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Original Research Article

Evaluation of Medication Adherence in Cardiovascular Disease Patients in Tertiary Care Hospitals of Warangal: Development of New Medication Adherence Scale

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Abstract

Objective: To evaluate medication adherence and analyse the prescribing pattern of cardiovascular disease patients in tertiary care hospital using a newly developed medication adherence scale. ***Methods:*** It is a multi centered retro prospective observational study, conducted for a period of 6 months involving around 300 cardiac patients. The level of adherence is measured using newly developed medication adherence scale and prescribing patterns in cardiovascular patients is assessed through case reports. Analysis of data was done. ***Results:*** Among 300 cardiovascular patients, 58% were male and 42% were female. Most commonly diagnosed diseases are ST segment elevated myocardial infraction (28.3%) and left ventricular dysfunction (14%). Drugs used for the treatments are aspirin (95%) and clopidogrel (85.6%). Major risk factor is alcohol (11.6%) consumption, Hypertension and Diabetes Mellitus (9.6%). Major indication of cardiac patients is chest pain (42%), nausea (41%).The diagnosis was performed using Echocardiogram (89%), 2D-Echo (52%). The maximum adherence is seen in the age group of 31-40 female and male. Age group of 51-60 are more non adherent compared to other groups in males, whereas in females age group of 61-70 are more non adherent. Overall study show that Females (62%) are more non adherent compared to males (58.6%). The major reason for reduction of medication adherence is long duration regimens, lack of clinical communication between patients and health care professionals, forgetfulness etc. ***Conclusion:*** According to the study there is a suboptimal adherence is seen in cardiac patients and requires clinical interventions, which include affordable medications, easy-to-use medication regimens with fewer daily doses, communication between patients and healthcare providers.

Keywords: Medication Adherence, Prescription, Cardiovascular diseases, Regimen, aspirin, Echo cardiogram.

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INTRODUCTION

Cardiovascular diseases are a group of disorders of the heart and blood vessels which includes coronary artery diseases (CAD) such as angina pectoris and myocardial infarction (commonly known as a heart attack). Other Cardiovascular diseases include stroke, heart failure, hypertension, carditis, aortic aneurysms, arrhythmia, cardiomyopathy, atherosclerosis, congenital heart diseases, myocarditis, endocarditis, valvular heart disease, thromboembolic disease, venous thrombosis etc [1]. Cardiovascular diseases are the frontiers among the non communicable diseases across the globe responsible for increasing the burden of morbidity and mortality. Age, Sex, tobacco use, excessive alcohol consumption, obesity, diabetes, genetic predisposition are the major risk factors for heart diseases (Figure 1) [2]. According to World health organisation 2019 statistics cardiovascular diseases is number one cause of global death, it is estimated that 17.9 million people died due to cardiovascular disease in 2016, representing 31% of all global deaths, of this 85% are heart attacks and strokes. Over 3 quarter deaths takes place in middle and low income countries [3]. Thus, the prevention and management of cardiovascular illness has become a major focus of healthcare provider's worldwide [4].

As per world health organisation, Medication adherence is "the degree to which the person's behaviour corresponds with the agreed recommendations from a health care provider [5]". Processes of Adherence are classified as three steps [6].

- Initiation,
- Implementation and
- Discontinuation of therapy.

Medication-taking behaviour is extremely complex process. Poor adherence to medication compromises of increased patient mortality and morbidity. According to the WHO, medication adherence for conditions like hypertension, hyperlipidaemia, and diabetes would yield very substantial health and economic benefits [7].

The WHO classifies multifactorial causes for non-adherence into 5 categories [6].

- Socioeconomic factors,
- Factors associated with the health care team and system in place·
- Disease-related factors,
- Therapy-related factors,
- Patient-related factors.

In broader terms, these factors fall into the categories of patient-related factors, physician-related factors, and health system/team building–related factors [6]. Various methods are used to measure adherence, which includes direct and indirect methods. Direct methods include direct observed therapy by measuring the level of a drug or it's metabolite in blood or urine [8]. Indirect methods includes interviewing patient through questionnaires, patient self-reports, pill counts, rates of prescription refills, assessment of patient's clinical response, electronic medication monitors(EME)[8], Each method has its own advantages and disadvantages and no method is considered as the gold standard[9].

Patient questionnaires include several adherence rating scales. In our study we used mainly 3 scales [10].

