



## African Journal of Biological Sciences



### IMPACT OF PHYSICIAN LED APPROACHES TO DRUG PROBLEM RESOLUTION IN TERTIARY HOSPITALS

Anne Lakshmi Pavani, Katragadda Pradeepthi, Sahithi. K, Haritha Mandava, Sushmitha Mandava, Eswar Kumar Kolusu, Yasaswi Maguluri, Bhavana. A, Minakshi. K, Kanaka Durga Devi. N\*

KVSR Siddhartha College of Pharmaceutical Sciences, Vijayawada, Andhra Pradesh, India.

\*Corresponding Author: nelluriss@rediffmail.com

#### Abstract:

The majority of DRPs happen at moments of transition in care, like admission, inpatient stay, and release. Adverse drug events, or unwanted and unpleasant drug side effects, are a significant source of avoidable iatrogenic morbidity and death and can be brought on by DRPs. Our aim is to study the effectiveness of physician facilitated pharmaceutical care in identification and resolution of drug related problems in General medical wards of a tertiary care hospital. For six months, prospective observational research was conducted. About the identification and resolution of DRPs in patients admitted to the 1000-bed tertiary care teaching hospital, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, with physician assistance. The study enrolled 200 patients in total who fulfilled the inclusion criteria. To characterise the DRPs, a data collecting form was created utilising PCNE principles. Two hundred medical records in all were examined. According to the results, 153 out of 200 records had DRPs identified, while 47 records had none at all. Out of 153 records, 293 were found, of which 226 (77.13%) were attributed to ineffective therapy, 105 (36.18%) to drug treatment failure, and 66 (22.68%) to adverse events. This study shows that chemist engagement can be a useful tool in avoiding and resolving DRPs. In summary, our research demonstrates that DRPs are a major problem in hospitals, leading to co-morbidity, longer hospital stays, and higher cost burdens for the patients. According to the study, drug-related issues can be found and fixed by general practitioners (physicians) and chemists cooperating. This type of cooperation fills a crucial gap in the public health system, considering the substantial expense and disease burden associated with ADRs.

**Key-Words:** Drug-Related Problems, Patient Safety, Medication Errors, Clinical Pharmacy, Adverse Drug Reactions, Pharmaceutical Care

Article History

Volume 6, Issue 5, 2024

Received: 22 May 2024

Accepted: 02 Jun 2024

doi: 10.48047/AFJBS.6.5.2024.9199-9215

## INTRODUCTION

Patient safety is paramount in healthcare delivery, with medication administration standing at the forefront of ensuring positive health outcomes. However, the improper use of medications can lead to a myriad of drug-related problems (DRPs), posing significant challenges to patient well-being and healthcare systems worldwide. This article aims to provide a detailed examination of DRPs, exploring their classification, prevalence, contributing factors, and potential solutions. By synthesizing existing literature and research findings, this review seeks to inform healthcare professionals and policymakers about the complexities surrounding DRPs and advocate for strategies to enhance medication safety and optimize patient care. <sup>[1-8]</sup>

**Classification of Drug-Related Problems:** DRPs can manifest at various stages of medication use, encompassing prescription, dispensing, administration, and patient levels. Common examples include adverse drug reactions (ADRs), prescription errors, drug interactions, and medication non-adherence. Understanding the diverse manifestations of DRPs is essential for targeted intervention and risk mitigation strategies. <sup>[9-12]</sup>

**Prevalence and Impact of Drug-Related Problems:** The prevalence of DRPs is significant, particularly among hospitalized patients where treatment continuity may be compromised. ADRs alone affect 10–20% of hospitalized patients and account for a notable portion of hospital admissions. Beyond the immediate health implications, DRPs also incur substantial healthcare costs, increase morbidity and mortality rates, and diminish patients' quality of life. Elderly populations are particularly vulnerable to DRPs due to factors such as polypharmacy, medication non-adherence, and age-related physiological changes. Addressing DRPs is thus imperative for reducing healthcare expenditures and improving patient outcomes. <sup>[13-18]</sup>

**Contributing Factors to Drug-Related Problems:** Several factors contribute to the occurrence of DRPs, including prescribing errors, dispensing issues, medication non-adherence, and inadequate monitoring. Physician-related factors such as carelessness, pressure from external sources, and incomplete patient information can lead to prescription errors and inappropriate drug use. Nurses also play a crucial role in medication administration, and errors in charting or administration can exacerbate DRPs. Additionally, societal factors such as polypharmacy and inadequate patient education contribute to medication-related challenges, particularly among the elderly population. <sup>[19-26]</sup>

**Interventions and Strategies for Addressing Drug-Related Problems:** Effective management of DRPs requires a multidisciplinary approach involving healthcare professionals, policymakers, and patients. Clinical pharmacists, in particular, play a vital role in identifying, resolving, and preventing DRPs through pharmaceutical care practices. These practices involve comprehensive medication reviews, patient counseling, and collaboration with other healthcare providers to optimize medication therapy. Additionally, the integration of legal, ethical, social, and economic principles underscores the holistic nature of clinical pharmacy practice and its impact on patient care. <sup>[27-34]</sup> List of drug related problems classifications are ABC system, ASHP classification, Cipolle et al., Granada consensus, Hanlon, Hepler/Strand, Krska et al., NCC MERP, Mackie, PAS, PCNE Classification, PIdoc, SHB-SEP, Westerlund classification. The PCNE classification is the most widely recognised and validated system of classification among all of these.

