Assessment of Quality of Prescribing in Patients with Hypertension at Tertiary Care Hospital Using Prescription Quality Index (PQI)

Aiswarya A A[*1]**, Jismy Jose**[2]**, Linsa Linet V**[3]**, Alfet Raju Anthraper**[4]

[*1,2,3] *Pharm D, St. James College of Pharmaceutical Sciences, Chalakudy, Kerala, India.*

[4]*Assistant Professor, St. James College of Pharmaceutical Sciences, Chalakudy, Kerala, India*

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ABSTRACT

Hypertension have to be treated effectively to reduce the disease burden and to prevent various complications, for that the clinician need to individualize the drug therapy for the patients according to their condition. The rational prescribing of antihypertensive drugs along with other drugs can be assessed effectively using Prescription Quality Index (PQI) tool. **Aim:** To assess the quality of prescribing in patients with hypertension at a tertiary care hospital using PQI. **Materials and methods:** A prospective cross-sectional study was conducted for a period of 6 months in the general medicine, cardiology, gynecology and surgery departments of a 450 bedded tertiary care hospital. A specially designed data entry format was prepared for data collection and a total of 100 prescriptions were collected and analyzed using PQI tool. Data was analyzed using Statistical Package for Social Science version 20. Finally, the percentage of poor quality (score ≤ 31), medium quality (score 32-33) and high quality (score 34-43) prescriptions were determined. **Results:** Prescriptions of 100 patients were analyzed and found that 54% were females and 46% were males. Most of the patients are from the age group 70-80 years (48%) and 60-70 years (26%). Using PQI tool it was found that 44% of the prescription were of medium quality, 39% were of high quality and the remaining 17% were of poor quality. **Conclusion:** The study concluded that out of the 100 prescriptions, majority of them were of medium quality. The PQI is a useful tool for determining the quality of prescription in various clinical settings.

INTRODUCTION

Prescribing is the process involved in the decision making which is undertaken by the prescriber before the act of writing the prescription. A rational approach to prescribing involves evidence based prescribing and it has outcome goals and evaluation alternatives in partnership with the patient. There is a need for a systematic approach for prescribing and understanding of the factors that influence the decision to prescribe a medicine. The WHO promotes the rational use of medicines. The rational use means that the patients receives medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost of them at their community.

Prescription quality index (PQI) is a reliable and valid tool to assess quality of prescription in patients with chronic diseases. It is practical, applicable to a broad variety of medications and clinical condition. Also, it can easily be adopted for application in different settings and in limited availability of data.[5]

Nowadays the prevalence of Cardiovascular diseases are increasing worldwide and increasing day by day due to risk factors like smoking, obesity, Low Density Lipoprotein Cholesterol, Hypertension, Diabetes Mellitus, Chronic Kidney Disease etc and is the most common cause of adult death in the world. Many strategies for the treatment and prevention of heart diseases are present and are highly effective and have been subjected for evaluation. The evidence based for the treatment of CVD is stronger than for any other disease group.[3] Hypertension doubles the risk of cardiovascular diseases, which includes coronary heart disease (CHD), congestive heart failure (CHF), ischemic and hemorrhagic stroke, renal failure and peripheral arterial disease (PAD). There are significant clinical benefits in treating patients of hypertension with rational use of medications. Rational prescribing has to be checked for validity. The patients who are admitted in the hospital for the treatment of any conditions including some chronic diseases, who is having hypertension and taking antihypertensive therapy should be prescribed adequately. The rational prescribing of antihypertensives can be assessed effectively using prescription quality index tool.

Prescription Quality Index (PQI) developed by Hassan et al., in 2010 contains 22 criteria in questionnaire form. The PQI has been claimed to be an ideal tool applicable to a broad variety of medications and clinical conditions and applicable in different settings and with

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limited data. Validation of the PQI was performed in patients with chronic diseases. This study was approved by the University of Sains Malaysia Research and Ethical Committee.

Prescriptions may be containing a single drug or multiple drug therapy. In PQI, for prescriptions consisting of more than one drug, each drug was rated individually. Similarly, if patients suffered from more than one disease state, each disease state was rated separately. The minimum score was then selected for the PQI summation. The criteria in the PQI were in question form and the range of scores varied from '0' to'4' for very important criteria, '0' to '2' for criteria considered as important and '0' to '1' for less important criteria. Compliance criterion was measured based on physician notes in patient's medical record. When it was not possible to obtain certain data such criteria were rated as having no information and score of '9' was given. If a drug was not indicated, criterion 1 should be scored as '0' (not indicated). Subsequently, criterion 2 (dosage), criterion 13 (duration) and criterion 14 (cost minimization) were all scored as '0'. The PQI total score was obtained by summing up all the minimum scores for the 22 criteria for all drugs in a prescription. The possible maximum score of the PQI was '43' (table:6).

Prescription with the PQI total score of less than or equal to 31 was interpreted as poor quality, 32 to 33 as medium quality and 34 to 43 as high quality. The PQI can be typically completed in about 10 min or longer, although it may on occasion take longer, depending on the number of drugs in the prescription and rater's specialty, experience and training.

