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Assessment Of Drug Related Problems In Orthopaedic Patients

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ABSTRACT: A Drug Related Problem(DRP) is defined as an event or circumstance that actually or potentially interferes with desired health outcomes. Orthopedics is the department of medication which treats trauma and disorder of musculoskeletal system. It consists of bones, muscles, tendons, ligaments, joints, peripheral nerves, vertebral column and spinal cord and its nerves. Objective: The objective of this study was to identify and assess the DRPs in various diseased patients in orthopedic department.

Methods: In this prospective interventional study a total of 152 patients were involved. The study was conducted in Medicover hospital, Kurnool and Krishna hospital, Adoni for a period of six months. DRPs were categorized using PCNE classification version v9.0.Drug interactions were identified using medscape drug interaction checker database.

Results: A total of 178 DRPs were identified in 106 patients. The sex ratio in males to females was 2:1.The most common type of DRP identified was drug interactions(39.32%) followed by therapeutic duplication(31.46%).The major factor associated with DRPs was polypharmacy, comorbidity condition.

Conclusion: Early identification of DRPs and associated factors help to prevent and management in orthopedic patients.

KEYWORDS: Drug related problems, orthopedic department, drug interactions, therapeutic duplication, polypharmacy, comorbidity

I. INTRODUCTION

Orthopedics is the department of medication which treats trauma and disorder of musculoskeletal system. It consists of bones, muscles, tendons, ligaments, joints, peripheral nerves, vertebral column and spinal cord and its nerves.

Musculoskeletal conditions includes joints such as osteoarthritis, rheumatoid arthritis, psoriatic arthritis, gout and ankylosing spondylitis Bones such as osteoporosis, osteopenia,and associated fragility and traumatic fractures, Muscles such as sarcopenia, Spinal cord such as cervical and lumbar Spondylosis, Spondylolythesis, discdengeration and wedge compression

Drug related problems as, an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcome.

Drug related problems are most commonly observed in elderly patients due to polypharmacy, decreased ability of metabolism and excretion, under use of medications, medication non adherence etc. The most common drug related problems were adverse drug effects, drug interactions, inappropriate dosage, therapeutic duplication.

Polypharmacy is a condition in which more than five medications were prescribed. It is usually seen in elderly patients due to multiple disease conditions associated with age.

Adverse drug effects is an undesired harmful effects results from administration of a drug.

Drug interactions majorly are of three types. i. Drug - drug interactions: It is an interaction between two or more drugs which may cause the drug to be more or less effective. ii. Drug - food interaction: In this condition food alters the drug effects. iii. Drug- disease interactions: In this condition drug alters or worsens a disease condition.

Inappropriate dosage means prescribing high or low doses than required. Therapeutic duplication means prescribing multiple medication from the same class or same indication.

II. OBJECTIVES

The objective of this study was to identify and assess the DRPs in various diseased patients in orthopedic department.

III. METHODOLOGY

Study site : Medicovermultispeciality hospital, Kurnool and Krishna hospital, Adoni

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Study duration : The study was conducted over a period of six months.
Sample size :152 subjects
Study design: It is a prospective interventional multi-centered study
Study criteria

Inclusive Criteria
- ✓ Patients who are willing to participate in the study
- ✓ Patients who were diagnosed with orthopedic related disorders with or with out comorbidities

Exclusive Criteria
- ✓ Pregnant women
- ✓ Paediatrics and patients who had insufficient data.

Ethical approval
The study is planned to initiate after the clearance of institutional ethics committee

Sources of data
Data was collected through patient documentation form and interview with the patient and/or patient representatives, followed by an interpretation of all available information to identify the patients actual and potential DRPs.

Statistical analysis
The collected data was analysed by using chi square test.

Classification and assessment of DRPs
DRPs were categorized using PCNE classification version v9.0. The version used has been validated and is compatible with previous versions.This classification was the most suitable tool to match the study objective and methodology and hence was used in this study to assess problems and causes associated with DRPs.

The basic classification now has 3 primary domains for problems, 9 primary domains for causes and 5 primary domains for interventions.

However, on a more detailed level there are 7 grouped subdomain for problems, 43 grouped subdomains for causes and 17 grouped subdomains for interventions, and 10 subdomains for intervention acceptance.