### **PCNE Classification**

A classification system for drug-related disorders<sup>[35-37]</sup>(DRPs) was developed in January 1999 during the Pharmaceutical Care Network Europe working session. The categorization is a component of an entire instrument set. The instances for training or validation, reporting forms, and the classification scheme make up the set. Regular validation and adaptations are made to the classification system. The classification is intended to be used as a process indicator in experimental studies of Pharmaceutical Care outcomes as well as in investigations into the nature, prevalence, and incidence of DRPs. Additionally, it is intended to support medical practitioners in recording DRP data during the pharmaceutical care process. The hierarchical classification is different from current approaches in that it isolates the causes of the problems from the problems themselves, although being founded on comparable work in the field. There are currently four primary domains for interventions, three primary domains for acceptability and implementation, eight primary domains for causes, and four primary domains for intervention outcomes in the basic classification. On the other hand, there are 36 grouped subdomains for causes, 15 grouped subdomains for interventions, and 7 grouped subdomains

for problems at a more comprehensive level. One could consider those subdomains to be explanatory for the main domains. While improvements in drug therapy over the past forty years have improved patient care, there has been a discernible rise in the frequency of drug-related disorders (DRPs). Drug-related issues are particularly common in hospitalised patients where there may be a lack of continuity of care and many medication regimen modifications. Thus, this study adds to our understanding of the factors that lead to DRPs in hospitals.

	CODE	PRIMARY DOMAIN
<b>PROBLEM</b>	P1	Treatment effectiveness
	P2	Adverse event
	P3	Others
<b>CAUSE</b>	C1	Drug Selection
	C2	Drug Form
	C3	Dose selection
	C4	Treatment Duration
	C5	Dispensing
	C6	Drug use process
	C7	Patient Related
	C8	Others
<b>INTERVENTION</b>	I0	No Intervention
	I2	Patient/ Carer Level
	I3	Drug Level
	I4	Other Intervention or Activity
<b>ACCEPTANCE &amp; IMPLEMENTATION</b>	A1	Intervention accepted
	A2	Intervention not accepted
	A3	Others(no information on acceptance)
<b>OUTCOME</b>	O0	Problem status unknown
	O1	Problem totally solved
	O2	Problem partially solved
	O3	Problem not solved

## METHODOLOGY

This study, conducted at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, aimed to explore drug-related problems (DRPs) among hospitalized patients. Over six months, from June 2022 to October 2023, patients meeting inclusion criteria were enrolled, while exclusions were applied to certain patient groups. A uniform data entry format facilitated patient information collection, including demographics, diagnosis, and

prescribed medications. An Institutional Ethical Committee clearance was obtained prior to data collection. A standard DRP documentation form, incorporating PCNE classification, was developed for comprehensive DRP assessment. Data were gathered through chart reviews, patient interviews, and consultations with healthcare professionals, utilizing various drug databases for validation. Statistical analysis employed Epi Info version 7.1.5 and Graph Pad Prism version 5.0. Data analysis revealed a spectrum of DRPs, including dosage errors, inappropriate drug use, and contraindications. PCNE classification guided the identification and documentation of DRPs, with interventions recorded for each case. Prescription review identified inaccuracies, corroborated by reference sources, and statistical analysis facilitated result interpretation. This study underscores the significance of addressing DRPs in hospitalized patients, emphasizing the need for rigorous prescription review and intervention strategies. By employing standardized documentation and classification methods, healthcare professionals can mitigate the impact of DRPs on patient safety and treatment outcomes.

### RESULTS: Table: 1 Gender distribution of study Population(n=200)

SL.NO	Gender	No.of patients	Percentage (%)
1	Male	121	60.5
2	Female	79	39.5

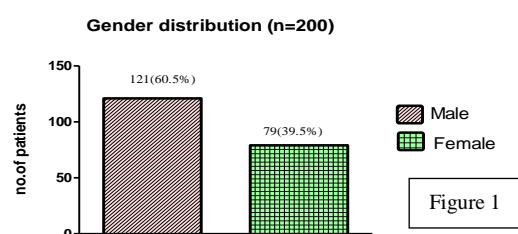


Table 1 and Figure 1 shows that During the studyperiod, a total of 200 patients were admitted into the hospital. Of which 121 (60.5%)are males and females are 79(39.5%). And 293 Drug related Problems were identified in 153 Patients.

