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Assessment of drug related problems in patients with hypertension at a tertiary care hospital Lucknow

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Abstract

Background: Drug related problems (DRPs) encompass a range of categories. These include untreated indications, overdose, inappropriate drug selection, adverse drug reaction, drug-drug interaction, need for monitoring, and non-adherence etc. by recognizing and addressing these various drug related problems, healthcare professionals can optimize treatment outcomes and ensure patient safety.

Methodology: A prospective observational study with 120 subjects was conducted in the Department of Medicine at Integral Institute of Medical Sciences and Research (IIMS&R) Hospital, Lucknow.

Results: A total of 120 patients were analyzed, out of which 61 (50.8%) were male and 59 (49.2%) were female. Average age was found 52.87 ± 12.47 years, Drug Related Problems (DRPs) 92 (76.7%), need for monitoring 57 (47.5%), non-adherence 47 (39.16%), drug-drug interaction 41 (34.16%).

Conclusion: It was concluded that the major problem for the late presentation and poor awareness and knowledge about hypertension symptoms and its complications. The polypharmacy, uncontrolled blood pressure and co-morbidity increases the chances of drug related problems this calls for an urgent need for health education and sensitization.

Keywords: Hypertension, Drug Related Problems, Prevention, Co-morbidities.

1. Introduction

Hypertension (HTN) may be defined as persistent elevated arterial Blood Pressure (ABP), which increases the various complications like stroke, and myocardial infarction. In accord with World Health Organization(WHO) 3/4th incidence of death because of coronary heart disease& stroke.¹According to WHO, about 1.4 million people suffering from high blood pressure (BP) worldwide, but only 14 percent having normal BP.² In accord Eighth Joint National Committee (JNC 8) Around 77.9 million American adults and approximately 970 million people have Hypertension globally. It is assessed that by the year 2025, 156 crores adults will be having HTN. The WHO has a statistical data of about 62 percent of cerebrovascular diseases (CVD) and 49 percent of ischemic heart disease (IHD).³Hypertension has recently leading cause of death globally. According to WHO 1.67 crores deaths reported in 2003 (29.2 % of total worldwide deaths) only due to cardiovascular disease.⁴CVD is recognized as the most important reason of death Worldwide.⁵The lives of an estimated 17.9 million people each year.⁶The annual number of CVD deaths in India is expected to increase by 2.26 million from 1990 to 4.77 million in 2020.⁷CVD-related deaths being reported from low and middle-income countries like India.⁸The National Institute for Health and Care Excellence [NICE] in the United Kingdom (UK) explains hypertension, clinically persistent rise in BP at an average of 135/85 mmHg.⁹Drug Related Problems is any unfavorable occurrence a patient has that involves, or is considered to involve, pharmacological therapy and prevents them from reaching their therapy's intended aims.¹⁰Unnecessary drug therapy, the need for extra drug therapy, ineffective drugs, dosages that are excessively low or high, adverse drug reactions, and noncompliance are the several types of Drug Related Problems.¹¹ Drug related problems encompass a range of categories. These include untreated indications, Improper or inappropriate drug selection, Sub therapeutic dosage, Failure to receive medication, non-adherence, Over dosage, Medication use without indication, Adverse drug reactions etc. By recognizing and addressing these various drug related problems, healthcare professionals can optimize treatment outcomes and ensure patient safety.¹²

2. Study design and methodology

2.1 Study Design: Prospective observational study.

2.2 Departments involved: Department of Pharmacy Practice, Integral University and Department of Medicine, Integral Institute of Medical Sciences and Research, Integral University.

2.3 Study Site: Study was carried out in the in-patient department (IPD) and out-patient department (OPD) at Integral Institute of Medical Sciences and Research, Integral University, Lucknow-226026, India.

2.4 Study period: 3 Years. Data was collected from January 1, 2021 to December 31, 2023.

2.4 Sample size: 120 patients with Hypertension were evaluated between January 1, 2021 to December 31, 2023.

2.5 Study Population: Study was conducted on eligible 120 patients at Integral University Hospital.

2.6 Inclusion criteria:

- Patients diagnosed with hypertension and related complications were included.
- All the patients were included with the age of more than 18 years.
- All the patients of hypertension with co-morbidity were included in this study.

2.7 Exclusion criteria:

- Patients with Psychological conditions.
- Patients who were not treated with hypertension.
- Patients unable to comply.
- Drug abuse patients

3. Results

3.1 General demographical characteristics of study population

Among the study population, 61 (50.8%) male and 59 (49.2%) female, it was observed that majority of patients were urban 69 (57.5%) and 51 (42.5%) rural. Occupation, medical history, medication history, social history, allergy history, smoking, tobacco, alcohol and family history were also observed **Table-3.1** summarizes the general demographical characteristics of the study population.

Table 3.1: General demographical characteristics of study population

S.No	DEMOGRAPHICAL CHARACTERISTICS	FREQUENCIES (N=120)	PERCENTAGE (%)
01	GENDER		
	Male	61	50.8%
	Female	59	49.2%
02	OCCUPATION		
	Government job	1	0.8%
	Private job	18	15%
	Job less	1	0.8%
	House wife	55	45.8%
	Farmer	36	30%
	Unknown	9	7.5%
03	RESIDENCE		
	Rural	51	42.5%
	Urban	69	57.5%
04	QUALIFICATION		
	Qualified	94	78.3%
	Unqualified	26	21.7%
05	HISTORY OF ALLERGIES		
	Present	1	0.8%
	Absent	119	99.2%
06	MEDICAL HISTORY		
	Present	96	80%
	Absent	24	20%
07	MEDICATION HISTORY		
	Present	44	36.7%
	Absent	76	63.3%
08	SOCIAL HISTORY		
	Present	40	33.3%
	Absent	80	66.7%
09	SMOKING		
	Present	18	15%
	Absent	102	85%
10	TOBACCO		
	Present	26	21.7%
	Absent	94	78.3%
11	ALCOHOL		
	Present	10	8.3%
	Absent	110	91.7%

12	FAMILY HISTORY		
	Present	8	6.7%
	Absent	112	93.3%

3.2 Age-wise distribution

The average age of the study population was found as 52.87±12.47 years (Mean±SD). Age – wise distribution of study population showed that majority of patients i.e. 38 (31.66%) were in the age category 51–60 years, as shown in **table 3.2**.

