

Prescribing Habits of Doctors in Cardiovascular Disease in Bangladesh

A Research Report submitted to the Department of Pharmacy, East West
University in partial fulfillment for the requirements of the degree of
Bachelor of Pharmacy

Submitted To

Department Of Pharmacy
East West University

Submitted by

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Declaration by the Research Candidate

I, **Tamanna Kabir (ID # 2011 – 3 – 70 – 032)** , hereby declare that the Research entitled “**Prescribing Habits of Doctors in Cardiovascular Disease in Bangladesh**” , submitted by me to the Department of Pharmacy, East West University, Aftabnagar, Dhaka, Bangladesh in the partial fulfillment of the requirement for the award of the degree of Bachelor of Pharmacy is a bonafide record of original Project work carried out by me during 2013 under the supervision and guidance of **Ms. Nazia Hoque**, Senior Lecturer, Department of Pharmacy, East West University, Aftabnagar, Dhaka, Bangladesh and it has not formed the basis for the award of any other Degree/Diploma/Fellowship or other similar title to any candidate of any University.

Place: Dhaka

Signature of the Candidate

Date: 01 / 12 / 2013

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This is to certify that the Research entitled “**Prescribing Habits of Doctors in Cardiovascular Disease in Bangladesh**” submitted to the Department of Pharmacy, East West University, Aftabnagar, Dhaka in partial fulfillment of the requirements of the Degree of Bachelor of Pharmacy was carried out by **Tamanna Kabir** (ID # 2011 – 3 – 70 – 032). We further indorse that all the sources of information and facilities availed of in this connection duly acknowledged.

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Certificate

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Signature of Research Supervisor

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Acknowledgement

First, all praise and glory are to **Allah** for all the bounties granted to me and only with His guidance and help this achievement has become possible.

I wish to express my thanks and gratitude towards my supervisor **Ms. Nazia Hoque**, Senior Lecturer, Department of Pharmacy, East West University, for her constant encouragement, helpful discussions and able guidance throughout this study. Her generosity with time and constructive comments were of vital support and were above the call of duty.

I am indebted to Dr. Chowdhury Faiz Hossain, Chairperson and Professor, East West University, for his kind support and the permission to use the facilities available at the Department of Pharmacy, East West University, as well as for his encouragement to carry out research.

I would like to convey deepest love and obedience to my caring parents and younger sister for their support and guiding me all through my life until today, which keeps me strong and honest to do the things I needed to do.

Finally I would also like to thank all the students for their technical direction and cooperation which enabled me to work in a very congenial and comfortable atmosphere and for giving me moral support behind my research.

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List of Acronyms

AMI - Acute Myocardial Infarction

AV- Atrioventricular

IHD - Ischemic Heart Disease

LVF - Left Ventricular Failure

MDR - Multi-Drug Resistant

OMI - Old Myocardial Infarction

NICVD- National Institute of Cardiovascular Disease

RHD - Rheumatic Heart Disease

UNICEF- United Nations International Children's Emergency Fund

USAID - United States Agency for International Development

WHO - World Health Organization

Abstract

Cardiovascular diseases 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. By 2030, almost 25 million people will die from cardiovascular diseases, mainly from heart disease and stroke. These are projected to remain the single leading cause of death. The objective of the present study was to find out the prescription habit of doctors in various cardiovascular diseases in Bangladesh. The survey of the study was conducted in National Institute of Cardiovascular Disease situated in Dhaka, the Capital City of Bangladesh. From the present study among the 715 prescription it was seen that among 715 patients 40% were female patient & 60% were male patient. It was seen that among 715 patients 2% were within 16-30 years, 10% were within 31-45 years, 49% were within 46-60 years, 28% were within 61-75 years & 11% were within 76-90 years. It was seen that among 715 patients 43% suffered from UA & HTN, 33% patient suffered from AMI & HTN, 16% patients suffered from UA & HTN & LVF, 8% patients suffered from LVF & IHD & 28% have HTN, 25% have unstable angina(UA), 20% have AMI, 18% have left ventricular failure, 9% have IHD. Among the 715 prescription, 33% patient used clopidogrel, 29% patient used glyceryl trinitrate, 14% patient used trimetazidine dihydrochloride, 9% patients used metoprolol, 7% patients used carvedilol, 5% patients used atorvastatin, 3% patient used digoxin. From the present study among the 715 prescription, controls of different pharmaceutical companies over total drug market for cardiovascular diseases were found out, And it was found out that 62% of the drug market for the management of cardiovascular diseases was controlled by Drug International Ltd as it is the company whose drugs are most prescribed. The Drug Include Nidocard (Glyceryl Trinitrite), Betaloc (Meteprolol Tartrate), Clopid (Clpidogrel Bisulphate). Aristopharma Pharmaceutical Share 17%. The Drug include Metacard and Agoxin. Beximco held their share at 7% & their drug is Atova. Sunpharma share 4% & their drug include Cardivas.

Keywords: Cardiovascular diseases, Heart failure, Acute Myocardial Infarction, Glyceryl trinitrite, Heart disease

Introduction

1.1 Objective of the Study:

The core objective of this study was to know the awareness among the patient as well as create awareness among this patient & different occupational people. To know prescription pattern for the cardiovascular disease patient, which common drugs the physician currently consider for the routine CVD treatment. Another not less important target was to find out the number of patient suffered by major CVD disease. The similarity and dissimilarity among the patient's case history how a patient prescribed and why prescription varies though have some cause and case history.

The most significant objective of this study are-

1. To generate awareness in cardiovascular patients of the life threatening complications of heart failure.
2. To estimate the tendency of a physician to advice same drugs though patient have different case history.
3. To avoid the irrational and polypharmacy of drug use in patients.
4. To know the specific pattern followed by the doctor

1.2 Definition

Cardiovascular disease is a class of diseases that involve the heart or blood vessels i.e. arteries, capillaries and veins. Cardiovascular disease refers to any disease that affects the cardiovascular system, principally cardiac disease, vascular diseases of the brain and kidney, and peripheral arterial disease. The causes of cardiovascular disease are diverse but atherosclerosis and hypertension are the most common. Additionally, with aging come a number of physiological and morphological changes that alter cardiovascular function and lead to subsequently increased risk of cardiovascular disease, even in healthy asymptomatic individuals. Heart attacks and strokes are usually acute events and are mainly caused by a blockage that prevents blood from flowing to the heart or brain. The most common reason is a build-up of fatty deposits on the inner walls of the blood vessels. Strokes can be caused by bleeding from a blood vessel in the brain or by blood clots. Cardiovascular disease is the leading cause of deaths worldwide, though since the 1970s, cardiovascular mortality rates have declined in many high-income countries. At the same time, cardiovascular deaths and disease have increased at a fast rate in low- and middle-income countries. Although cardiovascular disease usually affects older adults, the

antecedents of cardiovascular disease, notably atherosclerosis, begin in early life, making primary prevention efforts necessary from childhood. There is therefore increased emphasis on preventing atherosclerosis by modifying risk factors, such as healthy eating, exercise, and avoidance of smoking.

1.3 Types of Cardiovascular Disease

- Coronary Artery Disease
- Heart Failure
- Myocardial infarction (MI)
- Congestive heart failure
- Cardiac Arrhythmia
- Angina
- Peripheral vascular disease
- Atherosclerosis
- Valvular heart disease
- Hypertension

Cardiovascular disease is a general term that describes many different diseases:

1.4 Coronary Artery Disease

Coronary artery disease is also called coronary heart disease. Coronary artery disease is developed due to atherosclerosis of the coronary arteries, producing blockages in the vessels which nourish the heart itself. Atherosclerosis occurs when the arteries become clogged and narrowed, restricting blood flow. Without adequate blood flow from the coronary arteries, the heart becomes starved of oxygen and vital nutrients and fails to work properly (Flecher et al. 1996)

1.4.1 Development

Coronary arteries are blood vessels on the heart. They are smooth and elastic, allowing blood to flow freely. Before teen years, fat can start to deposit in the blood vessel walls. In older, the fat builds up. This causes injury to the blood vessel walls. In an attempt to heal itself, the fatty tissues release chemicals that promote the process of healing but make the inner walls of the

blood vessel sticky. Then, other substances, such as inflammatory cells, proteins, and calcium that travel in bloodstream start sticking to the inside of the vessel walls. The fat and other substances combine to form a material called plaque, which can narrow the flow of blood in the artery (atherosclerosis). Some plaque deposits are hard on the outside and soft and mushy on the inside. When this happens, platelets come to the area, and blood clots accumulate on the injured vessel wall. This causes the artery to narrow even more. The inside of the arteries develop plaques of different sizes. The new arteries may not be able to supply enough oxygen-rich blood to the heart muscle (American Heart Association, 2003).

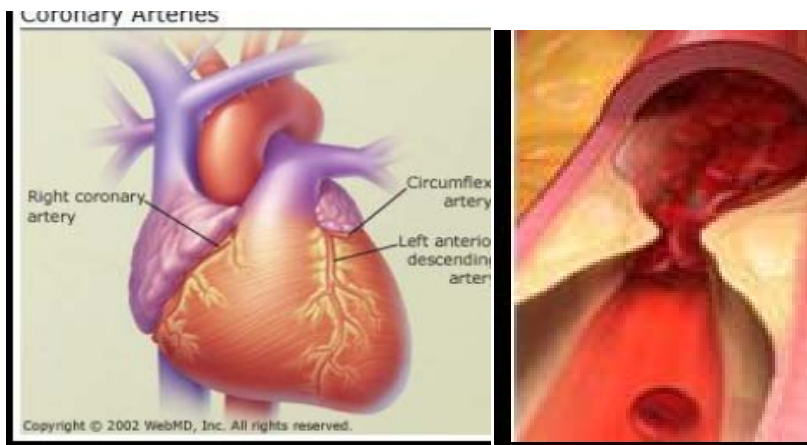


Figure 1: Coronary Artery Disease

1.4.2 Symptoms

The most common symptom of coronary artery disease is angina pectoris, or simply chest pain. Angina can be described as a discomfort, heaviness, pressure, aching, burning, numbness, fullness, squeezing or painful feeling on the chest. It can be mistaken for indigestion or heartburn. Angina is usually felt in the chest, but may also be felt in the left shoulder, arms, neck, back, or jaw.

1.4.3 Diagnosis

Coronary Artery Disease are diagnosed by performing diagnostic tests, including an electrocardiogram (ECG or EKG), exercise stress tests, electron beam (ultrafast) CT scans, cardiac catheterization, and others.

1.4.4 Treatment

Treatment for coronary artery disease involves reducing risk factors, taking medications, possibly undergoing invasive and/or surgical procedures, and seeing doctor for regular health care follow up visits.

- **Reduce risk factors:**

This involves making lifestyle changes. Patients should quit smoking. Low fat, low salt, and low cholesterol foods are recommended. Patient should also get more exercise to help maintain a healthy weight and. But, they should consult with the doctor before starting an exercise program.

- **Medications:**

If making lifestyle changes isn't enough to control the heart disease, medications may be needed to help heart work more efficiently and receive more oxygen-rich blood.

- **Surgery and other procedures:**

Common procedures to treat coronary artery disease include balloon angioplasty (PTCA), stent placement, and coronary artery bypass surgery. All of these procedures increase blood supply to heart, but they do not cure coronary heart disease.

- **Angiogenesis:**

This involves giving substances through the vein or directly into the heart that trigger the heart to grow new blood vessels to bypass the clogged ones (Etsuda & Mizuno 1993).

1.5 Heart Failure

Heart failure means that for some reason, heart is not pumping blood around the body as well as it used to. The most common reason is that heart muscle has been damaged, for example, after a heart attack.

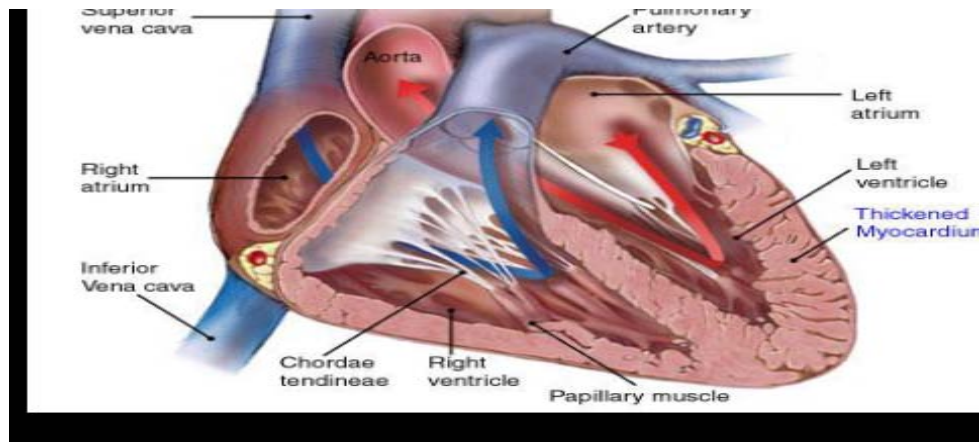


Figure 2: Heart Failure

1.5.1 Causes

Some causes of heart failure are:

- A previous heart attack
- High blood pressure
- Problems with the valves in heart
- Cardiomyopathies diseases of the heart muscle
- Too much alcohol
- Congenital conditions

1.5.2 Symptoms

There are four different stages of heart failure and symptoms will vary from stage to stage. Patient might feel out of breath if physically active or for some people even at rest. They may also have swollen feet and ankles and feel very tired.