### Table: 2Cases of DRP's in total Population (N=200)

DRP's	Number of cases	percentage
Yes	153	76.5%
No	47	23.5%

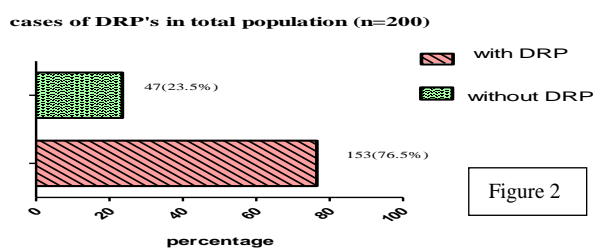


Table 2 and Figure 2 presents that Out of 200 Patients,a total of 293DRP's were observed in 153(76.5%) Patients and 47(23.5%) patients were free of DRP's.

**Table 3: Age distribution of study population(n=200)**

Age in years	Number of patients	Percentage(%)
21-30	14	7
31-40	28	14
41-50	57	28.50
51-60	53	26.50
61-70	29	14.50
71-80	17	8.50
81-90	2	1

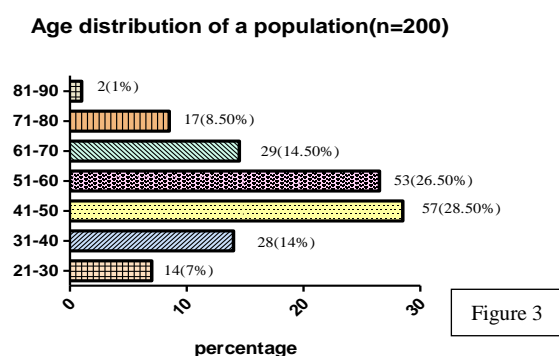


Table 3 and Figure 3 presents that Out of 200 Patients, 57(28.50%) patients with 41-50 year age group are more Prone to Drp's Followed by 53 (26.50%) Patients with 51-60 year age group are more susceptible

**Table: 4 Ward-wise distribution of Population (n=200)**

Ward	Number of patients	Percentage (%)
Cardiology	51	25.50
General medicine	70	35
Nephrology	50	25
Neurology	29	14.50

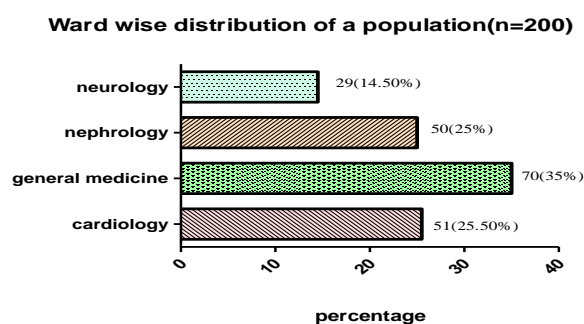


Table 4 and Figure 4 displays that Out of 200 Patients more number of DRP's were observed in General Medicine Department 70(35%) followed by Cardiology 51(25.50%), Nephrology 50(25%).

**Table: 5 Types of DRP's**

Type of DRP	Number of DRP's	Percentage (%)
Potential	<b>76</b>	<b>25.94</b>
Manifest	<b>217</b>	<b>74.06</b>

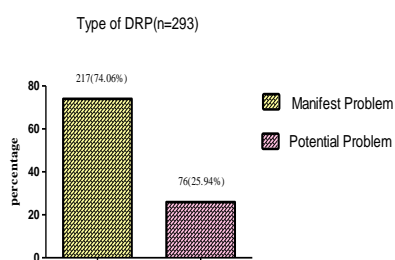


Figure 5

Table 5 and Figure 5 displays that Out of 200 Patients, A Total of 293 DRP's were observed in which 76(25.94%) were Potential DRP's and remaining 217(74.06%) were Manifest DRP's.

**Table: 6 Type of problem**

Type	Frequency	Percentage(%)
<b>P1.Treatment Effectiveness</b>	226	77.13
No effect of drug treatment	105	36.08
Effect of drug treatment not optimal	5	1.05
Unnecessary drug treatment	53	18.21
Untreated indication	63	21.64
<b>P2.Adverse Event</b>	66	22.68
<b>P3.Others</b>	1	0.34
Patient dissatisfied with therapy	0	0
Unclear problem / complaint	1	0.34

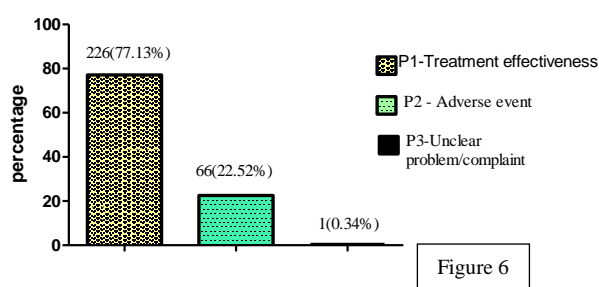


Figure 6

Table 6 and Figure 6 presents that Out of 200 Patients a total of 293 DRP's . Types of Problems observed were P1.Treatment Effectiveness 226(77.13%) in which No effect of drug treatment 105(36.08%) was more Significant one and P2.Adverse Event 66(22.68%).

