

## ORIGINAL ARTICLE

# Frequency of Hyponatremia in Patients with Chronic Kidney Disease in a Tertiary Care Hospital

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## ABSTRACT

**Objectives:** To assess the frequency of hyponatremia in patients with chronic kidney disease.

**Materials and Methods:** The design of this study was cross sectional study design. This study was conducted in the Department of Nephrology, in a DHQ Hospital Faisalabad. Totally 179 patients who were suffering from chronic kidney disease were enrolled. A 3ml blood samples were taken from each patient and sent for the measurement of electrolytes to the hospital laboratory. A unique number will be given to each sample. All the demographic details and study results were recorded on a predesigned data collection proforma.

**Results:** Out of total 179 patients, 105 were male and 74 were female with mean age of  $40.91 \pm 12.13$  years. The most common age group was 20-35 years in which 76 (42.5%), followed by 36-50 years in which 52 (29.0%) and 51 (28.5%) patients were in the age group of < 60 years. 41.9% patients have hyponatremia while 104 (58.1%) patients do not have hyponatremia. Frequency distribution of different variables in patients with respect to Hyponatremia was done and it was noted that P-value was not significant.

**Practical Implication:** In human Hyponatremia develops as a result of the kidney's inability to emit extra water, particularly in chronic kidney disease (CKD). In CKD the human kidney fails to regulate water homeostasis. The main aim of this study was to determine the frequency of hyponatremia in CKD patients.

**Conclusion:** It is concluded that in most of the CKD patients, hyponatremia was developed. And also, hyponatremia is age dependent so in elder patients the hyponatremia prone to develop.

**Keywords:** Hyponatremia, Chronic Kidney Disease, Frequency, Laboratory, Variables, Symptom.

## INTRODUCTION

Hyponatremia is a life-threatening disorder worldwide. Its occurrence rate in varying in hospitalized patients is up to 4%-35%. A serum sodium (Na) concentration of less than 135 mEq/l is considered as hyponatremia (1, 2). The United States guidelines recommended daily sodium intake of 2.3 g per day (3). Symptom of hyponatremia includes: gastrointestinal manifestations like nausea, malaise, and neurological manifestations such as confusion, lethargy, headache, disturbed and consciousness and in severe condition it leads to seizures and coma.

According to the joint European guidelines, in adults the hyponatremia is classified as mild: in which the Na concentration is in the range of 130-134 mmol/l, moderate: in which Na concentration is in the range of 125-129 mmol/l, and profound: in which the Na concentration is less than 125 mmol/l (4, 5). Hyponatremia may be chronic or acute (6). In acute case the onset of symptoms occur in less than 48h while in chronic case the onset of symptoms occur after 48 h (7). Most of the individuals develops chronic condition. Hyponatremia is one of the most common electrolyte abnormalities that has been described primarily in hospitalized patients; the prevalence of hyponatremia in hospitalized patients has been reported to be as high as 42% in some studies. Hyponatremia has been associated with various adverse clinical outcomes such as increased mortality, length of inpatient stay, gait imbalance and falls, rhabdomyolysis, and bone fractures (3). Additionally, hyponatremia has also been linked to significantly increased healthcare costs. Most of the studies that examined outcomes associated with hyponatremia studied hospitalized patients at single medical centers, and many restricted their analyses to patients with various preexisting pathological conditions known to cause hyponatremia, such as congestive heart failure (CHF) and liver cirrhosis (5). Although most studies that examined outcomes associated with abnormal serum sodium levels have focused on low serum sodium (hyponatremia), elevated serum sodium (hypernatremia) has also been associated with an increase in mortality in hospitalized patients. Patients with chronic kidney disease (CKD) may be more susceptible to the development of dysnatremias by virtue of their diminished ability to

maintain water homeostasis in the face of decreasing kidney function. Despite this, other than a single study in hemodialysis patients, to our knowledge there have been no attempts to explore the association of abnormal serum sodium levels in patients with CKD (6).

In human Hyponatremia develops as a result of the kidney's inability to emit extra water, particularly in chronic kidney disease (CKD). In CKD the human kidney fail to regulate water homeostasis (8). The main aim of this study was to determine the frequency of hyponatremia in CKD patients.