- Drug Attitude Inventory (DAI)
- Brief Adherence Rating Scale (BARS)
- Morisky Medication Adherence Scale (MMAS)

Based on the questionnaires given in above three scales, new adherence scales containing 30 questionnaires were developed.

MATERIALS AND METHODS

It is a multi centered retro prospective observational study designed to evaluate the adherence of patients with cardiovascular diseases to their medications. The present study was conducted at territory hospitals in Warangal covering both outpatients and inpatients. This study was conducted for a period of 6 months involving around 300 subjects. Male and female subjects of age group 21-90 with cardiovascular disease are taken for the study based on inclusion and exclusion criteria. Subject with psychiatric disorders, pregnant women, patient who refused to take medication, patient who are not willing to participate in the study were excluded in study. Prescription auditing and medication adherence monitoring of 300 patients was done. Prescription auditing is done by examining case reports of patient and medication adherence through questionnaires by patient interaction.

The questionnaire was translated into patient specific language. The accuracy and meaning of the translated versions whichever is convenient were examined, and required corrections were made if necessary. It was pre-tested for content, design, reliability, readability and comprehension on 15 patients with cardiovascular diseases and modifications were made for accurate results and easy understanding to patients. The final version of questionnaire consists of 3 sections, and it contained both open-ended and closed questions. The first section consist the information about sociodemographic details of patient (age, gender, marital status, educational level, residence and monthly income). Second section consists of information about clinical aspects (type and duration of cardiovascular disease and medications used by the patient, past medication history, comorbid diseases, surgeries)[2, 7]. The third section includes evaluation of medication adherence of patient using 30 questions taken from different scales.1 to17 questions taken from DAI (Drug Attitude Inventory Scale), 18 to 25 questions from MMAS (Morisky Medication Adherence Scales), 26 to 30 questions are from BARS(Brief Adherence Rating Scale).

Self-Ratings for medication Adherence

Each question measures a specific patient behaviour about medication, reasons for medication nonadherence, patient knowledge on medication. Response of patient is categorised as T (TRUE) / F (FALSE), Answer shown in BOLD are scored as +1, Answers in NORMAL font are scored as -1.The total score was calculated by summing the values of responses. Positive score indicates good adherence and negative score indicates nonadherence/poor adherence. Last Five questions are used to explore the reasons for not taking the medications regularly. Data was collected by interviewing patient for 15-30 minutes during ward round in territory hospital. The medication adherence in the patients was assessed using the score given after the questionnaire has been answered. Based on the score the medication adherence was divided as lowest adherent, lower adherent, higher adherent and highest adherent.

RESULTS

Table.1. Shows among 300 patients 126(42%) are females and 174(58%) are males. Table.2. indicates the risk factors in cardiovascular disease patients. These risk factors includes Hypertension-29 (9.6%), Diabetes mellitus - 5(1.6%), Smoking - 15 (5%), alcohol consumption - 35 (11.6%), Obesity - 1 (0.3%), Hypertension+Diabetes mellitus - 29 (9.6%), Hypothyroidism - 1(0.3%).

Table.3. reveals the information about the patients having various cardio vascular diseases. Among these cardiovascular disease's Ischemic Heart Disease (IHD) are 13(4.3%), ST Segment Elevated Myocardial Infraction(STEMI) - 81 (27.3%), Non ST Segment Elevated Myocardial Infraction (NSTEMI) - 38 (12.3%), unstable angina – 15,(5%), stable angina - 12(4%), Left Ventricular Dysfunction(LVD) -39 (13%), Dilated Cardiomyopathy (DCM) - 28 (9.3%), Chronic Rheumatic Heart Disease (CRHD)- 11(3.3%), Atrial Fibrillation (AF) - 33 (11%), Congestive Cardiac Failure (CCF) - 30(10%).

Table.4. Represents the indications of each patient and found to be Shortness of Breath (SOB)86 (28%), Breathlessness 18(6%), chest pain 156 (52%), fever10 (3%), giddiness19 (6.3%), nausea 123 (41%), vomitings 54(18%), anorexia 15 (5%), orthopnea 23 (7%), edema 19 (6.3%), sweating 102(34%), loss of appetite 10 (3%), cough 8 (2.6%), burning sensation 65 (21%).

Table.5. Explains top essential drug list of cardiology department prescribed mainly is Aspirin 286 (95.3%), Pantoprazole 265 (88.3%), Clopidogrel 257 (85.6%), and Atorvastatin 257 (85.6%). It also describes most commonly used Hypertension drug Enalapril 156 (52%), Amlodipine 143 (47.6%), Telmisartan 67(22.3%) and Diabetes mellitus drugs were Metformin 34 (11.35), insulin 23 (7.6%).

