Research Article

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A Prospective Study on Identification of Actual and Potential Drug Related Problems in Geriatric Patients: The Role of the Clinical Pharmacist

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ABSTRACT

Drug related problems can be defined as the drug therapy that potentially or actually interferes with desired health outcomes. Drug related problems are common among elderly (Geriatric) patients using multiple drugs for the treatment of chronic disease. The fact that elderly patients take more medication for the treatment of several diseases makes them more vulnerable to the occurrence of many drug related problems and also due to the physiological changes that occurs with advancing age. Drug related problems can originate when prescribing, dispensing or taking/administering drugs. Over the past decade, there has been a dramatic rise in the number of elderly people in the developed and as well as developing countries although the disability rates among the elderly population were declining in the developed countries but increasing in the developing countries due to limited pharmaceutical care. The increase in the life expectancy has posed one of the toughest challenges to be met by the health care professionals and by the society. As life expectancy increases, there is a need to improve the health, quality of life, discovery of new treatments, prevention strategies, improving health behaviour and medication use.

In this study, drug related problems in elderly patients are being studied and pharmacist interventions are being made for better therapeutic efficacy and improved quality of life. The main aim of the study was to analyse the usage of drugs among geriatric patients and the Drug related problems associated with it. This study was conducted at a tertiary care hospital. The result of the study shows, males (62.8%) were more affected by chronic disease than females (36%). The most common drug related problem was found to be Drug interaction, Drug duplication and followed by the long duration of drugs. Patient counseling being the cause of many drug related problems were able to be rectified and also imposing to the patient the importance of compliance better therapeutic care was provided. Our study concludes that pharmacist intervention can reduce drug related problems and thereby providing better pharmaceutical care.

Key-words: Geriatric, Drug related problem (DRP), Interventions by pharmacist, polypharmacy.

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INTRODUCTION

Diseases generally increases with age and as result elderly population suffers from multiple disease. Generally, elderly people are more sensitive to their medication compared to younger adults. The sensitivity towards medication is because of the result of physiological changes that occurs due to increase in advancing age which in turn results in altered pharmacokinetics of the patient and Pharmacodynamics for most drugs. The diseases the elderly people are affected with is of a chronic nature, they persist for a longer period of time and requires following drug therapy for a longer period of time. Due to the increase in the disease condition in the elderly patients, they tend to take more drugs compared to younger adults and thus polypharmacy is of major concern in the geriatric population (Beers, MH2005, the Merck manual of geriatrics). Geriatrics refers to the person or patients aged 65 years and above. The Elderly are classified as young old (65 -74 years), old (75-84 years), old-old (85-94 years) and elite old or chronologically gifted (95 years and older).

Polypharmacy is widespread in the elderly population due to increase in their chronic disease, which leads to multiple drug regimens. The simultaneous use of many drugs increases the risk of Drug related problems and also increase the drug related costs. Even though polypharmacy is a contributing factor for drug related problems, it is not always easy to reduce polypharmacy. Polypharmacy increases further due to the negligence of the health care providers, many physicians do not review their patient's drug list, to evaluate drugs that can be stopped and also symptoms that is a cause of adverse effect of a drug is wrongly diagnosed as a new illness, which leads to additional drugs in the prescription. DRPs can be defined as problems in the pharmacotherapy of the individual patient that actually or potentially interferes with the desired health outcome (definition PCNE 1999). A drug related problem is different from medication error. According to NCC MERP a medication error can be termed as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of a health care professional, patient or consumer. A medication error is process oriented i.e. if an error occurs in prescribing or dispensing process, it is considered to be a medication error regardless of whether there was an impact on patient outcome. Drug related problems can occur during prescribing, dispensing or when the consumer consumes it. DRP can be of two types actual and potential drug related problems. Potential drug related problem is when those problems cannot be avoided without influencing the pharmacotherapy. Drug related problems causes unwanted suffering and also prolongation of hospital stay. Every issue that affects the pharmacotherapy of the patient is a DRP, such as medication error, adverse drug events, and adverse drug reaction [18]. Elderly people are more prone to DRP due to increased prevalence of chronic disease and drug consumption. The association of the above mentioned factors, along with patient metabolic changes suffer drug-drug interaction and adverse drug event since they are hospitalized more frequently [19,20]. An important rule to follow when initiating drug therapy in the elderly population is to "start low, go slow" (Rohan et al 2004). Pharmacists have a key responsibility to respond to patient DRPs. The problem faced by the health care system is that, the pharmacist does not have an active role in the hospital, suggests that the occurrence of DRP may be high.