PQI was developed with strong structural foundation and subjected to extensive psychometric testing and demonstrated acceptable validity and reliability. PQI is also able to discriminate between the proportion of good prescriptions that of with problems. The PQI is specifically developed to be consistent with current scientific knowledge on rational and evidence based practice, effectiveness, efficacy and safety. Thus it enables to analyze the prescription and thereby improve the quality of prescription. Benefits of interventions can result in improvements in patient care.[5]

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Table: 6 PRESCRIPTION QUALITY INDEX

Sl. no	Criterion	SCORE	Drug 1	Drug 2	Drug 3	Min. Score
1.	Is there an indication for the drug?	Not indicated	0	0	0	
		Weakly indicated	2	2	2	
		Indicated	4	4	4	
		No information	9	9	9	
2.	Is the dosage correct?	Incorrect	0	0	0	
		Marginally correct	2	2	2	
		Correct	4	4	4	
		No information	9	9	9	
3.	Is the medication effective for the condition?	Ineffective	0	0	0	
		Slightly effective	1	1	1	
		Effective	2	2	2	
		No information	9	9	9	
4.	Is the usage of drug for the indication supported by evidence?	No evidence	0	0	0	
		Weak evidence	1	1	1	
		Strong evidence	2	2	2	
		No information	9	9	9	
5.	Are the directions for administration correct?	Incorrect	0	0	0	
		Marginally correct	1	1	1	
		Correct	2	2	2	
		No information	9	9	9	
6.	Are the directions for administration practical?	Impractical	0	0	0	
		Marginally practical	1	1	1	
		Practical	2	2	2	
		No information	9	9	9	
7.	Are there clinically significant drug-drug interaction?	Major significant	0	0	0	
		Minor significant	1	1	1	
		Insignif. / no inter.	2	2	2	
		No information	9	9	9	
8.	Are there clinically significant drug-disease/condition interaction?	Significant	0	0	0	
		Insignif. / no inter.	2	2	2	
		No information	9	9	9	
9.	Does the patient experience any adverse drug reaction?	Definite	0	0	0	
		Possible	1	1	1	
		No ADR	2	2	2	
		No information	9	9	9	
10.	Is there unnecessary duplication with other drugs?	Unnecessary	0	0	0	
		Necessary /no dup.	1	1	1	
		No information	9	9	9	
11.	Is the duration of therapy acceptable?	Unacceptable	0	0	0	
		Marg. Acceptable	1	1	1	

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		Acceptable	2	2	2	
		No information	9	9	9	
12.	Is this drug the cheapest compared to other alternatives for the same indication?	No	0	0	0	
		Yes	1	1	1	
		No information	9	9	9	
13.	Is the medication being prescribed by generic name?	No	0	0	0	
		Yes	1	1	1	
		No information	9	9	9	
14.	Is the medication available in the formulary or essential drug list?	No	0	0	0	
		Yes	1	1	1	
		No information	9	9	9	
15.	Does the patient comply with the drug treatment?	Non compliant	0			
		Compliant	2			
		No information	9			
16.	Is the medications name on the prescription clearly written?	Not clear	0			
		Marginally clear	1			
		Clear	2			
17.	Is the prescribers writing on the prescription legible?	Illegible	0			
		Barely legible	1			
		Legible	2			
18.	Is the prescribers information on the prescription adequate?	Inadequate	0			
		Adequate	2			
19.	Is the patient's information on the prescription adequate?	Inadequate	0			
		Marg. Adequate	1			
		Adequate	2			
20.	Is the diagnosis on the prescription clearly written?	Not clear / written	0			
		Marg. Clear	1			
		Clear	2			
21.	Does the prescription fulfill the patient's requirement for drug therapy?	No	0			
		Yes	1			
		No information	9			
22.	Has the patient condition improved with treatment?	Not improved	0	0	0	
		Slightly improved	1	1	1	
		Improved	2	2	2	
		No information	9	9	9	
TOTAL SCORE FOR THE INDEX (43)						

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MATERIALS AND METHODS

A prospective cross-sectional study was conducted for a period of six months. The study is being conducted in general medicine, cardiology, gynaecology and surgery departments of St. James Hospital, Chalakudy, Kerala, India in 2019. A total of 100 prescriptions are collected from selected departments. PQI tool and data entry form were used for analyzing the prescription.

The protocol of study submitted to Institutional Human Ethics Committee (IHEC). The protocol was approved by committee with the approval number SJPCEC/P25/PP/2016/032 and hospital approval number SJCP/DIR/A.9/2018-2019.

A computerized literature and manual search was conducted to identify relevant studies, for the evaluation and prescription analysis of antihypertensive drugs. Literatures which found to support the study were collected and properly reviewed. A data entry form was specially designed for the study to collect patient details. During ward rounds, the relevant patient details including demographic details, co- morbid conditions, past medication details, current diagnosis, drug therapy, laboratory investigations, drug interactions were recorded in the data entry form. All the prescriptions of patients with hypertension were evaluated and was categorized as poor quality, medium quality and high quality prescription using Prescription Quality Index (PQI) tool.