1.5.3 Diagnosis

Heart failure are diagnosed by the tests which include blood tests, an electrocardiogram (ECG) and an echocardiogram

1.5.4 Treatment

They will give an advice about making changes to lifestyle that will help to do all the things that enjoy, improve the condition and live a normal life. These include:

- Cutting down on salt
- Stop smoking
- Keeping active (British Heart Foundation, 2010)

1.6 Myocardial infarction (MI)

Myocardial infarction (MI) or acute myocardial infarction (AMI), commonly known as a heart attack is the interruption of blood supply to part of the heart, causing heart cells to die. This is most commonly due to blockage of a coronary artery following the rupture of a vulnerable atherosclerotic plaque, which is an unstable collection of lipids (fatty acids) and white blood cells (especially macrophages) in the wall of an artery. The resulting ischemia and oxygen shortage, if left untreated for a sufficient period of time, can cause damage or death (infarction) of heart muscle tissue (myocardium) (British Heart Foundation, 2010).

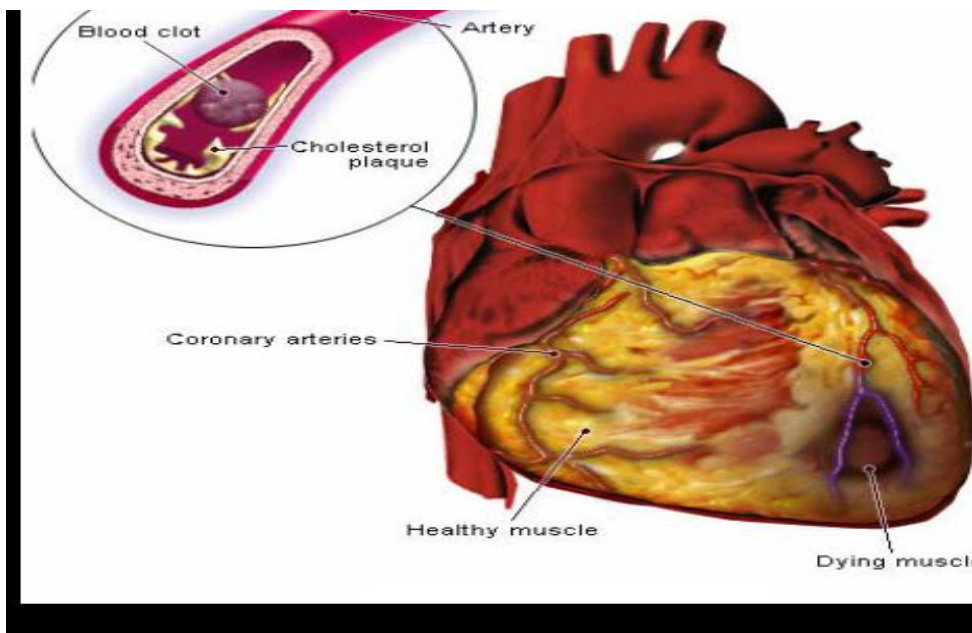


Figure: Myocardial Infarction

1.6.1 Risk Factors

High blood cholesterol

Total blood cholesterol levels of 5.5 mmol/L or more are an indication of an increased risk of developing coronary heart disease, and levels of 6.5 mmol/L or more are considered to indicate high risk. There are two types of cholesterol HDL and LDL cholesterol—so called „good“ and „bad“ cholesterol, respectively. HDL cholesterol provides protection against heart disease by helping to reduce atherosclerosis. Excess levels of LDL cholesterol can contribute to clogging of the arteries (atherosclerosis), increasing the risk of heart attack and stroke. For most people, a high level of saturated fat in the diet is the main factor that raises blood cholesterol levels. Genetic factors also affect blood cholesterol levels and a few people have high cholesterol levels regardless of their dietary intake of saturated fat and cholesterol (Flecher et al. 1993)

1.6.2 Treatment of Myocardial infarction

The goal of treatment for a heart attack is to relieve pain, preserve the heart muscle function, and prevent death. Treatment of the emergency patient may include:

- Intravenous therapy - nitroglycerin, morphine
- Continuous monitoring of the heart and vital signs
- Oxygen therapy - to improve oxygenation to the damaged heart muscle
- Pain medication - by decreasing pain, the workload of the heart decreases, thus, the oxygen demand of the heart decreases
- Cardiac medication - such as beta-blockers or calcium channel blockers to promote blood flow to the heart, improve the blood supply, prevent arrhythmias, and decrease heart rate and blood pressure
- Fibrinolytic therapy - intravenous infusion of a medication which dissolves the blood clot, thus, restoring blood flow
- Antithrombin/antiplatelet therapy - used to prevent further blood clotting Antihyperlipidemics - medications used to lower lipids (fats) in the blood, particularly Low Density Lipid (LDL) cholesterol. Statins are widely used to decrease LDL including simvastatin , atorvastatin and pravastatin among others. Bile acid sequestrants - colesevelam, cholestyramine and colestipol - and nicotinic acid (niacin) are two other types of medications that may be used to reduce cholesterol levels (Elizabeth et al. 2008).

1.7 Congestive Heart Failure

Congestive heart failure (CHF), or heart failure, is a condition in which the heart can't pump enough blood to the body's other organs. This can result from narrowed arteries that supply blood to the heart muscle causes. Myocardial infarction, with scar tissue that interferes with the heart muscle's normal work, heart valve disease due to past rheumatic fever or other causes primary disease of the heart muscle itself, called cardiomyopathy (American Heart Association, 2003).

1.7.1 Causes

Many disease processes can impair the pumping efficiency of the heart to cause congestive heart failure. However the most common causes of congestive heart failure are:

- Coronary artery disease,
- High blood pressure (hypertension),
- Longstanding alcohol abuse, and
- Disorders of the heart valves. Less common causes include viral infections of the stiffening of the heart muscle, thyroid disorders, disorders of the heart rhythm, and many others.

1.7.2 Diagnosis

The diagnosis of congestive heart failure is most often a clinical one that is based on knowledge of the patient's pertinent medical history, a careful physical examination, and selected laboratory tests. The physical examination is focused on detecting the presence of extra fluid in the body (breath sounds, leg swelling, or neck veins) as well as carefully characterizing the condition of the heart (pulse, heart size, heart sounds, and murmurs). Useful diagnostic tests include the electrocardiogram (ECG) and chest x-ray to explore the possibility of previous heart attacks, arrhythmia, heart enlargement, and fluid in and around the lungs.

1.8 Cardiac Arrhythmia

An arrhythmia is a problem with the rate or rhythm of the heartbeat. During an arrhythmia, the heart can beat too fast, too slow, or with an irregular rhythm. Most arrhythmias are harmless, but some can be serious or even life threatening. When the heart rate is too fast, too slow, or irregular, the heart may not be able to pump enough blood to the body. Lack of blood flow can damage the brain, heart, and other organs.

1.8.1 Causes

An arrhythmia can occur if the electrical signals that control the heartbeat are delayed or blocked. This can happen if the special nerve cells that produce electrical signals don't work properly, or if electrical signals don't travel normally through the heart. This can also occur if another part of the heart starts to produce electrical signals. This adds to the signals from the special nerve cells and disrupts the normal heartbeat. Smoking, heavy alcohol use, use of certain drugs (such as cocaine or amphetamines), use of certain prescription or over-the-counter medicines, or too much caffeine or nicotine can lead to arrhythmias in some people.

1.8.2 Symptoms

More serious signs and symptoms include:

- Anxiety
- Weakness, dizziness, and lightheadedness
- Fainting or nearly fainting
- Sweating
- Shortness of breath
- Chest pain

1.8.3 Treatment

Common arrhythmia treatments include medicines, medical procedures, and surgery. Some arrhythmias are treated with a pacemaker. A pacemaker is a small device that's placed under the skin of the chest or abdomen to help control abnormal heart rhythms. Some people who are at risk for ventricular fibrillation are treated with a device called an implantable cardioverter defibrillator (ICD). Like a pacemaker, an ICD is a small device that's placed under the skin in the chest. This device uses electrical pulses or shocks to help control life-threatening arrhythmias.

1.9 Angina

Angina (angina pectoris) is chest discomfort that occurs when there is a decreased blood oxygen supply to an area of the heart muscle. In most cases, the lack of blood supply is due to a narrowing of the coronary arteries as a result of arteriosclerosis.

Angina is usually felt as:

CHAPTER 1

- Pressure
- Heaviness
- Tightening
- Squeezing or
- Aching across the chest, particularly behind the breastbone. This pain often radiates to the neck, jaw, arms, back, or even the teeth.

1.9.1 Causes

The most common cause of angina is coronary artery disease. A less common cause of angina is spasm of the coronary arteries.

1.9.2 Diagnosis

The electrocardiogram (EKG) is a recording of the electrical activity of the heart muscle, and can detect heart muscle which is in need of oxygen. The EKG is useful in showing changes caused by inadequate oxygenation of the heart muscle or a heart attack.

1.9.3 Treatment

Treatment options include:

- Rest
- Medications (nitroglycerin, beta blockers, calcium channel blockers)
- Percutaneous transluminal coronary angioplasty (PTCA) or
- Coronary artery bypass graft surgery (CABG).

1.9.4 Medications

These commonly include Nitroglycerin, Beta Blockers, and Calcium Channel Blockers. New drugs are being studied to treat angina.

1.10 Atherosclerosis

Atherosclerosis is the process in which deposits of fatty substances, cholesterol, cellular waste products, calcium and other substances build up in the inner lining of an artery. This buildup is called plaque. It usually affects large and medium-sized arteries. Some hardening of arteries often occurs when people grow older.

1.10.1 Causes

Atherosclerosis is a slow, complex disease that typically starts in childhood and often progresses when people grow older. In some people it progresses rapidly, even in their third decade. Many scientists think it begins with damage to the innermost layer of the artery. This layer is called the endothelium. Causes of damage to the arterial wall include:

- Elevated levels of cholesterol and triglyceride in the blood
- High blood pressure
- Tobacco smoke
- Diabetes (American Heart Association 2003)

1.10.2 Treatment

- Medication is unsatisfactory for treating atherosclerosis, since the damage has already been done.
- Anticoagulant drugs have been used to try to minimize secondary clotting and embolus formation.
- Vasodilator drugs are helpful in providing symptom relief, but are of no curative value.
- Surgical treatment is available for those unresponsive to medical treatment or in certain high-risk situations.

1.11 Rheumatic heart disease

Chronic rheumatic heart disease (RHD) is characterized by repeated inflammation with fibrinous resolution. The cardinal anatomic changes of the valve include leaflet thickening, commissural fusion, and shortening and thickening of the tendinous cords. It is caused by an autoimmune reaction to Group α - β -hemolytic streptococci (GAS) that results in valvular damage. Fibrosis and scarring of valve leaflets, commissures and cusps leads to abnormalities that can result in valve stenosis or regurgitation. The inflammation caused by rheumatic fever, usually during childhood, is referred to as rheumatic valvulitis. About half of patients with acute rheumatic fever develop inflammation involving valvular endothelium. The majority of morbidity and mortality associated with rheumatic fever is caused by its destructive effects on cardiac valve tissue. The pathogenesis of RHD is complex and not fully understood, but it is known to involve molecular mimicry and genetic predisposition that lead to autoimmune reactions.

1.11.1 Treatment:

In the first few days presentation, the major priority is confirming the diagnosis. With the exception of heart failure management, none of the treatments offered to patients with ARF has been proven to alter the outcome of the acute episode, or the amount of damage to heart valves. Thus, there is no urgency to begin definitive treatment. Non-steroidal anti-inflammatory drugs reduce the pain of arthritis, arthralgia and fever of ARF, but can confuse the diagnosis. Paracetamol and codeine are recommended for pain relief until the diagnosis is confirmed. Corticosteroids are sometimes used for severe carditis, although there is no evidence that they alter the longer-term outcome. Ideally, all patients with suspected ARF (first episode or recurrence) should be hospitalized as soon as possible after onset of symptoms. This ensures that all investigations are performed and, if necessary, the patient observed to confirm the diagnosis before commencing treatment.