**Table:7 Planned Intervention**

<b>Planned Interventions</b>	<b>frequency</b>	<b>Percentage(%)</b>
<b>I0.No Intervention</b>	47	9.91
<b>I1.Prescriber Level</b>	288	60.75
Intervention proposed to prescriber	211	44.51
Prescriber asked for information	1	0.21
Prescriber Informed Only	76	16.03
<b>I2.Patient /Carer Level</b>	10	2.10
Patient (drug ) counselling	8	1.68
Patient referred to prescriber	2	0.42
<b>I3.drug level</b>	129	27.21
Dosage changed	9	1.89
Dosage changed ; drug stopped	1	0.21
Dosage changed ;new drug started	2	0.42
Drug changed	1	0.21
drug changed;drug stopped	5	1.05
Drug stopped	61	12.86
Formulation changed	1	0.21
Instruction for use changed	10	2.10
New drug started	36	7.59
New drug started ; drug stopped	3	0.63



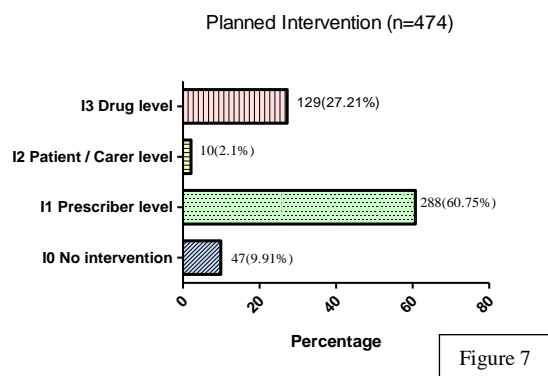
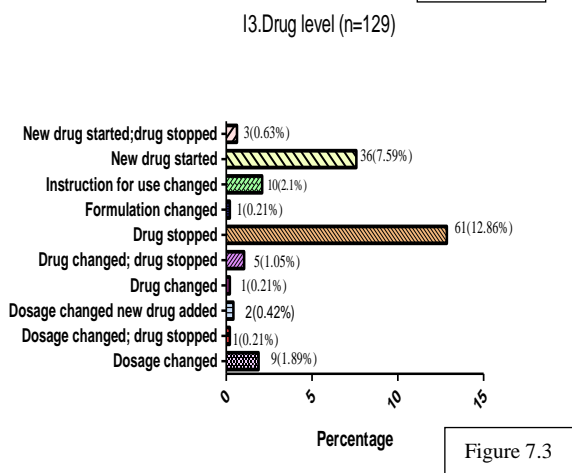
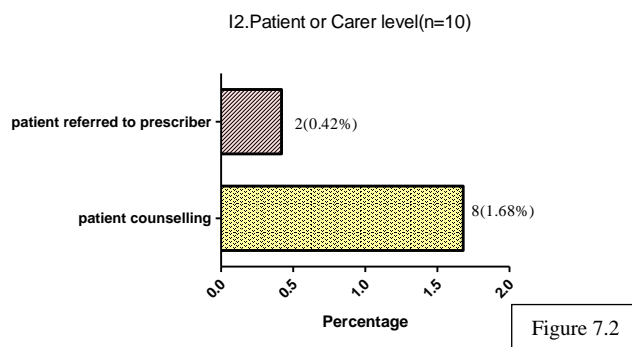
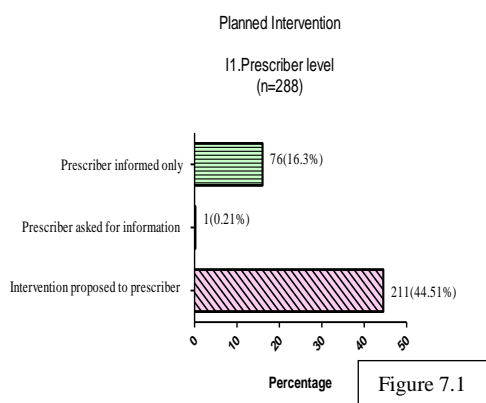


Table 7 and Figure 7 and its subgroups displays that Out of 293 DRP's Planned Intervention are 474 in which (I0)No intervention was 47(9.91%), I1 Prescriber level 288(60.75%) DRP's were reached to the physician, (I2)Patient /carer level 10(2.10%) DRP's were resolved 8(1.68%) by giving patient counselling, More number of DRP's were observed by pharmacist in review of patient profile form at (I3)Drug Level 129(27.21%) in which drug stopped by pharmacist in collaboration with physician was found to be 61(12.86%) and recommendations made by the pharmacist to initiate new drug 36(7.59%) through physician to minimize the manifest DRP's.