IV. PLAN OF THE STUDY

The orthopedic patients were prospectively selected and assessed for DRPs .All necessary and relevant baseline information was collected in a standardized data collection form which includes patient demographic details, social history, personal history, family history, provisional diagnosis, past medical and medication history, laboratory investigation data, radiographic data, physicians medication and type of DRPs identified.
Assessment of DRPs was based on the Pharmaceutical Care Network Europe(PCNE) classification version v9.0
Drug interactions were examined using Medscape drug interaction checker database.

Study procedure
- ✓ Data will be collected from the case sheets of patients who are admitted in orthopedic ward in Medicovermultispeciality hospital and/or krishna hospital.
- ✓ Collection of patient information through a patient documentation form and interview with the patient and/or representative and health care providers
- ✓ Interpretation of all available information to identify the patients with various types of DRPs
- ✓ Identified DRPs were recorded on a standardized data collection form
- ✓ DRPs identified were discussed and addressed with the physician

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V. RESULTS

Demographic characteristics
A total of 152 patients were enrolled in the study.The number of male patients (68.42%) was 2 times higher than the female patients (31.57%).The majority of the patients belonged to the age group of 20-29 years.Zero patients were observed in age group of 80-89.Non elderly patients (78.94%) were present in high number than the elderly patients (21.05%).

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Figure 1:Age-groups of study population(Years, n=152)

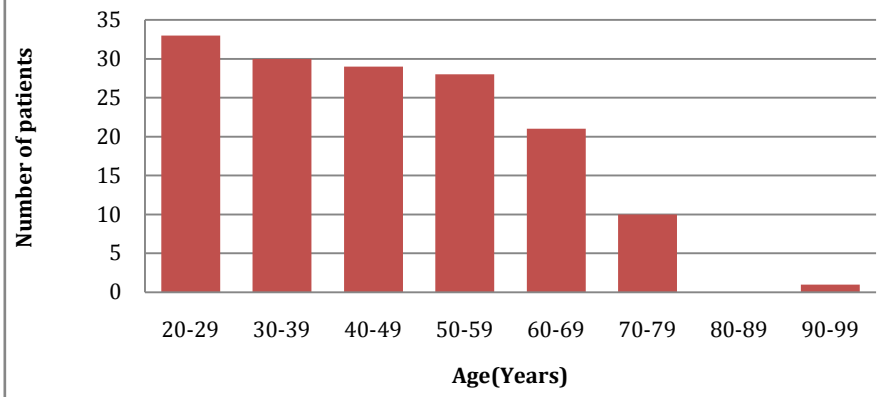

Figure 2:Gender wise distribution

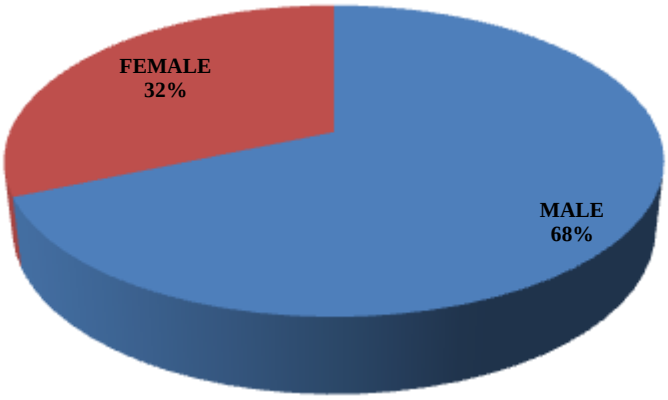

Table 1 Gender wise distribution

Gender	With DRPs	Without DRPs	P value
Male Female	75 31	29 17	0.34

Clinical characteristics

Around 26.31% of the study population had comorbid conditions, ranging from 1 to 5 diseases.Hypertension and anemia were the top 2 comorbidities followed by type 2 diabetes mellitus, hypothyroidism, cancer and fluorosis.