1.12 Hypertension

Hypertension is a progressive cardiovascular syndrome arising from complex and interrelated etiologies. Early markers of the syndrome are often present before blood pressure elevation is sustained; therefore, hypertension cannot be classified solely by discrete blood pressure thresholds. Progression is strongly associated with functional and structural cardiac and vascular abnormalities that damage the heart, kidneys, brain, vasculature, and other organs and lead to premature morbidity and death (Cziraky, 1998)

Hypertension is high blood pressure. Blood pressure is the force of blood pushing against the walls of arteries as it flows through them. Arteries are the blood vessels that carry oxygenated blood from the heart to the body's tissues (Cziraky, 1998).

Hypertension is the term used to describe high blood pressure. Blood pressure readings are measured in millimeters of mercury (mmHg) and usually given as two numbers. For example, 120 over 80 (written as 120/80 mmHg). The top number is systolic pressure, the pressure created when heart beats. It is considered high if it is consistently over 140. The bottom number is diastolic pressure, the pressure inside blood vessels when the heart is at rest. It is considered high if it is consistently over 90. Either or both of these numbers may be too high. Pre-hypertension is when systolic blood pressure is between 120 and 139 or diastolic blood pressure is between 80 and 89 on multiple readings.

1.12.1 Treatment and medication of Hypertension

Drugs are prescribed after hypertension

- To reduce the hypertension.
- To help prevent heart diseases from hypertension.
- The drugs are usually taken each day for life.(British Heart Foundation, 2010) Classes of drugs used in the treatment of hypertension are given below:

A. Diuretics

- Loop Diuretics: Furosemide, Torsemide, Bumetanide.
- Thiazide: Chlorthiazide, Hydrochlorthiazide.
- Osmotic diuretics: Mannitol, Glycerine.
- Carbonic anhydrase inhibitor: Acetazolamide, Metazolamide.
- K⁺ sparing anhydrase inhibitor: Amiloride, Triamterene.
- Aldosterone antagonist: Spironolactone.

B. Adrenergic receptor blocker:

- α blocker: Terazosin, Prazosin.
- β blocker: Atenolol, Propanolol.

C. Vasodilators

- Na Nitro prusside
- Hydralazine

D. Calcium Channel blocker

- Amlodipine
- Nifedipine
- Diltiazem

E. ACE Inhibitor

- Captopril
- Ramipril
- Enalapril

F. Angiotensin blocker

- Losartan
- Candesartan
- Valsartan

G. Centrally acting agent

- Methyldopa
- Clonidine

1.13 Types of Drug used in cardiovascular disease:

Cardiovascular drugs encompass a large number of prescription medications that are used to control heart disease. It is a complicated group of drugs with many being used for multiple heart conditions. For example, Propranolol is a common cardiovascular drug that can be used to treat hypertension as well as arrhythmias. Drugs are namely below:

1. Anticoagulants
2. Antiplatelet Agents
3. Angiotensin-Converting Enzyme (ACE) Inhibitors
4. Angiotensin II Receptor Blockers (or Inhibitors)
5. Beta Blockers
6. Calcium Channel Blockers
7. Diuretics
8. Vasodilators
9. Digitalis Preparations
10. Statins

1.14 Anticoagulants:

An anticoagulant is a substance that prevents coagulation (clotting) of blood. Such substances occur naturally in leeches and blood-sucking insects. A group of pharmaceuticals called anticoagulants can be used in vivo as a medication for thrombotic disorders. Some anticoagulants are used in medical equipment, such as test tubes, blood transfusion bags, and renal dialysis equipment (Suellen et al. 2006)

1.14.1 Mechanism:

Decreases the clotting (coagulating) ability of the blood sometimes called blood thinners, although they do not actually thin the blood. They do NOT dissolve existing blood clots. Used to treat certain blood vessel, heart and lung conditions (Suellen et al. 2006).

- increases force & strength of myocardial contractions
- makes heart a more efficient pump
- increases cardiac output
- reduces heart size, helping it function more effectively
- removes & eliminates from body fluid accumulated in tissues

1.14.2 Drugs name

(Also known as Blood Thinners) Commonly prescribed include:

- Dalteparin (Fragmin)
- Danaparoid (Orgaran), Enoxaparin (Lovenox)
- Heparin (various) Tinzaparin (Innohep) and Warfarin (Coumadin)

1.14.3 Reason for Medication

Helps to prevent harmful clots from forming in the blood vessels. May prevent the clots from becoming larger and causing more serious problems. Often prescribed to prevent first or recurrent stroke.

1.15 Antiplatelet Agents

An antiplatelet drug (antiaggregant) is a member of a class of pharmaceuticals that decrease platelet aggregation and inhibit thrombus formation. They are effective in the arterial circulation, where anticoagulants have little effect.

1.15.1 Drugs name

The class of antiplatelet drugs includes:

- Irreversible cyclooxygenase inhibitors
- Aspirin

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- Adenosine diphosphate (ADP) receptor inhibitors
- Clopidogrel (Plavix)
- Prasugrel (Effient)
- Ticagrelor (Brilinta)
- Ticlopidine (Ticlid)
- Phosphodiesterase inhibitors
- Cilostazol (Pletal)
- Glycoprotein IIB/IIIa inhibitors (intravenous use only)
- Abciximab (ReoPro)
- Eptifibatide (Integrilin)
- Tirofiban (Aggrastat)
- Adenosine reuptake inhibitors
- Dipyridamole (Persantine)
- Thromboxane inhibitors
- Thromboxane synthase inhibitors
- Thromboxane receptor antagonists
- Terutroban

1.15.2 Reason for Medication:

Helps prevent clotting in patients who have had a heart attack, unstable angina, ischemic strokes, TIA (transient ischemic attacks, or “little strokes”) and other forms of cardiovascular disease. Usually prescribed preventively, when plaque buildup is evident but there is not yet a large obstruction in the artery.

1.16 Angiotensin-Converting Enzyme (ACE) Inhibitors

An ACE inhibitor (or angiotensin-converting-enzyme inhibitor) is a medication pharmaceutical drug used primarily for the treatment of high blood pressure (hypertension) and weak heart muscle (congestive heart failure). This group of drugs causes dilation of blood vessels which results in lower blood pressure. In treating heart disease ACE inhibitors are usually used with other medications. A typical treatment plan will often include an ACE inhibitor, beta blocker, a

long acting nitrate and a calcium channel blocker in combinations that are adjusted to the individual patient's needs. ACE inhibitors inhibit angiotensin-converting enzyme (a component of the blood pressure-regulating renin-angiotensin system), thereby decreasing the tension of blood vessels and blood volume, thus lowering blood pressure.

1.16.1 Mechanism

Expands blood vessels and decreases resistance by lowering levels of angiotensin II. Allows blood to flow more easily and makes the heart's work easier or more efficient. Block an enzyme in the kidneys

This...

- reduces vasoconstriction
- stimulates water excretion

1.16.2 Drug name:

Commonly prescribed include:

- Benazepril (Lotensin)
- Captopril (Capoten)
- Enalapril (Vasotec)
- Fosinopril (Monopril)
- Lisinopril (Prinivil, Zestril)
- Moexipril (Univasc)
- Perindopril (Aceon)
- Quinapril (Accupril)
- Ramipril (Altace) and
- Trandolapril (Mavik)

1.16.3 Reason for Medication:

Used to treat or improve symptoms of cardiovascular conditions including high blood pressure and heart failure (Suellen et al. 2006).

1.17 Angiotensin II Receptor Blockers (or Inhibitors)

An ACE inhibitor (or angiotensin-converting-enzyme inhibitor) is a medication pharmaceutical drug used primarily for the treatment of high blood pressure (hypertension) and weak heart muscle (congestive heart failure). It is the type II Angiotensin blocker.

1.17.1 Mechanism:

Rather than lowering levels of angiotensin II (as ACE inhibitors do) angiotensin II receptor blockers prevent this chemical from having any effects on the heart and blood vessels. This keeps blood pressure from rising. Their mechanism of action differs from that of the angiotensin-converting enzyme (ACE) inhibitors, which also affect the reninangiotensin system. The ARBs were developed to overcome several of the deficiencies of ACE inhibitors: competitive inhibition of ACE results in a reactive increase in renin and angiotensin I levels, which may overcome the blockade effect; ACE is a relatively nonspecific enzyme that has substrates in addition to angiotensin I, including bradykinin and other tachykinins, and thus, inhibition of ACE may result in accumulation of these substrates; production of angiotensin II can occur through non-ACE pathways as well as through the primary ACE pathway, and these alternative pathways are unaffected by ACE inhibition; specific adverse effects are associated with ACE inhibitor effects on the enzyme; and ARBs may offer more complete angiotensin II inhibition by interacting selectively with the receptor site. All 7 drugs in this class are approved by the Food and Drug Administration for the treatment of hypertension, either alone or in combination with other drugs.

1.17.2 Name of drugs:

(Also known as ARBs, Angiotensin-2 Receptor Antagonists and AT-2) Commonly prescribed include:

- Candesartan (Atacand)
- Eprosartan (Teveten)
- Irbesartan (Avapro)
- Losartan (Cozaar)
- Telmisartan (Micardis) and
- Valsartan (Diovan)

1.17.3 Reason for Medication:

Used to treat or improve symptoms of cardiovascular conditions including high blood pressure and heart failure.

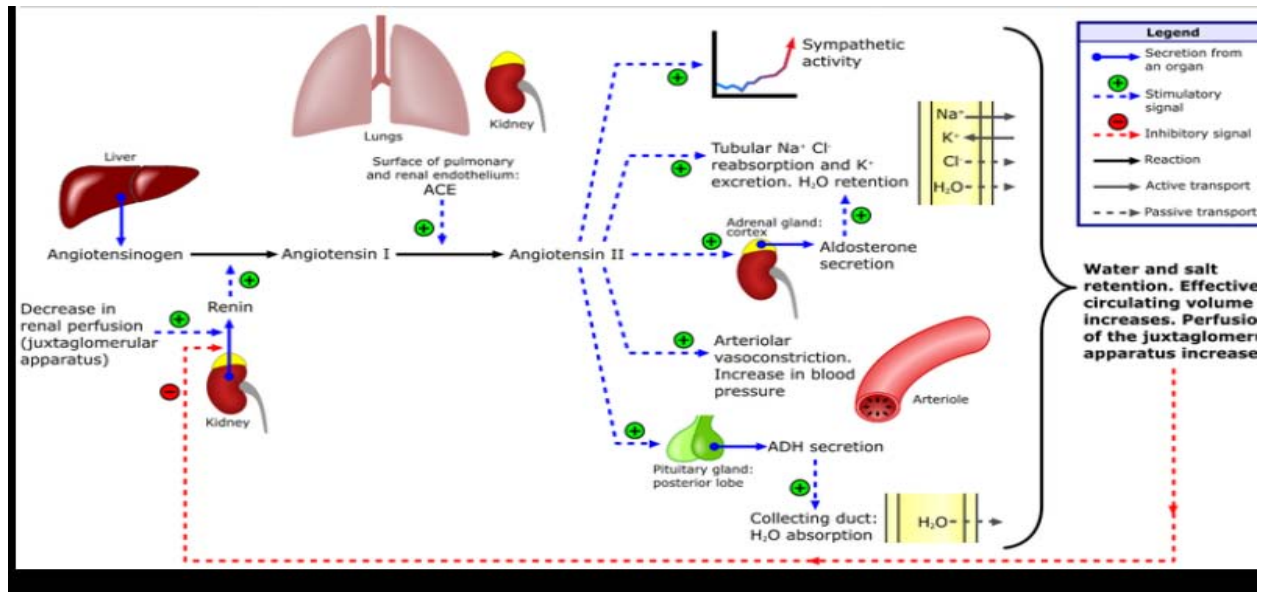


Figure: Renin-angiotensin-aldosterone system (Suellen et al. 2006)

1.18 Beta Blockers

Beta blockers (β -blockers, beta-adrenergic blocking agents, beta antagonists, betaadrenergic antagonists, beta-adrenoreceptor antagonists, or beta adrenergic receptor antagonists) are a class of drugs. Beta blockers target the beta receptor. Beta receptors are found on cells of the heart muscles, smooth muscles, airways, arteries, kidneys, and other tissues that are part of the sympathetic nervous system and lead to stress responses, especially when they are stimulated by epinephrine (adrenaline). They are particularly used for the management of cardiac arrhythmias, protecting the heart from a second heart attack (myocardial infarction) after a first heart attack (secondary prevention) and hypertension.