Data was analyzed using Statistical Package for Social Science version 20. Descriptive statistics were used for describing the samples. The correlation coefficient r value has been found out using spearman's correlation coefficient. The correlation was significant at the 0.01 level and at 0.05 level (2 tailed). Mean and standard deviation were also used to describe the each criteria of PQI tool.

Inclusion criteria:

➢ Patients above the age of 18 years suffering from hypertension with or without co-morbidities attending inpatient department of general medicine, cardiology, gynaecology and surgery in a tertiary care hospital.

Exclusion criteria:

➢ Patients other than selected departments.

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➢ Patients who are unable to communicate.

RESULTS AND DISCUSSION

The study aims to determine the quality of prescribing in patients with hypertension in a tertiary care unit. A total of 100 prescriptions were collected and their demographic data, medications prescribed, drug interactions, category of drugs and combination drugs of antihypertensive drugs were analyzed.

The demographic analysis suggested that females (54%) were more presented with hypertension than males (46%) (figure:2). People of 70-80 years (48%) were found to be the most affected age group followed by 60-70 years (26%) (figure:1).

The analysis of co-morbid conditions revealed that diabetes mellitus (43.28%) was the most common co-morbid condition along with hypertension, followed by dyslipidemia (20.15%), CAD (10.45%), stroke (6.72%) and thyroid disorders (5.22%) (figure:3). This analysis was useful to find the association of various conditions with hypertension.

The stay of most of the patients (53%) were for 4-6 days in hospital for the course of treatment and about 23% of patients for 1-3 days (figure:4).

The major antihypertensive drug category prescribed was found to be Angiotensin Receptor Blockers (ARBs) (30.40%) followed by Calcium Channel Blocker (CCB) (29.82%), diuretics (19.88%) and beta blockers (13.45%). Angiotensin Converting Enzyme (ACE) inhibitors (1.16%) were rarely prescribed and other drugs accounted for 5.26% (figure 5).

Among the antihypertensive drugs prescribed telmisartan (23.39%) was the most commonly prescribed drug, followed by amlodipine (11.11%), cilnidipine (9.94%), furosemide (9.35%), losartan (5.84%), spironolactone (4.67%), nebivolol (4.67%) and so on (figure:6).

Nearly 52% of patients received single drug therapy and 48% of patients were prescribed with multiple drugs (figure:7).

Among the combination of antihypertensives, the most commonly found combination were of Telmisartan and Clinidipine (31.81%), followed by Amlodipine and Atenolol (13.63%) (figure:8).

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The study revealed that most of the prescriptions enrolled were of medium quality (44%), 39% of prescriptions were of high quality and 17% were of poor quality (figure:9). In a similar study conducted by Suthar et al 58% of prescriptions were of poor quality followed by high quality (39%) and medium quality (1%) prescriptions.

Data was analyzed using Statistical Package for Social Science version 20. Descriptive statistics were used for describing the samples. The correlation coefficient r value has been found out using spearman's correlation coefficient. The correlation was significant at the 0.01 level and at 0.05 level (2 tailed). Mean and standard deviation were also used to describe the each criteria of PQI tool.

Table 4 shows the PQI mean scores and their SD for each PQI criteria. The criteria's were not normally distributed and the highest SD is shown by drug indication. Item total correlation measures extend to which item intercorrelate with one another. The table 5 shows the PQI total score correlation with 22 criteria. The item correlation ranged from r value 0 to 0.56. The PQI total score were strongly correlated with 10 criteria's which includes drug indication, drug dosage, drug effectiveness, evidence based prescribing, drug interaction, unnecessary duplication, duration of therapy, patient compliance, legibility of prescription and fulfill patient's requirement for drug therapy, that displayed an item total correlation of the value >0.2. The correlation < 0.2 is shown by the rest of the criteria (correct directions, drug disease/drug interactions, adverse drug reaction, cost, formulary or essential drug list, medication name, prescriber information, patient information, diagnosis, patient improvement). In a similar study conducted by Suthar et al. the strong correlation was with drug indication, drug effectiveness, evidence based prescribing, correct directions, unnecessary duplication, duration of therapy and cost. There is no correlation between PQI score and these three criteria: directions of administration correct, directions of administration practical and generic prescribing. In our study, drug indication shows strong correlation (r-value = 0.561, p value = <0.001) with total PQI score and can have major impact on quality of prescribing which was similar to the previous study.