Table 2 Clinical characteristics of study population(n=152)

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Factor	Total,n(%) 152(100%)	With DRP	With out DRP	P value
Comorbidities				
Hypertension	14 (9.21%)	10	4	0.26
Anemia	10 (6.57%)	7	3	
Type 2 diabetes	6 (3.94%)	6	0	
Hypothyroidism	2 (1.31%)	2	0	
Cancer	1 (0.65%)	0	1	
Fluorosis	1(0.65%)	1	0	
Polypharmacy				
Yes	106(69.73%)	80	26	0.62
No	46(30.26%)	33	13	

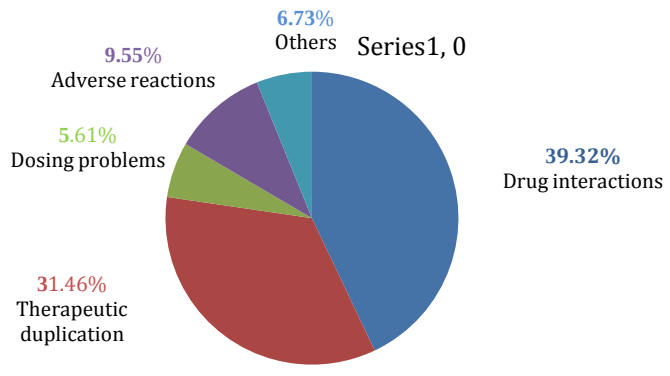
Drug related problems

A total of 178 DRPs were identified in the 152 patients.The number of DRPs in the patients ranged from 0 to 4.A total of 88 patients(57.89%) were detected with atleast 1 DRP.As shown in figure:-3 the top 2 DRPs were drug interactions(39.32%) and therapeutic duplication(31.46%)followed by adverse reactions(9.55%), dosing problems(5.61%) and other DRPs like need of additional therapy, untreated condition and patient under administration of drugs.

Drug interactions

About 38.8% of cases had drug-drug interactions and only 11.18% of cases had drug-disease interaction.The major drug-disease interaction was between the NSAIDs(Non steroidal anti-inflammatory drugs) and the hypertension.NSAIDs retain sodium and water which may cause blood pressure to rise even higher and potentially reduce the efficacy of several antihypertensive drugs (Eg:- ACE inhibitors, ARBs and diuretics).95% of drug-drug interactions were reported as minor interactions and only 5% were reported as major interactions.

Figure 3:Drug related problems(n=178)



Therapeutic duplication

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Approximately 31.46% of DRPs were identified to be therapeutic duplication.The major class involved in therapeutic duplication was NSAIDs/Analgesics and supplements like vitamin B 12, cholecalciferol etc.Therapeutic duplication increases the medication cost to the patient.

Adverse reactions

A total of 17 (9.55%) cases of adverse reactions were identified.Most of the adverse reactions were gastrointestinal disturbances comprising diarrhoea, constipation, epigastric pain, bloating.

Gabapentin induced sedation were reported in some patients.Other adverse reactions like headache, weight gain were also reported in some patients.

Dosing problems

Among the 10(5.61%)cases of dosing problems, there were 8 cases identified with medication low dose.Drug involved was rabeprazole.Medication high dose were identified in 2 cases involving antibiotics like ceftriaxone, amoxicillin and clavulanic acid.