Table.6. Indicates Medication adherences of different age groups, the adherence percentage in females are 38% and males are 41.4%. Medication non adherence percentage in females is 62% and males are 58.6%.

Table.7. Explains the percentage of medication adherence in patients with Ischemic heart disease are 69%, Non ST elevated myocardial infraction 39.3%, ST elevated myocardial infraction 54.3%, Stable angina 41.6%, Unstable angina 33.3%, Left ventricular dysfunction 43.5%, Dilated cardiomyopathy 46.4%, Chronic rheumatic heart disease 45.4%, Atrial fibrillation 45.4%, Congestive cardiac failure 50%.

Table.8. Indicates statistical analysis of age group verses different diseases. In the patients with Ischemic heart disease and chronic rheumatic heart disease number of female patients are more compare to Male patients. In the patients with ST elevated myocardial infraction, NST elevated myocardial infraction, Unstable Angina, Stable Angina, Left ventricular dysfunction, Dilated cardiomyopathy, Atrial fibrillation, Congestive cardiac failure number of Male patients are more compare to Female patients.

Table.9 Indicates statistical analysis of age group verses adherent and non-adherent. The (Mean±SD, Variance) of adherent female (6.7±4.4,19.9), male (10±5.65,32.9), non-adherent female (11.2±9.42,88.9) and male (14.5±9.94,98.9). P-value of adherent is 0.21, non-adherent is 0.53. Table.10. Contains list of questions prepared and score was calculated based on the answers provided.

The data for the patient adherence and the percentages were given in the table no. 11. Figure.2. Indicates comorbidities among 300 patients with Chronic kidney disease1(3%), Dilated cardiomyopathy 5 (1.6%), Edema 20(6.6%), Congestive cardiac failure 21 (7%), COPD 1(0.3%), Hypothyroidism 1(0.3%), Asthma 2(0.6%), Diabetes mellitus 5 (1.6%), Hypertension 29 (9.6%), Cardiovascular attack 5 (1.6%), Kidney problems 3(1%), respiratory problems 5 (1.6%), anaemia 2 (0.6%).

Figure.3. Indicates, diagnostic test majorly done were ECG 267 (89%),Chest X-ray 17 (5.6%), Angiogram 78 (26%), USG abdomen 25 (8.3%), 2D-Echo 156 (52%), Complete blood picture 129 (43%), Complete urine examination 89 (29.6%).

Table-1: Distribution of CVD patients as per age group

Age Groups	No of patients		Percentage of patients	
	Female	Male	Female	Male
21-30	7	8	2.3	2.7
31-40	17	34	5.7	11.3
41-50	29	35	9.7	11.7
51-60	19	44	6.3	14.7
61-70	32	22	10.7	7.3
71-80	19	26	6.3	8.7
81-90	3	5	1	1.7

Table-2: Risk factors of CVD patients

Risk factors	No of patients	Percentage of patients
Diabetes mellitus	5	1.6
Smoking	15	5
Alcohol	35	11.6
Obesity	1	0.3
Hypertension+Diabetes mellitus	29	9.6
Hypothyriodism	1	0.3

Table-3: Gender and Age group wise distribution of patients with different CVD's

Age Groups	IHD		STEMI		NSTEMI		Unstable Angina		Stable Angina		LVD		DCMP		CRHD		AF		CCF	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
21-30	1	0	1	3	0	2	0	0	1	1	1	0	1	0	1	0	0	1	1	1
31-40	0	0	3	16	4	7	0	2	1	2	4	4	1	2	0	0	2	0	2	1
41-50	2	1	8	7	2	5	3	2	1	2	2	5	1	6	3	0	4	2	2	6
51-60	2	0	2	22	1	3	3	2	1	0	1	6	6	1	0	1	2	8	1	1
61-70	2	1	8	2	7	2	0	0	1	0	3	6	3	3	3	1	3	3	2	4
71-80	2	1	3	5	1	1	1	1	1	1	2	4	1	3	2	0	2	6	4	4
81-90	1	0	0	1	2	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1
Total	**1 3**		**8 1**		**3 8**		**1 5**		**12**		**3 9**		**2 8**		**1 1**		**3 3**		**30**	

