Evaluation of Angina Pectoris Treatment : Appropriateness of Indications, Drug Selection and Dosage Accuracy in Tertiary Care Hospital, Peshawar

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ABSTRACT

There are many presentation of coronary artery diseases, out of which angina pectoris is one variety. Angina pectoris is define as chest pain or discomfort due to coronary heart disease, which occurs when the heart muscle doesn't get sufficient blood as it needs. Angina usually causes uncomfortable pressure, tightness, fullness, squeezing or pain in the center of the chest which radiates to left arm, shoulder and neck, experience a significant rise worldwide, presenting a considerable challenge in contemporary healthcare. This study was an observational study conducted among patients diagnosed with Angina Pectoris based on Canadian Cardiovascular Society Classification of Angina pectoris (CCS), Aiming to assess the appropriateness of drug indications and the selection of prescribed medications for treating Angina pectoris and associated comorbidities, based on relevant clinical guidelines and to evaluate dosage accuracy for effective angina management.

The study examined the baseline characteristics such as gender, age, address and comorbidities of angina patients. All patients included in this study were adults, with a total of 53 participants, comprising 28 males (52.83%) and 25 females (47.17%) of varying ages. Hypertension was the common co-morbidity with (64.14%) in all patients. Diagnosis based on Canadian Cardiovascular Society (CCS) Classification of Angina Pectoris (66%) patients was diagnosed with CCS Ⅱ class. Angiography is an imaging test to view body blood vessels, this test was performed for all patients and found that triple vessel coronary artery disease was among 39.62% patients. Angioplasty is a procedure to widen the narrowed Vessels and was performed for 62.6% Average number of drugs per prescription was 5.62. The most commonly prescribed Anti-anginal drug classes were Beta Blocker, Nitrates, Ranolazine, Trimetazidine, Angiotensin converting enzymes inhibitors, calcium channel blocker, Antiplatelet and Statin. The doses of all the Anti-anginal drug classes were according to the established European society of cardiology (ESC) guideline.

The study concludes that the prescribed medications, which included a variety of Anti-anginal drug classes, were aligned with established European Society of Cardiology (ESC) guidelines, ensuring appropriate drug selection and dosage for effective management of angina and related comorbidities.

CHAPTER #1 INTRODUCTION

1.1   INTRODUCTION

Angina also known as angina pectoris, is chest pain or pressure, usually caused by flow to the heart muscle (myocardium). It is most commonly a symptom of coronary artery disease. Usually, partial blockage or spasm of the arteries supplying blood to the heart muscle causes angina (1). In the center of the chest, angina typically causes painful pressure, fullness, tightness, squeezing, or pain that spreads to the left arm, shoulder, neck, and jaw This usually occurs as a result of one or more coronary arteries getting narrowed or constricted which causes ischemia injury to the heart muscles (1, 2). Other causes of angina include heart failure, abnormal heart rhythms, and less commonly anemia. The degree of oxygen deprivation in the heart muscle is correlated with the severity of angina. An imbalance between the heart's supply and demand of oxygen leads to angina (1).

Globally, One of the main indicators of acute coronary syndrome (ACS) is angina pectoris, which is the primary cause of morbidity and mortality worldwide (2). The prevalence of angina in most European countries is estimated to be 20,000–40,000 individuals of the population per million (3). Angina due to ischemic heart disease affects approximately 112 million people being slightly more common in males, than females (1,7% to 1,5%) (1). It is a common clinical manifestation of Ischemic heart diseases (IHD) with an estimated prevalence of 3%–4% in UK adults (4). According to the England Health Survey (2006), angina was experienced by approximately 8% of men and 3% of women in the 55–64 age group and 14% of men and 8% of women in the 65–74 age group. Men are more likely than women to be affected, and the prevalence rises with age (5).

1.2   TYPE OF ANGINA PECTORIS

1.2.1   STABLE ANGINA

This is the most prevalent type of angina, this angina is caused by activity, Exercise increases the heart muscle's need for oxygen, which can be relieved by rest or the use of angina medication (6). Less than 5-10 minutes is the typical duration of stable angina pain, which is predictable, brief, and typically comparable to prior episodes of chest pain (2).

1.2.2   UNSTABLE ANGINA

In the past this angina was called angina before a heart attack (6). It is an unforeseen medical emergency that can happen while you're at rest or even with minimal physical effort. It can happen for more than 20 minutes, is usually more severe, and lasts longer than stable angina. The pain doesn't relive with rest or the usual angina medications. If the blood flow doesn't improve, the heart is in need of oxygen and myocardial infarction(MI) occurs, which is dangerous and requires emergency treatment (2).

1.2.3   PRINZMETAL ANGINA

Prinzmetal angina, also known as variant angina or vasospastic angina, is a form of angina that results from a coronary artery spasm but not a coronary artery disease that temporarily reduces blood flow. The main symptom of variant angina will be severe chest pain, which commonly occurs in cycles, usually at rest during overnight (2).

1.2.4   REFRACTORY ANGINA

It is type of angina, in which the angina episodes will be frequent and lethal. It can be managed by administering a combination of medications and lifestyle modifications (2).

1.3   CLASSIFICATION OF ANGINA

1.3.1   CANADIAN CARDIOVASCULAR SOCIETY CLASSIFICATION OF ANGINA PECTORIS (CCS)

While evaluating and monitoring patients with persistent symptoms, it's critical to quantify the severity of anginal symptoms. Each patient should be categorized based on how much exercise triggers angina and how frequently angina episodes occur each week. The most widely used classification scheme for angina symptoms is the Canadian Cardiovascular Society (CCS) Classification of Angina, which places symptoms on a scale from 1 (angina only with strenuous or prolonged exercise) to 4 (inability to perform any activity without angina) as shown in table (Table 1.1) (7, 8).

Table 1.1: Canadian Cardiovascular Society Classification of Angina

Sr. No	Class	Description
1	Class I	Ordinary physical activity does not cause angina strenuous or rapid or prolonged exertion produce angina
2	Class II	Slight limitation of ordinary activity (e.g walking or climbing stairs rapidly, walking uphill, Walking more than two blocks on the level and climbing more than one flight of ordinary stairs at a normal pace and in normal conditions). Angina may be worse after meals, in cold temperatures, or with emotional stress.

| 3	Class Ⅲ	Marked limitation of ordinary physical activity. Walking one or two b locks on the level and climbing one flight of stairs in normal conditions and at normal pace
4	Class Ⅳ	Inability to carry out any physical activity without angina discomfort, may be present at rest.

1.4 PATHOPHYSIOLOGY OF ANGINA

The heart needs a sufficient quantity of oxygen to produce energy and support contractility. At the cellular level, ischemia causes an increase in anaerobic glycolysis. This increases the levels of hydrogen, potassium, and lactate in the venous return of the ischemic or affected area of the myocardium. The hydrogen ions compete with calcium ions causing hypokinesia/ akinesia of the affected area. Exercise, stress, and low body temperature are triggers that would result in a metabolic mismatch and lead to stable angina (2).

1.5 ETIOLOGY

common etiologies of Angina pectoris are obesity, mental stress, inadequate physical activity, genetics, smoking, drug abuse like cocaine, ischemic heart diseases, blood coagulation disorders, cardio-toxins etc (2).