Table 3.2: Age-wise distribution of study population

	Age category (year)	Frequency (N=120)	Percentage (%)	Mean ± SD
01	0-10	0	0%	52.87±12.47
02	11-20	0	0%	
03	21-30	04	3.33%	
04	31-40	20	16.66%	
05	41-50	28	23.33%	
06	51-60	38	31.66%	
07	61-70	20	16.66%	
08	71-80	10	8.33%	
	TOTAL	120	100%	

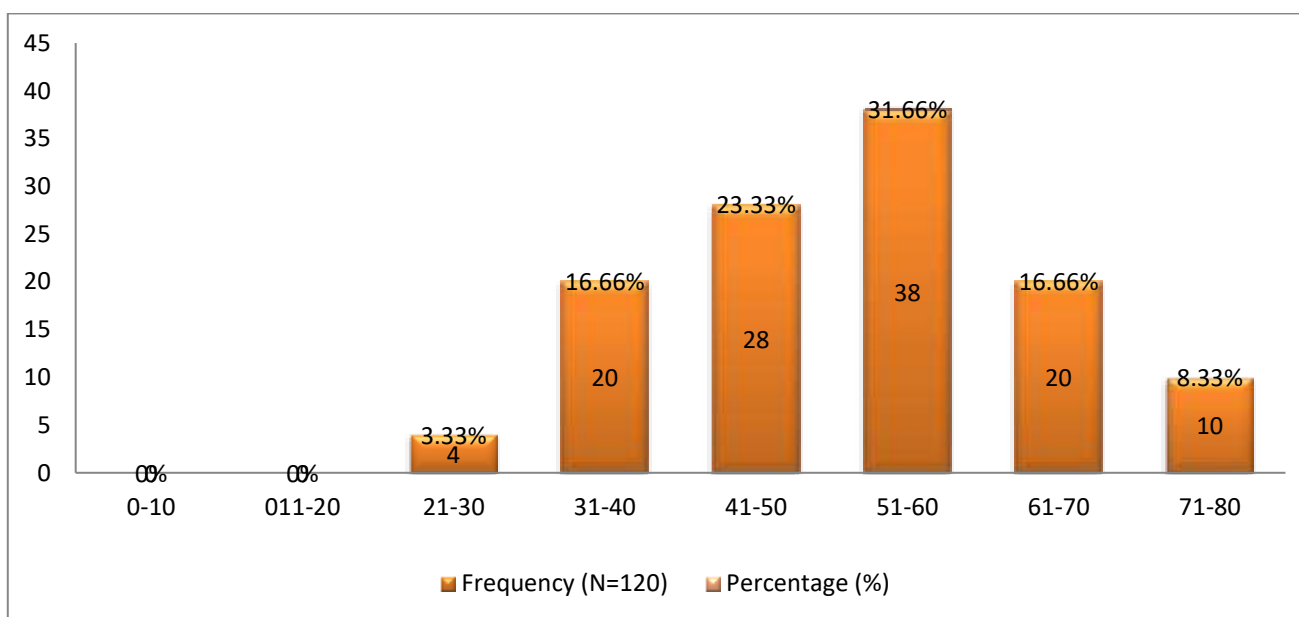


Figure 3.2: Graphical represent of age-wise distribution of study population:

Figure-3.2 shows a plot of percentage and frequency of patient’s vs. age of patients in years. It was observed that maximum percentage of patients were in 51–60 years age group category which is 38 (31.66%) suggesting that the this age category patients with hypertension were more affected.

3.3 Co-morbid illness

Among 120 patients, 74 (61.7%) had co-morbidities. The type of co-morbidity also observed and it was found the majority of patients had Type 2 Diabetes mellitus 44 (36.6%) followed by Chronic Kidney Disease (CKD) 8 (6.7%). The detailed summary of co-morbid illness is given below **table 3.3**.

Table 3.3: Tabular representation of Co-morbidity status of study subjects:

S.No	CO-MORBIDITY STATUS	FREQUENCIES (N=120)	PERCENTAGE (%)
01	CO-MORBIDITY		
	Present	74	61.7%
	Absent	46	38.3%
02	NUMBER OF CO-MORBIDITY		
	One	67	55.8%
	Two	15	12.5%
	More than two	06	5.0%
	None	32	26.7%
03	TYPE OF CO-MORBIDITY		
	T2DM	44	36.6%
	CKD	08	6.7%
	CAD	03	2.5%
	Others	29	24.2%
	None	36	30%

3.4 Analysis of treatment pattern of hypertensive patients

In our study population, hypertension (HTN) diagnosed patients were generally managed with mono-therapy, combination therapy and multy-combination therapy. The detailed summary of treatment pattern of hypertensive patients is given below **table 3.4**.