Table-4: Signs and Symptoms of patients

Indication	No of patients	Percentage of patients
Shortness of breath	86	28
Breathlessness	18	6
Chest pain	156	52
Fever	10	3
Giddiness	19	6.3
Nausea	123	41
Vomiting	54	18
Anorexia	15	5
Orthopnea	23	7
Oedema	19	6.3
Sweating	102	34
Loss of appetite	10	3.3
Cough	8	2.6
Burning sensation	65	21

Table-5: List of Drugs Prescribed in study participants CVD patients

Drug	Drug category	drug dose	Frequency	No of Prescriptions	Percentage
Aspirin	Antiplatelet	75mg	OD	286	95.3
Clopidogrel	P2Y12receptor inhibitor	75mg	OD	257	85.6
Atorvastatin	HMG-CO A inhibitor	40mg	OD	257	85.6
Nitrogylcerin	Vasodilator	0.6mg		123	41
Cardivelol	Beta blocker	3.125mg	OD/BID	125	41.6
Isosorbide dinitrate	Nitrates	2.5MG	OD	125	41.6
Metformin	Oral hypoglycemic agent	500mg	OD/BID	34	11.3
Furosemide	Loop diuretics	20mg	OD	119	39.6
Spironolactone+ torsemide	Direutics	25mg +5mg	OD	45	15
Enalapril	ACE inhibitor	20mg	OD	156	52
Ondansetron	H2 receptor blocker	4mg	OD	51	18
Pantoprazole	PPI	40mg	OD	265	88.3
Telmisartan	ARB'S	40mg	OD	67	22.3
Amoldipine	CA channel blocker	5mg	OD	143	47.6
Atenolol	Beta blocker	50mg	OD	147	49
Ceftriaxone	Cephalosporin	75mg	OD	34	11.3
Amoxicillin+clavulanate	Pencillin	500mg	OD	23	7.6
Insulin	Hypoglycemic agent	12units	OD/BID	23	7.6
Asthalin	Bronchodilator	2.5mg	OD	207	69
Budocort	Bronchodilator	0.5mg	OD	207	69
Heparin	Anticoagulant	5000IU	OD/BID	67	22.3
Digoxin	Cardiac glycoside	0.25mg	OD	65	21.6
Tramadol	Nsaid	50mg	OD	14	4.6
Metaprolol	B blocker	25mg	OD	42	14
Neurokind	Vit supplements		OD	107	35.6
Metronidazole	Antiprotozoal	500mg	OD	32	10.6

Table-6: Medication adherence data in different age groups

Age group	No of patients Adherent		No of patients Non adherent	
	FEMALE	MALE	FEMALE	MALE
21-30	7	7	0	1
31-40	14	18	3	16
41-50	10	13	19	22
51-60	5	15	14	29
61-70	7	11	25	11
71-80	4	7	15	19
81-90	0	1	3	4

Table-7: Medication adherence data indifferent diseased patients

Age group	No of patients Adherent		No of patients Non adherent	
	FEMALE	MALE	FEMALE	MALE
Ischemic heart disease	6	3	4	0
ST elevated myocardial infraction	10	34	15	22
NST elevated myocardial infraction	5	10	12	11
Stable angina	3	2	3	4
Unstable angina	3	2	4	6
left ventricular dysfunction	3	14	10	12
Cardiomyopathy	4	9	9	6
Chronic rheumatic heart disease	4	1	5	1
Atrial fibrillation	4	11	9	9
Congestive cardiac failure	6	9	6	9

Table-8: Statistical analysis of age group verses disease

Diseases	Mean± S.D		Variance		P-value
	FEMALE	MALE	FEMALE	MALE	
Ischemic heart disease	1.4±0.78	0.42±0.53	0.61	0.28	0.016
ST elevated myocardial infraction	3.57±3.20	8±2.23	10.2	63.3	0.197
Non ST elevated myocardial infraction	2.42±2.37	3±2.23	5.61	5	0.65
Unstable Angina	1±1.41	2.14±0.899	2	0.80	0.82
Stable Angina	0.85±0.37	1.05±0.89	0.14	0.80	1
Left ventricular dysfunction	1.85±1.34	3.71±2.36	1.8	5.57	0.09
Dilated cardiomyopathy	1.85±2.03	2.14±2.11	4.14	4.47	0.80
Chronic rheumatic heart disease	1.28±1.38	0.28±0.48	1.90	0.23	0.09
Atrial fibrillation	1.85±1.46	2.85±3.07	2.14	9.4	0.45
Congestive cardiac failure	1.714±1.46	2.57±2.07	1.57	4.28	0.367