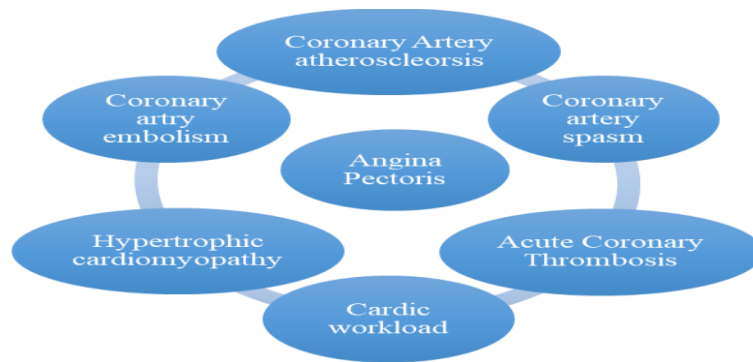**Figure 1.1: Pathophysiology of Angina**
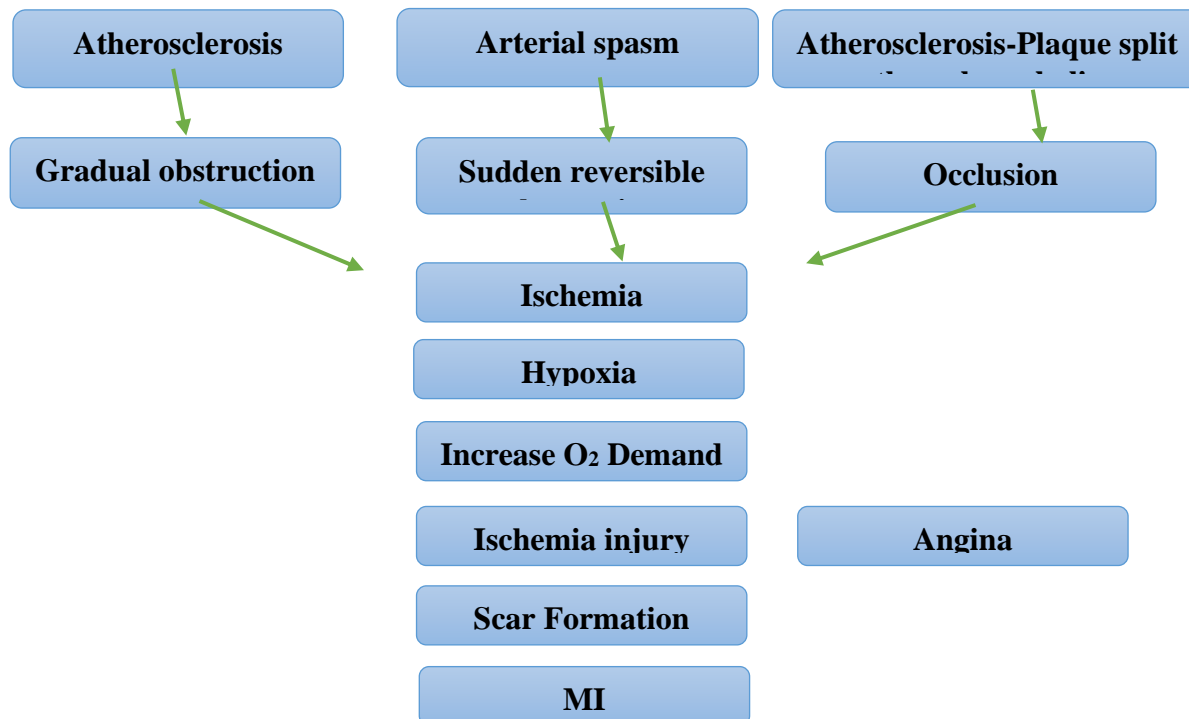
Figure 1.2: Etiologies of Angina

1.6   CHARACTERISTICS OF ANGINA PAIN

Angina pain has the following characteristics:

1.6.1   DIFFUSE PAIN

Angina pain may spread to the left shoulder and then extend from the inside of the left arm to the elbow, wrist or fingers.

1.6.2   INITIATING FACTORS

Any activity that increases the demand for heart muscle, such as exercise, exposure to cold, heavy food consumption, sexual intercourse may cause angina pain to begin (6).

1.7   CAUSES OF CHEST PAIN

Chest pain can have different causes and mechanisms, which are summarized in Figure 1.3. These are grouped into 3 broad categories: non-cardiac, cardiac non-ischemic causes, and cardiac ischemic causes. Causes of non-cardiac chest pain are gastro-esophageal reflux disease, musculoskeletal alterations, pulmonary and aortic diseases, and psychiatric conditions. Causes of non-ischemic cardiac pain are pericarditis and pericardial diseases. As for the cardiac ischemic group, atherosclerotic disease of the epicardial coronary arteries has been accepted as the cause of angina pectoris for more than 2 centuries (9).
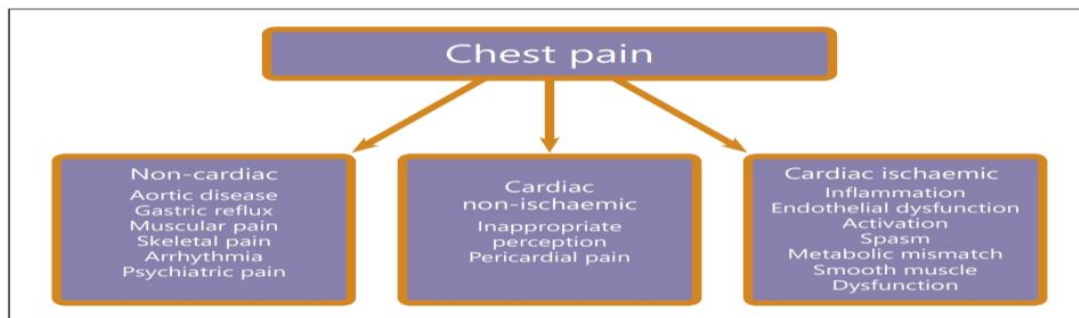

Figure 1.3: Categories of Chest Pain

1.8   TRETMENT GUIDELINES OF ANGINA PECTORIS

Treatment for angina pectoris is a multifactorial management which involves lifestyle modifications, risk factor modification, and medical therapy. Medical care is regarded as a crucial part of treating angina, unless in which symptoms are refractory to medical therapy, revascularization may be attempted (2).

1.8.1   LIFE STYLE MODIFICATION

The general management of patients with angina must include an attempt to improve prognosis. The first step in this is evidence-based lifestyle modification, which focusses on patient education and the management of coronary artery disease (CAD) risk factors(10)

1.8.2   PHARMACOLOGICAL MANAGEMENT OF ANGINA

Angina is a symptomatic manifestation of complex physiological processes and can be manipulated pharmacologically through multiple pathways: within each pathway, several options are available. Some agents have been available for decades, while recent advancements have brought newer, better tolerated, or even more effective alternatives (10). European society of cardiology (ESC), consider sublingual or short-acting nitro-glycerin, beta-blockers, and calcium channel blockers as first-choice therapy, whilst the other more recent drugs (Ivabradine, Nicorandil and Ranolazine) are reserved for patients who have contraindications to the first-choice drugs, or who fail to tolerate them, or who remain asymptomatic. These drugs are labelled as second-choice treatment despite their similar objectives and more contemporary data being available for them than for the first-choice drugs (9). Trimetazidine and allopurinol are recommended as third line treatment (11). Traditionally, drug treatment for angina focused on improving the balance between myocardial oxygen delivery and consumption through heart rate and blood pressure or afterload reduction and enhancement of coronary flow by vascular (coronary) muscle relaxation. Heart rate is the major determinant of oxygen consumption, and most attacks of angina are preceded by an increase of heart rate (10).