Table 3.4: Drugs therapy treatment of study population

S.No	DRUG THERAPY TREATMENT	FREQUENCIES (N=120)	PERCENTAGE (%)
01	MONO-THERAPY		
	Present	98	81.7%
	Absent	22	18.3%
02	COMBINATION -THERAPY		
	Present	50	41.7%
	Absent	70	58.3%
03	MULTY-COMBINATION -THERAPY		
	Present	5	4.2%
	Absent	115	95.8%

3.5 Different Anti-Hypertensive Drugs given in Study Populations

According to hypertension guideline management, different anti-hypertensive drugs were given in different hypertension condition of patients. Among the 120 patients, 32 (26.7%) patients received amlodipine, 31 (25.8%) patients received telmisartan and 30 (25%) patients received both the combination of amlodipine and telmisartan which is summarizes given below **figure-3.5**

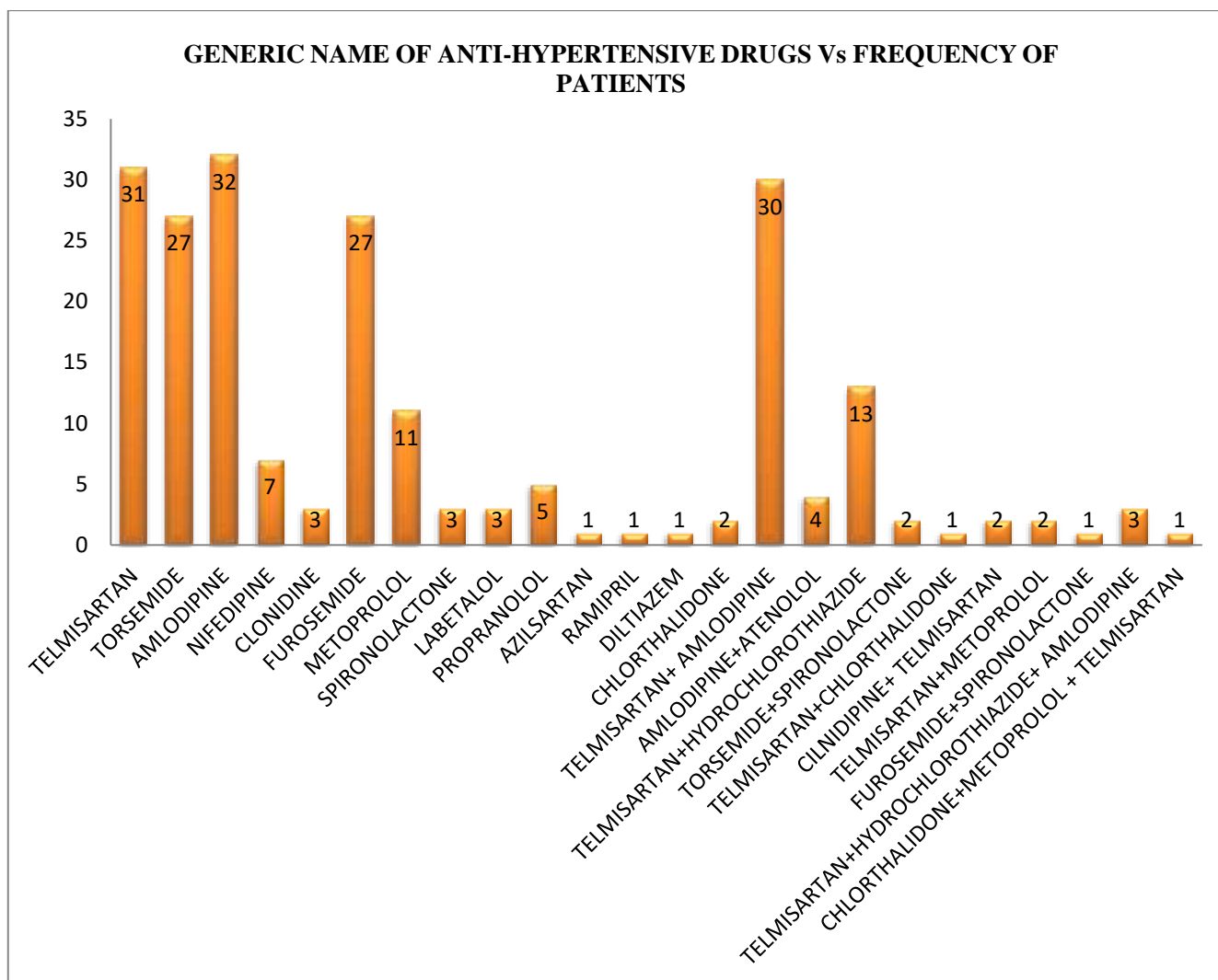


Figure 3.5: Graphical Representation of Generic Name of Anti-Hypertensive Drugs in Study Populations

3.6 Route of drugs administration

Among 120 patients, it was observed that generally oral as well as intravenous route. The detailed is given below table 3.6.

Table 3.6: Route of administration of antihypertensive drugs in study population

S.No	ROUTE OF ADMINISTRATION	FREQUENCIES (N=120)	PERCENTAGE (%)
01	ORAL ROUTE OF ADMINISTRATION		
	Present	115	95.8%
	Absent	05	4.2%
02	INTRAVENOUS (IV) ROUTE OF ADMINISTRATION		
	Present	31	25.8%
	Absent	89	74.2%

3.7 Drug Related Problem

Among 120 patients, it was observed that majority of patients were Drug Related Problems(DRPs) 92 (76.7%) patients had at list one or two DRP and 28 (23.3%) patients did not had Drug Related Problems(DRPs).

Table 3.7: Drug Related Problems of study population

S.No	DRUG RELATED PROBLEMS	FREQUENCIES (N=120)	PERCENTAGE (%)
01	Present	92	76.7%
02	Absent	28	23.3%