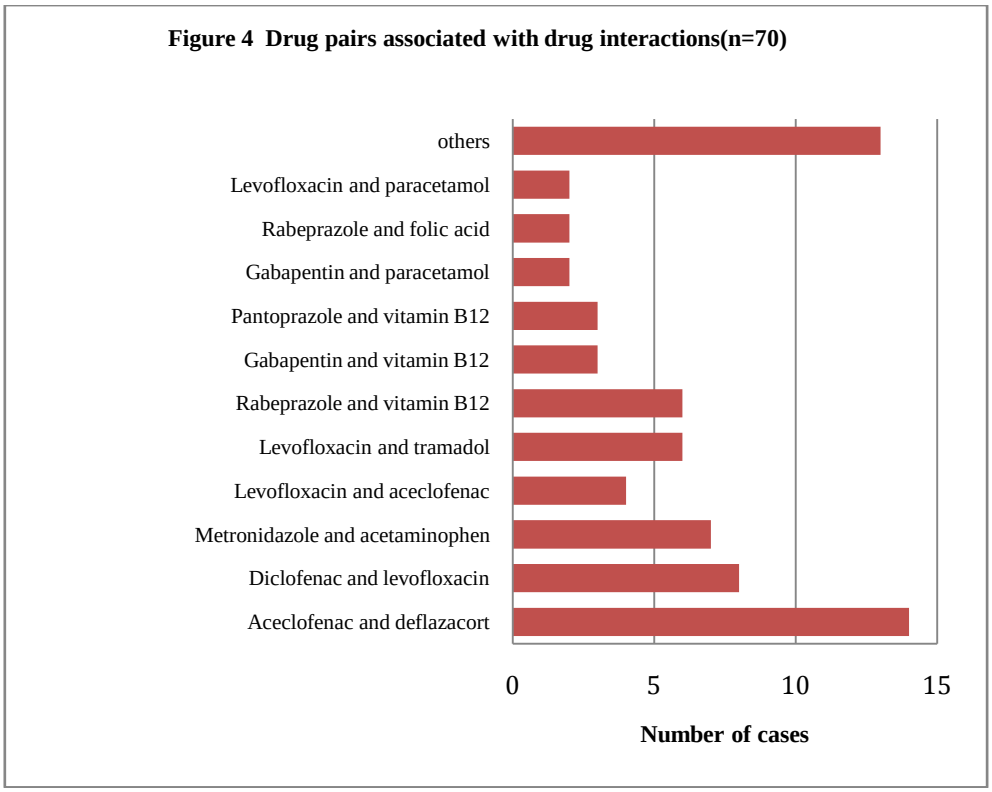
Other problems

A total of 12(6.73%) cases were associated with DRPs like need of additional therapy(4.54%) and untreated condition(1.13%).

Causes of DRPs

Table 2 and 3 shows a total of 178 causes for DRPs.Among all the 5 domains of causes "others" and "drug selection" were found to be the 2 most common which comprised 51.12% and 31.46% respectively.Among the 2 domains of problems "treatment safety" was found to be the most common with 9.55%.

Figure 4 Drug pairs associated with drug interactions(n=70)



Factors associated with DRPs

Factors that were significantly associated with the occurrence of DRPs in orthopedic patients include polypharmacy, elderly, multiple comorbidities, hypertension, type-2 diabetes mellitus etc.

In this study the major causes were associated with polypharmacy condition with average of 5 to 6 drugs per patient.Some patients were seen with 2 to 5 comorbidities.

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Table 3 Problems of drug related problems (n=178)

Code(V9.0)	Problem	n(%)
P1	**Treatment effectiveness**	
P1.3	Untreated symptom or indication	2(1.123%)
P2	**Treatment safety**	
P2.1	Adverse reactions	17(9.55%)

Table 4 Causes of drug related problems(n=178)

Code(V9.0)	Cause	n(%)
C1	**Drug selection**	
C1.5	Duplication of therapeutic group	56(31.46%)
C3	**Dose selection**	
C3.1	Drug dose too low	8(4.49%)
C3.2	Drug dose too high	2(1.123%)
C6	**Drug use process**	
C6.2	Drug under administered	1(0.56%)
C7	**Patient related**	
C7.1	Patient uses less drug than prescribed or does not take the drug at all	1(0.56%)
C9	**Other**	
C9.2	Other cause	91(51.12%)

Table 5 Planned interventions for DRPs

Code(V9.0)	Intervention	n(%)
C11	**At prescriber level**	
C11.3	Intervention proposed to prescriber	67(37.64%)
C11.4	Intervention discussed with prescriber	53(29.77%)
C12	**At patient level**	
C12.1	Patient counseling	2(1.12%)
C13	**At drug level**	
C13.2	Dosage changed	10(5.61%)

VI. DISCUSSION

In this study the median age of the patient population was 33 yrs, ranging from 20 to 99 yrs.The sex ratio was found to be 2:1 for males:females in this study.The higher number of male patients could be explained by the fact that smoking and drinking effect on bone density along with other risk factors responsible for developing orthopedic disorders.

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Hypertension(41.17%), anemia(29.41%) and type-2 diabetes mellitus(17.64%) were the three most prevalent comorbidities in this study population.Polypharmacy was the most common factor associated with the occurrence of DRPs.