1.8.2.1   DRUG THAT REDUCE HEART RATE

There are 3 classes of drugs that reduce heart rate: Beta-blockers, Ivabradine, and Non-Dihydropyridine calcium antagon**is**ts, mainly Verapamil and Diltiazem.

1.8.2.2   DRUGS THAT INDUCE VASCULAR SMOOTH MUSCLE RELAXATION

Three classes of drugs exert their main effects by primarily reducing vascular smooth resistance and, consequently, cause arteriolar and coronary artery dilatation: these are Dihydropyridine calcium channel blockers, nitrates and Nicorandil.

1.8.2.3   METABOLIC MODULATORS AND LATE SODIUM CURRENT INHIBITORS

Drugs that belong to this class are Piperazine derivatives. At present, 2 agents are clinically available: Trimetazidine and Ranolazine (9, 10).

1.9   ANGINA PHARMACOTHERAPY

The summarized form of angina pharmacotherapy are shown in (Table 1.2).(2, 4, 9-11)

Table 1.2: Pharmacotherapy of Angina Pectoris

S.no	Drug class	Indication	Mechanisms of action	Example	Line of therapy
1	Beta blocker	Heart rate reduction	This reduces heart rate and contractility thereby decreasing myocardial oxygen demand	Bisoprolol: 1.25–10mg	First line of therapy
2	I$_f$ channel blocker	Heart rate reduction	Ivabradine exerts its action through the inhibition of the so-called "I$_f$ channel" Ivabradine has shown anti-ischemic and anti-angina activity	Ivabradine: 2.5–7.5mg two times a day	Second line of therapy
3	Non-Dihydropyridine calcium antagon**is**ts	Heart rate reduction	Non-Dihydropyridine calcium antagon**is**ts have effects on calcium channels of the myocytes as well as of the cardiac pacemaker and Atrioventricular conduction cells, leading to a negative inotropic effect and reduction of heart rate and reduce myocardial oxygen demand.	(verapamil: 40–240 or Diltiazem: 120-360 mg)	First line of therapy
	Dihydropyridine	vascular smooth muscle	Inhibit calcium influx through the high-voltage-activated L-type calcium channel, located in the smooth	Dihydropyridine (amlodipine:	First line of therapy

4	calcium antagonists	relaxation	muscle of the arterial wall, leading to smooth muscle relaxation, reduction in myocardial oxygen consumption	2.5–10 mg daily)	
5	Nitrates	vascular smooth muscle relaxation	Decrease spontaneous and inducible coronary spasm via large epicardial vasodilation, Decrease oxygen demand	Nitroglycerin 0.3-0.6mg mg 3 to 4 times a day Glyceryl trinitrate 2.5 - 6.5mg two-four time a day	First line of therapy
6	Nicorandil	vascular smooth muscle relaxation	Potassium channel activator with coronary micro vascular dilatory effect	Nicorandil: 5–30 mg two times a day	Second line of therapy
7	Late Na+ Current Inhibitors	Sodium Current Inhibitor	Ranolazine causes a concentration, voltage and frequency-dependent inhibition of the late sodium current, thus preventing intracellular calcium overload during ischemia, resulting in the distribution of myocardial blood flow toward the ischemic areas with a reduction of ischemia	Ranolazine: 375–500 mg two times a day	Second line of therapy
8	Partial fatty-acid oxidation inhibitors	Metabolic Modulators	Inhibiting fatty acid oxidation, thereby enhancing myocardial glucose utilization; it has been described as a 'metabolic modulator' of the ischemic cascade.	Trimetazidine: 50–400mg daily	Third line of therapy
9	ACE inhibitors	Manage hypertension	ACEi reduce workload, may improve small vessel remodeling. Improves endothelial vasomotor dysfunction	Ramipril: 2.5–10mg daily	Reducing the risk of MI or death
10	Statins	LDL lowering	Improved coronary endothelial function reduced vascular inflammation, lower cholesterol level.	Rosuvastatin: 5–40mg daily	Treatment of dyslipidemias
11	Aspirin	Antiplatelet	Aspirin inhibit platelet function through irreversible inhibition of cyclooxygenase activity, Decreases the risk of cardiovascular events in patients with acute coronary syndrome, cardiovascular death, and stroke.	Aspirin LD 300 mg then 75-150 mg daily	ESC recommend the use of aspirin
12	Clopidogrel	Antiplatelet	Prevent platelet aggregation. Prevention of Arthero- thrombotic event patients suffering from myocardial infarction	300-600 mg LD followed by 75mg per day	-
13	Non-pharmacological	_	Smoking cessation, Exercise, Cardiac Rehabilitation, weight loss.	_	_

1.10 DIAGNOSIS OF ANGINA

A medical history, a cardiac examination, and further testing, such as blood tests, echocardiograms, ECG and imaging are used to identify heart disease. There may be further invasive procedures that are involved, including cardiac catheterization (12).

1.10.1 DIGNOSTIC TEST AND PROCEDURES FOR ANGINA

1.10.1.1 IMAGING

Several imaging methods can be used to assess the anatomy and function of the heart, including ultrasound (echocardiography), angiography, CT scans, MRI (Magnetic Resonance Imaging) and PET (Positron Emission Tomography). An echocardiogram is an ultrasound of the heart used to measure the heart's function, assess for valve disease, and look for any abnormalities (12).

1.10.1.2 ANGIOPLASTY

Angioplasty, sometimes referred to as balloon angioplasty and percutaneous trans-luminal angioplasty (PTA), is a minimally invasive endovascular procedure used to widen narrowed or obstructed arteries or veins, typically to treat arterial atherosclerosis. Angioplasty has come to include all manner of vascular interventions that are typically performed percutaneously (12, 13). Coronary angioplasty is a therapeutic procedure to treat the stenotic (narrowed) coronary arteries of the heart found in coronary heart disease. These stenotic segments of the coronary arteries arise due to the buildup of cholesterol-laden plaques that form in a condition known as atherosclerosis. A percutaneous coronary intervention (PCI), or coronary angioplasty with stenting, is a non-surgical procedure used to improve the blood flow to the heart (12).

1.10.1.3 ANGIOGRAPHY

Angiography, also known as arteriography, is a type of medical imaging that shows images of the body's internal organs and blood vessels, specifically the heart chambers, veins, and arteries. . This is traditionally done by injecting a radio-opaque contrast agent into the blood vessel and imaging using X-ray based techniques such as fluoroscopy (14).

1.10.1.4 ECHOCARDIOGRAM

Echo can show how well your heart pumps blood to the rest of your body. An echo may help identifying problem inside your heart, such as blood cloth or damage heart valve (15).