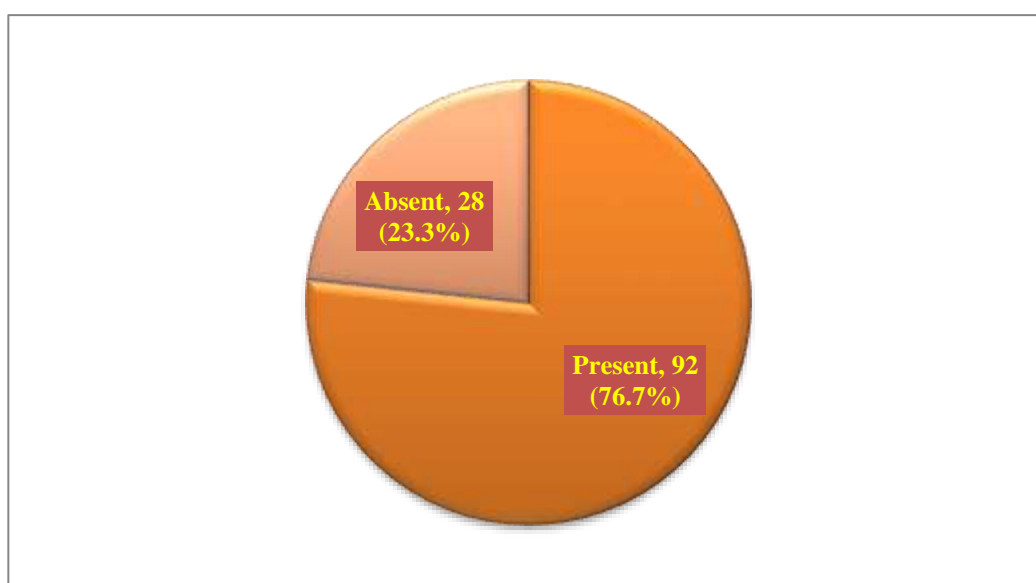


Figure 3.7: Graphical representation of Drug Related Problems in study population

This graph represent that the majority of patients were Drug Related Problems (DRPs) 92 (76.7%) therefore, we need to closely monitor the patients with hypertension to minimize the Drug Related Problems (DRPs) and improved the quality of life of patients.

3.8 Different type drugs related problems

Among the 120 patients, majority of patients 57 (47.5%) had need for monitoring, 47 (39.16%) non-adherence and 41 (34.16%) had drug-drug interaction followed by drug duplication, unnecessary drug, drug duplication, need for additional drug etc. which is summarizes given below table 3.8.

Table 3.8: Different type drugs related problems in study population

S.No	DIFFERENT DRUG RELATED PROBLEMS	FREQUENCIES (N=120)	PERCENTAGE (%)
01	UNTREATED INDICATION		
	Present	00	0%
02	SUBTHERAPEUTIC DOSE		
	Present	00	0%
03	INAPPROPRIATE DRUG SELECTION		
	Present	8	6.7%

	Absent	112	93.3%
04	FAILURE TO RECEIVE MEDICATION		
	Present	4	3.3%
	Absent	116	96.7%
05	OVERDOSE		
	Present	7	5.8%
	Absent	113	94.2%
06	ADR		
	Present	7	5.8%
	Absent	113	94.2%
07	DRUG-DRUG INTERACTION		
	Present	41	34.2%
	Absent	79	65.8%
08	POTENTIAL INTERACTION		
	Present	4	3.3%
	Absent	116	96.7%
09	FIXED DOSE COMBINATION		
	Present	00	0%
	Absent	120	100%
10	DRUG DUPLICATION		
	Present	10	8.3%
	Absent	110	91.7%
11	WRONG ROUTES		
	Present	00	0%
	Absent	120	100%
12	NON- ADHERENCE		
	Present	47	39.2%
	Absent	73	60.8%
13	PRESCRIPTION ERROR		
	Present	3	2.5%
	Absent	117	97.5%
14	UNNECESSARY DRUG		
	Present	10	8.3%
	Absent	110	91.7%
15	NEED FOR ADDITIONAL DRUG		
	Present	9	7.5%
	Absent	111	92.5%
16	NEED FOR MONITORING		
	Present	57	47.5%
	Absent	63	52.5%
17	NO NEED OF FURTHER DRUG		
	Present	00	0%
	Absent	120	100%
18	MEDICATION CHART E ERROR		
	Present	3	2.5%
	Absent	117	97.5%
19	MEDICATION WITHOUT INDICATION		
	Present	1	0.8%
	Absent	119	99.2%