DISTRIBUTION OF PATIENTS BASED ON AGE

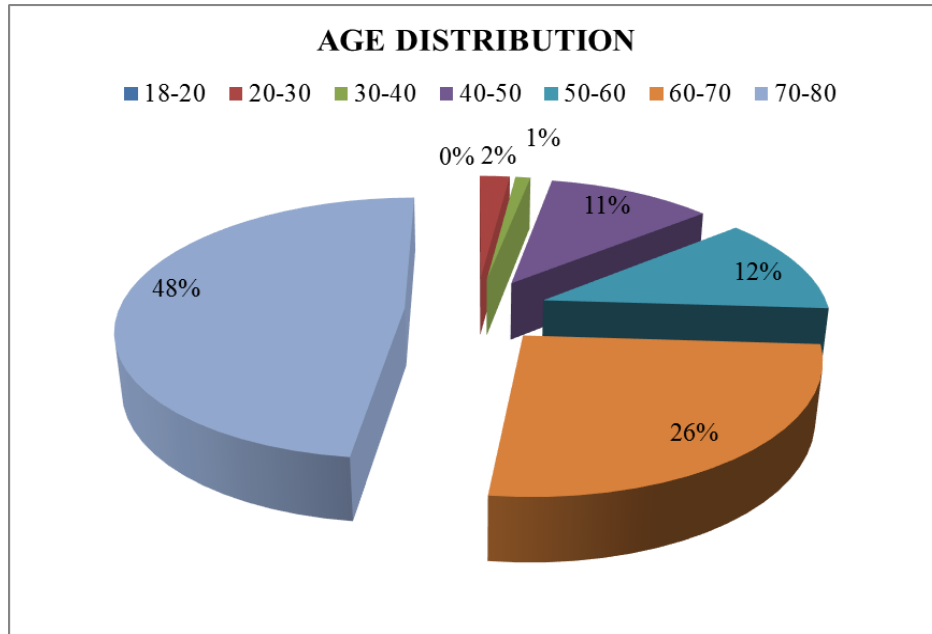100 patients were recruited in the study according to inclusion criteria.

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Figure No. 1: Distribution based on age

DISTRIBUTION OF PATIENT BASED ON GENDER
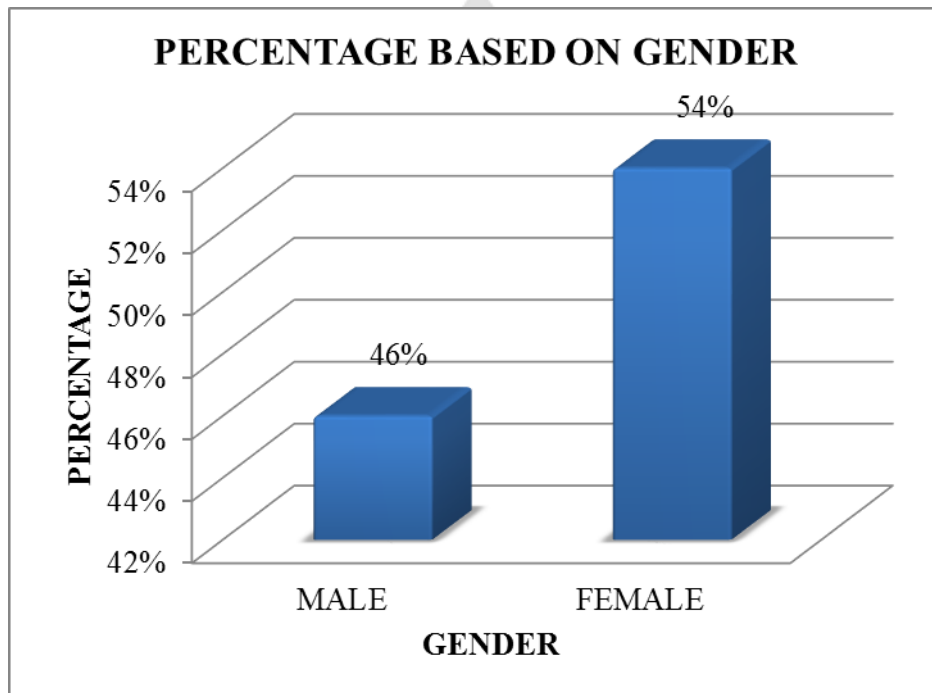
Figure No. 2: Distribution based on gender

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DISTRIBUTION BASED ON CO-MORBID CONDITIONS

Table No. 1: Distribution based on co-morbid condition

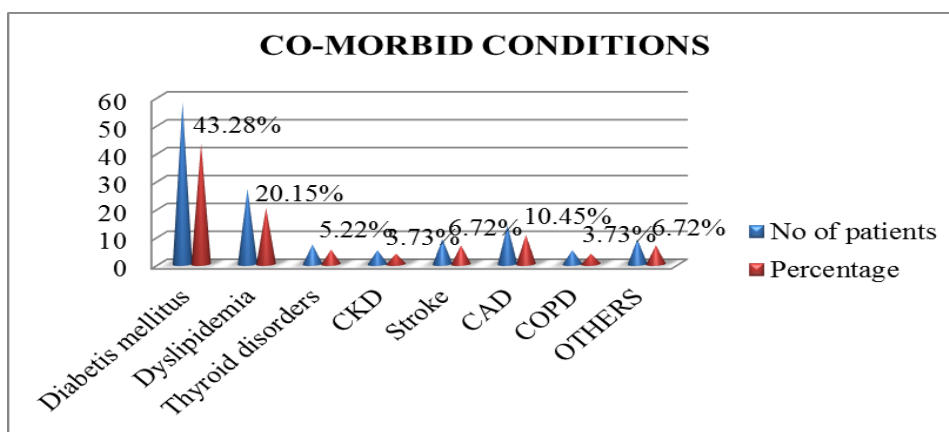| CO-MORBID CONDITIONS	FREQUENCY (n=134)	PERCENTAGE (%)
Diabetes mellitus	58	43.28
Dyslipidemia	27	20.15
CAD	14	10.45
Stroke	9	6.72
Thyroid disorders	7	5.22
CKD	5	3.73
COPD	5	3.73
OTHERS	9	6.72

