenorecpor blockers and Anticoagulants are prescribed mostly than other class of drugs. Changes in patterns of cardiovascular disease management and drug use are changing day by day. Organic nitrates, anti-platelet and thrombolytic drug, Calcium channel blocker, Diuretics, Renin-angiotensin system drugs, Lipid lowering drugs are also used prominantly. This Survey has many drawbacks such as many times it was not possible to collect latest information about the drugs due to demand a charge for the new journals, medical representatives of different companies do such type presentation survey almost every time so drug housekeeper feels disturb in this events. Hence sometimes prescription goes in irregular fashion, Patient feels disturb to collect prescription, Professor level doctor's interview was very difficult. Now a days in cardiovascular disease the approach is much more preventive than cure. For example using of antioxidant, antilipidemic agents to reduce the factor of diseases. Cardiovascular disease is not totally curable. So patients should be conscious about using the drug. There is a trend when it feels good patient stop taking medication. This approach hampers the therapy. During this survey it was observed that though the cardiovascular drugs are so potentially lifesaving one.Moreover, this survey based on demographic data and statistical approach collected from National Heart Foundation & Dhaka Medical College Hospital, Dhaka, Bangladesh. Morever, the study based on a tertiary level hospital, may not accord with the data to other generalized hospitals. Furthermore, this study protocol will also ascertain the further evaluation and

practice of cardiovascular drugs practice in cardiac disease management in Bangladesh.

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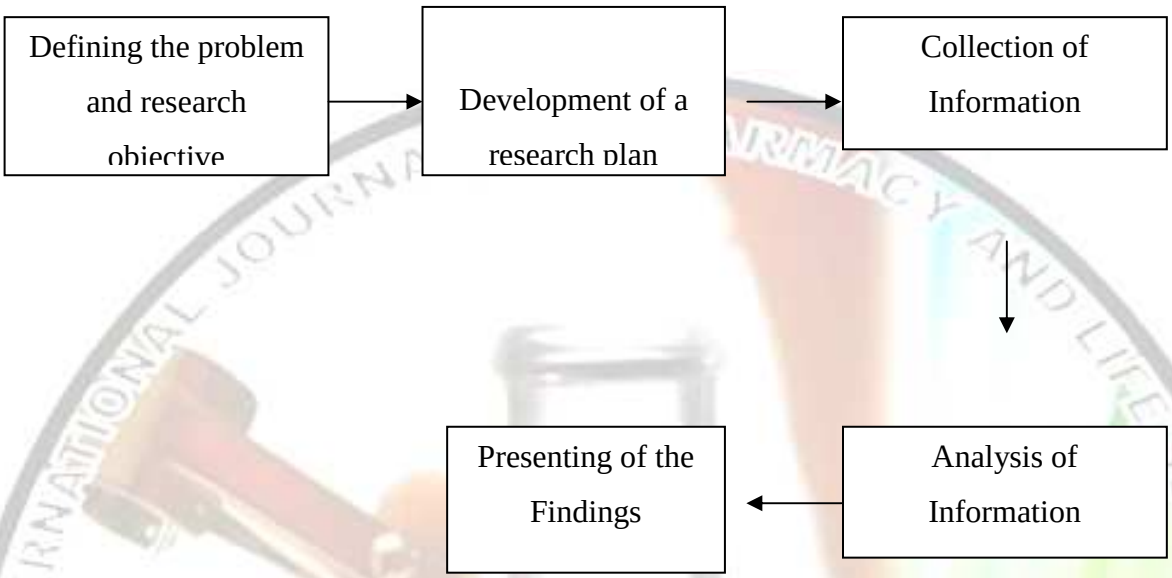

Flow chart of research process