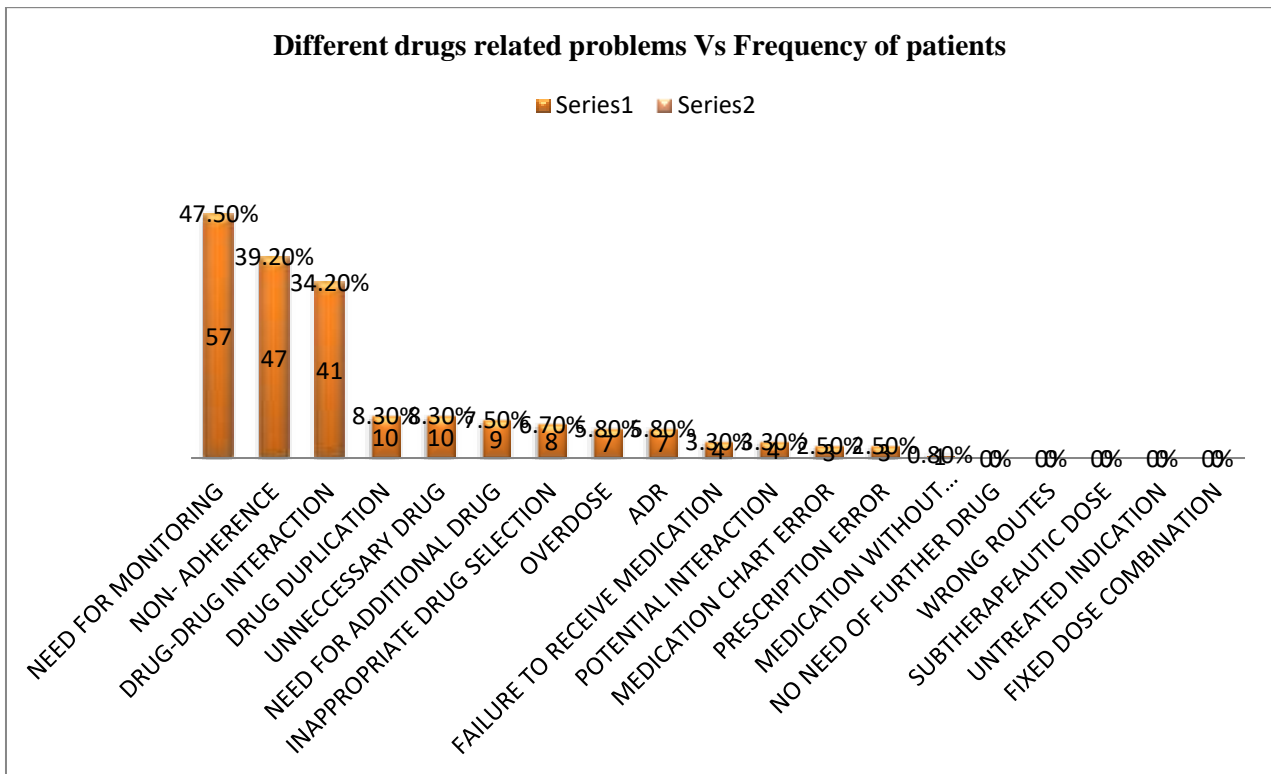


Figure 3.8: Graphical representation of different drugs related problems in study population

This graph represent that the majority of patients 57 (47.5%) had need for monitoring, 47 (39.16%) non-adherence and 41 (34.16%) had drug-drug interaction etc. therefore; we need to closely monitored the patients with hypertension to minimized the Drug Related Problems (DRPs) and improved the quality of life of patients.

3.9 Numbers of Drug Related Problems

Among 120 patients, some had single 33 (27.5%) one type of drug related problems (DRP), whereas some had double drug related problems 37 (30.8%), which is summarizes given below table 3.9.

Table 3.9: Numbers of Drug Related Problems of study population

S.No	NUMBERS OF DRUG RELATED PROBLEMS (DRPs)	FREQUENCIES (N=120)	PERCENTAGE (%)
01	One DRP	33	27.5%
02	Two DRPs	37	30.8%
03	Three DRPs	17	14.2%
04	Multi DRPs	10	8.3%
05	None	23	19.2%
	TOTAL	120	100%

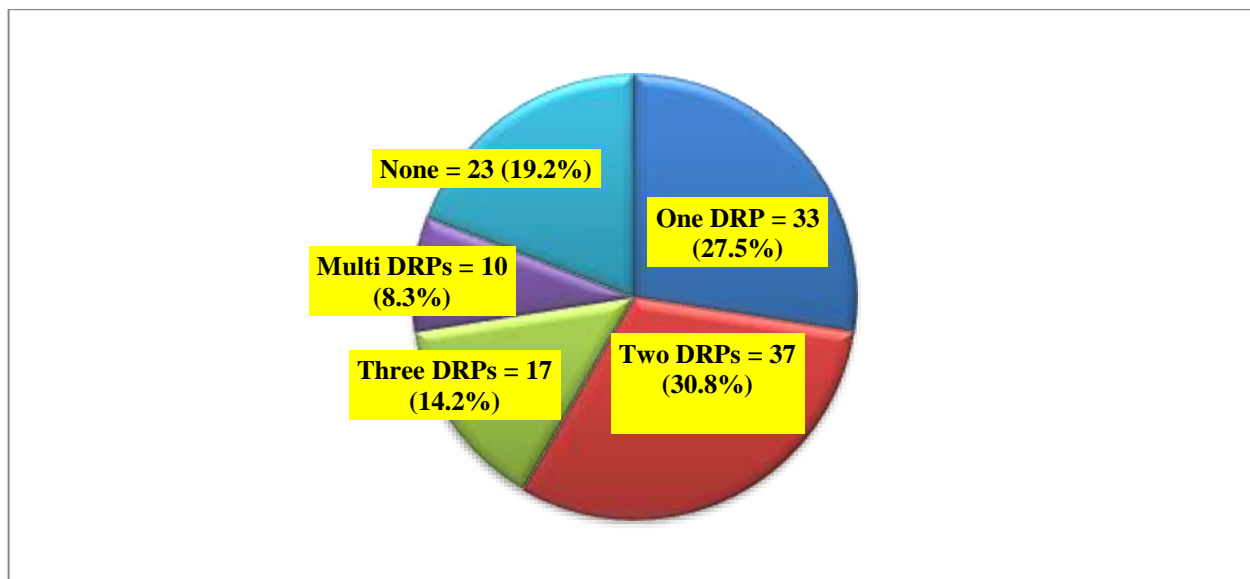


Figure 3.9: Graphical represent of Numbers of Drug Related Problems of study populations

This graph represents that majority of patients were single 33 (27.5%) one type of drug related problems (DRP), double drug related problems 37 (30.8%), therefore, it is indicating that we need to closely monitored the patients with hypertension to minimized the number of Drug Related Problems(DRPs) and improved the quality of life of patients.

3.10 Clinical characteristics

Among 120 study population the majority of patients had at list one or more clinical characteristics and it was observed that the 116 (96.7%) patients had at list one or more clinical characteristics.