Figure No. 3: Distribution based on co-morbid conditions
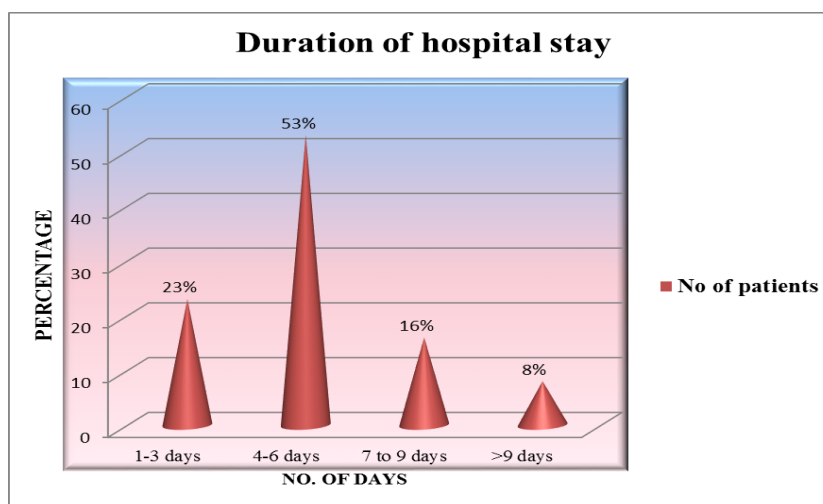
DISTRIBUTION BASED ON DURATION OF HOSPITAL STAY

Figure No. 4: Distribution based on duration of hospital stay

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DISTRIBUTION BASED ON ANTIHYPERTENSIVE DRUGS

Table No. 2: Distribution based on antihypertensive drugs

Drugs	Frequency (n=171)	Percentage (%)
Telmisartan	40	23.39
Amlodipine	19	11.11
Cilnidipine	17	9.94
Furosemide	16	9.35
Losartan	10	5.84
Nebivolol	8	4.67
Spironolactone	8	4.67
Nifedipine	7	4.09
Metoprolol	6	3.50
Atenolol	6	3.50
Clonidine	5	2.92
Hydrochlorothiazide	5	2.92
Torsemide	4	2.33
Nimodipine	3	1.75
Propranolol	2	1.16
Olmesartan	2	1.16
Carvedilol	2	1.16
Verapamil	2	1.16
Azilsartan	2	1.16
Labetalol	2	1.16
Chlorothiazide	1	0.58
Enalapril	1	0.58
Prazosin	1	0.58
Diltiazem	1	0.58
Ramipril	1	0.58

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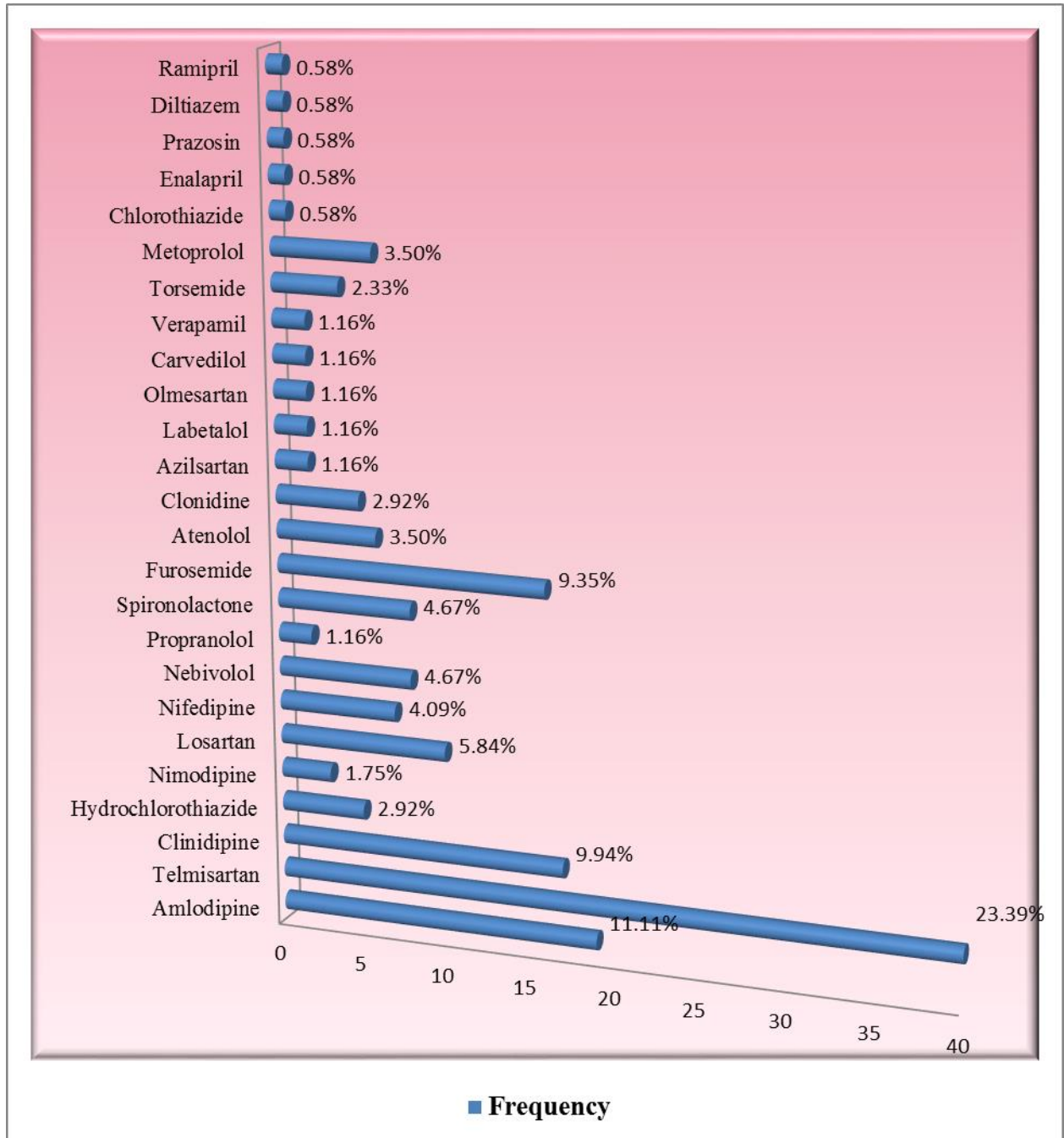
Figure No. 5: Distribution based on antihypertensive drugs