Role of pharmacist in solving drug therapy problems

Drug therapy problems can be reduced through therapeutic interventions by clinical pharmacists. The role of pharmacists in the health care system continues to develop gradually from dispensing functions to greater involvement in pharmaceutical care. Pharmaceutical care deals with the way patients should receive instructions for the use of drugs, medication surveillance, counseling and outcomes of care

Helper and strand defined pharmaceutical care as the responsible provision of drug therapy for the purpose of achieving definite outcome that improves the patient's quality of life. These outcomes include alleviation of symptoms and prevention, cure or slowing of progression of a disease. Other outcomes of interests include patient satisfaction, knowledge of disease state and management and improved health related quality of life. In pharmaceutical care, the direct relationship between patient safety and well being are the responsibilities of the pharmacist, who commits to honoring that trust through appropriate professional actions that are in the patient's best interest. As an accountable member of the healthcare team, the pharmacist must document the care provided. Economically, by rationalizing the drug regimen, pharmacists could prevent excess financial resources caused by prescription of wrong drugs and polypharmacy. Also, alternative drugs that is of low cost but equally effective could be altered by the clinical pharmacist, when expensive drug is given, that could not be afforded by a patient from low socioeconomic class. A pharmacist is required to review a patient's drug regimen with reference to the physician's diagnosis and prescriptions, laboratory tests results and patients past medical information. The pharmacist must therefore work very closely with the physician and patient in order to gain an accurate understanding of the appropriateness and impact of the different medications on the patient. It is the pharmacist's

responsibility to ensure that the patient is able to adhere to medication instructions in order to produce the desired outcomes. The Pharmacist has a major role to play in identifying drug therapy problems (DTPs), resolving actual drug therapy problems, and preventing potential drug related problems. This is achieved through collaboration with the patient and other health care professionals. Pharmaceutical care is therefore a multidisciplinary process. Potential and actual drug therapy problems can be identified through review of medication profile of the patient. A number of actual drug therapy problems can be resolved with patient counseling to the patient and recommendation to prescriber's. A drug therapy problem, if left unresolved, would affect the patient health or prolong the time for the patient to get well soon and also would increase the cost for the therapy. Adverse drug reactions are well documented in hospitalized and non-hospitalized patients, and they contribute significantly to morbidity and mortality. Pharmacist can reduce drug related problem and thus improve the quality of life of the patient's.

The main objective of the study was to examine the nature and frequency of drug related problem among hospitalized elderly patients and to evaluate the impact of clinical pharmacist in identifying drug related problems and their role in rectifying DRP with pharmacist intervention which in turn would improve the quality of life of the patients.

AIMS AND OBJECTIVES
Aim:
1. To identify the actual and potential drug related problem in geriatric patients.
2. To minimize the drug related problem and to improve the therapeutic outcome by pharmaceutical care provided by the clinical pharmacist.

Objectives:
1. To assess the drug related problems in geriatrics with polypharmacy.
2. To measure the risks associated for the development of DRPs in geriatrics.
3. To assess the drug usage pattern among geriatric patients.
4. To provide pharmaceutical care interventions based on the existing DRPs.
5. To improve the medication adherence by appropriate patient counseling

MATERIALS AND METHODS
Study sites: The study was conducted with patients admitted in a tertiary care hospital in Chennai.
Study design: This was a prospective study conducted at a tertiary care hospital in Chennai.
Study period: This study was conducted over a period of 9 months from August 2015 to April 2016.
Study criteria:

Inclusion criteria:
- Patients of either sex, aged more than or equal to 65 years.
- Who are on prescription medications for chronic diseases.
- Patients taking 4 or more of prescribed medication

Exclusion criteria:
- Patients who are taking other system of medications (Ayurvedic, Homeopathic medications).
- Patients who are taking Anti cancer drugs.
- Patients who are not willing to or unable to give consent to participate in the study

Study procedure:
➢ The study was conducted after getting approval from the Institutional Ethical Committee, School Of Pharmaceutical Sciences, and Vels University. [IEC/DOPV/2015/14]
➢ Patients aged 65 and above, using 4 or more prescription medications, admitted in the hospital was included in the study based upon the inclusion and exclusion criteria.
➢ Patients using 4 or more drugs were selected because polypharmacy is generally defined as 4 or more drugs. Drugs were classified according to the pharmacological category.
➢ The DRPs were collected from various departments from the tertiary care hospital.
➢ Information on Drug related problems, risk factors, age, gender; number of drugs, level of adherence were recorded and analyzed.