Table 3.10: Clinical characteristics of study population

S.No	CLINICAL CHARACTERISTICS	FREQUENCIES (N=120)	PERCENTAGE (%)
01	Present	116	96.7%
02	Absent	04	3.3%

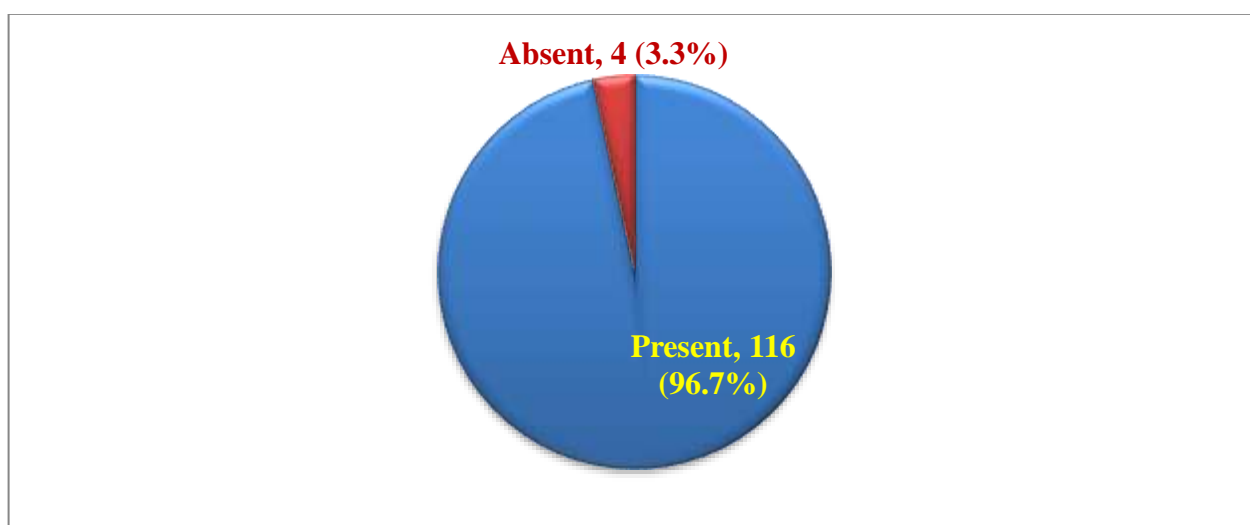


Figure 3.10. Graphical represent of Clinical characteristics of study population

Therefore, we need to improved adherence to minimized clinical characteristics and improved the quality of life of patients.

3.11 Risk factors

Among 120 study population the majority of patients had at list one or more risk factors and it was observed that the 114 (95%) patients had at list one or more risk factors.

Table 3.11. Risk factors of study population

S.No	RISK FACTORS	FREQUENCIES (N=120)	PERCENTAGE (%)
01	Present	114	95%
02	Absent	06	5%

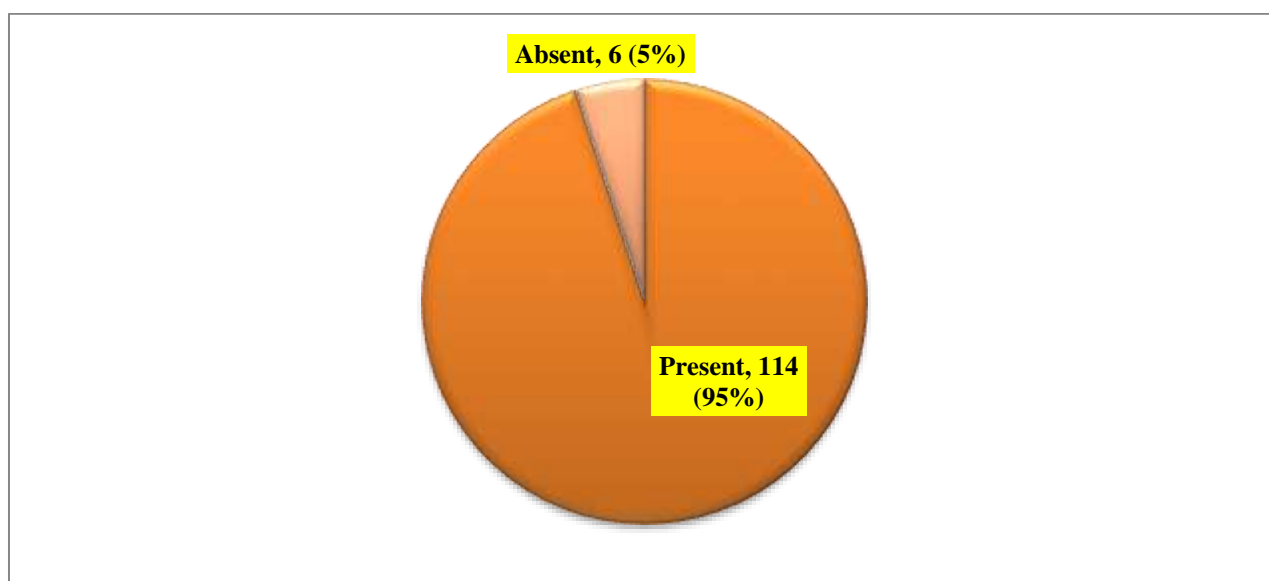


Figure 3.11: Graphical represent of risk factors of study population

Therefore, we need to minimize the risk factors and improved the quality of life of patients.

3.12 Different risk factors

Among 120 study population the majority of patients had at list one or more different risk factors and it was found that the 74 (61.7%) had co-morbidities etc. which is summarized given below table 3.12.

Table 3.12: Different risk factors of study population

S.No	DIFFERENT RISK FACTORS	FREQUENCIES (N=120)	PERCENTAGE (%)
01	AGE		
	Present	73	60.8%
	Absent	47	39.2%
02	GENETICS		
	Present	9	7.5%
	Absent	111	92.5%
03	SMOKING		
	Present	35	29.2%
	Absent	85	70.8%

04	ALCOHOL Present Absent	10 110	8.3% 91.7%
05	CO-MORBIDITIES Present Absent	74 46	61.7% 38.3%
06	LIFESTYLE MODIFICATION Present Absent	27 93	22.5% 77.5%
07	LOW POTASSIUM INTAKE Present Absent	7 113	5.8% 94.2%
08	HIGH SODIUM INTAKE Present Absent	65 55	54.2% 45.8%
09	LACK OF PHYSICAL ACTIVITY Present Absent	28 92	23.3% 76.7%
10	STRESS Present Absent	58 62	48.3% 51.7%
11	SLEEP DISORDER Present Absent	27 93	22.5% 77.5%
12	UNHEALTHY DIET Present Absent	30 90	25% 75%
13	OBESITY Present Absent	12 108	10% 90%