1.18.1 Mechanism

Decreases the heart rate and cardiac output, which lowers blood pressure and makes the heart beat more slowly and with less force. Decrease cardiac output & peripheral vascular resistance. Beta-blockers decrease arterial blood pressure by reducing cardiac output. Many forms of hypertension are associated with an increase in blood volume and cardiac output. Therefore,

reducing cardiac output by beta-blockade can be an effective treatment for hypertension, especially when used in conjunction with a diuretic. Acute treatment with a beta-blocker is not very effective in reducing arterial pressure because of a compensatory increase in systemic vascular resistance. This may occur because of baroreceptor reflexes working in conjunction with the removal of β_2 vasodilatory influences that normally offset, to a small degree, alpha-adrenergic mediated vascular tone. Chronic treatment with beta-blockers lowers arterial pressure more than acute treatment possibly because of reduced renin release and effects of beta-blockade on central and peripheral nervous systems. Beta-blockers have an additional benefit as a treatment for hypertension in that they inhibit the release of renin by the kidneys (the release of which is partly regulated by β_1 -adrenoceptors in the kidney). Decreasing circulating plasma renin leads to a decrease in angiotensin II and aldosterone, which enhances renal loss of sodium and water and further diminishes arterial pressure.

Hypertension in some patients is caused by emotional stress, which causes enhanced sympathetic activity. Beta-blockers can be very effective in these patients.

1.18.2 Drugs name

(Also known as Beta-Adrenergic Blocking Agents)

Commonly prescribed include:

- Acebutolol
- Atenolol
- Betaxolol
- Bisoprolol
- hydrochlorothiazide
- Bisoprolol
- Carteolol
- Metoprolol
- Toprol
- Nadolol
- Propranolol

1.18.3 Reason for Medication

- Used to lower blood pressure.
- Used with therapy for cardiac arrhythmias (abnormal heart rhythms) and in treating chest pain (angina).
- Used to prevent future heart attacks in patients who have had a heart attack.

1.19 Calcium Channel Blockers

A calcium channel blocker (CCB) is a chemical that disrupts the movement of calcium (Ca^{2+}) through calcium channels. CCB drugs devised to target neurons are used as antiepileptic. However, the most widespread clinical usage of calcium channel blockers is to decrease blood pressure in patients with hypertension. CCBs are particularly efficacious in treating elderly patients. Calcium channel blockers are also frequently used to alter heart rate, to prevent cerebral vasospasm, and to reduce chest pain caused by angina pectoris. Despite their effectiveness, CCB's often have a high mortality rate over extended periods of use, and have been known to have multiple side effects. Potential major risks however were mainly found to be associated with short-acting CCB's (British Heart Foundation, 2010).

1.19.1 Mechanism:

The calcium channel blockers known as non-dihydropyridines decrease the force of contraction of the myocardium (muscle of the heart). This is known as the negative inotropic effect of calcium channel blockers. It is because of these negative inotropic effects that the nondihydropyridine calcium channel blockers, such as verapamil or diltiazem, may be avoided (or used with caution) in individuals with cardiomyopathy.[6] Many calcium channel blockers also slow down the conduction of electrical activity within the heart, by blocking the calcium channel during the plateau phase of the action potential of the heart (see: cardiac action potential). This results in a negative chronotropic effect, or a lowering of heart rate. This can increase the potential for heart block. The negative chronotropic effects of calcium channel blockers make them a commonly used class of agents in individuals with atrial fibrillation or flutter in whom control of the heart rate is generally a goal. Negative chronotropy can be beneficial when treating a variety of disease processes because lower heart rates represent lower cardiac oxygen requirements. Elevated heart rate can result in significantly higher "cardiac

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work," which can result in symptoms of angina (British Heart Foundation, 2010). Overall how the medication does that, Interrupts the movement of calcium into the cells of the heart and blood vessels. May decrease the heart's pumping strength and relax blood vessels.

1.19.2 Name of Drugs:

(Also known as Calcium Antagonists or Calcium Blockers)

Commonly prescribed include:

- Amlodipine
- Bepridil
- Diltiazem
- Felodipine
- Nifedipine
- Nimodipine
- Nisoldipine and
- Verapamil

1.19.3 Reason for Medication:

Used to treat high blood pressure, chest pain (angina) caused by reduced blood supply to the heart muscle and some arrhythmias (abnormal heart rhythms).

1.20 Diuretics

A diuretic is any substance that promotes the production of urine. This includes forced diuresis. There are several categories of diuretics. All diuretics increase the excretion of water from bodies, although each class does so in a distinct way. Alternatively, an antidiuretic such as vasopressin is an agent or drug which reduces the excretion of water in urine. Most commonly the drug used in heart disease also.

1.20.1 Mechanism:

Causes the body to rid itself of excess fluids and sodium through urination. Helps to relieve the heart's workload. Also decreases the buildup of fluid in the lungs and other parts of the body,

such as the ankles and legs. Different diuretics remove fluid at varied rates and through different methods. increase sodium & water excretion by kidneys.

1.20.2 Name of drugs:

(Also known as Water Pills)

Commonly prescribed include:

- Amiloride (Midamor)
- Bumetanide (Bumex)
- Chlorothiazide (Diuril)
- Chlorthalidone (Hygroton)
- Furosemide (Lasix)
- Hydrochlorothiazide (Esidrix,
- Hydrodiuril)
- Indapamide (Lozol) and
- Spironolactone (Aldactone)

1.20.3 Reason for Medication:

Used to help lower blood pressure. Used to help reduce swelling (edema) from excess buildup of fluid in the body.

1.21 Vasodilators

A drug may be classified by the chemical type of the active ingredient or by the way it is used to treat a particular condition. Each drug can be classified into one or more drug classes. Vasodilators are agents that widen the blood vessels therefore cause a decrease in vascular resistance and an increase in blood flow. They may act by activation of the vasomotor center in the brain, which brings about relaxation of the smooth muscle in the blood vessel walls or they can act locally on blood vessel smooth muscle cells. Vasodilators are used to treat hypertension, angina and congestive heart failure.

1.21.1 Mechanism

Relaxes blood vessels and increases the supply of blood and oxygen to the heart while reducing its workload. Prescribed to patients who cannot tolerate ACE inhibitors (another type of medicine that relaxes the blood vessels). Can come in pills to be swallowed, chewable tablets and as a topical application (cream).

1.21.2 Name of drugs

(Also known as Nitrates. Nitroglycerin tablets are a form of vasodilator.)

Commonly prescribed include:

- Isosorbide dinitrate (Isordil)
- Nesiritide (Natrecor)
- Hydralazine (Apresoline)
- Nitrates and
- Minoxidil

1.21.3 Reason for medication

Used to ease chest pain (angina).

1.22 Digitalis Preparations

A group of medicines extracted from foxglove plants are called Digitalin. The use of Digitalis extract containing cardiac glycosides for the treatment of heart conditions was first described in the English-speaking medical literature by William Withering, in 1785, which is considered the beginning of modern therapeutics. It is used to increase cardiac contractility (it is a positive inotrope) and as an antiarrhythmic agent to control the heart rate, particularly in the irregular (and often fast) atrial fibrillation. Digitalis is hence often prescribed for patients in atrial fibrillation, especially if they have been diagnosed with congestive heart failure.

1.22.1 Mechanism

Increases the force of the heart's contractions, which can be beneficial in heart failure and for irregular heartbeats. Digitalis works by inhibiting sodium-potassium ATPase. This results in an increased intracellular concentration of sodium ion and thus a decreased concentration gradient

across the cell membrane. This increase in intracellular sodium makes the actions of the Na/Ca exchange pump unfavorable, thereby decreasing sodium influx and calcium efflux via this pump. This gradient-induced inhibition results in a higher cytoplasmic calcium concentration. The increased cytosolic calcium ion concentration results in increased calcium ion storage in the sarcoplasmic reticulum. Upon action potential (cardiac contraction), more calcium is released from the sarcoplasmic reticulum and this gives a positive inotropic effect (higher contractility). Digitalis also has a vagal effect on the parasympathetic nervous system, and as such is used in re-entrant cardiac arrhythmias and to slow the ventricular rate during atrial fibrillation. The dependence on the vagal effect means digitalis is not effective when a patient has a high sympathetic nervous system drive, which is the case with acutely ill persons, and also during exercise.

1.22.2 Name of Drugs

(Also known as Digoxin and Digitoxin)

Commonly prescribed include:

- Lanoxin

1.22.3 Reason for medication

Used to relieve heart failure symptoms, especially when the patient isn't responding to ACE inhibitors and diuretics. Also slows certain types of irregular heartbeat (arrhythmias), particularly atrial fibrillation.

1.23 Statin

Statins (or HMG-CoA reductase inhibitors) are a class of drugs used to lower cholesterol levels by inhibiting the enzyme HMG-CoA reductase, which plays a central role in the production of cholesterol in the liver. Increased cholesterol levels have been associated with cardiovascular diseases and statins are therefore used in the prevention of these diseases. Research has found that statins are most effective for treating cardiovascular disease (CVD) (secondary prevention), with questionable benefit in those without previous cardiovascular disease, but with elevated cholesterol levels. Statins have rare but severe adverse effects, particularly muscle damage, and some doctors believe they are overprescribed.

1.23.1 Mechanism

Various medications can lower blood cholesterol levels. They may be prescribed individually or in combination with other drugs. They work in the body in different ways. Some affect the liver, some work in the intestines and some interrupt the formation of cholesterol from circulating in the blood. Statins act by competitively inhibiting HMG-CoA reductase, the first committed enzyme of the HMG-CoA reductase pathway. Because statins are similar to HMG-CoA on a molecular level, they take the place of HMG-CoA in the enzyme and reduce the rate by which it is able to produce mevalonate, the next molecule in the cascade that eventually produces cholesterol, as well as a number of other compounds. This ultimately reduces cholesterol via several mechanisms (Suellen et al. 2006).

1.23.2 Name of drugs

Common types of cholesterol lowering drugs include

- Atorvastatin
- Cerivastatin
- Rosuvastatin
- Fluvastatin
- Lovastatin
- Simvastatin
- Simvastatin+Niacin
- statins,
- resins and nicotinic acid (niacin),
- gemfibrozil and clofibrate.

2. Literature review

Cardiovascular disease remains one of the primary causes of preventable death in developed countries. Cardiovascular disease includes heart disease (i.e., myocardial infarction and angina), stroke, hypertension, congestive heart failure (CHF), hardening of the arteries, and other circulatory system diseases. Cardiovascular disease is the largest contributor to all-cause mortality in the United States and accounts for one-third of the excess mortality experienced by non-Hispanic black compared with non-Hispanic white Americans (Will and Casper, 1996).

2.1 Study of Life-Threatening arrhythmias in patients receiving electro cardiographic telemetry and therapeutic interventions:

Patient delay in seeking medical assistance for acute ischemic heart disease and the incidence of potentially life-threatening arrhythmias en route to the hospital were examined in a 22-month community trial of ambulance telemetry. Of 7,654 patients transported, 179 who had electrocardiograms (ECGs) transmitted were found to have had acute myocardial ischemic events. Fifty per cent of these patients summoned an ambulance within 30 minutes and 72 per cent within two hours after the onset of acute symptoms. Fifty-eight patients had potentially lifethreatening arrhythmias. Interventions with drugs and/or defibrillation were required in 22 patients with or without cardiopulmonary resuscitation (CPR); intervention with CPR alone was required in six patients. Twelve of these 28 patients survived through hospital admission and six were alive at three months. The relatively low outcome/input ratio of this experience necessitates re-evaluation of the epidemiological characteristics and patient selection criteria in populations considered for telemetry (Pozen et al. 1977).

2.2 Study of Diabetes to Early Deaths from Ischemic Heart Disease (US Gender and Racial Comparisons):

Ischemic heart disease is the leading cause of death among the US population.' Persons with diabetes mellitus are at particularly high risk for ischemic heart disease. The contribution of diabetes mellitus to ischemic heart disease mortality among Whites less than 65 years old has been extensively studied,' but less is known about the contribution of diabetes mellitus to ischemic heart disease mortality among Blacks less than 65 years old." The percentage of early

ischemic heart disease deaths attributable to diabetes mellitus in the population has not been previously reported across both gender and racial (Black and White) lines. To evaluate the contribution of diabetes mellitus to death from ischemic heart disease, they compared ischemic heart disease death rates for persons aged 45 to 64 years by gender, race, and diabetes mellitus status with use of information from national death certificate data; National Health Interview Survey (NHIS) data; They calculated ischemic heart disease mortality rates for persons with diabetes mellitus by dividing mortality counts of deaths from ischemic heart disease with any mention of diabetes mellitus (obtained from the Centers for Disease Control and Prevention's National Center of Health Statistics) by the NHIS estimates of the number of persons with diabetes mellitus in the United States (Will and Casper, 1996).