➢ The data collection form were reviewed to determine the presence of drug related problems (such as drug interactions, adverse drug reactions, over dosing, under dosing, untreated indication, drug used without indication, failure to receive drug, non-adherence, improper selection of drugs).

➢ Patients were interviewed on any OTC (over the counter) medications that they were taking along with the prescription medication and also upon interview if there were any medication non adherence, they were counselled to improve the adherence.

➢ Drug related problems were categorized according to PCNE classification, all data were coded and analyzed using SPSS program version 20.

➢ The Drug – related problems of elderly patients were identified with the help of guidelines and Beer's criteria.

Assessment of drug-related problems

DRP are events or circumstances involving drug therapy that actually or potentially interfere with desired health outcomes (definition by Pharmaceutical Care Network Europe [PCNE]).[1] We classified the drug related problem with the help of PHARMACEUTICAL CARE NETWORK EUROPE (PCNE) scale version 6.2 DRP (Table 1)

TABLE 1, Categories of drug related problems [1]

Categories	Explanation
Drug interaction	A combination of two or more drugs, administered by one patient that can result in a modification of the effect of at least one drug. The effect may be an undesired effect or a lack of effect of the drug.
Inappropriate drug	Drugs which are not given based on the guidelines for specific disease or specific population.
No drug clear indication	When there is a clear clinical indication, no drug is being administered.
No indication drug given	When there is no clinical indication, but a drug being administered.
Dose too low	When the dose of the drug is too low for the patient.
Dose too high	When the dose of the drug is too high for the patient.
Contraindication	A drug that is undesired because of the medical condition of the patient, which can lead to an adverse drug event or a lack of effect of the drug or a worsening of the medical condition of the patient.
Drug overuse	Can also be termed as long duration of drug usage, usage of drug longer than it is needed.
Drug duplication	Therapeutic duplication is defined as the use of two or more drugs in the same ATC classification and with similar Pharmacodynamic properties, which can lead to adverse drug events.
No drug administered	When no drug is prescribed when it is scheduled to be prescribed.
Medication chart error	Errors that occur in the medication chart of a patient.
Adverse drug reaction	A drug causing unwanted, uncomfortable, or dangerous effects.

Several guidelines to prevent drug related problems in the elderly are available; some of them that were used in this study to assess the DRP were Beers criteria is a guideline for healthcare professionals to help improve the safety of prescribing medications for older adults. Assessing care for vulnerable elders (ACOVE). It measures aim to comprehensively evaluate the medical care provided to older persons with illness. Screening Tool of Older Persons' Prescriptions (STOP/START)[11] Screening Tool to Alert to Right Treatment criteria have addressed several shortcomings of the Beers criteria although the tool medical status and clinical parameters are not taken into account. Tool to improve medication in the elderly via review (TIMER), it is a stepwise guide to assess the DRP systematically.

To measure the medication adherence of the patients, Malaysian Medication Adherence Scale (MALMAS) was used, to measure their level of adherence before and after patient counseling.

Medication records were collected from patient's case report form and also by interviewing the participants about the medications they are taking listing all the drugs prescribed and dispensed to them. DRP found where classified based on PCNE and the appropriateness of the prescription was assessed with the help of Beers criteria, START/STOP and ACOVE. All the collected data were coded and entered in statistical package for the social sciences (SPSS) program version 20.

Statistical Analysis
All the collected data's from patient case record form and from interview were entered and the statistical analysis was performed using Statistical package for the social sciences version 20 software (SPSS).
Chi- square test was done to assess the significance of patient's medication adherence before and after patient counseling. Multiple linear regression analysis was done to find the significance between the drug related problem versus age, gender, disease severity, duration of hospital stay, comorbidity and total number of drugs prescribed to the patient. The analysis showed that the number of drugs taken by the patient had a significant effect on the number of drug related problem (DRP).