Table -9: Statistical analysis of adherent and non-adherent versus age groups

Statistical analysis	Adherent		Non adherent	
	Female	Male	Female	Male
Mean± S.D	6.7±4.4	10±5.65	11.2±9.42	14.5±9.94
Variance	19.9	32.9	88.9	98.9
Overall P-Value	0.217		0.53	

Table-10: Questionnaire

S.No	QUESTIONS	ANSWERS
1	I don't need to take medication once I feel better	T/**F**
2	For me good things about medication outweights the bad	**T**/F
3	I feel dopped up on medication	T/**F**
4	Even when I am not in hospital I need medication	**T**/F
5	Taking medication will do me no harm	**T**/F
6	I take medications of my own free choice	T/**F**
7	The unpleasent effect of medication are always present	T/**F**
8	Medication make me feel tired and sluggish	T/**F**
9	I take medication only when feel ill	T/**F**
10	I would rather be ill on medication	T/**F**
11	By taking medication I can prevent myself getting sick	**T**/F
12	I take medication of my own free choice	T/**F**
13	My thoughts are clearer on medication	**T**/F
14	Are you careless at times about taking your medication.	T/**F**

15	sometimes if you feel worse when you take the medication,do you stop taking it.	T/**F**
16	I take medication only when I am sick	T/**F**
17	Does cost hinder adherence of taking medication	T/**F**
18	Do you forget to take medication	T/**F**
19	Have you ever cut back or stopped taking your medication without telling	T/**F**
20	When you travel you Forget to take medication	T/**F**
21	Did you take medication yesterday	T/**F**
22	Taking medication make u inconvenience	T/**F**
23	Do you often have difficulty in remembering taking medication	T/**F**
24	People sometime miss taking medications for reasons other than forgetting?in past 2 weeks were there any day you missed the dose	T/**F**
25	When you feel symptoms relieved ,you stop taking medicine	T/**F**
26	Can you tell me the names of your medication and why you are taking it	
27	How many times have you missed taking your medication and the reason	
28	No of medication prescribed per day	
29	No of days in past month when patient took less than the prescribed dose	
30	No of days in the past month when pt didn't take medication	

Table-11: Medication Adherence according to the scores given for the selected subjects

Adherence score Range	Condition	No of subjects (N=300)	Percentage adherence
-25 to -11	Lowest Adherence	74	24.7
-10 to 0	Less Adherence	116	38.7
01 to 10	Higher Adherence	76	25.3
11 to 25	Highest Adherence	34	11.3

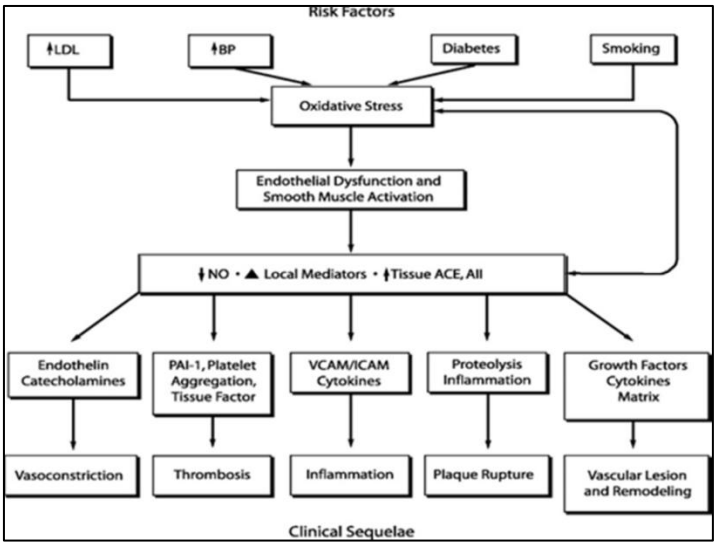


Fig-1: Clinical sequelae of risk factors leading to cardiovascular disease [2]