**Table 8: Drugs involved in ADR n=62**

S.No	class	Drug	ADR	No.of patients	percentage
1	Analgesic	Tramadol	Constipation	10	27.7%
2	Analgesic and antibiotics	NSAID's	Neuropathy	2	3.17
			Kidney damage	5	7.9

			Cushingssyndrome, hyperkalemia	1	1.58
3	Antipsychotic	Amisulpride	Dry mouth	1	1.58
4	Loop diuretic	Furosemide	Hypokalemia	6	9.52
5	Diuretic	Torseamide	Hypokalemia	2	3.17
6	ACE Inhibitor	Ramipril	Shortness of breath	3	4.76
7	Steroids	Corticosteroids	Diabetes , diarrhea	1 2	1.58
8	Mineral supplement	calcium gluconate	Constipation	1	1.58
9	Analgesic	Ecospirin	Atricular rash	1	1.58
10	Antibiotic	Doxycyclin	Diarrhea	1	1.58
11	HMG Co- A Reductase inhibitor	Atorvastatin	Constipation myalgia	6 1	9.52 1.58
12	Calcium channel blocker	Amlodipine	Edema	5	7.9
13	Anti tubercular	ATT	Pulmonary fibrosis	1	1.58
14	Antibiotic	Cefoperazone	Diarrhea	1	1.58
15	Mono nitrates, k <sup>+</sup> channel activator	ISMO,Nicorandi l	Hypotension	1	1.58
16	nuetropic	Citocoline	vomiting	1	1.58
17	Antibiotic	Novaclox	Loose stools	1	1.58
18	Anticonvulsant	Oxcarbazepine	Decrease in eye vision	1	1.58
19	Analgesic	Indomethacin	Loose stools	1	1.58
20	Beta-blocker	Carvedilol	Diarrhea	1	1.58
21	Anti epileptic	Pregabalin	Blurred vision	3	4.76
22		IV Fluids	Thrombophlebitis	1	1.58
23	Antibiotic	Ofloxacin	Rash	1	1.58
24	Beta 2 adrenergic receptor agonist	Levosambutamol	Hypokalemia	1	1.58

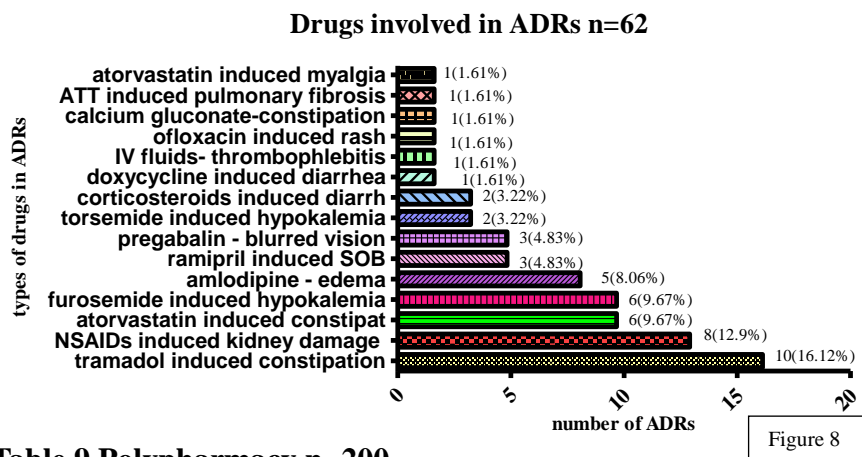
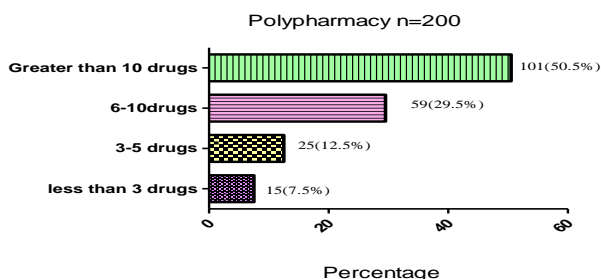


Table 8 and Figure 8 shows the number of drugd involved in ADRs and their respective percentages.