RESULTS

TABLE 2, GENDER AND AGE DISTRIBUTION (N = 170)

CHARACTERISTICS		NO. OF PATIENTS	PERCENTAGE (%)
GENDER	Male	108	62.8%
	Female	62	36%
AGE	65 -74 years	64	37.2%
	75- 84 years	89	51.7%
	85 and above	17	9.9%
MEAN ± S.D		56.6±36.5	

Among the study population (n=170). The study shows that males 108(62.8%) are more affected with chronic disease than females 62(36%). The age was categorized into 3 groups such as 65-74, 75-84, and 85 and above. The table shows that, most of the patients fall between the age group of 75- 84 years 89 (51.7%) and mean of the ages was found to be 56.6±36.5.

TABLE 3, DISEASES (N=194)

DISEASES	FREQUENCY	PERCENTAGE (%)
Diabetes Mellitus	56	28.9%
Hypertension	38	19.6%
Asthma	12	6.2%
COPD	7	3.6%
Cardiovascular Disease	14	7.2%
Gastrointestinal Disease	8	4.1%
Renal Disorder	19	9.8%
Liver Disorder	11	5.7%
Thyroid Dysfunction	8	4.1%
Joint Disorder	21	10.8%

**Note: ***Participants could have more than one chronic disease.
Abbreviation: COPD, chronic obstructive pulmonary disease.
The table shows that most of the patients were suffering with diabetes mellitus 56(28.9%) and hypertension 38(19.6%).

TABLE 4, COMORBIDITIES (N= 154)

COMORBIDITIES	FREQUENCY	PERCENTAGE (%)
DM nephropathy	7	4.5%
DM foot ulcer	27	17.5%
DM retinopathy	17	11.0%
Urinary tract infection	12	7.8%
Pneumonia	11	7.1%
Anemia	12	7.8%
Seizure	4	2.6%
Dyslipedimia	7	4.5%
Insomnia	18	11.7%
Diarrhea/constipation	11	7.1%
Tuberculosis	10	6.5%
Dementia	2	1.3%

Depression	13	8.4%
Others	3	1.9%

Note: *Participants could have more than one chronic disease
Abbreviation: DM, Diabetes Mellitus

In the study population of 170, there were 7 (4.5%) with DM nephropathy, 17 (11.0%) with DM retinopathy, 12 (7.8%) with Urinary tract infection, 11 (7.1%) with Pneumonia, 12 (7.8%) with Anemia, 4 (2.6%) with Seizure, 7 (4.5%) with Dyslipedimia, 18 (11.7%) with Insomnia, 11 (7.1%) with Diarrhea/constipation, 10 (6.5%) with Tuberculosis, 2 (1.3%) with Dementia, 13 (8.4%) with Depression and most patients were suffering with DM foot ulcer 27 (17.5%)

TABLE 5, DRUGS DISTRIBUTION IN GERIATRICS (N= 296)

DRUG CLASS	FREQUENCY	PERCENTAGE (%)
Anti- Diabetic	84	28.4%
Anti- Hypertensive	49	16.6%
Anti-Anginal	26	8.8%
Anti- lipidemic	21	7.1%
Anti- Anxiolytic	6	2.0%
Anti- Bacterial	2	0.7%
Anti- Ulcer	12	4.1%
Anti- Asthmatic	17	5.7%
NSAID	16	5.4%
Anti- Convulsant	5	1.7%
Anti- Thrombolytic	3	1.0%
Anti- Depressants	2	0.7%
Anti- Emetic	8	2.7%
Anti- Tubercular	9	3.0%
Anti- Thyroxine	11	3.7%
Anti- Diuretic	10	3.4%
Anti- Histamine	12	4.1%
Other drugs	3	1.0%

Note: *Participants could have more than one comorbidity.
Abbreviation: NSAID, Non steroidal anti inflammatory drug.
The table shows that oral hypoglycemic agents and insulin 84(28.4%) are more frequently used than other medications followed by Anti-Hypertensive 49(16.6%).