**Objective:** To assess the frequency of hyponatremia in patients with chronic kidney disease.

## MATERIALS AND METHODS

**Study Design and setting:** This Cross-sectional Study was done at the department of nephrology in a DHQ Hospital Faisalabad.

**Duration of the study:** Duration of the study was 6 months (Dec 2021 – June 2022).

**Sample Size:** By using the formula  $Z_{2pq}/d_2$ , the Sample size of 179 patients was calculated by keeping the following parameter

Level of significance= 5%

Prevalence of disease is 13.5% (9).

**Sampling Technique:** Consecutive non probability sampling technique was done for the recruitment of affected individuals.

### Inclusion Criteria:

- Patients suffering from chronic kidney disease.
- Patients of 20-60 years of age.
- Both genders.
- Patients who will be willing to give consent.

### Exclusion Criteria:

- Patients suffering from COPD.
- Patients suffering from liver disease, carcinoma and renal impairment.
- Any congenital disease.
- Patients suffering from thyroid disease (hypothyroidism or hyperthyroidism).

**METHODS**

Totally 179 patients who were suffering from chronic kidney disease were enrolled in this study. Approval was obtained from hospitals ethical committee. Informed consent was obtained from the patients. The purpose of the study was explained to the patients. A predesign questionnaire were used to collect data after clinical examination of the patients. Demographic data were taken from each patient and duration of illness was noted. 3 ml blood samples were taken from each patient and sent for the measurement of electrolytes to the hospital laboratory. A unique number will be given to each sample.

**Statistical Analysis:** SPSS (version 25.0) was used for the analysis of data. The data was presented in the form of table and graph.

**RESULTS**

Totally 179 affected individuals were enrolled, out of which 105 were male and 74 were female with mean age of 40.91±12.13 years (Table 1, Fig 1-0). The most common age group was 20-35 years in which 76 (42.5%), followed by 36-50 years in which 52 (29.0%) and 51 (28.5%) patients were in the age group of < 60 years (Table 2, Fig 2-0).

Table 1: Frequency of Patients According To Gender (n=179)

Variable	Frequency	Percentage
Gender:		
Male	105	58.7
Female	74	41.3
	Mean	SD
Age (Years)	40.91	12.13
Duration of disease (Month)	10.17	4.29

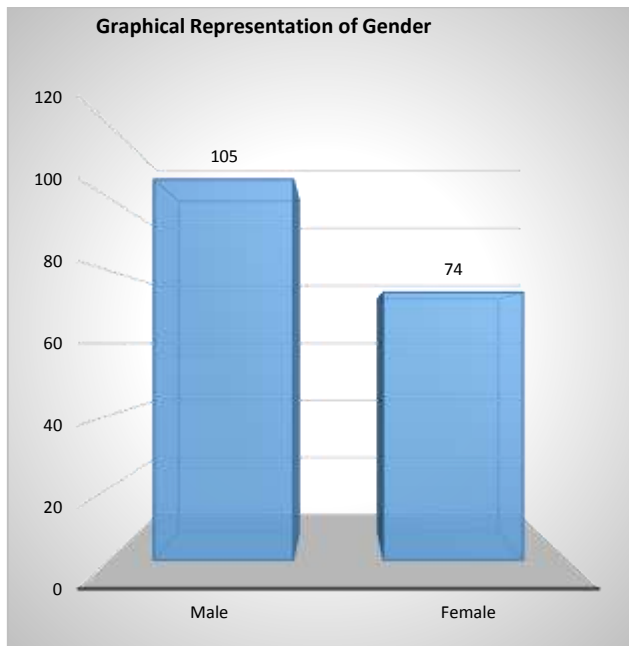


Figure 1: Graphical Representation of Gender

Table 2: Frequency Of Patients According To Age Group (n=179)

Age Group (Years)	Frequency	Percentage
20-35	76	42.5
36-50	52	29.0
< 60	51	28.5
Total	179	100.0

Out of total patients, 75 (41.9%) patients have hyponatremia while 104 (58.1%) patients do not have hyponatremia.

