International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 01 Issue 08 Oct 2016, ISSN No. – 2455-8737
Available online at - www.ijirms.in

Open Access Journal www.ijirms.in ISSN - 2455-8737

STUDY ON APPROPRIATENESS OF PRESCRIBING PATTERNS IN GERIATRIC PATIENTS WITH RENAL FAILURE AT A TERTIARY CARE TEACHING HOSPITAL

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Abstract:

Since the beginning of the 20th century, the number of elderly people is steadily increasing. The effect of advancing age in decreasing renal reserve and the associated comorbid conditions of the elderly patients increase the risk for kidney injury. Patients with CKD require appropriate adjustment of nephrotoxic and renally cleared medications to ensure safe and effective pharmacotherapy. In particular, older patients are at a higher risk of developing advanced disease and related adverse events caused by age-related decline in renal function and the use of multiple medications to treat comorbid conditions and inappropriate dosing can cause toxicity or ineffective therapy.

The objective of the study was to analyze the prescribing pattern of drugs in renally impaired patients, to identify the inappropriate drugs prescribed, do necessary dose adjustments and to evaluate drug interactions. A prospective interventional study was conducted. Data was collected from patient records during regular ward rounds. The collected data was analyzed thoroughly using Truven Health Micromedex Solutions software.

The prevalence of renal failure in geriatric population was found to be 24%. Among the geriatric population, renal failure was found significantly more in males. The degree of renal impairment was assessed and the study population was categorized according to K/DOQI and was found that a majority falls in the ESRD category (48.33%). The required dosage adjustments were identified and rectified with proper interventions. It was found that 42.85% of drugs required dose reduction, 28.57% of drugs require dose increment and 28.57% of drugs were withdrawn. A total of 33.3% major interactions were found and diuretics were found to be involved in a majority of the interactions.

The study signifies the importance of clinical pharmacists having an essential role to provide safe and effective therapy for patients with renal failure. The pharmacists need to identify the drugs requiring dosage adjustments and manage the drug interactions by resolving the same; can improve the safe and effective use of drugs in renal failure cases.

Keywords: - Geriatric, renal failure, CKD, dose adjustments, Cockcroft- Gault equation, drug interactions.

INTRODUCTION:

Globally the elderly populations are found to be steadily increasing. In India, the number of elderly people has increased by 54.77% in the last 15 years. As the age advances, health problems proportionately increase. After the age of 50 years, the number of nephrons progressively declines, in addition, up to 35% of nephrons show clinically important evidence of sclerosis. The effect of advancing age in decreasing renal reserve and the associated comorbid conditions of the elderly patients increase the risk for kidney injury. [1] Medication safety in patients with CKD is a growing concern. This is particularly relevant in older adults due to underlying CKD. Some of the medication related problems in the elderly are polypharmacy, inappropriate medication use, errors in dose and administration frequency of drugs, ADRs, drug interactions and poor patient compliance.[2]

As the geriatric population with renal failure rapidly grow, it is vital to provide the care they deserve. Elderly people with CRF require constant monitoring due to multiple comorbidities.[3]. In renal failure patients, the clinical pharmacist has a greater role to play by understanding the patient's current renal status. Necessary interventions must be initiated for the safe and effective use of drugs in geriatric patients with CKD.

OBJECTIVES:

The main objectives of the our study was to analyze the prescribing pattern of drugs in renal failure patients, to identify the inappropriate drugs prescribed, to identify the

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drugs that require dosage adjustment, to evaluate drug interactions and to make necessary interventions for the identified drug related issues.

METHODOLOGY:

A prospective –interventional study was conducted for duration of 6 months in a 700 bedded multi-specialty hospital located at South India. Regular ward rounds were carried out in the study department and each patient's medication profile was reviewed. A total of 60 patients were included according to inclusion criteria. A patient information form has been prepared, to inform the patient or the caregivers about the purpose and their consent was obtained. The data from medical chart were recorded in customized data entry form. The prescribed drugs were evaluated and the inappropriately prescribed drugs were identified and categorized. Necessary dosage adjustments for the drugs to be used with caution in renal failure patients has been done based on the creatinine clearance obtained by Cockcroft-Gault equation. The equation calculates creatinine clearance, which is considered to be the most reliable marker to assess the degree of renal impairment. Other medication problems such as drug interactions were monitored and reported.