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DISTRIBUTION BASED ON CATEGORY OF ANTIHYPERTENSIVE DRUGS

Table No. 3: Distribution based on category of antihypertensive drugs

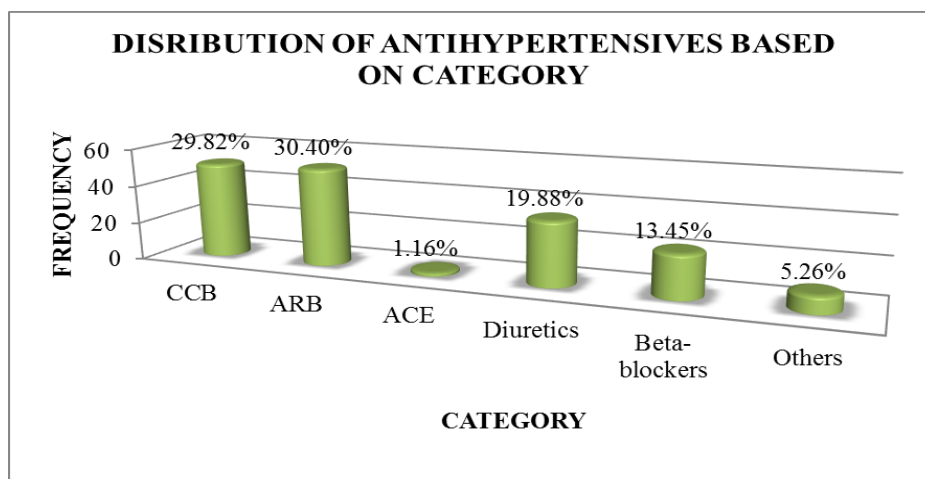| CATEGORY	FREQUENCY (n=171)	PERCENTAGE (%)
ARB	52	30.40
CCB	51	29.82
Diuretics	34	19.88
Beta-blockers	23	13.45
ACE	2	1.16
Others	9	5.26