1.10.1.5 BLOOD TEST

Troponin is a component of the heart's muscle fibers, and the level of troponin in the blood is considered as the one of the most important cardiac marker used for assessing heart attacks. Troponin is the most sensitive (that is, it can be detected at low levels) and specific (its presence has a high probability of indicating cardiac muscle damage) of the cardiac markers. When the heart is deprived of oxygen, the muscle fibers are damaged, and their components (including troponin) leak in to the bloodstream. Within 3 to 4 hours after a heart attack, blood levels of two types of troponin (cTnI and cTnT) begin to increase. Troponin levels peak at about 12 to 16 hours and stay elevated for up to 2 weeks (16).

1.11 AIMS AND OBJECTIVES

The aim of this study is to Investigates the admitted diagnosed patients of angina pectoris in the cardiology wards of tertiary care hospital Peshawar, for the following specific purpose such as

1. To assess the appropriateness of drug indications and the selection of prescribed medications for treating Angina patients.
2. To analyze the prescription pattern of patients diagnosed with angina pectoris.
3. To evaluate the dosage accuracy for the effective Angina management according to established guidelines.

2 CHAPTER # 2 METHODOLOGY

2.1   STUDY DESIGN AND SAMPLING

This project is based on observational study and was conducted in Cardiology department of Tertiary care Hospital Peshawar. Non-probability convenient sampling technique was used to include appropriate respondents for the study.

2.2   STUDY POPULATION

Those people were selected who visited Hayatabad Medical Complex Peshawar belonging to different regions of Khyber Pakhtunkhwa for diagnosis of Angina pectoris referred by physicians or on their own wish. Data of 53 patients with angina pectoris were selected for the work based on the following criteria.

2.3   INCLUSION CRITERIA AND EXCLUSION CRITERIA

The study subjects were patients diagnosed with angina pectoris based on clinical assessments, all of whom met the relevant diagnostic and treatment criteria for angina pectoris and the indications for drug treatment. Male and female, new and post PCI patients of all ages were included in this study. The patients with incomplete data and those who refused to participate were excluded from this project.

2.4   DATA COLLECTION

An interview-based questionnaire was used to collect the data which was chosen to ensure authentic and accurate questionnaire filling. The questions asked by the interviewers were in the native language of the participants or in a language easier for the participants to understand. The questionnaire organized in the following 4 sections: 1) Demographics information 2) Patient history and comorbidities 3) Diagnostic test 4) Medication prescription trends 5) Doses of drugs.

The First section consists of question such as Patient name, Gender, age, Date of admitted and date of Follow ups. Second section consists of question such as type of angina according to CSS classification and other comorbidities which may worsen the severity of concurrent diagnosis. The third section have question related to Diagnostic tests and the fourth section consists of question related to dose, Strength, route, frequency and duration of medications.

2.5   DATA ANALYSIS

Data of individual case was statistically analyzed by using Microsoft excel 2013 and IBM SPPS Statistics 25, the analysis was done for every parameter and has been presented in the form of Tables and graphs.

3   CHAPTER # 3 RESULTS AND DISCUSSION

3.1   BASIC CHARACTERISTICS

The Frequency, Cumulative Frequency and Percentage of basic characteristic such as gender and address regarding the individual involved in study is shown in table 3.1

Table 3.1: Basic Characteristics

Basic Characteristic		Frequency(n)	Cumulative frequency	Percent (%)
Gender	Male	28	28	52.83
	Female	25	53	47.17
Address	Charsadda	9	9	16.98
	Peshawar	7	16	13.2
	Mardan	5	21	9.43
	Kohat	2	23	3.77
	Kurram Agency	3	26	5.66
	Hangu	2	28	3.77
	Bajaur	2	30	3.77
	Buner	2	32	3.77
	Khyber Agency	4	36	7.54

Swabi	2	38	3.77
Nowshera	3	41	5.66
Cherat	1	42	1.88
Lakki Marwat	1	43	1.88
Orakzai	1	44	1.88
Waziristan	1	45	1.88
Bannu	1	46	1.88
Chitral	1	46	1.88
Shangla	1	48	1.88
Batagram	1	49	1.88
Dir	1	50	1.88
Afghan	1	51	1.88
Karak	2	53	3.77

The Prevalence of Angina Pectoris in both gender is depicted in figure 3.1, and the different age groups prevalence of angina pectoris is depicted in figure 3.2.
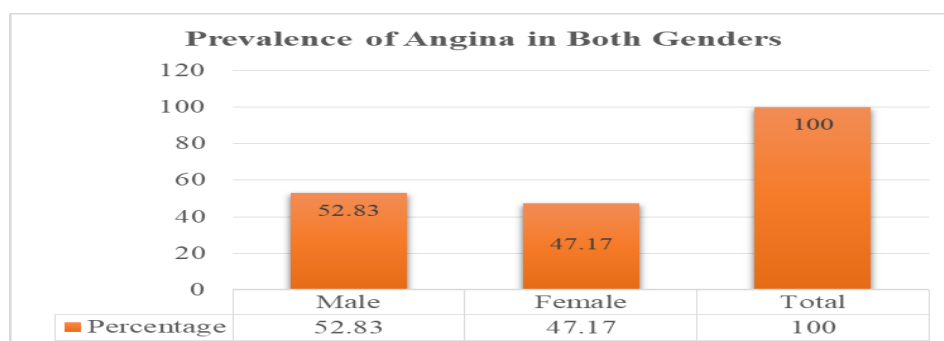

Figure 3.1: Prevalence of Angina in Both Gender (Male and Female).
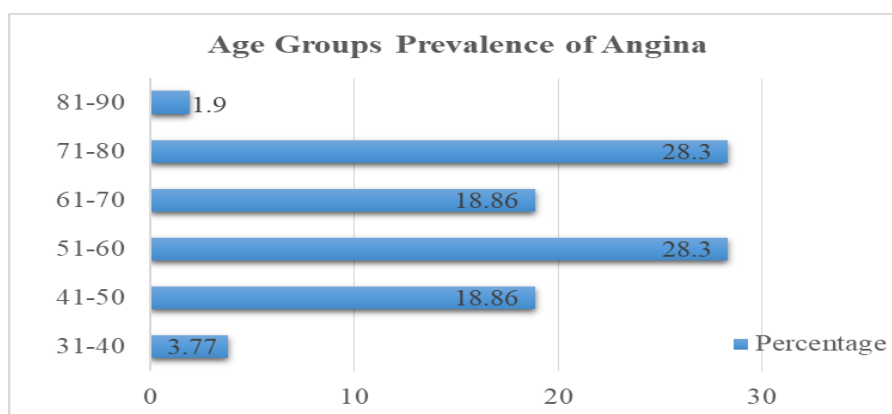