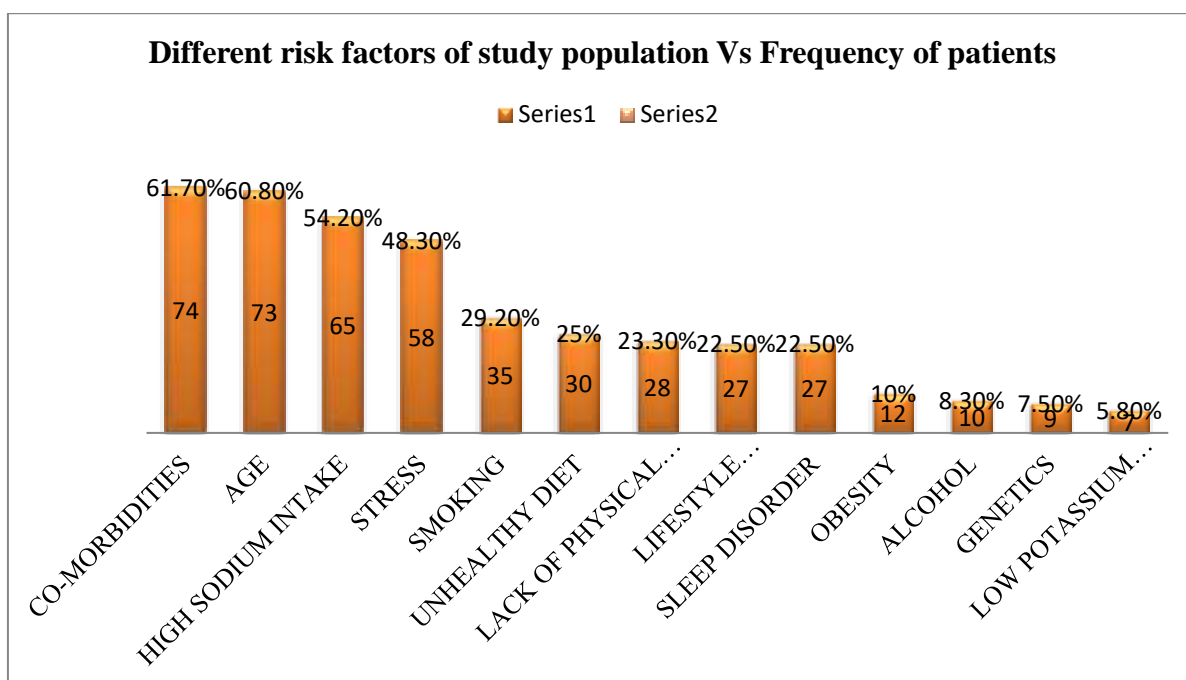


Figure 3.12: Graphical representation of different risk factors in study population:

Among 120 patients the majority of patients had at list one or more different risk factors therefore, we need to minimize the risk factors and improved the quality of life of patients.

3.13 Risk factors for Drug Related Problems:

Among 120 patients, the 107 (89.2%) patients had at list one or more risk factors for Drug Related Problems.

Table 3.13: Risk factors for Drug Related Problems (DRPs) of study population:

S.No	RISK FACTORS FOR DRPs	FREQUENCIES (N=120)	PERCENTAGE (%)
01	Present	107	89.2%
02	Absent	13	10.8%

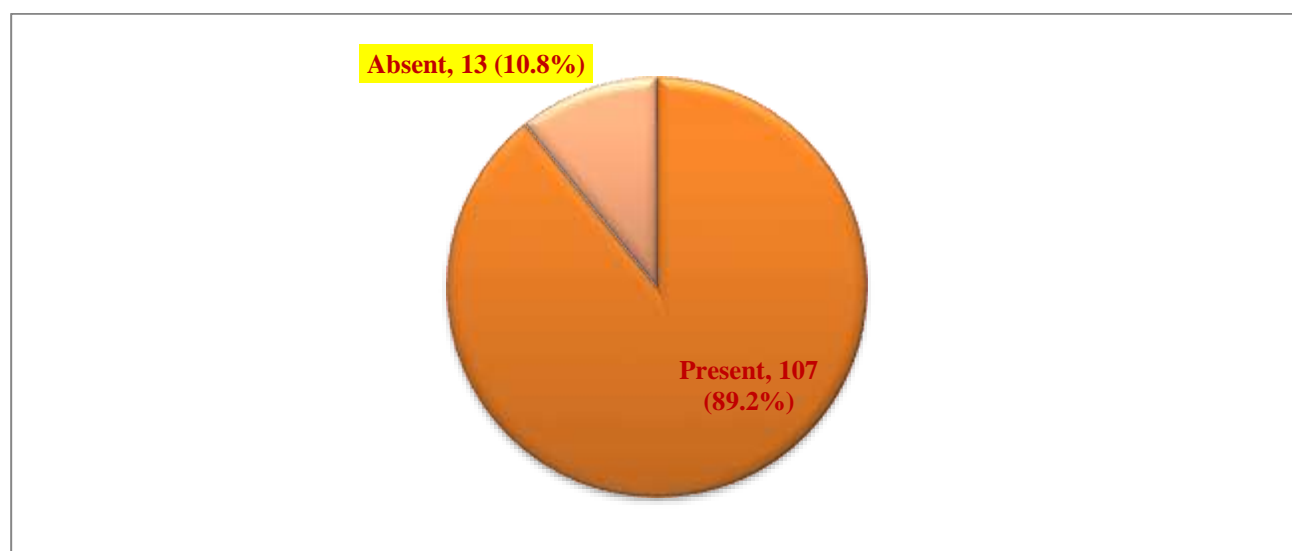


Figure 3.13: Graphical representation of Risk factors for Drug Related Problems (DRPs) in study population:

This graph representing, we need to minimize the risk factors for drug related problems and improved the quality of life of patients.

3.14 Different risk factors for Drug Related Problems:

Among 120 study population the majority of patients had at list one or more different risk factors for Drug Related Problems, which is summarizes given below **table 3.14**.