Figure No. 6: Distribution based on category of antihypertensive drugs

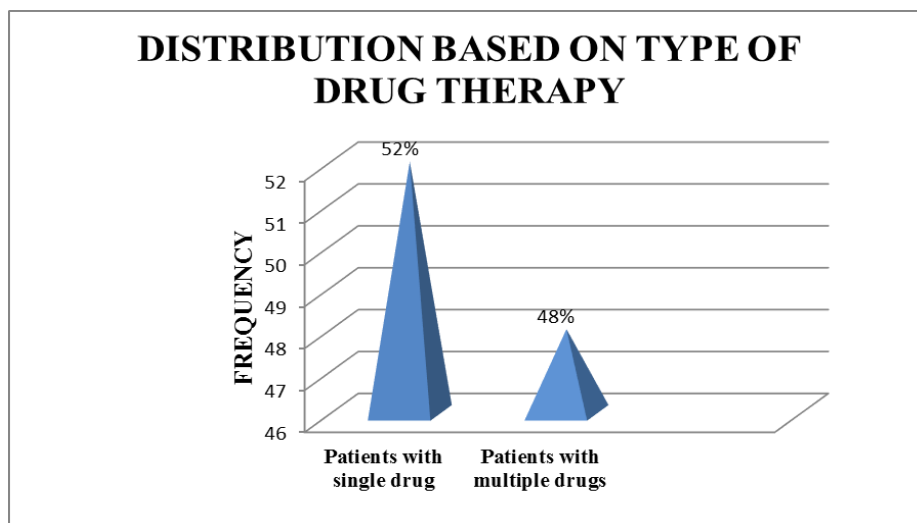**DISTRIBUTION BASED ON TYPE OF THERAPY IN PATIENT**

Figure No. 7: Distribution based on type of therapy in patient

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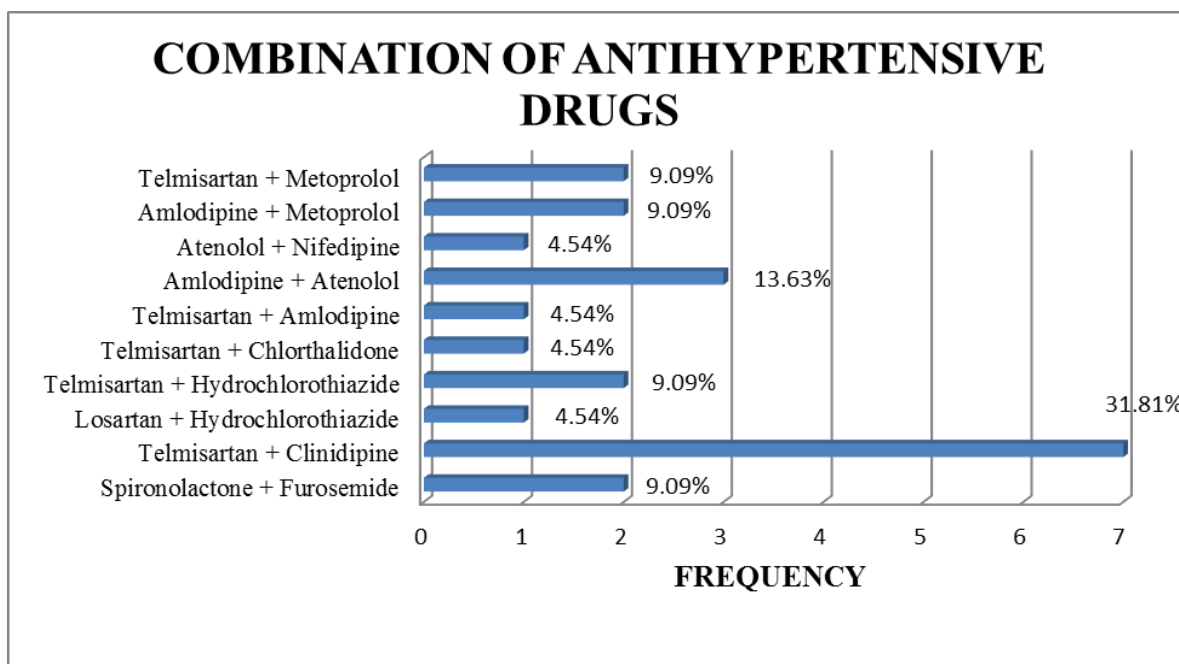**DISTRIBUTION BASED ON COMBINATION OF ANTIHYPERTENSIVES**

Figure No. 8: Distribution based on combination of antihypertensive drugs

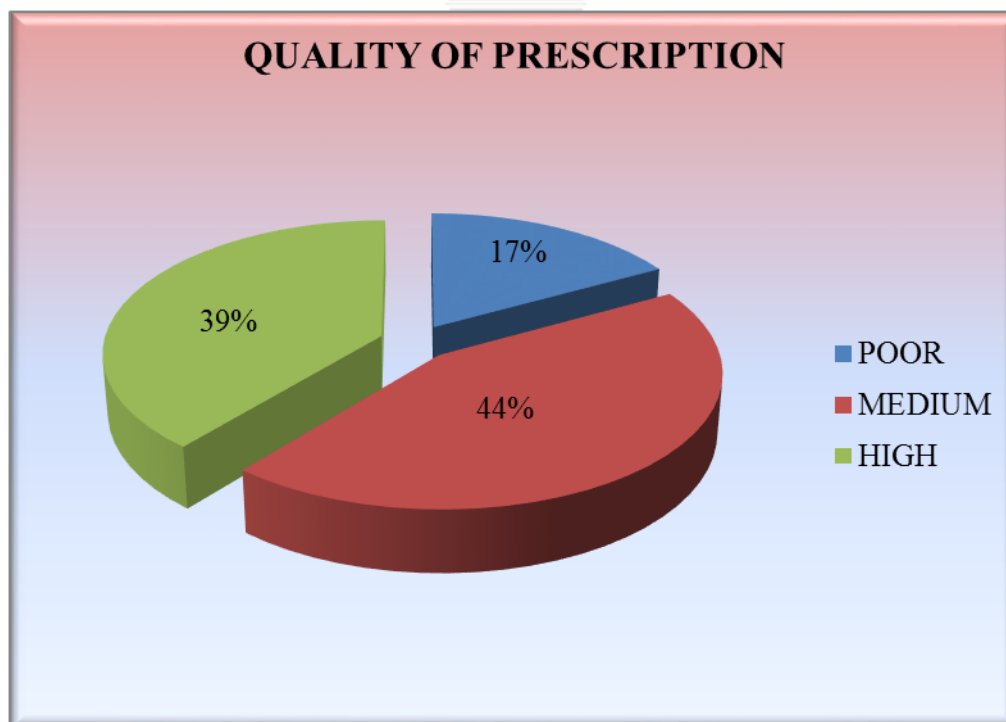**DISTRIBUTION OF QUALITY OF PRESCRIPTION**