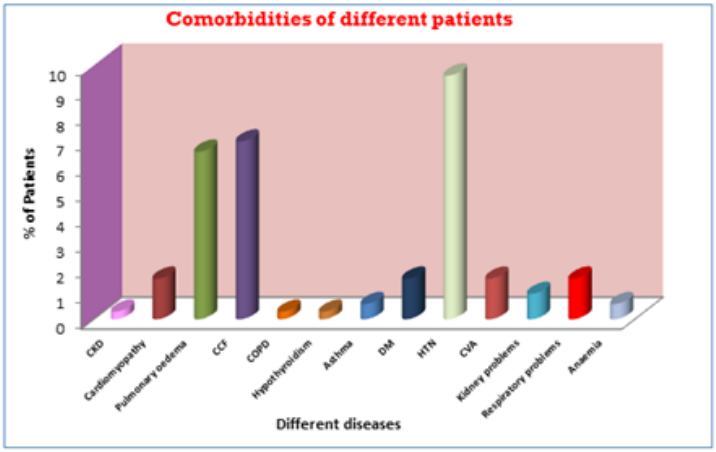


Fig-2: Co morbidities of different patients

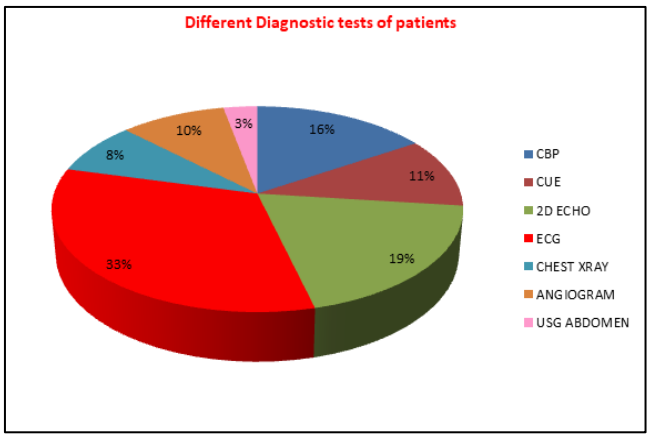


Fig-3: Different Diagnostic test of patients

DISCUSSION

Medication adherence study was conducted on 300 patients. Gender wise statistical analysis reveals more no of males (24.8±14.38) than females (18±10.53).Our study indicates that males are more prone to cardiovascular disease than females it is due to major risk factors like alcohol consumption and smoking, high blood pressure.

NST elevated myocardial infraction, Unstable angina, Stable angina, Dilated cardiomyopathy, Atrial fibrillation, Congestive cardiac failure Disease prevalence statistical domains is high for males compared to females except in Ischemic heart disease and Chronic rheumatic heart disease.

Females have higher prevalence of Ischemic heart disease than males, according to National Institute of Health and Wise (Women Ischemic Syndrome Evaluation), shows that abnormal coronary reactivity and microvascular dysfunction and plaque erosion contributes to specific Ischemic heart disease pathology [11]. Chronic rheumatic heart disease is more in females due to streptococcal infections, mitral stenosis and atrial stenosis higher in females compared to females.

The age groups of 21-90, males (174) are more prone to cardiovascular disease than females (126) because males have major risk factors like high blood pressure, high cholesterol, and Diabetes mellitus.

Age group of 61- 70 females (32) are more prone compared to males (22). This is because men generally develop cardiovascular disease at younger ages than females. Womens in constrast are at higher risk of strokes at older ages [12].

Highest disease prone age group is 51-60 in males (44), 61-70 in females (32). This study shows that womens are more likely to have cardiovascular disease in older ages. The studies shows that for men risk of cardiovascular disease starts to increase at about 45,by age of 55 risk doubles and continues to increase with age. For women's, risk of cardiovascular disease also increases with age**,** but the trend begins about 10 years later than in men and especially with the onset of menopause[13]. Hormones in women in prevent early stages of cardiovascular disease attack. It was found that the subjects who are lowest adherent are about 24.7 %, lower adherent patients are about 38.7. Subjects with higher adherence score were found to be 25.3 and highest adherence was found to be 11.3. Maximum adherence is seen in age group of 31-40 of female (14) and male (18) because this age group of patients have early stages of diseases and with less comorbidity. Age group of 51-60(29) are more non adherent compared to other groups in males, in females 61-70(25), these age groups are older and have comorbid diseases like Hypertension and Diabetes mellitus, and they even have longer duration of regimens.

In our study, adherence male (10±5.65) is more compared to female (6.7±4.4), Mean ± S.D, variance and P-value also shows that more number of cardiovascular disease patients is non-adherent to their medications due to various reasons like long term regimens, poor communication between physician and patients, forgot fullness.

CONCLUSION

This study concludes that the major age groups prone to cardiovascular disease disease in female are 61-70 due to post menopause effect. The major reason for non-adherence is illiteracy, poverty and lack of knowledge. Females are more non adherent to medication compared to males. So, females need to follow treatment regimens regularly. Finally the role of clinical pharmacist is a very crucial in medication adherence.

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