TABLE 6, NO. OF DRP/ PRESCRIPTION (N=170)

NO. OF DRP/PRESCRIPTION	FREQUENCY	PERCENTAGE (%)
Less than 5	58	33.7%
Equal to or greater than 5	112	65.1%

Abbreviation: DRP, Drug related problem.

The total number of DRP per prescription was calculated and the results were as follow, 112 (65.1%) prescription had equal to or greater than 5 DRP per prescription and 58 (33.7%) prescription had less than 5 DRP per prescription.

TABLE 7, INTERVENTIONS MADE FOR DRP

TYPES OF DRP		NO. OF DRP			NO. OF INTERVENTIONS	
		Frequency		Percentage (%)	Frequency	Percentage (%)
Drug interaction	Mild	29	87	24%	39	44.8%
	Moderate	42				
	Serious	16				
Inappropriate drug		53		14.6%	46	86.7%
No drug clear indication		27		7.4%	23	85.1%
No indication drug given		18		4.9%	17	94.4%
Dose too low		13		3.5%	11	84.6%
Dose too high		21		5.8%	19	90.4%
Contraindication		12		3.3%	11	91.6%
Long Duration		31		8.5%	27	87%
Double medication		43		11.8%	36	83.7%
No drug given		19		5.2%	16	84.2%
Medication chart error		14		3.8%	14	100%
ADR		24		6.6%	23	95.8%
TOTAL		N= 362			N= 282	

Abbreviation: DRP, Drug related problem, ADR, Adverse drug reaction.

Table shows that most of the patients faced drug related problems due to drug interaction 87(24%), inappropriate drug 53(14.6%) followed by double medication 43(11.8%). Most of the DRP were rectified and improved by intervention.
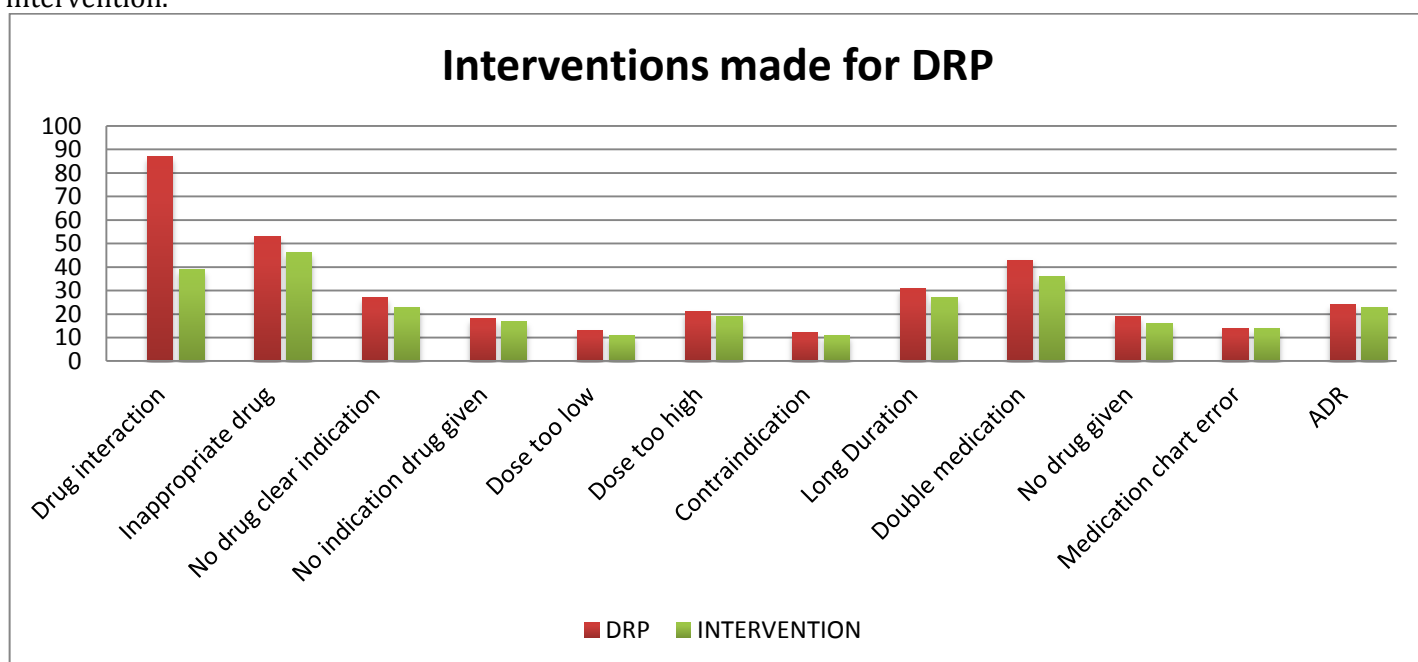