Drug interactions

Approximately more than a third(39.32%) of the DRPs identified in this study were drug interactions, particularly in patients with polypharmacy and comorbid conditions.The most common type of drug interaction was drug-drug interaction(84.33%) followed by drug-disease interaction.The majority of drug-drug interactions found in this study involved levofloxacin.Among the drugs interacting with levofloxacin, Diclofenac was found to be the major representative of drug-drug interactions followed by tramadol and aceclofenac.The interaction between levofloxacin and tramadol was a serious interaction which increases the risk of causing seizures.Intervention is needed to change the frequency of both the drugs.The association of aceclofenac and deflazacort cause complications in gastrointestinal tract.i.e,GI ulceration.

Therefore, patients who receive combinations of drugs concurrently should be strictly monitored to avoid complications.

In drug-disease interaction the most common type of interaction was between NSAIDs and hypertension.NSAIDs have a property of sodium and water retention causing increased blood pressure and potentially reduce the efficacy of several anti-hypertensive drugs like diuretics, ARBs and ACEs.

Therapeutic duplication

Therapeutic duplication comprised of 31.81% of DRPs in this study.The most common class of drugs involved in therapeutic duplication were NSAIDs/Analgesics followed by supplements like cholecalciferol, methylcobalamin, calcium etc. Besides increasing medication cost there is a chance of causing adverse reactions.The need to review the medications prescribed to patients is crucial to reduce the DRPs.

Adverse reactions

In this study 9.65% of cases reported adverse reactions.Most commonly involved drugs in causing adverse reactions were NSAIDs.The use of NSAIDs is often responsible for GI ulceration and other complications.Need of adding antacids like proton pump inhibitors along with NSAIDs is essential.Other major adverse reaction was gabapentin induced sedation.No need of planning intervention as it was prescribed to take during night time.

Dosing problems

Ceftriaxone high dose was detected in one case in this study.The recommended daily dose was upto 1 to 2g/day.But prescribed more than the recommended dose.i.e,3g/day.In this study there was another case with high dose of amoxicillin and clavulanic acid.i.e,3.6g/day which was more than a recommended daily dose of 2g/day.There is a high risk of liver problems, intestinal infections and allergic reactions in patients receiving high dose of amoxicillin and clavulanic acid.

However, in this study, there were few cases with low dose of rabeprazole.i.e,10mg/day which is lower than the daily recommended dose of 20mg/day.

Other problems

In this study there were 2 cases of untreated conditions and nearly 8 cases of need of additional therapy.In this study few cases were seen experiencing GI complications like gastric irritation, heart burn, bloating and diarrhoea when administered NSAIDs .Hence,it was recommended to include antacids to avoid GI complications.

Factors associated with DRPs

Elderly

The prevalence of DRPs was high in the elderly population, as risk increases with age, especially when polypharmacy was one of the risk factors.The high prevalence of DRPs in elderly people can be explained by the fact that they were highly sensitive to pharmacotherapy due to changes in pharmacokinetic and pharmacodynamic parameters and also impairment in many organ functions.

Multiple comorbidities

Patients who possessed comorbid diseases had a higher risk of encountering DRPs.Adversereactions, drug-drug interactions, drug-disease interactions, drug use problems were shown to be significantly associated with DRPs in this study.Patients with comorbidities were 3 times more susceptible to DRPs than those without comorbidities.It is important to have medical reconciliation in all health care settings to avoid DRPs in elderly patients with comorbidity conditions

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Polypharmacy

Polypharmacy was found to be significantly associated with the occurrence of DRPs in this study.In elderly patients multiple comorbidities that require chronic medical therapies elevated risk of DRPs.Therefore more efforts needed in medication review to minimize polypharmacy to reduce the risk of DRPs.

Hypertension

In this study patients with hypertension are associated with higher risk of DRPs.The high risk of drug interactions could be explained by the use of anti-hypertensives particularly ARBs,ACEs and diuretics, which commonly interacts with NSAIDs.

VII. CONCLUSION

In this study nearly 178 DRPs were identified. The most commonly identified DRPs were drug interactions, therapeutic duplication, adverse reaction and dosing problems. On the other hand, several factors were found to be significantly associated with the occurrence of DRPs, including polypharmacy, multiple comorbidities and hypertension etc.

Among drug interactions the major type was found to be drug-drug interaction followed by drug-disease interaction. The most commonly involved drugs in DRPs were NSAIDs.

VIII. ACKNOWLEDGEMENT

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