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### Study on prescribing pattern of diuretic agents and occurrence of abnormal electrolyte levels among cardiovascular disease patients in a private corporate hospital

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#### ABSTRACT

Diuretics are used extensively in hospitals and in community medical practice for the management of cardiovascular diseases. A prescription monitoring study for diuretic drugs was undertaken in the cardiology department of a 700 bedded private corporate hospital. The purpose of this study was to investigate the prescribing patterns of diuretics in CVDs patients and assess the abnormalities in electrolyte levels due to diuretic use. Prospective observational study of 9 months duration was undertaken from December 2014 to August 2015. A total number of 133 patients with various CVDs disorders were enrolled in the study. The utilization pattern of diuretic evaluated, loop diuretics were most widely used in patients with CVDs. Electrolyte abnormality in diuretic users were analysed, it was found that 36.09% patients were having hypokalemia followed by hyperkalemia, hyponatremia, hypochloremia. Patients with hypokalemia were categorized into three groups based on potassium level. The results reveal that 48.37% patients were having mild hypokalemia 20.38% were with moderate hypokalemia and 31.25% patients were with severe hypokalemia. The statistical evaluation signifies the association between the age and hypokalemia. The rate of prevalence of hypokalemia was found to be more when the age increases. The present study demonstrated the positive impact on diuretic management and pharmaceutical care in cardiovascular disease patients. The elderly populations are more affected abnormality by diuretic therapy, monitoring of potassium levels in the elderly population was a major factor to reduce the adverse events.

**KEYWORDS:** Cardiovascular diseases, Diuretic, Electrolyte abnormality, hypokalemia.

#### INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death in the world and accounts for more than one million deaths each year in the United States.<sup>1</sup>In 1998 more than two million deaths occurred in the United States and CVD was listed as the primary or contributing cause in 70% of cases<sup>2</sup>. According to the Centers of Disease Control and Prevention and the

National Health and Nutrition Examination Survey III, the probability at birth of dying from CVD is 47%, compared to 22% from cancer, 2% from diabetes, and less than 1% from human immunodeficiency virus (HIV) disease.<sup>3</sup> CVD includes hypertension, coronary artery disease, congestive heart failure (CHF), congenital cardiovascular defects, and stroke. Although these diseases are associated with a high mortality, the

associated morbidity affects all walks of life and has a great impact on the quality of life of affected individuals. Monitoring a person on diuretics is necessary to assess response to treatment and to prevent adverse events, particularly electrolyte imbalance and decline in renal function.<sup>4,5,6</sup> Worldwide the role of clinical pharmacists is becoming valuable and expanding in an alarming rate especially in developed countries. Clinical Pharmacists has important role in the identification and management of drug therapy related problems among hospitalized patients. Accordingly, it was found that clinical pharmacists were able to detect drug related problems during the management of CVDs and provide evidence based recommendation to address the problems identified.<sup>7,8</sup> Previous studies have demonstrated that involvement of clinical pharmacists in integrated patient care models can decrease CVD risk factors and improve outcomes. Diuretics are used extensively in hospitals and in community medical practice for the management of cardiovascular diseases.<sup>9</sup> They are used frequently as the first line treatment for mild to moderate hypertension and are an integral part of the management of symptomatic cardiovascular diseases.<sup>10</sup> Although diuretics have been used for several decades, there is still some ambiguity and confusion regarding the optimal way of using diuretics. The various substances used as diuretics can have serious side effects, such as volume depletion, ototoxicity and the induction of electrolyte disorder. A study among cardiovascular patients utilizing diuretics report that serum potassium levels were significantly lower or higher in patients treated with diuretics.<sup>11</sup> Patient of heart failure require more frequent monitoring than those with hypertension because they are more likely to be taking multiple medicines and their clinical condition is often less stable.<sup>12</sup> Based on the evidences obtained from the literatures the study was decided to evaluate prescription pattern of various diuretic in CVDs and assess the prevalence of electrolyte abnormality by the use of diuretics. The study also focused on the

role of Clinical Pharmacist in the management of electrolyte abnormality due to diuretic use.