RESULTS & DISCUSSION:

The total number of geriatric patients admitted during the study period was 250. The prevalence of renal failure in geriatric patients was found to be 60(24%). The results reveal that nearly one in four of geriatric patients are suffering from renal failure. The increasing prevalence of renal impairment in geriatric patients is due to the presence of risk factors such as CVD, diabetes mellitus and hypertension.

The gender categorization of study group revealed that male population (65%) were more predominantly suffering from renal failure than female population (35%). A.K Singh et al (2013)[4], in their study observed that in geriatrics, 55.1% males and 44.9% females were affected with renal failure. The factors suggested for the gender disparity may include diet, kidney and glomerular size, differences in glomerular hemodynamics and the direct effects of sex hormones. The mean age of the study subjects was found to be 71.1±5.71 years.The age categorization reveals that 78.33% of patients were found to be in the age group of 65-74 years. 18.33% in the age group of 75-84 years and 3.33% of the population were more than 85years old

The major comorbidities present in the study population were hypertension (56.67%) followed by diabetes mellitus (55%) and CVDs (26.67%). Ramdial et al (2011)[5] in their study found that 32.1% of their study population was affected with both diabetes and hypertension and they also pointed out that hypertension was most commonly associated with renal failure.The presence of diabetes mellitus and hypertension causes significant damage to the renal blood vessels, thereby injuring the kidneys.

The mean serum creatinine concentrations were calculated and it was found to be 4.54±2.90 mg% (Table -1). The serum creatinine concentrations were categorized into different ranges and it was found that 7 (11.66%) patients had normal creatinine levels, 20 (33.33%) patients had mild increase in creatinine levels, 16 (26.66%) patients had a moderate increase in creatinine levels and 17 (28.33%) patients had a drastic increase in creatinine levels A. X. Garg et al (2004) [6], reported in their study that a majority of study subjects had increased serum creatinine concentrations.

Table No. 1 Serum Creatinine Concentrations

Serum creatinine concentrations	Number of patients (%) (n=60)
Normal (0.6- 1.4 mg %)	7 (11.666%)
Mild (1.4- 3.4 mg %)	20 (33.333%)
Moderate (3.4- 6.4 mg %)	16 (26.666%)
Severe (>6.4 mg %)	17 (28.333%)

The mean urea concentration for the study population was found to be 107.75±48.92 mg%. The study shows that 10(16.67%) had urea concentrations in the normal range, 40 (66.66%) patients had mildly increased urea levels, 7 (11.66%) patients had moderately increased urea levels and 3 (5%) patients had severely increased urea levels (Table - 2). A study conductedby S.V George et al (2015) [7], reported that 70% had blood urea levels between 50- 130 mg%.

Table No. 2 Serum Urea Concentrations

Serum urea concentrations	Number of patients (%) (n=60)
Normal (0-45 mg %)	10 (16.66%)
Mild (46- 135 mg %)	40 (66.66%)
Moderate (136-225 mg %)	7 (11.66%)
Severe (226- 315 mg %)	3 (5%)

The number of drugs prescribed for the patients were calculated and as a mean, 12.25±3.65 drugs were taken by the study population. P.R.Shankar et al (2010) [8] observed in their study that each patient consumed 7.73 ± 4.24 mean number of drugs. The rise in number of drugs prescribed per patient is largely attributed to the growing number of drug related problems and requires close monitoring of patients.

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The drugs were analyzed using Truven Health's Micromedex Solutions and necessary renal dose adjustment was done based on GFR. The drugs prescribed in the study population were evaluated in terms of dosage appropriateness. It was found that 21 drugs were inappropriately prescribed. The inappropriate drugs needs necessary dose adjustment or they have to be discontinued. 9(42.85%) drugs required dose reduction, 6(28.57%) drugs require dose increment and 6(28.57%) drugs were contraindicated in renal failure (Table 3). The drugs needed dose adjustment and modifications are reported in the study site and the interventions were done (Table 4). A study performed by H.S Blix et al (2006) [9], concluded that most of the drug related problems (DRP) seen in their renal failure study population was due to contraindicated drugs and errors in dose adjustments. This indicates that, while prescribing for renal failure patients; utmost care must be taken to prevent toxicity.