2.3 Study of oral bioavailability of Atorvastatin:

The aim of the present study was to formulate a self-emulsifying drug delivery system of atorvastatin calcium and its characterization including in vitro and in vivo potential. The solubility of atorvastatin calcium was determined in various vehicles. Pseudoternary phase diagrams were plotted on the basis of solubility data of drug in various components to evaluate the micro emulsification region. Formulation development and screening was carried out based on results obtained from phase diagrams and characteristics of resultant microemulsion. Prepared formulations were tested for micro emulsifying properties and evaluated for clarity, precipitation, viscosity determination, drug content and in vitro dissolution. The optimized formulation further Literature Review Prescribing Habit of Doctors in Cardiovascular Disease in Bangladesh Page 44 evaluated for particle size distribution, zeta potential, stability studies and in vivo potential. In vivo performance of the optimized formulation was evaluated using a Triton-induced hypercholesterolemia model in male Albino Wistar rats. The formulation significantly reduced serum lipid levels as compared with atorvastatin calcium. Thus studies illustrated the potential use for the delivery of hydrophobic drug such as atorvastatin calcium by oral route (Pawn et al. 2009).

2.4 Study of Ischemic Heart Disease Mortality of Firemen and Policemen:

Ischemic heart disease (IHD) mortality of Connecticut firemen and policemen is studied for the years 1960-78, using death certificate data. The mortality of these two occupations is expected to be greater than that of other workers. Standardized Mortality Odds Ratios for firemen and policemen are greater than 1.00. Although some increased IHD risk for firemen and policemen is suggested, the exact role of occupational risk factors remains to be determined. Mortality ratios suggest somewhat higher IHD mortality for Connecticut firemen and policemen, compared to other workers. When firemen and policemen are compared directly to each other, the mortality of policemen is somewhat greater than that of firemen. For all comparisons, when an excess of deaths is found, it is usually small. The average MOR for firemen suggests an excess of 7 per cent, and for policemen, 32 per cent. In this and other studies, explanations for finding the mortality of fire fighters and police less than expected in view of their risk factor exposures include unique local conditions, variations according to time, and, most important, "the healthy worker effect." Fire fighters and police are healthy compared to the general population, and to most other occupations, as a result of selectivity in recruitment, job assignment, and retirement (Sardinas et al. 1986).

2.5 Study of Angina Pectoris:

Patients with angina pectoris have a reduced quality of life because of their symptoms, impaired activity and anxiety. However, there is no consensus on the best method of measuring quality of life. A systematic literature search of randomized controlled trials (RCTs) in angina showed that the most common generic questionnaire was the Nottingham Health Profile (NHP) Part 1, and the most common angina-specific measure was the Quality-of-Life after Acute Myocardial Infarction. Literature Review Prescribing Habit of Doctors in Cardiovascular Disease in Bangladesh Page 45 Angina pectoris is a common symptom in patients over 50 years of age and is usually secondary to myocardial ischemia due to coronary artery disease. This review includes an evaluation of the impact of drugs and revascularisation procedures on quality of life in patients with angina. A statistical synthesis of data was not appropriate since the type of patients, the length of follow-up and the type of interventions were very heterogeneous. Depending on the goals of the trial, a suitable questionnaire may be selected. By comparing the NHP Part 1 domain scores of angina patients with those of the normal population, it can be concluded that patients

with angina particularly experience a lack of energy, reduced sleep and decreased physical mobility. The amount of reduced energy, sleep and physical mobility can be illustrated by the following examples: in comparison with the normal population, patients with angina are tired most of the time, lie awake most of the night and have trouble getting up and down stairs or steps. Furthermore, this analysis suggests that antinational drugs are not more effective than placebo in terms of quality of life. However, the instruments used to measure quality of life might not have been sensitive enough to pick up small differences. Drugs such as β -blockers or calcium antagonists have been shown to attenuate the frequency, severity and duration of exercise induced anginal pain (Gandjour and Lauterbach, 1999)

2.6 Study of Chronic obstructive pulmonary disease severity:

Patients with impaired pulmonary function have an elevated risk of cardiovascular disease. A study in the Saskatchewan population provided evidence that the prevalence of cardiovascular diseases and incidence of hospitalization due to cardiovascular diseases is higher among patients with chronic obstructive pulmonary disease (COPD). At the same time, the relationship between the degree of severity of COPD and cardiovascular outcomes is unclear. The original cohort of 11,493 patients diagnosed with and treated for COPD comprised 46% females. The cohort was largely made up of elderly people, including 25.0% over 80, 34.4% ages 70-79, 24.8% ages 60-69, 11.1% ages 50-59 and 4.8% ages 40-49. Of the original COPD cohort, 2525 cases with a COPD hospitalization were identified. Follow-up time from index date to COPD hospitalization was < 90 days for 40% of cases, 91 days to 1 year for 25%, between 1 and 2 years for 22%, between 2 and 3 years for 13% and between 3 and 4 years for 6%. Females comprised 44% of the cases. The cases were slightly older than the overall COPD cohort with 27.7% over 80, 39.8% ages 70-79, 23.1% ages 60-69, 7.6 ages 50-59 and 1.8% ages 40-49. Literature Review Prescribing Habit of Doctors in Cardiovascular Disease in Bangladesh Page 46 This study describes a method of assigning severity of COPD in a population of patients with diagnosed and treated COPD using frequently available utilization data: recent intensity of use of drug therapies for COPD, recent hospitalizations for COPD and COPD exacerbations, home oxygen services, recent pneumonia, and presence of emphysema. The strength of this study is that it used a clinical outcome, COPD hospitalizations, in a larger COPD population than previously studied. The validity of COPD hospitalization as a severity indicator is enhanced by

its relationship with mortality. The method is particularly applicable for use in administrative data where spirometry results are unavailable (Suellen, 2006).

2.7 Study of Heart Attack Deaths:

Delays in emergency care can have grave consequences for certain emergency patients, particularly those suffering an Acute Myocardial Infarction. The study setting was the city of New York, which is comprised of five boroughs— Manhattan, the Bronx, Brooklyn, Queens, and Staten Island—and has a population exceeding 8 million. The geography of New York City, where most of the boroughs are connected only by bridges and tunnels (the exception is Brooklyn and Queens, which are contiguous, an issue we address in the sensitivity analysis section), allows for a quasi-experimental analysis since it is very unlikely for an ambulance to cross borough lines. The borough-day is the unit of analysis and we control both for the experience of other boroughs (which may or may not have had diversions) and for the experience of that same borough at other times. AMI deaths per day in New York City over the time period between January 2, 1999, and December 31, 2000. A total of 9,743 adults died of myocardial infarctions. Forty-six percent were men; 65% were white, 19% were black, and 11% were Hispanic (not shown). The boroughs' mortality levels mirrored their populations; Brooklyn accounted for the most myocardial deaths with 2,975, and Staten Island the least, at 741. The mean number of myocardial infarction deaths per borough-day was 2.67 (95% confidence interval, 2.60 to 2.74). Over the same period, there were 3,023 inpatient deaths with a primary myocardial infarction diagnosis, and 5,643 inpatient deaths with a primary or secondary myocardial infarction diagnosis (31% and 58% of total deaths due to myocardial infarction, respectively). Thus, our definition of inpatient deaths 1 is consistent with the American Heart Association's estimate that only 28% of deaths from myocardial infarction nationwide occur among inpatients. The objective of this study was to examine the covariance of ambulance diversion with AMI patient mortality (Natalia, 2010).

2.8 Study of Diabetes and modifiable risk factors for cardiovascular disease for the prospective Million Women study:

To compare the effect of potentially modifiable lifestyle factors on the incidence of vascular disease in women with and without diabetes. In 1996-2001 over one million middle-aged women in the UK joined a prospective study, providing medical history, lifestyle and sociodemographic information. All participants were followed for hospital admissions and deaths using electronic record linkage. The study shows characteristics at recruitment of 1,242,338 women included in these analyses, of whom 25,915 (2.1%) were treated for diabetes. Women with diabetes had higher BMI than those without diabetes (46% versus 17% obese), and were more likely to be inactive (62% versus 48%). Smoking prevalence was similar in the two groups (18% versus 20%). Women with diabetes requiring insulin therapy were less likely than all women with diabetes to be obese, inactive or to smoke. The cohort was followed for an average of 6.1 years per woman. During this period 21,928 women had incident CHD, 7,087 had incident stroke and 2,938 had incident pulmonary embolism. This large prospective study, including 26,000 middle aged women with diabetes and over one million without diabetes, confirms the well-established substantially increased incidence of coronary heart disease and stroke among women with diabetes (Elizabeth et al. 2008).

2.9 Study of Lead Exposure and Cardiovascular Disease:

This systematic review evaluates the evidence on the association between lead exposure and cardiovascular end points in human populations. A positive association of lead exposure with blood pressure has been identified in numerous studies in different settings, including prospective studies and in relatively homogeneous socioeconomic status groups. Several studies have identified a dose-response relationship. Although the magnitude of this association is modest, it may be underestimated by measurement error. The hypertensive effects of lead have been confirmed in experimental models. Beyond hypertension, studies in general populations have identified a positive association of lead exposure with clinical cardiovascular outcomes (cardiovascular, coronary heart disease, and stroke mortality; and peripheral arterial disease), but the number of studies is small. In some studies these associations were observed at blood lead levels < 5 pg/dL. The study concluded that the evidence is sufficient to infer a causal relationship of lead exposure with hypertension. We conclude that the evidence is suggestive but not

sufficient to infer a causal relationship of lead exposure with clinical cardiovascular outcomes. There is also suggestive but insufficient evidence to infer a causal relationship of lead exposure with heart rate variability (Acien et al. 2007).

2.10 Diastolic Dysfunction and High Levels of New Cardiac Biomarkers as Risk Factors for Cardiovascular Events and Mortality in Hemodialysis Patients:

Background/Aims: Cardiovascular events (CVEs) are the most frequent cause of death in hemodialysis (HD). We aim to determine cardiovascular and mortality risk factors. Methods: A historical cohort study was made of 211 prevalent HD patients [73 (60-80) years, 58% males] between 2005 and 2012. Demographic, laboratory test and echocardiographic values were recorded. During follow-up, CVEs and mortality were documented and analyzed. Results: 94 patients suffered a CVE. Age, history of cardiovascular disease (CVD), peripheral vascular disease, cardiac markers, systolic and diastolic dysfunction (DD) were associated to CVEs. Low albumin (RR 0.414, $p = 0.002$), DD (1.876, $p = 0.038$) and previous CVD (3.723, $p < 0.001$) were identified as independent predictors of CVEs. 98 patients died. Age, a history of CVD, peripheral vascular disease, cardiac markers, DD, dialysis vintage, and a vascular access different from autologous fistulae were associated to mortality. Low albumin (RR 0.499, $p = 0.046$), DD (RR 2.414, $p = 0.017$) and a vascular access different from autologous fistulae (RR 2.058, $p = 0.034$) were independent predictors of mortality. Conclusions: DD is an emergent risk factor for death and CVEs in dialysis. Low albumin is also a predictor for CVE. Non-autologous fistulae and low albumin are predictors for death. Nt-proBNP and hsTnT offer good information for identifying high-risk patients, but they do not predict events independently as they are only cardiac damage markers(Quiroga B et al.2011).

2.11 Cardiovascular changes during chronic hypertensive states:

It is well established that elevated blood pressure constitutes a major risk factor for coronary heart disease, arrhythmias, heart failure, cerebrovascular disease, peripheral artery disease and renal failure. Blood pressure level and the duration of arterial hypertension (HTN) impact target organ damage. Many studies in adults have demonstrated the role of antihypertensive therapy in preventing cardiovascular (CV) events. The so-called hard end-points, such as death, myocardial

infarction (MI) or stroke, are rarely seen in children, but intermediate target organ damage, including left ventricular hypertrophy, increased intima-media thickness and microalbuminuria, is already detectable during childhood. The goal of antihypertensive treatment is to reduce the global risk of CV events. In the adult population stratification of CV risk is based on blood pressure level, risk factors, subclinical target organ damage and established CV and kidney disease. Increased CV risk begins early in the course of kidney disease, and CV diseases are the most frequent cause of morbidity and mortality in patients with chronic kidney disease (CKD). Children with CKD are especially prone to the long-term effects of CV risk factors, which result in high morbidity and mortality in young adults. To improve the outcome, pediatric and adult CKD patients require nephro- and cardioprotection(Drozdz D.2006).