Figure No. 9: Distribution of quality of prescription

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Table No. 4: Criteria wise mean PQI score (N= 100)

PQI Criterion	Min score	Max score	Mean	SD(+/-)
Is there an indication for the drug?	0	4	2.64	1.06
Is the dosage correct?	2	4	3.92	0.39
Is the medication effective for the condition?	1	2	1.45	0.50
Is the usage of drug for the indication supported by evidence?	0	2	1.58	0.57
Are the directions for administration correct?	2	2	2.00	0.00
Are the directions for administration practical?	2	2	2.00	0.00
Are there clinically significant drug-drug interaction?	0	2	1.17	0.64
Are there clinically significant drug-disease/condition interaction?	0	2	1.93	0.33
Does the patient experience any adverse drug reaction?	0	2	1.97	0.22
Is there unnecessary duplication with other drugs?	0	2	0.73	0.47
Is the duration of therapy acceptable?	1	2	1.85	0.36
Is this drug the cheapest compared to other alternatives for the same indication?	0	2	0.05	0.26
Is the medication being prescribed by generic name?	0	0	0.00	0.00
Is the medication available in the formulary or essential drug list?	0	1	0.92	0.27
Does the patient comply with the drug treatment?	0	2	1.42	0.87
Is the medications name on the prescription clearly written?	0	2	1.22	0.64
Is the prescribers writing on the prescription legible?	0	2	1.12	0.59
Is the prescribers information on the prescription adequate?	0	2	1.98	0.20
Is the patient's information on the prescription adequate?	1	2	1.92	0.27
Is the diagnosis on the prescription clearly written?	0	2	1.88	0.38
Does the prescription fulfill the patient's requirement for drug therapy?	0	1	0.97	0.17
Has the patient condition improved with treatment?	0	2	1.20	0.51

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Table No. 5: PQI total score correlation with 22 criteria

PQI Criterion	Correlation with PQI Total Score (N=100)	
	Correlation Coefficient	**p Value**
Is there an indication for the drug?	0.561**	<0.001
Is the dosage correct?	0.261**	0.009
Is the medication effective for the condition?	0.559**	<0.001
Is the usage of drug for the indication supported by evidence?	0.404**	<0.001
Are the directions for administration correct?	0	1.000
Are the directions for administration practical?	0	1.000
Are there clinically significant drug-drug interaction?	0.422**	<0.001
Are there clinically significant drug-disease/condition interaction?	0.07	0.492
Does the patient experience any adverse drug reaction?	0.10	0.335
Is there unnecessary duplication with other drugs?	0.416**	<0.001
Is the duration of therapy acceptable?	0.402**	<0.001
Is this drug the cheapest compared to other alternatives for the same indication?	0.11	0.275
Is the medication being prescribed by generic name?	0	1.000
Is the medication available in the formulary or essential drug list?	0.04	0.706
Does the patient comply with the drug treatment?	0.517**	<0.001
Is the medications name on the prescription clearly written?	0.02	0.876
Is the prescribers writing on the prescription legible?	0.300**	0.002
Is the prescribers information on the prescription adequate?	0.08	0.453
Is the patient's information on the prescription adequate?	0.02	0.843
Is the diagnosis on the prescription clearly written?	0.08	0.401
Does the prescription fulfill the patient's requirement for drug therapy?	0.203*	0.043
Has the patient condition improved with treatment?	0.08	0.420

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed) Spearman's correlation. PQI=Prescription Quality Index

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CONCLUSION

After assessing the prescriptions using PQI, the study concluded that the majority of the prescriptions were of medium quality in our hospital. The study provides a baseline data for carrying out further studies on prescribing pattern in a tertiary care unit, which would provide information for improving the utilization of antihypertensive drugs.

The study also concludes that females have more chance of having hypertension than males. Our study shows that the major comorbidity associated with hypertension is diabetes mellitus. The most commonly prescribed antihypertensive medication was Telmisartan which belongs to the category of Angiotensin receptor blockers. This provides an information about the evidence based prescribing done in our hospital.

From the study, we found that the therapeutic outcome of the patient is strongly related to the quality of the prescription. Prescription quality index can be used as a valid and reliable tool for assessing the quality of prescribing in chronic diseases. PQI allows us to analyze prescription and thereby improve the quality of prescription which in turn result in improvements in patient care.

ACKNOWLEDGEMENT

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Image *Author -1*	***Aiswarya A A– Corresponding Author*** *Pharm D Intern* *St. James College of Pharmaceutical Sciences, Chalakudy, Kerala, India*
Image *Author -2*	***Jismy Jose*** *Pharm D Intern* *St. James College of Pharmaceutical Science, Chalakudy, Kerala, India*
Image *Author -3*	***Linsa Linet V*** *Pharm D Intern* *St. James College of Pharmaceutical Sciences, Chalakudy, Kerala, India*
Image *Author -4*	***Dr. Alfet Raju Anthraper*** *Assistant Professor* *St. James College of Pharmaceutical Sciences, Chalakudy, Kerala, India*

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