Figure 3.2 Prevalence of Angina in Different Age Groups

The percent Diagnosis of different classes of Angina such as CCS Ⅰ, CCS Ⅱ, CCS Ⅲ and CCS Ⅳ of different individuals noted during the data collection are shown in the figure 3.3
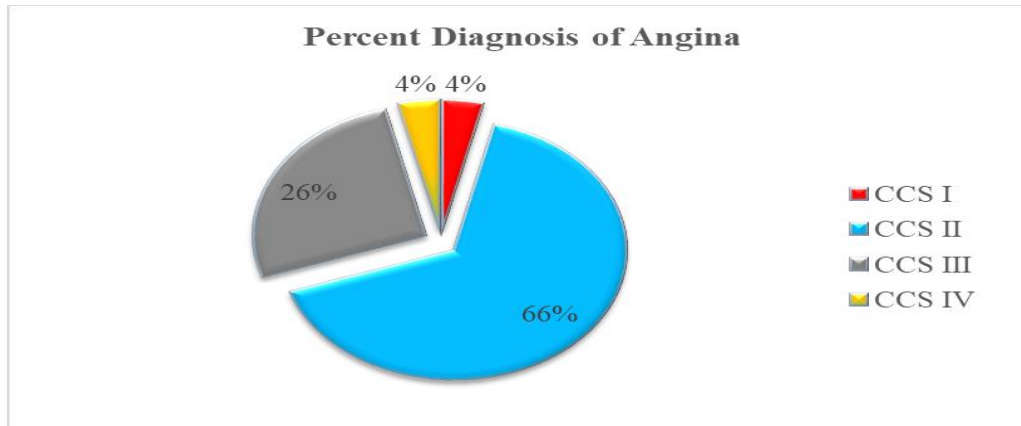
Figure 3.3: Percent Diagnosis of Angina

3.2 COMORBIDITIES REPORTED

The comorbidities of different individual noted during data collection are shown in the table 3.2, and percentage of different comorbidities are depicted in the figure 3.4.

Table 3.2: Comorbidities Reported

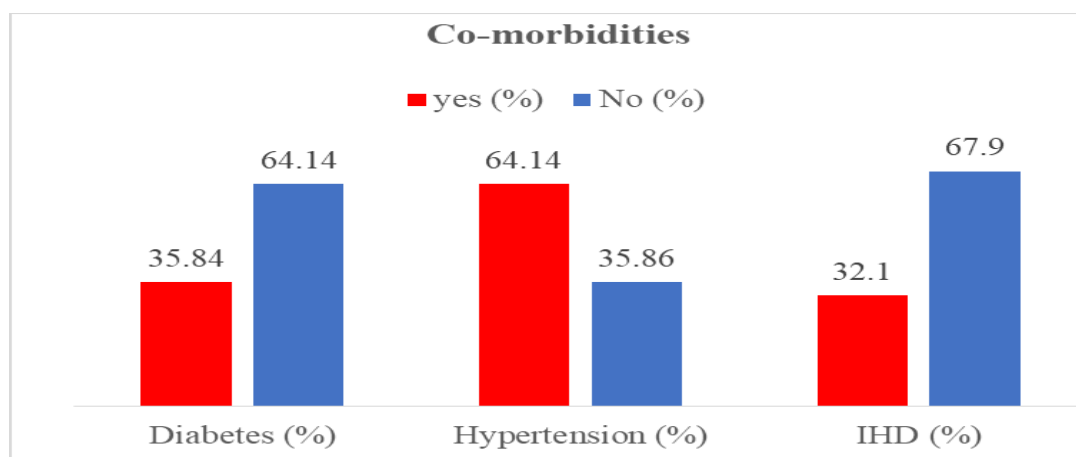| Comorbidities	Reported	Frequency (n)	Percentage (%)	Case number
Diabetes	Yes	19	35.84	1, 2, 5, 10 to 14, 23, 28, 33, 34, 40, 43, 46, 48, 51, 53
	No	34	64.16	
Hypertension	Yes	34	64.14	1 to 5, 7, 9, 10, 12, 13, 15, 17, 22, 23, 25, 27 to 30, 34, 35, 36, 37, 39, 40, 41, 42, 46, 48, 49, 50, 51, 52, 53
	No	19	35.84	
IHD	Yes	17	32.1	2, 3, 9, 17, 18, 19, 23, 24, 25, 27, 28, 30, 31, 46, 47, 52, 53
	No	36	67.9	

Figure 3.4: Percentage of Different Comorbidities

3.3   DIAGNOSTIC TESTS

The diagnostic test which played an important role in the detection of Angina pectoris are shown in the table 3.3 and figure 3.5

Table 3.3: Diagnostic Test Performed for Different Individuals

Diagnostic test	Performed	Frequency (n)	Percentage (%)
Troponin	Yes	51	96.2
	No	2	3.8
Echo	Yes	33	62.3
	No	20	37.7
Angiography	Yes	53	100

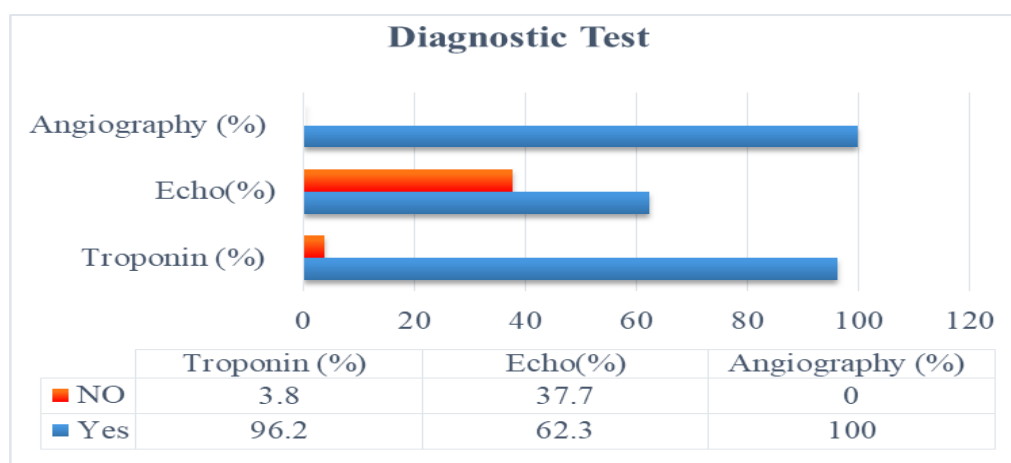|	Troponin (%)	Echo(%)	Angiography (%)
NO	3.8	37.7	0
Yes	96.2	62.3	100

Figure 3.5: Percent Diagnostic Test Performed

Angiography is one of the diagnostic test used to find different affected coronary Vessels such as Single vessel coronary artery disease (SVCAD), double vessel coronary artery disease (DVCAD), Triple vessel Coronary Artery disease (TVCAD) and Normal vessels, the percent of these affected vessels are shown in figure 3.6
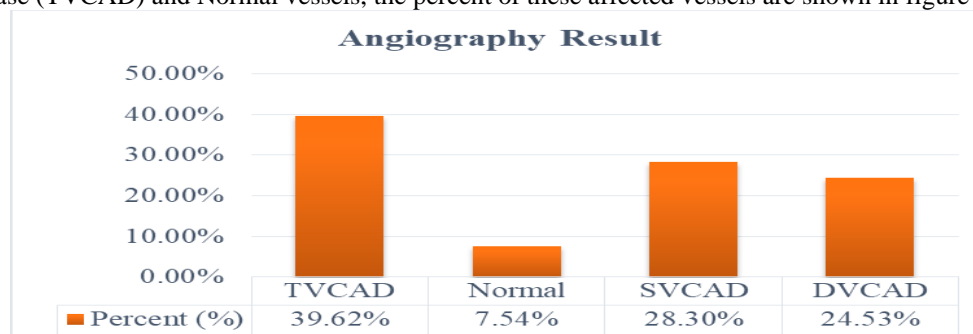
Figure 3.6 Angiography Results

3.4　DIFFERENT CLASSES OF DRUGS PRESCRIBED

The dosage forms used in the treatment were categorized as; Table, capsules, injection, syrup, as shown in Figure 3.7. The Tablet category mark high in percentage.