2.12 Cardiovascular risk factors and prevention in women: similarities and differences:

Epidemiological evidence shows that among women, the incidence of all, including less severe, coronary events is still increasing. However, owing both to diminished lethality as well as the reduction in the rate of acute myocardial infarction, mortality has globally decreased. The strong association observed between mortality and major cardiovascular risk factors as well as between their temporal changes and the occurrence of coronary disease makes the undertaking of multifactorial prevention strategies, including the formulation of risk charts for asymptomatic women and men, necessary. The excess risk of cigarette smoking is 2-4 times higher in women than in men and the correlation with the number of cigarettes smoked daily is distinct. However, the risk starts to decrease immediately after stopping and after 3-5 years is similar to that of non-smokers. In women, the association between hypertension, coronary artery disease and early mortality is stronger than in men: there is no threshold below which the risk disappears. Diet and lifestyle strongly influence the development of hypertension. An elevated total/HDL cholesterol ratio and the presence of lipoprotein(a) constitute significant risk factors for coronary events. On the other hand, high HDL cholesterol levels (> 45 mg/dl) are considered to be protective in women. However, data on the efficacy of strategies aimed at reducing blood LDL levels in hypercholesterolemic women are limited and controversial(Sclavo M.2005).

2.13 Evaluation of cardiovascular diseases and their risk factors in hospitalized patients in East azerbaijan province, northwest iran:

Coronary artery disease (CAD) is accountable for more than 30% of deaths worldwide and is, thus, deemed the most important factor in terms of disease burden around the globe. This study aimed to evaluate CAD and its risk factors in hospitalized patients in the East Azerbaijan Province, northwest Iran, from 2006 to 2007. The study population consisted of 56.6% male and 43.4% female patients. The median and range between quartile 1 and 3 (Q1-Q3) ages of the males and females were 59 (49-70) and 62 (51-71) years, respectively. Ischemic heart diseases were diagnosed in 68.4%, electrophysiological disorders in 6.5%, and valvular heart diseases in 4.5% of the patients. The frequencies of the studied risk factors were as follows: cigarette smoking (47.5%); hypertension (66.95%); diabetes mellitus (35.9%); and history of cerebrovascular accident (16.4%) and renal disease (13.4%). Medical therapy was performed in 79.23%, surgery in 6.28%, and cardiovascular interventional therapy in 13.99% of the patients. The in-hospital mortality rate was 1.57% (1.42% in the males and 1.76% in the females; p value = 0.009). The most frequent known risk factors in the hospitalized patients were smoking, alcohol consumption, and diabetes(Yaghoubi A. et al.2007).

2.14 Coronary stenting in elderly patients with acute myocardial infarction:

Cardiovascular disease and coronary heart disease are now the leading causes of death and disability in elderly and senile age. Patients with acute coronary syndrome (ACS) and myocardial-infarction (MI) constitute a large portion of emergency hospital admissions among patients with cardiovascular diseases. According to numerous studies, the coronary artery stenting in MI is an effective procedure for the superior results of all the hither to known methods of treatment of ACS. However, the role of endovascular treatment in the acute period of MI in Russia remains underestimated due to lack of awareness of cardiologists and specialists in primary care on this issue. Review of leading Russian and foreign advice and articles on the algorithm of patient care in elderly with ACS and systematization of the information can objectively evaluate the benefits of interventional procedures in the shortest time in AMI(No authors listed).

Materials & Methods

3.1 Type and Objective of the study

The present study was performed on a cross sectional observation which was attempted to find out the frequently prescribed drugs by the doctors in different Cardiovascular disorders.

3.2 Sampling Technique

In the present Study, Sample size consisted of 715 prescriptions which were sampled by using purposive sampling technique.

3.3 Place of study:

NATIONAL INSTITUTE OF CARDIOVASCULAR DISEASES

Cardiovascular Center of the country. The nation has been facing relentless burden of cardiovascular problems for a long time while the epidemiological pattern of some of the cardiac diseases show epidemic trends. The economic load of these diseases are enormous both at individual and national level. With these backgrounds, the Government of Bangladesh established the National Institute of Cardiovascular Diseases in 1978. Government has extreme interest about the development of this Institute by providing all kinds of support to make it a center of excellence. The institute feels proud to acknowledge the technical co-operation of the Government of Japan for the development of technology and manpower between period of 1979 and 1986 that results a competent team of cardiologists, cardiovascular surgeons, cardiac anesthesiologists and supporting staff. The Institute is showing all efforts to keep pace with this development and there is notable improvement in the field of investigations and management. There are five Cath Labs including a fully equipped EP Lab in NICVD. Interventional procedures like PCI, coronary and peripheral stenting, valvuloplasty, permanent cardiac pacing biventricular cardiac pacing, ICD implantation, Electrophysiological studies and radio frequency ablation are regularly done.



There are five well equipped operation theatres for cardiac surgery. Closed heart and open heart surgery has become routine procedure. Open heart procedures for Valvular, Congenital Heart Disease and CABG are increasing day by day. There is a well-equipped vascular surgery operation room which is open round the clock seven days a week The daily outpatient attendance averages 1500 patients, and an average of 500 patients are attended to in the emergency unit out of which 25-35 patients including 10-20 acute infarctions are admitted Daily. Over 3000 Coronary Angiographies and Cardiac Cath Studies are carried out every year and over 500 Coronary Angioplasties are done per year Temporary and permanent pacemakers are implanted routinely.

3.4 Study period

Overall study period was approx. one year. To complete the study in time, a work schedule was prepared depending on different task for the literature review, selection of topic and development of the protocol. Subsequent months were spend on official correspondence, data collection, data analysis, report writing and submission of report.

3.5 Data collection method

After explaining the purpose of the study to the respondents and obtaining their verbal consent, the researcher interviewed all the respondents by asking questions in Bangla and photographed their prescriptions consisting of list of drugs prescribed with their dosing schedule and length.

3.6 Data analysis

All the data were checked after collection. Then data were entered into computer and results were calculated with Microsoft® Excel 2007. The results were shown in Horizontal bar and pie chart and Histogram.

RESULT

1. Patient of different Gender

Gender	No. of patient	Percentage
Male	429	60%
Female	286	40%
Total	715	100%

Table 1: Percentage of number of patient of different gender

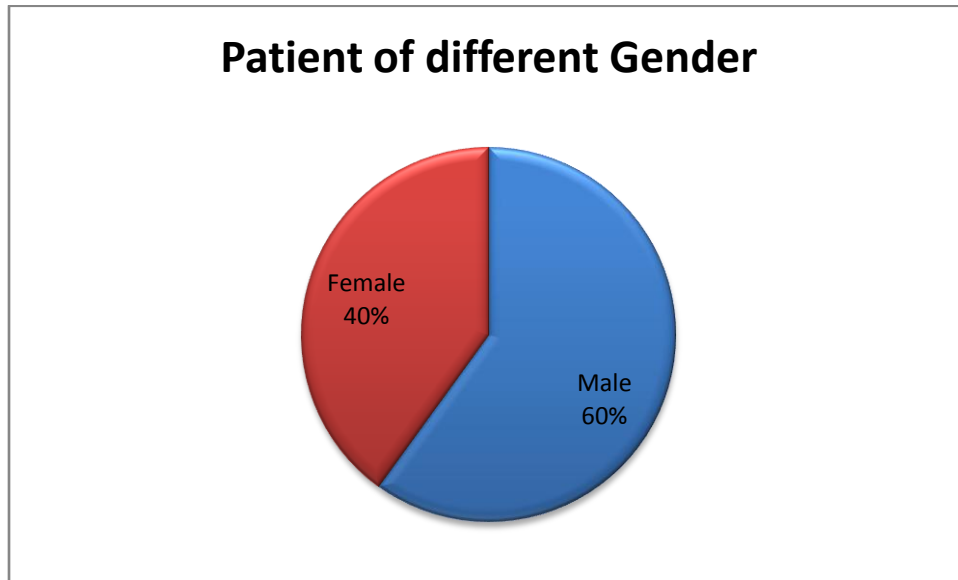


Figure 1: Graphical Representation of Cardiovascular Patients according to gender

2. Patient of different age

Age	No. of patient	Percentage
1-15	3	0%
16-30	12	2%
31-45	74	10%
46-60	351	49%
61-75	198	28%
76-90	77	11%
Total	715	100%

Table 2:percentage of number of patient of different age

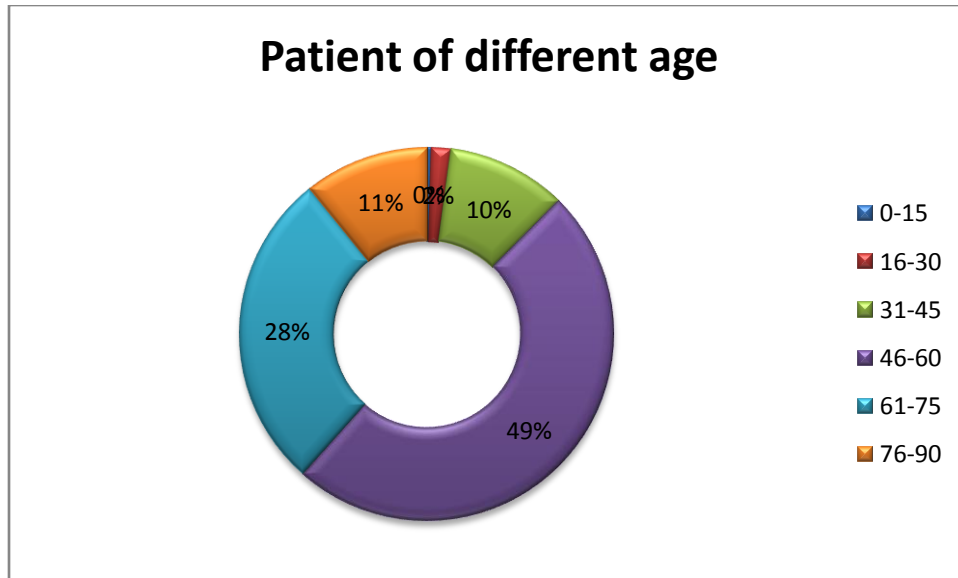


Figure 2: Graphical Representation of Cardiovascular Patients according to age

3. Mostly used combination of drugs given in total 715 cardiovascular patient

Combination of drug	No. of patient	percentage
Clopidogrel & glyceryl trinitrate	412	43%
Glyceryl trinitrate & trimetazidine	198	21%
Clopidogrel & trimetazidine	195	20%
Clopidogrel & carvedilol	91	9%
Carvedilol & metoprolol tartrate	67	7%

Table 3: Mostly used combination of drugs given in total 715 cardiovascular patient

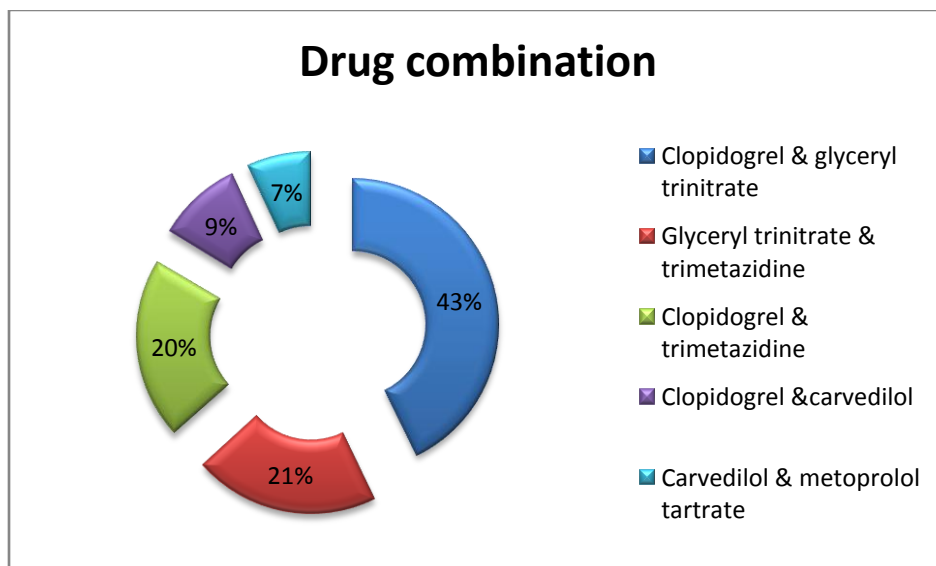


Figure 3: Graphical Representation of mostly used combination of cardiovascular drug

4. Multiple cardiovascular disease occurring patient

Multiple cardiovascular disease	No. of patient	Percentage
UA & HTN	88	43%
AMI & HTN	69	33%
UA & HTN & LVF	32	16%
LVF & IHD	17	8%