**Table 9 Polypharmacy n=200**

No of Drugs Taken	Frequency	Percentage
< 3	15	7.5
3-5	25	12.5
6-10	59	29.5
>10	101	50.5



**Table 10 DRUG CLASSES INVOLVED IN DRPs**

DRUG CLASS	NUMBER OF DRUGS	PERCENTAGE(%)
Anti- infectives	49	15.31
GI system drugs	20	6.25
Respiratory drugs	3	0.93
Cardiovascular drugs	164	51.25
Anti-inflammaory and corticosteroids	6	1.87
Vitamins and supplements	8	2.5
CNS drugs	17	5.31
Analgesics and antipyretics	24	7.5
Endocrine drugs	20	6.25

Anticoagulants	9	2.81
----------------	---	------

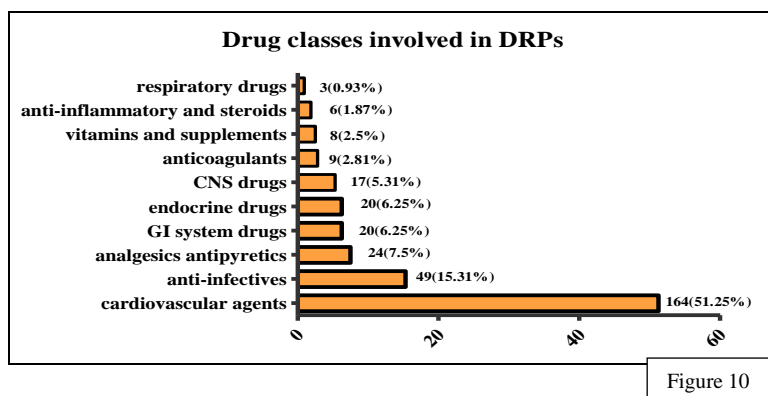


Figure 10

Table 10 and Figure 10 presents that Out of 200 Patients a total of 293 DRPs, Cardiovascular drugs 164 (51.25%) accounted for most of the DRPs followed by Anti-infectives, Analgesics and antipyretics, 49 (15.31%), 24 (7.5%) respectively.

**Table:11 Acceptance and implementation of intervention n=293**

Acceptance & implementation	Frequency	Percentage (%)
<b>A1. Intervention Accepted</b>	183	62.45
Intervention accepted & fully implemented	134	45.73
Intervention accepted but not implemented	29	9.8
Intervention accepted, implemented unknown	17	5.80
Intervention accepted & partially implemented	3	1.02
<b>A2. Intervention Not Accepted</b>	28	9.55
Intervention not accepted :no agreement	6	2.04
Intervention not accepted :not feasible	7	2.38
Intervention not accepted :unknown reason	15	5.11
<b>A3. Others</b>	82	27.98
Intervention not proposed	76	25.93
Intervention proposed ,acceptance unknown	6	2.04

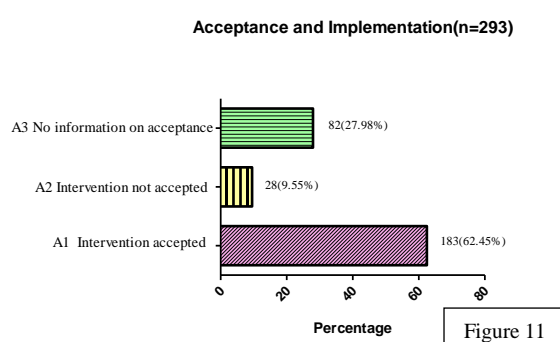
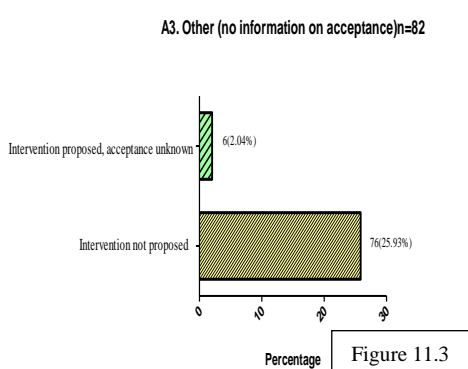
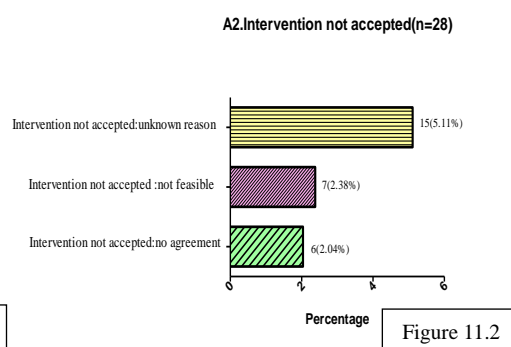
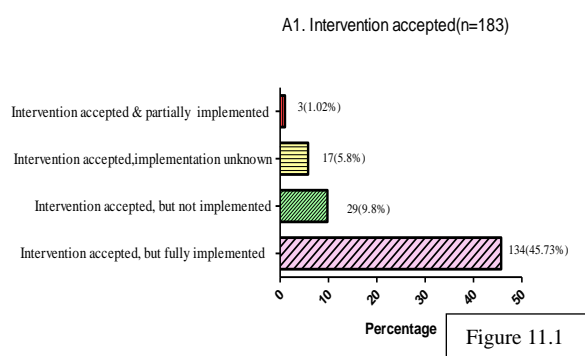


Table 11 and figure 11 and its subgroups shows that Out of 293 DRP's, 183(62.45%) were (A1) Intervention accepted, 28(9.55%) were (A2) Intervention not accepted, 82(27.98%) were (A3) Others which include Intervention not proposed 76(25.93%), Intervention proposed, acceptance unknown 6(2.04%).