TABLE 8, TYPES OF INTERVENTION (N= 282)

TYPES OF INTERVENTIONS	FREQUENCY	PERCENTAGE (%)
Drug Initiated	46	16.3%
Dose Adjusted	78	27.7%
Drug Changed	62	22.0%
Drug Discontinued	96	34.0%

Among the pharmacist interventions (n=282) made for the Drug related problems, the types of interventions made were 46 (16.3%) Drug Initiated, 78 (27.7%) Dose Adjusted, 62 (22%) Drug Changed and 96 (34%) Drug Discontinued.

TABLE 9, COMPARISON OF MEDICATION ADHERENCE BEFORE AND AFTER INTERVENTION

GROUP	ADHERENCE	NON ADHERENCE	CHI SQUARE	P-VALUE	LEVEL OF SIGN.
BEFORE COUNSELING	92	78	16.603	P<0.0001	Highly significant
AFTER COUNSELING	157	13			

Table shows that patient shows significant increase in medication adherence after counseling. Medication and non adherence were measure with the help of medication adherence scale (MALMAS).
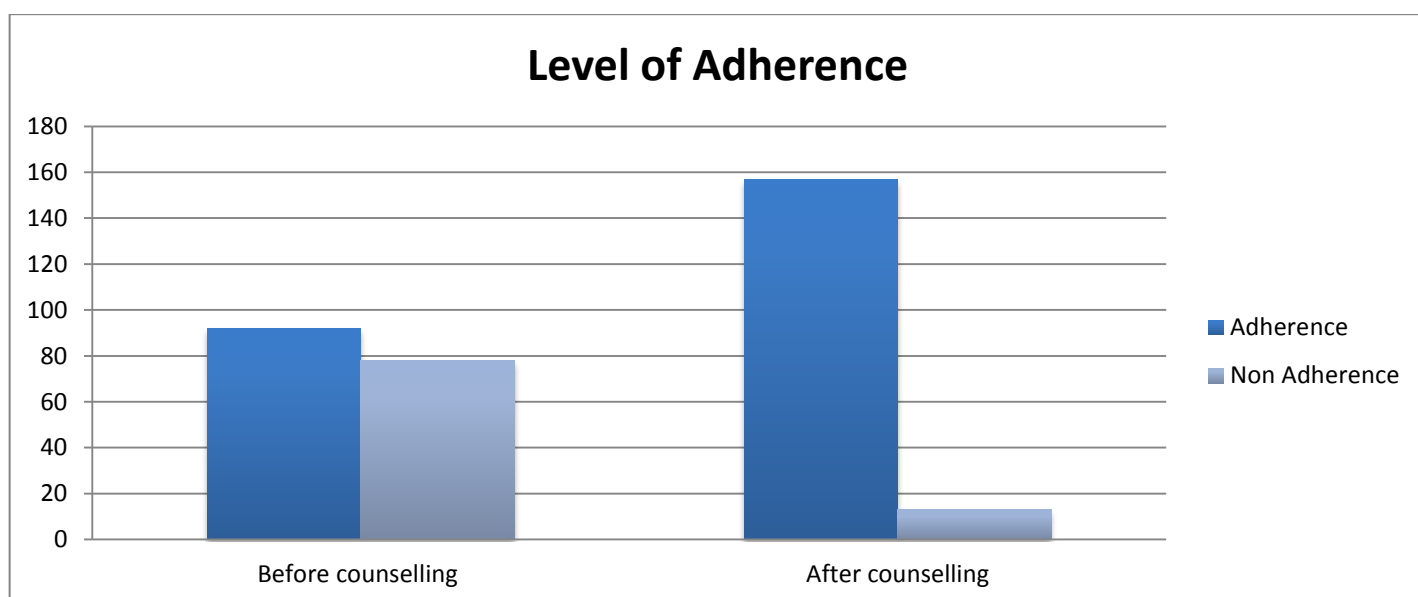