Table 4: Percentage of multiple cardiovascular disease occurring patient

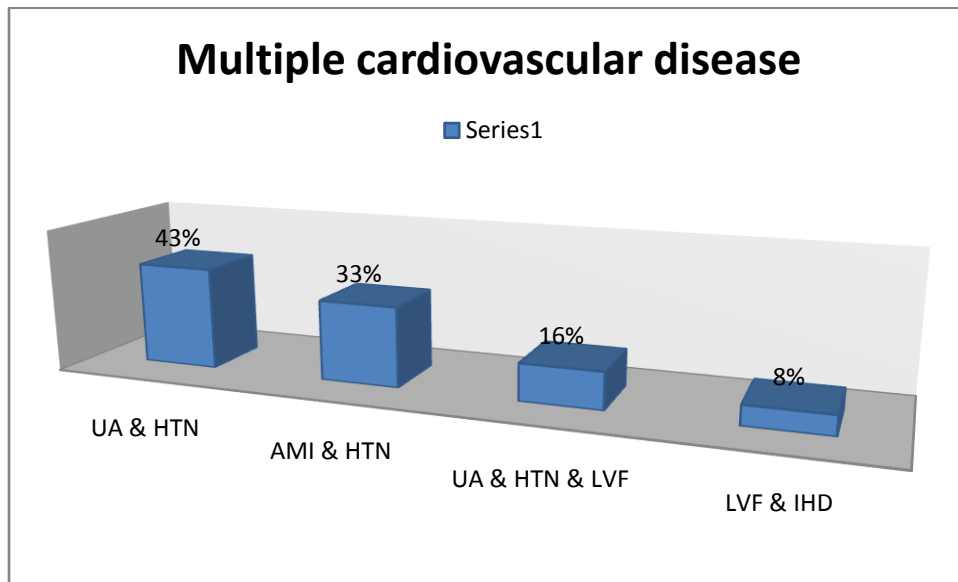


Figure 4: Graphical Representation of multiple Cardiovascular disease

5. Most frequently occurring cardiovascular disease in 715 patient

Name of disease	No. of patient	percentage
Hypertension(HTN)	167	28%
Unstable Angina(UA)	148	25%
Acute Myocardial Infarction(AMI)	117	20%
Left Ventricular Failure(LVF)	105	18%
Ischemic Heart Disease	55	9%

Table 5: percentage of mostly occurring cardiovascular disease

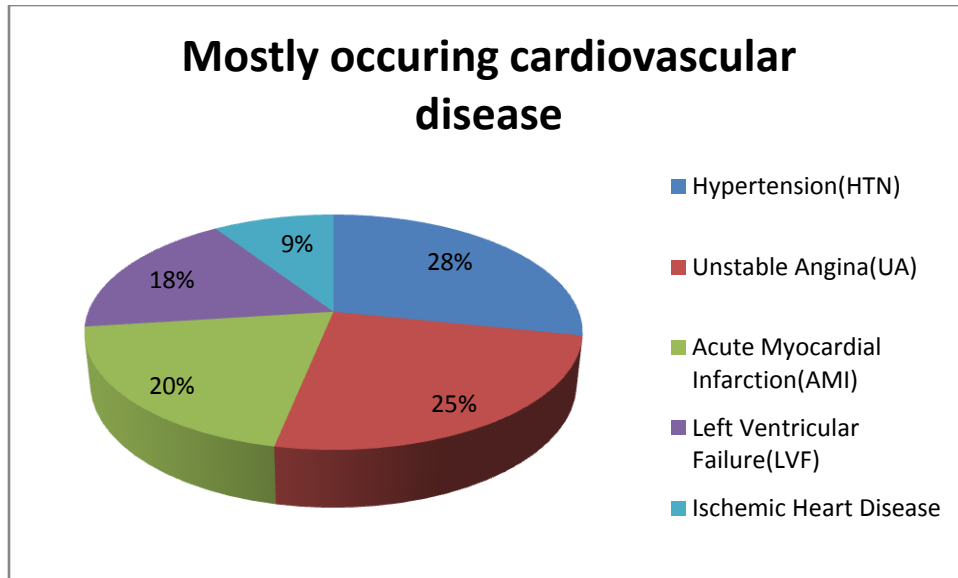


Figure 5: Graphical Representation of mostly occurring Cardiovascular disease

6. Medicines used in mostly occurring cardiovascular disease in 715 patient

Name of the medicine	No. of patient	percentage
Clopidogrel bisulphate	491	33%
Glyceryl trinitrate	442	29%
Trimetazidine dihydrochloride	218	14%
Metoprolol tartrate	129	9%
Carvedilol	109	7%
Atorvastatin	79	5%
Digoxin	38	3%

Table 6: percentage of medicines used in cardiovascular patient

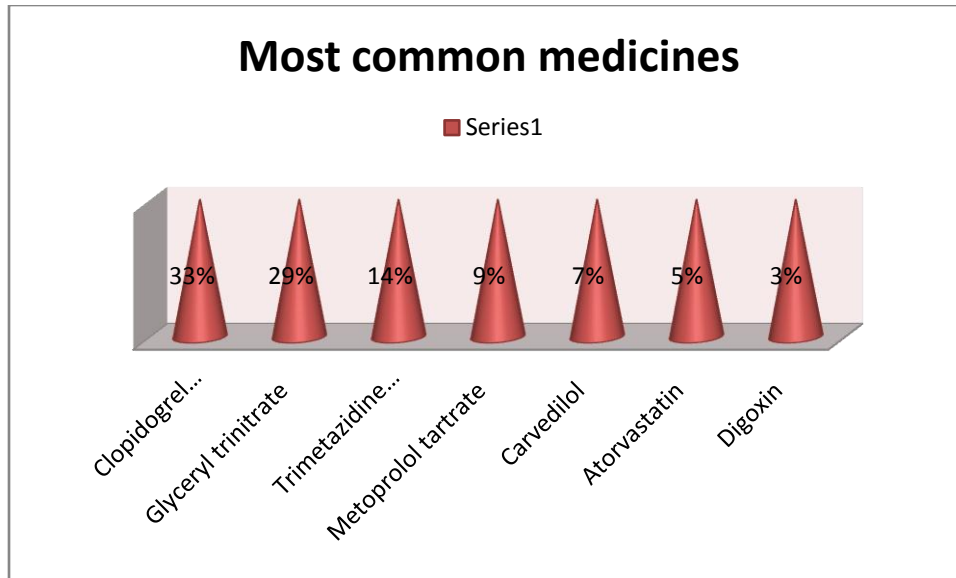


Figure 6: Graphical Representation of most common medicines

7. Medicines used in patient suffered from Acute myocardial Infarction(AMI) in 715 patient

Name of the medicine	No. of patient	percentage
Clopidogrel bisulphate	113	31%
Glyceryl trinitrate	107	29%
Trimetazidine dihydrochloride	64	18%
Metoprolol tartrate	34	9%
Carvedilol	23	6%
atorvastatin	23	6%

Table 7: percentage of patient taking different medicines in AMI

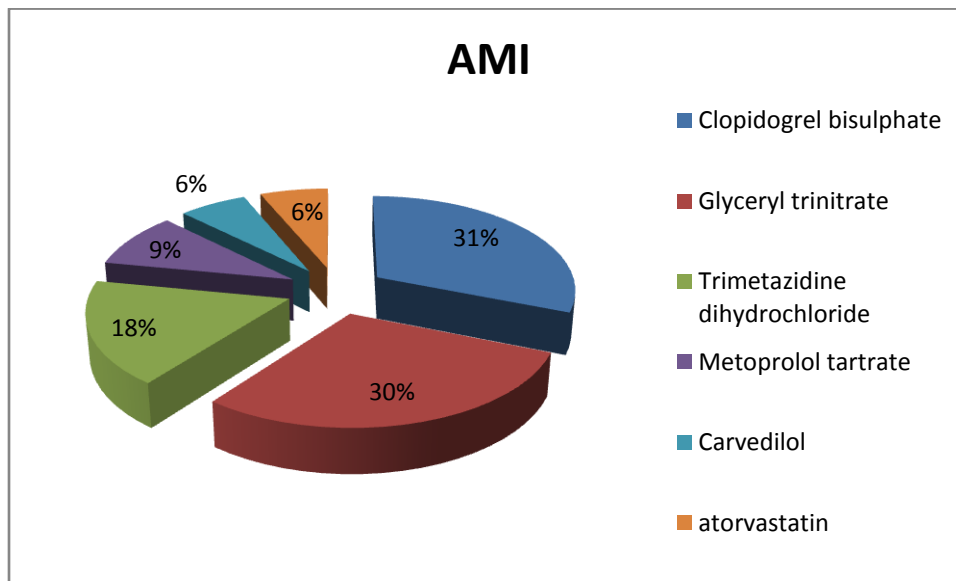


Figure 7: Graphical Representation of Cardiovascular Patients taking different medicines in AMI

8. Medicines used in patient suffered from Hypertension(HTN) in 715 patient

Name of the medicine	No. of patient	Percentage
Clopidogrel bisulphate	121	32%
Glyceryl trinitrate	118	31%
Trimetazidine dihydrochloride	47	12%
Metoprolol tartrate	42	11%
Carvedilol	24	6%
atorvastatin	17	4%
digoxin	13	3%

Table 8: percentage of patient taking different medicines in HTN

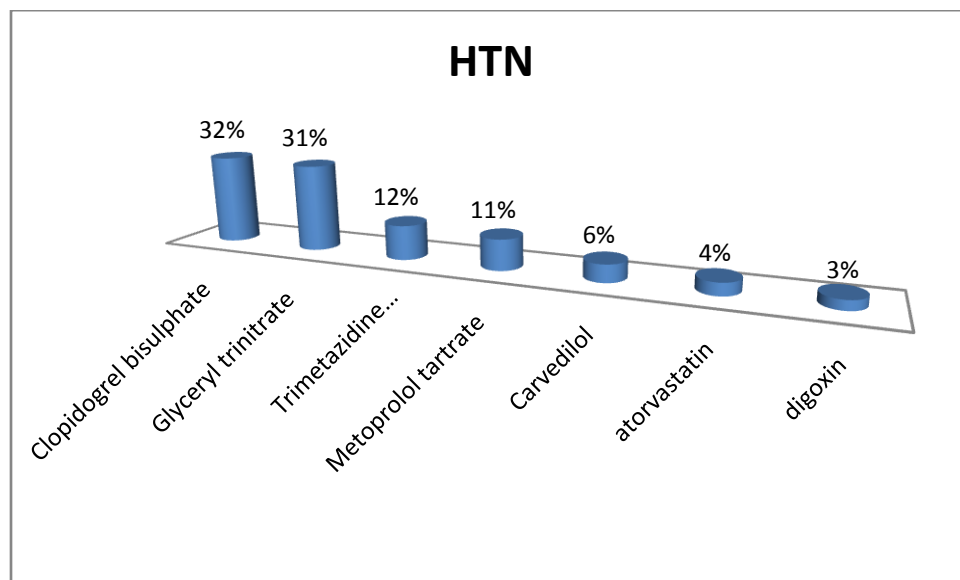


Figure 8: Graphical Representation of Cardiovascular Patients taking different medicines in HTN

9. Medicines used in patient suffered from Unstable Angina(UA) in 715 patient

Name of the medicine	No. of patient	Percentage
Clopidogrel bisulphate	118	34%
Glyceryl trinitrate	103	30%
Metoprolol tartrate	44	13%
Trimetazidine dihydrochloride	42	12%
atorvastatin	23	7%
Carvedilol	15	4%

Table 9: percentage of patient taking different medicines in UA

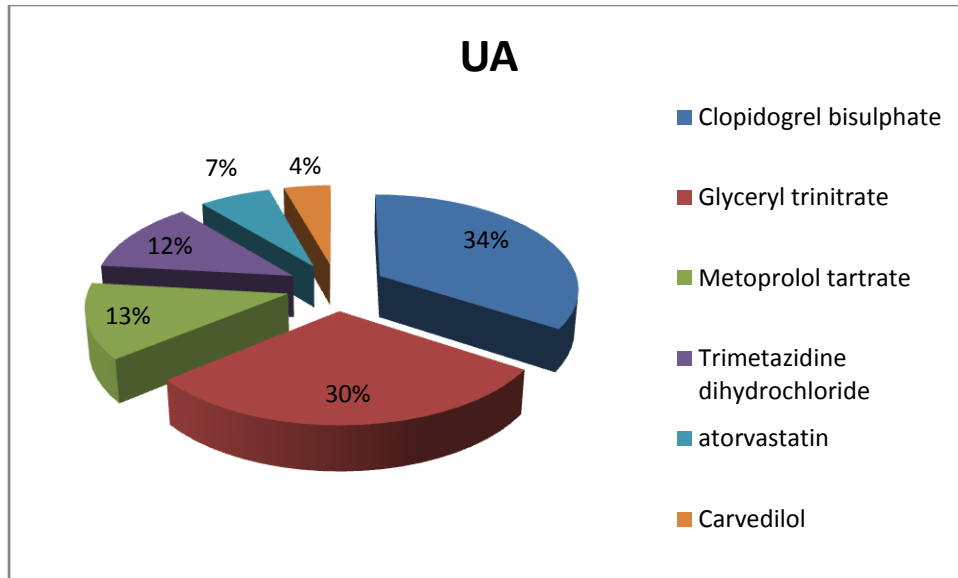


Figure 9: Graphical Representation of Cardiovascular Patients taking medicines in UA