Figure 3.7: Dosage Forms

The different class of drugs which were administered to patient calculated by percentage are shown in Table 3.4.

Table 3.4: Prescription Patterns

Class	Medication	Frequency(n)	Percentage (%)
Antiplatelet	Aspirin	51	17.11
	Clopidogrel	43	14.42
	Ticagrelor	4	1.34
β - blocker			
	Bisoprolol	35	11.74

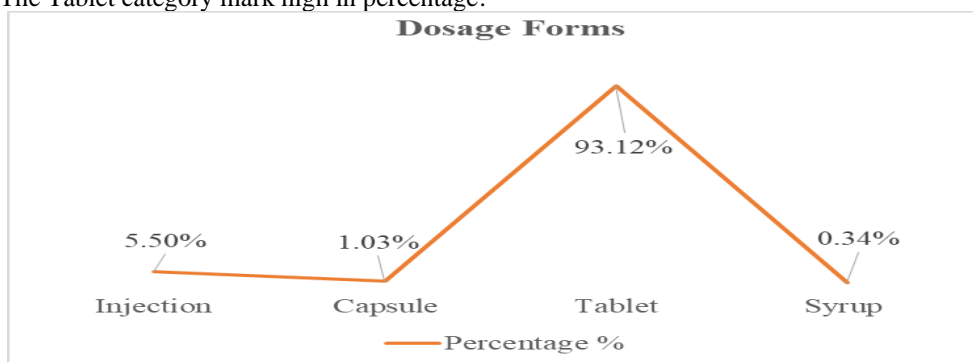|	Nebivolol	7	2.34
	Carvidolol	1	0.33
ARBs	Telmisartan	5	1.67
	Losartan	2	0.67
ACEs	Enalapril	1	0.33
	Lisinopril	5	1.67
	Ramipril	8	2.68
Nitrates	Glyceryl trinitrate	25	8.38
	Nitroglycerin	1	0.33
Combination of Anti-hypertensive	Amlodipine + valsartan + Hydrochlorothiazide	2	0.67
	Amlodipine + valsartan	4	1.34
	Sacubitril + Valsartan	2	0.67
	Spironolactone+ Furosemide	6	2.01
	Candesartan	1	0.33
Statin	Rosuvastatin	48	16.10
Ant diabetic	Humulin R	5	1.67
	Insulin glargine	1	0.33
	Dapagliflozin+ Metformin Hcl	2	0.7
	Glicolizide	1	0.33
	Empagliflozin	3	1.00
	Sitagliptin + metformin	4	1.34
CCB	Diltiazem Hcl	2	0.7
Anticoagulant	Rivaroxaban	1	0.33
	Enoxaparin sodium	7	2.34
Anti Anginal 2nd- 3rd line of therapy	Ranolazine	4	1.34
	Trimetazidine	5	1.67
K channel activator	Nicorandil	1	0.33
Others	Cefoperazone /sulbactam	1	0.33
	Meropenem	1	0.33
	Tramadol	1	0.33
	Domiperidone+ Cinnarizine	1	0.33
	Paracetamol, thioridazine, caffeine	1	0.33
	Omeprazole	3	1.0
	Glucosamine + chondroitin sulfate sodium	1	0.33
	Levocetirizine + Montelukast	1	0.33

	Itropide Hcl	1	0.33

3.5   DOSES COMPARISON WITH GUIDELINE

(Table 3.5) shown doses of different drugs which were given to patients with Indications in hospital involved in this study. These all doses were checked to guidelines and shown in the table with frequency (n).

Table 3.5: Dose Comparisons with Guidelines

Drugs	Indication	Dose given	Standard Dose	Complies with guidelines	(n)
Aspirin	Antiplatelet/ Blood thinner	75mg one daily	75-150mg	Yes (ESC)	34
Aspirin	Antiplatelet/ Blood thinner	150mg once daily	75-150mg	Yes (ESC)	17
Clopidogrel	Antiplatelet/ Blood thinner	75mg once daily	75mg	Yes (ESC)	43
Ticagrelor	Antiplatelet/ Blood thinner	90mg bid	90mg bid	Yes (ESC)	4
Bisoprolol	Anti-Anginal Drug	2.5mg once daily	1.25-10mg	Yes (ESC)	31
Bisoprolol	Anti-Anginal Drug	5mg once daily	1.25-10mg	Yes (ESC)	4
Nabivolol	Anti-Anginal	2.5mg once daily	1.25-10mg	Yes (ESC)	4
Nebivolol	Anti-Anginal	5mg once daily	1.25-10mg	Yes (ESC)	3
Carvidolol	Anti-Anginal	3.125mg once daily	1.25-10mg	Yes (ESC)	1
Glyceryl Trinitrate	Anti anginal (vascular smooth muscle relaxation)	2.6mg two time a day	Up to 6.5mg	Yes (ESC)	20
Glyceryl Trinitrate	Anti anginal (vascular smooth muscle relaxation), Angina	6.5mg twice a day	2.5-6.5mg	Yes (ESC)	5
Nitroglycerin	Anti anginal (vascular smooth muscle relaxation)	2.6 mg Twice a day	2.5-6.5mg	Yes (ESC)	1
Ranolazine	metabolic mediators and late sodium current inhibitor	500 mg Twice daily	500-2000mg	Yes (ESC)	4
Trimetazidine	Anti anginal (metabolic modulator)	35mg twice daily	35mg	Yes (ESC)	5
Rosuvastatin	LDL lowering agent	20 mg once daily	5-40mg	Yes (ESC)	45
Rosuvastatin	LDL lowering agent	10 mg once daily	5-40mg	Yes (ESC)	3
Telmisartan	Lowering BP, ARBs	40mg once daily	20-80mg	These doses according to Medscape.	4