## MATERIALS AND METHODS

The study was conducted in a 700 bedded private tertiary care hospital. A Prospective observational study of 9 months duration was done in the period of December 2014 to August 2015. Prescriptions with diuretic agents were identified during regular ward rounds. Specially designed data entry format was used to enter the details of the patient. Patients with insufficient data in their records and pregnant woman's and children's were excluded from the study. The data were analyzed to describe prescribing patterns of diuretics, changes in electrolyte levels and appropriateness of the prescribed diuretics. The result was subjected to statistical evaluation.

## RESULTS AND DISCUSSION

A total number of 133 patients were involved in the study as per the inclusion criteria. Among them 86(64.66%) were males and 47(35.33%) were females. The study result reveals that prevalence rate of CVDs in female population was lower than that of male population. The age categorization of the patients was done, majority of the patients 65(48.87%) were in the age group of 50-59 years, 19(14.28%) were in 60-69 years, 18(13.53%) were in 70-79 years, 15(11.27%) were in 40-49 years, 13(9.7%) were in the age group of 30-39 years, 2(1.5%) was above 80 years and 1(0.75%) was below 30 years. The majority of cardiovascular disease patients with diuretic use were above 40 years. An attempt was made to categorize the number of diuretics prescribed in the study population. Among the 133 patients, 116(87.21%) patients received single diuretic and 17(12.78%) patients received a combination therapy of diuretics. The utilization pattern reveals three classes of diuretics were utilized in the study population. Loop diuretics were most widely used in 83(62.4%) patients, potassium sparing diuretics taken by 42(31.57%) patients and thiazide diuretic were utilized by 8(6.01%) patients.[Table No: 1]

**Table No.1: Utilization pattern of diuretics**

Sl. No.	Drugs	No. of Patients (N=133)	Percentage (%)
1	Thiazide	8	6.01
2	Loop	83	62.4
3	Potassium sparing	42	31.57

The lab values of the study population were analyzed to identify various kinds of electrolyte abnormalities. There were 64 patients suffering from various electrolyte abnormalities and the rest were not having any abnormalities. The results reveals that 48(36.09%) patients were having hypokalemia, 4(6.25%) had hyperkalemia, 7(10.93%) had hyponatremia, 3(4.68%) had hypochloremia, and

2(3.12%) had hypocalcemia [Table No.2]. Patients with hypokalemia were categorized into three groups based on their potassium levels. 23(48.37%) patients were having mild hypokalemia (3.0-3.4mmol/L), 10 (20.38%) were with moderate hypokalemia (2.5-2.9mmol/L) and 15(31.25%) patients were with severe hypokalemia (<2.5mmol/L) [Table No.3]

**Table No.2: classification of electrolyte abnormalities**

Sl. No.	Electrolyte Abnormality	No. of Patient (n=64)	Percentage %
1	Hypokalemia	48	36.09
2	Hyperkalemia	4	6.25
3	Hyponatremia	7	10.93
4	Hypochloremia	3	4.68
5	Hypocalcemia	2	3.12

**Table No.3: Classification of patients with hypokalemia**

Sl. no.	Class of hypokalemia	No. of Patients (N=48)	Percentage %
1	Mild Potassium level (3.0- 3.4mmol/L)	23	47.91
2	Moderate Potassium level(2.5-2.9mmol/L)	10	20.83
3	Severe Potassium level (<2.5mmol/L)	15	31.25

The statistical evaluation signifies the association between the age and hypokalemia. The rate of prevalence of hypokalemia due to diuretic use was found to increase when the age increases. Statistical analysis also reveals the association between gender and plasma potassium level as a continuous variable or when the presence of hypokalemia was considered as a binary variable. The age is correlated negatively with potassium level in the Pearson correlation method (p=0.01).

## CONCLUSION

The result reveals electrolyte abnormality is more common in diuretic users, especially in the level of potassium. The elderly population is more affected by diuretic therapy, monitoring of potassium levels in the elderly population is key factor to reduce the adverse events. The study demonstrated the positive impact on diuretic management and pharmaceutical care in cardiovascular disease patients. The various factors which have influenced these positive changes include continuous monitoring of patients for the sign

of risk and patient education, about the risk factors associated with diuretic therapy. Pharmacists can have a significant role in monitoring electrolyte abnormality, signs of electrolyte abnormalities and

management of abnormal electrolyte levels in CVD patients with diuretic use. Long term pharmaceutical care will have added benefits to the patients in improving and maintaining their quality of life.

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