**Table:12 Status of the DRP(outcome of intervention)**

Status of DRP	Frequency	Percentage(%)
00.Problem Status Unknown	129	44.02
01.Problem Totally Solved	130	44.36
02.Problem Partially Solved	9	3.07
03.Problem Not Solved	25	8.53
Intervention Not Effective	2	0.66
Lack Of Cooperation Of Prescriber	20	6.68
No Need Or Possibility to Solve Problem	3	1.00

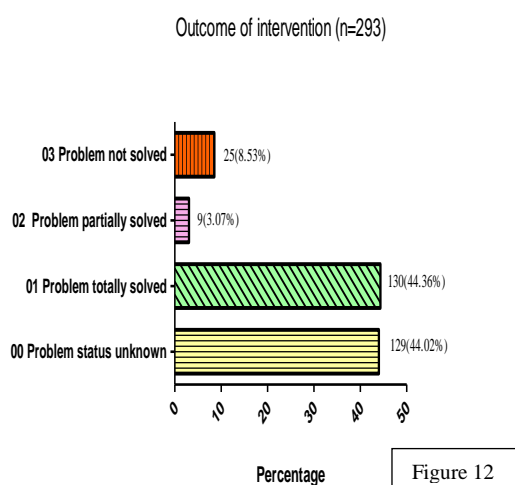


Table 12 and Figure 12 presents that Out of 293 DRPs, 129(44.02%) were (00) **Problem Status Unknown**, 130(44.36%) (01) **Problem Totally Solved**, 9(3.07%) (02) **Problem Partially Solved**, 25(8.53%) (03) **Problem Not Solved**.

## DISCUSSION:

In a prospective observational study titled "Effectiveness of Physician facilitated Pharmaceutical Care in Identification and Resolution of Drug Related Problems," conducted at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, 200 inpatients from the general medicine departments were enrolled between November 2017 and April 2018. The study aimed to evaluate drug-related problems (DRPs) among hospitalized patients, employing a specially designed data collection form to gather patient information. Of the total patients, 60.5% were male, and 39.5% were female. DRPs were identified in 26.5% of patients, primarily occurring in the age group of 51-60 years. Polypharmacy was associated with multiple DRPs in some cases. Cardiology and general medicine departments accounted for the highest number of patients. Adverse drug reactions (ADRs) was the most common problems seen. Cardiovascular drugs were frequently involved in DRPs, along with anti-infective and analgesic drugs. Interventions suggested by clinical pharmacists included drug cessation and addition, with a high acceptance rate of 62.45%. However, some recommendations were neither amended nor accepted, possibly due to limited knowledge of physician prescribing practices among pharmacists.

## CONCLUSION:

In conclusion, the study underscores the importance of establishing a systematic DRPs reporting system in hospitals to address medication-related challenges effectively. The pivotal role of clinical pharmacists in identifying, communicating, and preventing drug-related problems is highlighted, emphasizing the need for interdisciplinary collaboration in healthcare settings. These findings advocate for enhanced pharmacovigilance measures to mitigate the impact of DRPs on patient outcomes and healthcare costs. Further research is warranted to evaluate the long-term effects of such interventions on overall health outcomes.

## Acknowledgements:

The authors are very much thankful to Management and Principal of KVSRR Siddhartha College of Pharmaceutical Sciences, Vijayawada for their support and constant encouragement.

**REFERENCES:**

1. Ernst FR, Grizzile AJ. Drug-related morbidity and mortality: updating the cost-of-illness model. *J Am Pharm Assoc* 2001; 41: 192–9.
2. Meyboom R, Egberts A, Edwards R. Principles of signal detection in pharmacovigilance. *DrugSaf* 1997; 16: 355-65.
3. Pirmohamed M, Breckenridge AM, KitteringhamNR. Adverse drug reactions. *BMJ* 1998; 316:1295-8.
4. Parthasarathi G, Ramesh M, Kumar JK, Madaki S. Assessment of drug - related problems and clinical pharmacists' interventions in an Indian teaching hospital. *J Pharm Pract Res* 2003; 33: 272-274.
5. PMLA van den Bemt, ACG Egberts. Drug-related problems: definitions and classification. *EJHPP* 2007; 1(13): 62-64.
6. Blix HS, Viktil KK. The majority of hospitalised patients have drug-related problems: results from a prospective study in general hospitals. *Eur J ClinPharmacol* 2004; 60: 651–658.
7. Consensus Committee. Second consensus of Granada on drug therapy problems. *ArsPharm* 2002; 43: 179-87.
8. World Health Organization international drug monitoring: role of national centers. Geneva WHO, Tech Rep Ser WHO. 1972; 48.
9. Academic Health Centres. *Leading Change in the 21st Century*. Washington, DC: National Academy Press 2003; 1.
10. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. *American J Hospital Pharmacy* 1990; 47: 533-43.
11. Kevin T. Bain, Douglas J. Weschules, P Tillotson. Prevalence and predictors on medication-related problems. *MPM* 2006; 14-27.
12. Viktil KK, Blix HS. The impact of clinical pharmacist on drug-related problems and clinical outcomes. *ClinPharmacolToxicol* 2008 Mar; 102(3): 275-280.
13. Ganachari MS, Mahendra Kumar BJ, Shashikala C Wali, Fabin M. Assessment of drug therapy interventions by clinical pharmacist in a tertiary care hospital. *IJOPP* 2010; 3(3): 22-8.
14. Foppe Van Mil. Drug-related problems: a cornerstone for pharmaceutical care. *Journal of the Malta College of Pharmacy Practice* 2005; 10: 5-8.