TABLE 10, REASON FOR NON ADHERENCE (N= 78)

REASON FOR NON ADHERENCE	NO. OF PATIENTS	PERCENTAGE (%)
Side effect of drug use	4	5.1%
No knowledge of drug use	24	30.8%
Not satisfied with medication	8	10.3%
Fear of side effect	12	15.4%
Forgot to use	17	21.8%
Costs too much	13	16.7%

The table shows that patients who were Non-adherent to their medications had the following reasons, side effect of drug use 4 (5.1%), no knowledge of drug use 24 (30.8%), Not satisfied with medication 8 (10.3%), Fear of side effect 12 (15.4%), Forgot to use 17 (21.8%) and cost too much 13 (16.7%).

TABLE 11, OUTCOME OF INTERVENTION (N=362)

OUTCOME	FREQUENCY	PERCENTAGE (%)
Unknown	32	8.8%
Solved	178	49.2%
Partially Solved	104	28.7%
Problem Not Solved	48	13.3%

Among the outcomes established by pharmacist intervention 32 (8.8%) contribute to unknown intervention, 178 (49.2%) of solved intervention, 104 (28.7%) of partially solved intervention and 48 (13.3%) of problem not solved.

MULTIPLE LINEAR REGRESSION ANALYSIS
TABLE 12 VARIABLES ENTERED/REMOVED[a]

Model	Variables Entered	Variables Removed	Method
1	Comorbidity		Stepwise (criteria: Probability-of-F-to enter<=.050, probability-of-F-to-remove>=.100).
	No of drugs prescribed		Stepwise (criteria: Probability-of-F-to-enter<=.050, probability-of-F-to-remove>=.100).
	Disease		Stepwise (criteria: Probability-of-F-to-enter<=.050, probability-of-F-to-remove>=.100).
	Age		Stepwise (criteria: Probability-of-F-to-enter<=.050, probability-of-F-to-remove>=.100).
	Duration of hospital stay		Stepwise (criteria: Probability-of-F-to-enter<=.050, probability-of-F-to-remove>=.100).
	Gender		Stepwise (criteria: Probability-of-F-to-enter<=.050, probability-of-F-to-remove>=.100).

a. Dependent Variable: DRP

In this model the dependent variable is the DRP (Drug related problem) and it depends upon the comorbidity, no of drugs prescribed, disease, age, duration of hospital stay and gender.

Model	Variables Entered	Variables Removed	Method
2	Duration of hospital stay		Stepwise (criteria: Probability-of-F-to-enter<=.050, probability-of-F-to-remove>=.100).

a. Dependent Variable: No. Of Drugs prescribed
In this model the dependent variable is the no of drugs prescribed and it depends upon the duration of hospital stay.

TABLE 13 MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831[a]	.691	.680	.28309
2	.659[b]	.434	.430	.37529

a. Predictors: (Constant), Comorbidity, No Of Drugs Prescribed, Disease, Age, Hospital Stay, Gender
b. Predictors: (Constant), Duration of hospital stay.

TABLE 14 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	29.225	6	4.871	60.780	.000[a]
Residual	13.063	163	.080		
Total	42.288	169			
Regression	18.127	1	18.127	128.703	.000[b]
Residual	23.661	168	.141		
Total	41.788	169			

a. Predictors: (constant), Comorbidity, No of Drugs Prescribed, Disease, Age, Hospital Stay, Gender.
Dependent Variable: DRP
b. Predictors: (constant), Duration of hospital stay
   Dependent Variable: No. Of drugs prescribed

TABLE 15 COEFFICIENTS

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(constant)	3.191	.105		30.480	.000
Gender	-.058	.088	-.056	-.659	.015
Age	.079	.044	.100	1.783	.077
Duration of hospital stay	-.222	.051	-.276	-4.378	.000
Disease	-.383	.050	-.384	-7.601	.000
No of drugs prescribed	-.039	.059	-.039	-.666	.066
Comorbidity[a]	-.480	.082	-.477	-5.831	.000
(constant)	.630	.087		7.222	.000
Duration of hospital stay[b]	.526	.046	.659	11.345	.000

a. Dependent Variable: DRP
b. Dependent Variable: No. Of drugs prescribed
ANOVA, REGRESSION MODEL AND CHI SQUARE TEST was applied in the study and the tests were concluded that the NO OF DRP'S PER PRESCRIPTION depends upon the GENDER, AGE, DURATION OF HOSPITAL STAY, DISEASE, NO OF DRUGS PRESCRIBED AND COMORBIDITY and also the DURATION OF HOSPITAL STAY depends upon NO OF DRUGS PRESCRIBED.