Table No. 3 Drugs Requiring Dose Adjustments

Types of dose adjustments	No. of drugs (%) (n=60)
Dose reduction	9(42.85%)
Dose increment	6(28.57%)
Contraindicated	6(28.57%)

Table No: 4 Drugs Requiring Dosage Adjustment

S. No.	Drugs prescribed	Errors occurred	As per prescription	Adjusted dose	Intervention made
1.	Prazosin	5	5 mg OD	1 mg TID	Dose reduction
2.	Nebivolol	4	5 mg OD	2.5 mg OD	Dose reduction
3.	Piperacillin/ Tazobactam	5	4.5 g BD	3.5 g BD	Dose reduction
4.	Ranitidine	4	150 mg BD	50 mg OD	Dose reduction
5.	Diltiazem	1	90 mg BD	120 mg OD	Dose reduction
6.	Digoxin	4	0.25 mg OD	0.125 mg OD	Dose reduction
7.	Amlodipine	1	5 mg OD	2.5 mg OD	Dose reduction
8.	Glyceryl trinitrate	1	2.6 mg BD	0.2 mg to 0.4 mg BD	Dose reduction
9.	Torsemide	3	20 mg OD	10 mg OD	Dose reduction
10.	Voglibose	1	0.25 mg OD	200-300 mcg TID	Dose increment
11.	Etophylline + theophylline	1	110 mg TID	400- 600 mg OD	Dose increment
12.	Paracetamol	5	650 mg BD	650 mg Q6h	Dose increment
13.	Gabapentin	1	100 mg BD	200-700 mg BD	Dose increment
14.	Sevelamer Hydrochloride	1	400 mg TID	800 mg TID	Dose increment
15.	Darbepoeitin alpha	1	25 mcg OD	45mcg/kg OD	Dose increment
16.	Metformin	3	500 mg BD	Avoid	Withdrawn
17.	Fenofibrate	1	145 mg OD	Avoid	Withdrawn
18.	Esomeprazole	1	20 mg OD	Avoid	Withdrawn
19.	Aspirin	4	75mg OD	Avoid	Withdrawn
20.	Levosulpiride	1	25 mg BD	Avoid	Withdrawn
21.	Acebroxyphylline	1	100 mg BD	Avoid	Withdrawn

A total number of 42 drug interactions were found out of 60 prescriptions. Among the drug interactions identified 33.3% were major interactions, 57.14% were moderate interactions and 9.54% were minor interactions (Table 5). Among the different therapeutic classes, diuretics were causing majority of drug-drug interactions. The drug interactions which worsen the renal impairment were identified and necessary management measures were taken to prevent the interactions through proper interventions.

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Table No. 5 Drug Interactions

Drug Interactions	No. of interactions
Major	14
Moderate	24
Minor	4

During the hospital stay of the patients, most of the drugs were administered through IV route and thus there is increased risk of IV incompatibilities that may occur. On analyzing IV medications given, various incompatibilities were identified (Table 6). In a study conducted by E.V Sharon et al (2014)[10] it was reported that most of the drug related problems were due to IV incompatibilities which can be reduced by following SOPs.

Table No: 6 IV Incompatibilities (n=60)

S.No	Drugs		Inference	No of cases (%)
1.	Insulin	Piperacillin+Tazobactam	Incompatibility	13(44.82)
2.	Pantoprazole	Ramosetron	Incompatibility	3(10.34)
3.	Pantoprazole	Ondansetron	Incompatibility	3(10.34)
4.	Sodium bicarbonate	Calcium gluconate	Incompatibility	1(3.4)
5.	Furosemide	Ondansetron	Incompatibility	1(3.4)
6.	Pantoprazole	Insulin	Caution	11(37.93)
7.	Pantoprazole	Piperacillin+Tazobactam	Caution	9(31.03)
8.	Sodium bicarbonate	Pantoprazole	Caution	5(17.24)
9.	Pantoprazole	Furosemide	Caution	2(6.8)
10.	Ceftriaxone	Ondansetron	Caution	1(3.4)

CONCLUSION:

Our study was carried out in order to understand the prescribing patterns of drugs in geriatric patients with renal impairment and to evaluate them in terms of dosage appropriateness. During the course of the study, it was seen that nearly half of the study population needed dosage adjustments. This signifies the need for dosage monitoring in the renal failure patients. Customarily, the patients' degree of renal impairment is not taken into consideration while prescribing. The current study highlights the importance of analyzing individual patients' prescriptions for the right dose, possible drug- drug interactions and other drug related problems. Continued collaboration with clinical pharmacist should be encouraged for quality improvement in patients with renal impairment and to enhance patient care as a whole.

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