15. Roberts MS, Stokes JA, King MA, et al. Outcomes of a randomized controlled trial of a clinical pharmacy intervention in 52 nursing homes. *Br J Clin Pharmacol* 2001; 51:257-265.
16. Liz EF. Inappropriate multiple medications and prescribing of drugs in elderly patients: Do we do what we can? *Aten Primaria* 2006; 38: 476-82.
17. Koh Y, Kutty FB, Li SC. Drug related problems in hospitalized patients on polypharmacy: The influence of age and gender. *Ther Clin Risk Manag* 2005; 1: 3948.
18. Zhan C. Inappropriate medication use in the elderly. *Geriatr Pharm Pract* 2005; 29-33.
19. Laroche ML, Charmes JP, Nouaille Y, Picard N, Merle L. Is inappropriate medication use a major cause of adverse drug reactions in the elderly. *Br J Clin Pharmacol* 2006; 63: 177-86.
20. Howard M, Dolovich L, Kaczorowski J, Sellors C, Sellors J. Prescribing of potentially inappropriate medications to elderly people. *Fam Pract* 2004; 21: 244-7.
21. Alexa ID, Stoica S, Burca P, Obreja L, Rusu RI, Ungureanu G, et al. Noncompliance in a large population of elderly patients with cardiovascular disease. *J Clin Med* 2006; 1:14-8.
22. Martins SO, Soares MA, Vanmil JW. Cabrita Inappropriate drug use by Portuguese elderly outpatients-effect of the Beers criteria update. *Am J Manag Care* 2004; 10:711-8.
23. Prabha SG, Rodrigues PA, Kumar VA, Lavanya S. Drug usage in geriatrics. *Int J Community Pharm* 2009; 2: 34-41.
24. Miller SW. Evaluating medication regimens in the elderly. *Consult Pharm* 2008; 23: 538-47.
25. Bressler R, Bahl JJ. Principles of drug therapy for the elderly patient. *Mayo Clin Proc* 2003; 78: 1564-77.
26. Howard M, Dolovich L, Kaczorowski J, Sellors C, Sellors J. Prescribing of potentially inappropriate medications to elderly people. *Fam Pract* 2004; 21: 244-7.
27. Dooley MJ, Allen KM, Doecke CJ, Galbraith KJ, Taylor GR, Bright J et al. A prospective multicentre study of pharmacist initiated changes to drug therapy and patient management in acute care government funded hospitals. *British Journal of Clinical Pharmacology* 2003; 57(4): 513-21.
28. American College of Clinical Pharmacy. *Pharmacotherapy* 2008; 28(6): 816–817.
29. H Mifflin. *American heritage dictionary of the English language*. 2007; (4).
30. Dorland's illustrated medical dictionary. 2007; (31).



32. Clinical pharmacy services, British Columbia pharmacy association. 2013 March.
33. AD Michaels, Sarah AS, Barbara L, Magnus O. Medication errors in acute cardiovascular and stroke patients. *Circulation* 2010; 121: 1664-82.
34. Ganachari MS, Mahendra BJ, Wali SC, Fabin M. Assessment of drug therapy intervention by clinical pharmacist in a tertiary care hospital. *IJPP* 2010; 3(3): 22-28.
35. Suranjan Bantupalli, Atluri Deekshit, Bala yaswanth kumar.S, B.Radha Madhavi, Kanaka Durga Devi Nelluri. A Comparative Study Of Analgesic And Anti-Inflammatory Activities Of Diclofenac Sodium In Some Generic And Branded Drugs, *IJPSR*, 2022; Vol. 13(4): 1670-1679.
36. Foppe VM. Drug-related problems: a cornerstone for pharmaceutical care. *Journal of the Malta College of Pharmacy Practice* 2005; 10: 5-8.
37. Pharmaceutical Care Network Europe Foundation: PCNE classification for drug related problems V7.00.