DISCUSSION
Among the study population (n=170). The study shows that males 108(62.8%) are more affected with chronic disease than females 62(36%). The age was categorized into 3 groups such as 65-74, 75-84, and 85 and above. The table 2, shows that, most of the patients fall between the age group of 75- 84 years 89 (51.7%) and mean of the ages was found to be 56.6±36.5.
 (Table 3) Most of the patients were suffering with diabetes mellitus 56(28.9%) and hypertension 38(19.6%).
In the study population of 170, there were 7 (4.5%) with DM nephropathy, 17 (11.0%) with DM retinopathy, 12 (7.8%) with Urinary tract infection, 11 (7.1%) with Pneumonia, 12 (7.8%) with Anemia, 4 (2.6%) with Seizure, 7 (4.5%) with Dyslipedimia, 18 (11.7%) with Insomnia, 11 (7.1%) with Diarrhea/constipation, 10 (6.5%) with Tuberculosis, 2 (1.3%) with Dementia, 13 (8.4%) with Depression and most patients were suffering with DM foot ulcer 27 (17.5%)
The table 5, shows that oral hypoglycemic agents and insulin 84(28.4%) are more frequently used than other medications followed by Anti-Hypertensive 49(16.6%).
The total number of DRP per prescription was calculated and the results were as follow, 112 (65.1%) prescription had equal to or greater than 5 DRP per prescription and 58 (33.7%) prescription had less than 5 DRP per prescription.
Table 7, shows that most of the patients faced drug related problems due to drug interaction 87(24%), inappropriate drug 53(14.6%) followed by double medication 43(11.8%). Most of the DRP were rectified and improved by intervention.
Among the pharmacist interventions (n=282) made for the Drug related problems, the types of interventions made were 46 (16.3%) Drug Initiated, 78 (27.7%) Dose Adjusted, 62 (22%) Drug Changed and 96 (34%) Drug Discontinued.
Table 9, shows that patient shows significant increase in medication adherence after patient counseling. A statistical chi-square test was done to identify the level of significance before and after interventions. Chi square value was found to be 16.603 and P value <0.0001. Medication and non adherence were measure with the help of medication adherence scale (MALMAS).
The table 10, shows that patients who were Non-adherent to their medications had the following reasons, side effect of drug use 4 (5.1%), no knowledge of drug use 24 (30.8%), Not satisfied with medication 8 (10.3%), Fear of side effect 12 (15.4%), Forgot to use 17 (21.8%) and cost too much 13 (16.7%).
Among the outcomes established by pharmacist intervention 32 (8.8%) contribute to unknown intervention, 178 (49.2%) of solved intervention, 104 (28.7%) of partially solved intervention and 48 (13.3%) of problem not solved.

Multiple linear regression analysis was done (table 12), having DRP as a dependent variable and age, gender, disease severity, duration of hospital stay, comorbidity and total number of drugs given as predictors ANOVA, REGRESSION MODEL AND CHI SQUARE TEST was applied in the study and the tests were concluded that the no of DRP's per prescription depends upon the gender (p value<0.015), age (p value<0.077), duration of hospital stay (p value<0.000), disease (p value<0.000), no of drugs prescribed (p value<0.066) and comorbidity (p value<0.000) and also the duration of hospital stay (p value<0.000) depends upon no of drugs prescribed. Age, gender, duration of hospital stay, disease, comorbidity and total number of drugs prescribed has significant association between the risk factors of drug related problems. Overall study shows that drug related problems are more in this specific population and can be improved by clinical pharmacist's intervention, which would lead to better therapeutic care of the patient which in turn improves the quality of life of geriatric patients. Therefore an important task for the clinical pharmacist is to identify, resolve and prevent the occurrence of DRP.

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