10. Medicines used in patient suffered from Left Ventricular Failure(LVF) in 715 patient

Name of the medicine	No. of patient	Percentage
Clopidogrel bisulphate	93	32%
Glyceryl trinitrate	76	26%
Trimetazidine dihydrochloride	43	15%
Carvedilol	39	13%
digoxin	25	9%
atorvastatin	13	4%

Table 10: percentage of patient taking different medicines in LVF

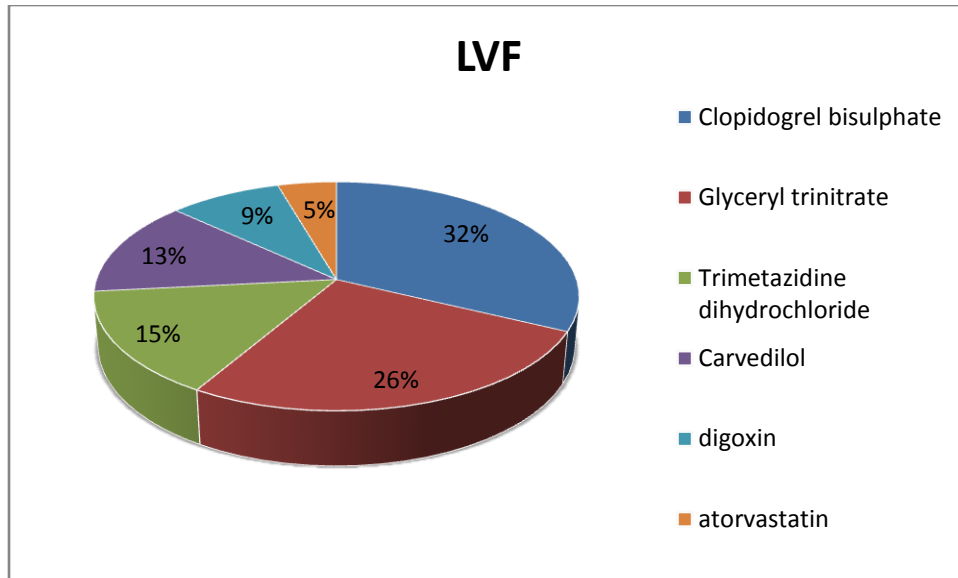


Figure 10: Graphical Representation of Cardiovascular Patients taking medicines in LVF

11. Medicines used in patient suffered from Ischemic Heart Disease(IHD) in 715 patient

Name of the medicine	No. of patient	Percentage
Clopidogrel bisulphate	46	38%
Glyceryl trinitrate	38	32%
Trimetazidine dihydrochloride	16	13%
Metoprolol tartrate	9	8%
Carvedilol	8	7%
atorvastatin	3	3%

Table 11: Percentage of patients taking medicines in IHD

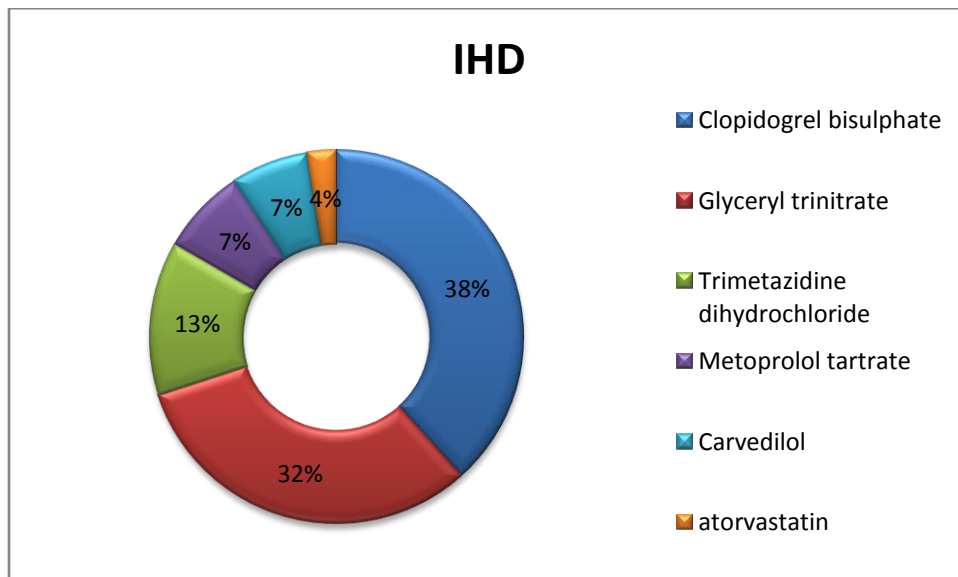


Figure 11: Graphical Representation of Cardiovascular Patients taking medicines in IHD

12. Pharmaceutical industries

company	Brand name	Generic name	No. of patient	percentage
Drug Inter.	Clopid As	Clopidogrel bisulphate	442	39%
Drug Inter.	Nidocard	Glyceryl trinitrate	285	25%
Aristopharma	Metacard	Trimetazidine dihydrochloride	156	14%
Drug Inter.	Betaloc	Metoprolol tartrate	85	8%
Beximco	Atova	atorvastatin	79	7%
Sun Pharma	Cardivas	carvedilol	41	4%
Aristopharma	agoxin	Digoxin	38	3%

Table 12: Overall control of Pharmaceutical companies of the overall patient concern with

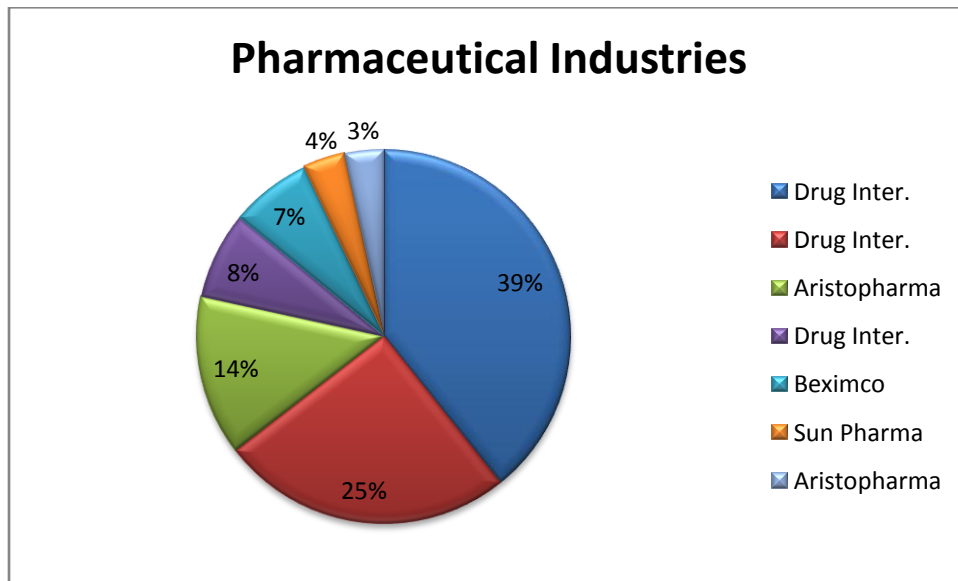


Figure 12: Graphical Representation of Overall control of Pharmaceutical companies over drug market for Cardiovascular Diseases

Discussion

Cardiovascular disease is an important problem in Bangladesh.. The TB mortality rate of in Bangladesh is 45 percent higher than then the Southeast Asian region average The objective of this study is to get a picture of overall condition of cardiovascular disease in Bangladesh and thereby get more accurate measures to minimize the occurrence. The results are obtained in this study re correlated with each other and by establishing a relationship among these give a better picture to make a suitable decision with cardiovascular patients.

1.Cardiovascular disease patients according to Gender:

From the present study among the 715 prescription it was seen that among 715 patients 40% were female patient & 60% were male patient from the **Figure 1**. So, from this study we can say that male among the people are more vulnerable to cardiovascular disease.

2. Cardiovascular disease patients according to Age:

From the present study among the 715 prescription it was seen that among 715 patients 2% were within 16-30 years, 10% were within 31-45 years, 49% were within 46-60 years , 28% were within 61-75 years & 11% were within 76-90 years from **Figure 2**.

3. Mostly used combination of drugs given in total 715 cardiovascular patient:

From the present study among the 715 prescription it was seen that among 715 patients 43% used Clopidogrel & glyceryl trinitrate, 21% used Glyceryl trinitrite & trimetazidine, 20% used clopidogrel & trimetazidine, 9% used clopidogrel & carvedilol, 7% used carvedilol & metoprolol used from **Figure 3**.

4. Multiple cardiovascular disease occurring patient:

From the 715 prescriptions, it was seen that among 715 patients 43% suffered from UA & HTN, 33% patient suffered from AMI & HTN, 16% patients suffered from UA & HTN & LVF, 8% patients suffered from LVF & IHD from **Figure 4**.

5. Different Diseases in Cardiovascular Patient:

From the present study among the 715 prescription it was seen that among 715 patients 28% have HTN, 25% have unstable angina(UA), 20% have AMI, 18% have left ventricular failure, 9% have IHD from **Figure 5**.

6. Different medicines taken by the patient:

From the present study among the 715 prescription, 33% patient used clopidogrel, 29% patient used glyceryl trinitrate, 14% patient used trimetazidine dihydrochloride, 9% patients used metoprolol, 7% patients used carvedilol, 5% patients used atorvastatin, 3% patient used digoxin from **Figure 6**.

7. Medicine used in AMI induced patient:

From the present study among the 715 prescription among the AMI induced patients, 31% used clopidogrel, 29% used glyceryl trinitrate, 18% used trimetazidine, 9% used metoprolol, 6% used carvedilol, 6% used atorvastatin from **Figure 7**.

8. Medicines taken by the HTN induced patient:

From the present study among the 715 prescription among the HTN induced patients, 32% used clopidogrel, 31% used glyceryl trinitrate, 12% used trimetazidine, 11% used metoprolol, 6% used carvedilol, 4% used atorvastatin, 3% used digoxin from **Figure 8**.

9. Medicines taken by the UA induced patient:

From the present study among the 715 prescription the UA induced patients, 34% used clopidogrel, 30% used glyceryl trinitrate, 13% metoprolol, 12% used trimetazidine, 7% used atorvastatin, 4% used carvedilol from **Figure 9**.

10. Medicines taken by the LVF induced patient:

From the present study among the 715 prescription the LVF induced patient, 32% used clopidogrel, 26% used glyceryl trinitrate, 15% used trimetazidine, 13% used carvedilol, 9% used digoxin & 4% used atorvastatin from **Figure 10**.

11. Drugs used in IHD induced patients:

From the present study among the 715 prescription the IHD patients, there 38% patients used clopidogrel, 32% used glyceryl trinitrite, 13% used trimetazidine, 8% used meteprolol, 7% used carvedilol, 3% used atorvastatin from **Figure 11**.

12. Control of Different Pharmaceutical Companies over Cardiovascular drugs:

From the present study among the 715 prescription, controls of different pharmaceutical companies over total drug market for cardiovascular diseases were found out, And it was found out that 62% of the drug market for the management of cardiovascular diseases was controlled by Drug International Ltd as it is the company whose drugs are most prescribed. The Drug Include Nidocard (Glyceryl Ttrinitrite), Betaloc (Meteprolol Tartrate), Clopid (Clpidogrel Bisulphate). Aristopharma Pharmaceutical Share 17%. The Drug include Metacard and Agoxin. Beximco held their share at 7% & their drug is Atova. Sunpharma share 4% & their drug include Cardivas from **Figure 12**.

Conclusion

The main objective of the study was to find out the prescribing medication of cardiovascular disease having patient. As the study shown that dominant disease is Hypertension, unstable angina, acute myocardial infarction, left ventricular failure, ischemic heart disease in the patient clinical history as well. As the study shows there are only some drugs are penetrate the market of cardiovascular disease patient. The major drugs are Glycery trinitrite as follows Atorvastatin, Meteprolol and Aspirin. The patient almost have developing disease condition is promptly. The recognition for this disease does depend on the age factor but also get other factor is the same time effective. The present condition of this disease shows that people don't get the perfect knowledge of how to deal with cardiovascular disease. In present study drugs given to the patient almost are the major drug combinations as given above like glyceryl trinitrite, atorvastatin etc. Appropriate knowledge and proper life style will give a relief of this attacking disease.

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