Telmisartan	Lowering BP, ARBs	80mg once daily	20-80mg	These doses according to Medscape.	1
Losartan	Lowering BP, ARBs	25mg once daily	25 -100mg	These doses according to Medscape.	2
Lisinopril	Prevention of cardiovascular event	5mg once daily	2.5 -10mg	Yes (ESC)	5
Ramipril	Prevention of cardiovascular event	2.5mg OD	2.5 -10mg	Yes (ESC)	8
Enalapril	Prevention of cardiovascular event	5mg OD	2.5 mg -10 mg	Yes (ESC)	1
Amlodipine + valsartan + hydrochlorothiazide	Antihypertensive	10/60/12.5 mg once daily	5/60/12.5 mg-10/120.25mg once daily	These doses are according to Medscape	2
Amlodipine + valsartan	Antihypertensive	10/160 mg OD	5/160mg - 10/320mg	These doses according to Medscape	1
Amlodipine + valsartan	Antihypertensive	5/160 OD	5/160mg - 10/320mg	These drugs are according to Medscape	1
Amlodipine + valsartan	Antihypertensive	5/80mg OD	5/160mg - 10/320mg	These doses are not according to Medscape	2
Spironolactone + Furosemide	To relive Edema	40mg OD	20 – 80 mg	These doses according to Medscape	6
Humulin R	To lower blood sugar level	10 unit TDS	Depend on Blood glucose	These doses according to Medscape	4
Humulin R	To lower blood sugar level	6unit TDS	Depend on Blood glucose	These doses according to Medscape	1
Insulin Lantus	To lower blood sugar level	8units OD	Depend on Blood glucose	These doses according to Medscape	1
Dapagliflozin + Metformin Hcl	To lower blood sugar level	5/1000 OD	Up to 10/1000mg	These drugs are according to Medscape	2
Empagliflozin	To lower blood sugar level	25mg OD	10-25mg once daily	These drugs are according to Medscape	1
Empagliflozin	To lower blood sugar level	10mg OD	10-25mg once daily	These drugs are according to Medscape	2
Gliclazide	To lower blood sugar level	60mg OD	30–120 mg	These drugs are according to Medscape	1
Sitagliptin + metformin	To lower blood sugar level	50/1000 mg BD	50/500-100/1000 mg BD	These drugs are according to Medscape	3
Sitagliptin + metformin	To lower blood sugar level	50/500 mg BD	50/500-100/1000 mg BD	These drugs are according to Medscape	1
Sacubitril + Valsartan	To lower blood sugar level	50mg(24/26mg) BD BD	26/24mg - 103/97mg twice daily	These drugs are according to Medscape	1
Diltiazem Hcl	Heart rate reduction	60mg BD	120-360mg daily	Yes (ESC)	1
Diltiazem	Heart rate reduction	90mg BD	120-360mg daily	Yes (ESC)	1
Rivaroxaban	Anticoagulants	20mg OD	10-20mg	These doses are according to Medscape	1
Enoxaparin sodium	Anticoagulants	60mg BD	1mg/Kg	These doses are according to ESC guidelines	7

Candesartan	To lower BP	4mg OD	4 -32 mg OD	These doses are according to Medscape	1
Nicorandil	Reduce angina pain	10mg BD	5-30mg twice daily	Yes (ESC)	1
Cefoperazone / sulbactam	Antibiotic- used in infection	2gm BD	2-8gram Per day	These doses are according to pharmaguide	1
Meropenem	Antibiotic- used in infection	1gm BD	1500-3000mg per day	These doses are according to Pharmaguide	1
Tramadol	Pain	50mg BD	500-400mg daily	These doses are according to Medscape	1
Domiperidone Maleate+ Cinnaizine	To relive Vomiting	10/20mg BD	10-20mg twice daily	These doses are according to pharmaguide	1
Paracetamol, thioridazine, caffeine	Joint pain	500/3/70 mg BD	500/3/7-100/6/140mg twice daily	These doses are according to pharmaguide	1
Omeprazole	For acidity and heart burn	40mg OD	10-40mg daily	These doses are according to Medscape	3
Glucosamine + chondroitin sulfate sodium	Joint pain	500/400 mg BD	500/400-1500/1200 mg daily	These Doses are according to pharmaguide	1
Itropide Hcl	Bloating pain	50mg BD	Up to 150mg daily	Doses are according to pharmaguide	1
Levocetirizine	Anti-allergic	5mg OD	5-10mg daily	Doses are according to pharmaguide	1

3.6   CORONARY ANGIOPLASTY PROCEDURE

A coronary angioplasty is a therapeutic procedure to treat the stenotic (narrowed) coronary arteries of the heart found in coronary heart disease. Angioplasty performed for different individuals are shown in the table 3.6 and depicted in figure 3.8.

Table 3.6: Angioplasty Procedure Responses

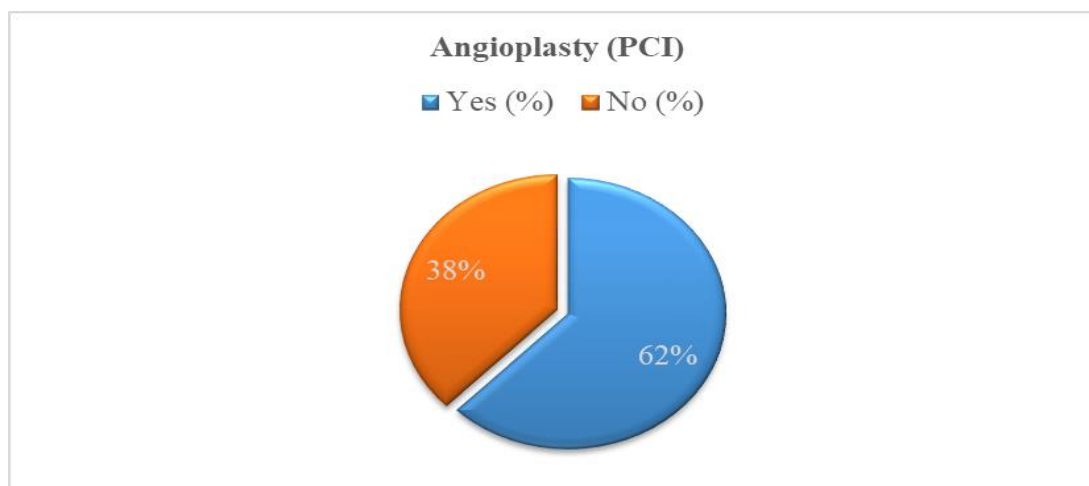| Procedure	Performed	Frequency (n)	Percentage (%)
Angioplasty	Yes	33	62.6
	No	20	37.7

Figure 3.8: Percentage of Coronary Angioplasty

Distribution of patients on the basis of multiple therapy of antiplatelet and anticoagulant prescription in different age groups are mentioned in table 3.7

Table 3.7: Age wise Distribution of Patients on the Basis of Antiplatelet and Anticoagulant Prescription

Age	Number of patients	Single antiplatelet	Double antiplatelet	Single anticoagulant
31-40	2	1	1	0
41-50	10	0	10	2
51-60	15	3	12	3
61-70	15	4	11	2
71-80	10	1	9	2
81-90	1	0	1	0
Total number of patients (%)	53 (100%)	9 (16.98%)	44 (83.02%)	9 (16.98%)

3.7　OVERALL DISCUSSION AND CONCLUSION

This study explores analysis of prescription pattern of patients with angina pectoris, non-probability convenient sampling techniques was used in the study. 53 questionnaires were filled from patients and process data for statistical analysis.