Table 3.14: Different risk factors for Drug Related Problems (DRPs) of study population:

S.No	DIFFERENT RISK FACTORS FOR DRPs	FREQUENCIES(N=120)	PERCENTAGE (%)
01	POLYPHARMACY		
	Present	82	68.3%
02	UNCONTROLLED BLOOD PRESSURE		
	Present	48	40%
	Absent	72	60%

03	CO-MORBID CONDITIONS		
	Present	77	64.2%
	Absent	43	35.8%

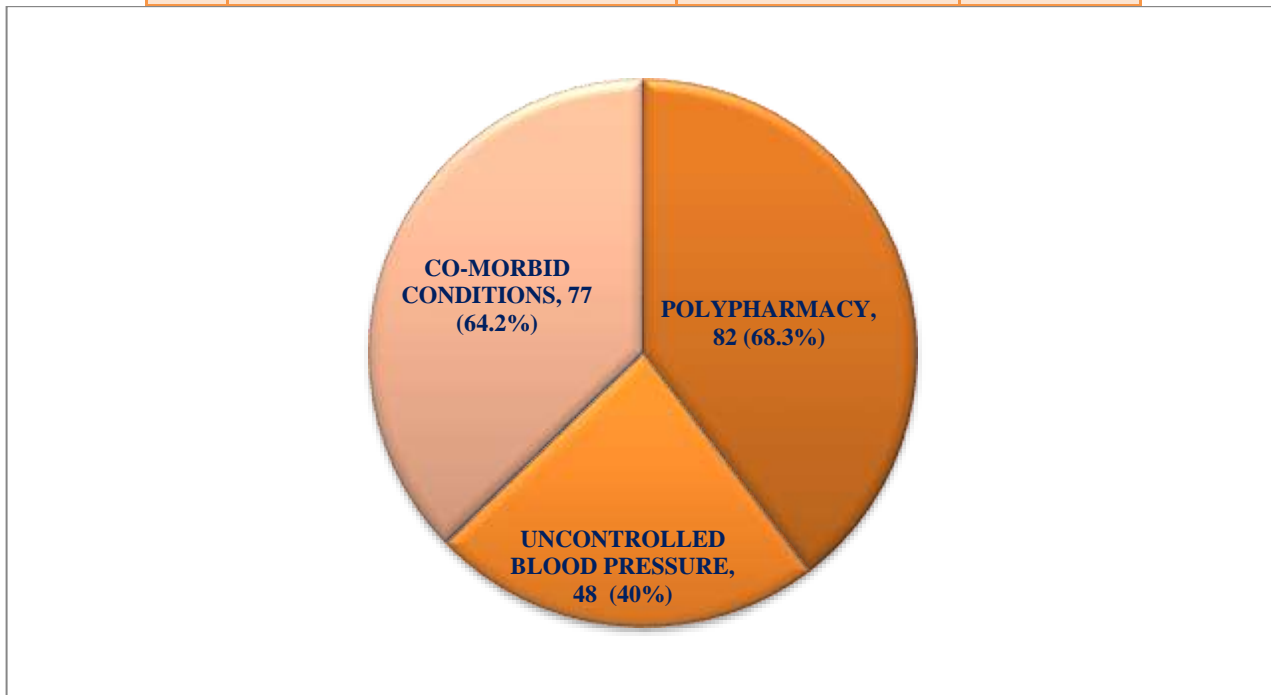


Figure 3.14: Graphical representation of different risk factors for Drug Related Problems (DRPs) in study population:

This graph representing, we need to minimize the different risk factors for drug related problems and improved the quality of life of patients.

4. Discussion

In this study total 211 Drug related Problems92 (76.7%) among 120 hypertensive patients were identified. When compared to similar studies conducted in various settings across Indonesia, which reported 378 Drug related Problems among 193 patients¹³and 66 Drug related Problems among 107.¹⁴Patients respectively, our study exhibited a higher prevalence of DTP. These findings indicate that managing hypertensive individuals is a more challenging task. Moreover, our study revealed a medication non-adherence rate 39.16%, whereas the corresponding study reported a rate of 13.6%. This difference could be attributed to patients' lack of carefulness. Additionally in our study, suspected Adverse Drug Reactions (ADRs) accounted for 5.8% of cases, with symptoms such as cough, dizziness, vertigo due to hypotension and vomiting being associated with polypharmacy due to the presence of multiple co-morbidities commonly linked to hypertension. In contrast, the previous study reported an ADR rate of 9.1% with a specific mention of cough as the symptom.¹⁴among the various Drug related Problems identified, the need for monitoring blood pressure three times daily to maintain proper dosing schedules emerged as the most problematic Drug related Problems, accounting for 47.5% of cases. This emphasizes the importance of diligent monitoring in hypertension management. Another significant finding was the drug-drug interactions, which were observed in approximately 34.2% of cases. Most of antihypertensive medications exhibit synergistic effects when taken together.Amlodipine³² (26.7%) and telmisartan³¹ (25.8%) were the most commonly prescribed agents. This differs from previous studies conducted in other regions which were prospective, randomized, controlled studies

undertaken in a private hospital located in Tamil Nadu¹⁵ and also a similar study conducted in a tertiary care teaching hospital Chidambaram, South India.¹⁶ The study identified a higher prevalence of Drug related Problems compared to previous studies in different regions, suggesting that the management of hypertension in this population is more complex. The findings contribute to the existing bulk of knowledge and can inform healthcare professionals in optimizing the management of hypertensive patients.

5. Conclusion

A total of 120 patients were analyzed, out of which 61 (50.8%) were male and 59 (49.2%) were female. The average age of the study population was found as 52.87 ± 12.47 years. Out of 120 patients, it was observed that majority of patients were Drug Related Problems (DRPs) 92 (76.7%). The risk factors of study population was found 114 (95%), It was concluded that the major problem for the late presentation and poor awareness and knowledge about hypertension.

Declaration of competing interest

We declare that we have no financial and personal relationships with other people or organizations that can inappropriately influence our work.

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