The basic characteristic consists of such parameters such as gender and age. There were two category in the gender parameter such as male and female having frequency of 28 (52.83%) and 25 (47.17%) the prevalence of angina were high in male as compared to female, one of the other studied conducted in Punjab province reported that the prevalence were high in male, also reported this by one another study (5, 17). A diverse set of patients hailed from different regions, the majority of patient were from Charsadda (n=9) followed by Peshawar (n=7) > Mardan (n=5) > Khyber agency (n=4) > Kurram agency (n=3) , Nowshera (n=3) > Kohat (n=2), Hangu (n=2), Bajaur (n=2), Buner (n=2), Swabi (n=2) and Karak (n=2) > Cherat (n=1), Lakki marwat (n=1), Orkzai (n=1), Waziristan (n=1), Bannu (n=1), Chitral (n=1), Shangla (n=1), Batagram (n=1), Dir (n=1)and Afghanistan (n=1). The mean age was 60.72± 1.52, the percentage of individual in the age range of 81-90 were (1.9%), 71-80 (28.3%), 61-70 (18.86%), 51-60 and 41-50 contributed (47.16%) and below 41 years age contributed 3.7%. The prevalence of angina rises with age which were also reported by another study (5). Increasing trend in the percent diagnosis of different classes of Angina such as CCS Ⅰ and CCS Ⅳ both contributed 8% < the proportion of CCS Ⅲ were 26% < CCS Ⅱ were diagnosed among 66% individuals.

The comorbidities of different individual noted during data collection were Hypertension having percentage 64.14% followed by diabetes and Ischemic heart diseases with percentage 35.84% and 32.1%. The diagnostic test and assessment for heart diseases include; taking of a medical history, a cardiac examination, & further investigations, including blood tests, echocardiogram and angiography (12).Three diagnostic test were

performed for different individual, angiography which were performed for all patients, Troponin (blood test) were performed for 96.2% and echo percentage were 62.3%. Angiography is one of the major diagnostic test used to find different affected coronary Vessels such as SVCAD, DVCAD, TVCAD and normal vessels, the decreasing trends of different affected vessels results reported by angiography such as TVCAD 39.62% > SVCAD 28.30% > DVCAD 24.53% and the normal vessels percentage were 7.54%.

There were more than one dosage forms observed in prescription of individuals. The trends were noted as Tablets (93.12%) > injection (5.50%) > Capsules (1.03%) > syrups 0.3%).

European society of cardiology (ESC), consider sublingual or short-acting Nitro-glycerin, beta-blockers, and calcium channel blockers as first-choice therapy, whilst the other more recent drugs (Ivabradine, Nicorandil, Ranolazine) these drugs are labelled as second-choice treatment (9). Trimetazidine and allopurinol are recommended as third line treatment(11). The average number of Drug per prescription was 5.62 ESC considered Beta Blocker as a first line therapy, among 298(100%) medicines, the percent regular medicine of Beta blocker were 14.41%, Nitrates 8.71%, Statin 16.10%, antiplatelet 32.87%, CCB 0.7%, Anticoagulants 2.67%, Anti diabetic medicine 5.37 %, Antihypertensive medicines which consists of ARB, ACE, Diuretic and there combination 14.72%, Ranolazine 1.34%, Trimetazidine 1.67%, Nicrandil 0.33% And the percentage of other medicines were 3.64%, which vary from these considered studies (22- 32). Drugs used in risk factor modification and to prevent disease progression includes statin and antiplatelet, statin16.10%, antiplatelet 32.87%.

The Anti-anginal drugs and the doses that were given to patients all align with established clinical guidelines for Angina management such as ESC guidelines (European society of cardiology guidelines) (18).The guidelines recommendations advocate for comprehensive evaluation of patients, taking into account their clinical presentation risk factor and underlying condition. They should consider individual patient profiles, including symptomatology and diagnostic test results, to select the most appropriate medication and treatment approaches the Prescription of medications including Bisoprolol, Rosuvastatin, Clopidogrel, aspirin, enoxaparin, Glyceryl trinitrate, Ranolazine and Trimetazidine, recommendation for antiplatelet therapy, statin for lipid management, Blood pressure control, diabetes and anticoagulation in cases corresponds with the ESC guidelines. (18, 19).

The rise in cardiovascular diseases is due to considerable change in diet habits, lack of physical activity, Hypertension, High cholesterol levels and diabetes. As most of the major risk factors (including hypertension, low HDL levels, smoking, and high LDL levels) have a direct link with mechanism of atherosclerosis(20) narrowing of the blood vessels which causes decrease in the blood supply to heart. The degree of oxygen deprivation in the heart muscle is correlated with the severity of angina. An imbalance between the heart's supply and demand of oxygen leads to angina (1). A coronary angioplasty is a therapeutic procedure to treat the stenotic (narrowed) coronary arteries of the heart found in coronary heart disease, these stenotic segments of the coronary arteries arise due to the buildup of cholesterol-laden plaques that form in a condition known as atherosclerosis. A percutaneous coronary intervention (PCI), or coronary angioplasty with stenting, is a non-surgical procedure used to improve the blood flow to the heart (4, 12). In our study Angioplasty were performed for 62.6%.

In this study distribution according the number of antiplatelet and anticoagulants prescribed to patients, among them single antiplatelet therapy was given to 9 patients (9.43%), double antiplatelet therapy was given to 45 patients (84.9%), In our this study single anticoagulant was given to the 9 patients the proportion of this was 16.98%, there was no double or triple anticoagulants given to patients, According to other study that were conducted by Vyas, et al,: single antiplatelet therapy was given to 54 patients (25.7%), double antiplatelet therapy was given to 110 patients (52.3%), single anticoagulant therapy was given to 100 patients (47.6%) (21).

In Conclusion, this study was about the appropriateness of drug indication and the selection of prescribed medications for treating Angina patients, to analyze the prescription pattern of patients diagnosed with angina pectoris and to evaluate the dosage accuracy for the effective management of angina according to established guidelines and to investigates the prevalence of different classes of Angina based on Canadian Cardiovascular Society Classification of Angina (CCS), an observational study in which 53 Participants were included among them the proportion of male patients were 52.83% and female were 47.17%. The mean age was 60.72± 1.52, majority of the patients were from Charsadda and Peshawar having percentage (30.18%). Based on CSS classification, CSS Ⅱ were the most diagnosed class with 66% and CCS Ⅰ , Ⅳ were the least diagnosed class each having (4%) Patients. Among the patients the most comorbid state were hypertension with the percentage of (64.14%) and the least comorbid condition were Ischemic heart diseases with percentage of (32.1%). Three different type of diagnostic test were performed for patients shown in the decreasing trends such as angiography, troponin and Echocardiogram. Angiography was performed to find different affected coronary vessels such as normal, single, double and triple

vessel coronary artery diseases. Majority of the patients were found with tipple vessel coronary artery diseases having percentage of 39.62% and the normal vessels percentage were 7.54%. There were more than one dosage forms observed in the prescription of individuals. Dosage form of most of the drugs classes were tablet (93.12%) and the least were syrup (0.3%). The average number of drug per prescription was 5.62 medicine. Among the prescriptions, antiplatelet were the most prescribed class with 32.87% and the least prescribed class were Calcium channel blockers with 0.2%. Among the antiplatelet class the dual antiplatelet were prescribed to 83.01% patient and single antiplatelet were prescribed to 16.98%. A coronary angioplasty with stenting, is a non-surgical procedure used to improve the blood flow to the heart, Angioplasty was performed for 62.6%. The Anti-Anginal drugs and their doses that were prescribed to the patients was found in the therapeutic range in accordance to European society of cardiology guidelines.

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