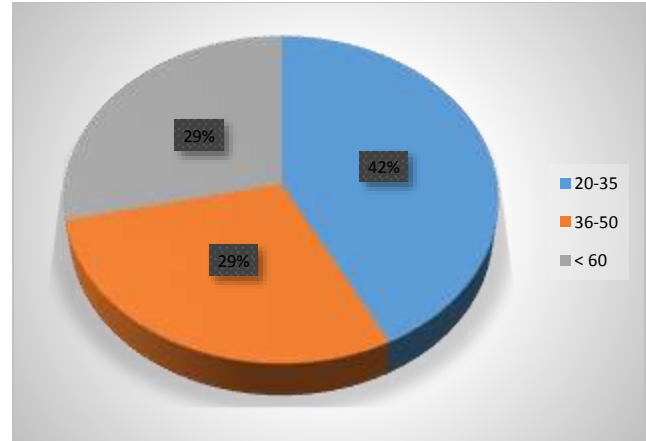


Figure 2: Graphical Representation of Distribution of Patients According to Age Group (n=179)

Table 3: Frequency of Patients According to Hyponatremia (n=179)

Hyponatremia	Frequency	Percentage
Yes	75	41.9
No	104	58.1
Total	179	100.0

Table 4: Frequency Distribution of Different Variables in Patients with Respect to Hyponatremia (n=179)

Age group (years)	Hyponatremia		P-Value
	Yes	No	
20-35	27	49	0.33
36-50	24	28	
< 60	24	27	
Gender			0.99
Male	44	61	
Female	31	43	
Duration of disease			0.74
4-10	42	62	
11-16	27	32	
17-23	6	10	

**DISCUSSION**

Chronic kidney disease (CKD) is a worldwide epidemic with an incidence rate of 5–15% (10, 11). This study was conducted in order to evaluate the frequency of Hyponatremia in patients with chronic kidney disease. Hyponatremia is potentially life-threatening disorder. In Hyponatremia the blood Na level is drop below normal range. Na is needed for various function such as fluid balance, BP, as well as the nerves and muscles in the human body (12). The normal blood Na level in human body is 135-145 mEq/L (13). Our research study showed that, most of the CKD patients were suffering from hyponatremia. Some other studies also shows that most of the patients have hyponatremia. Hyponatremia is seen in about 30% of hospitalized patients (14). Our study revealed that out of total enrolled patients 41.9% had hyponatremia. A study conducted by Csaba P. Kovessy on hyponatremia in CKD patients stated that about 13.5% patients had hyponatremia (9). In our study, male (58.7%) was more common than females (41.3%), though it was statistically insignificant. This means that male was more symptomatic of hyponatremia than female. In some other studies, female was mostly affected from hyponatremia. Age is a solid independent risk factor for hyponatremia, so elder CKD affected patients are most likely to suffer from hyponatremia (15). In our study most of the affected patients 47.1% were of age group of < 60 year, followed by age group of 36-50 year in which 46.2% were suffering from hyponatremia, though it was not statistically significant. In a study conducted by Miller et al. (16) found in his study that 18% of a population of age more than 60 years had hyponatremia. A study of maintenance hemodialysis patients enrolled in the Hemodialysis (HEMO) study also reported a

significant association of hyponatremia with mortality, even though in patients with anuric dialysis the development of low serum sodium is unrelated to the stimulation of arginine vasopressin by underlying comorbidities (12). Arguing against a causal effect of hyponatremia was a recent study in hospitalized patients in whom the authors could link fatalities associated with severe hyponatremia (<120 mEq/L) to more severe underlying disease processes rather than the hyponatremia itself. Nevertheless, observational studies cannot completely overcome the problem of residual confounding, which can be better addressed by randomized controlled trials (8). One such large trial in patients that examined the effects of the vasopressin V<sub>2</sub>-receptor antagonist tolvaptan on mortality in patients with CHF did not detect a significant benefit on mortality, but more interventional studies are needed to determine whether other patient populations, other treatment regimens, or patients with different severities of hyponatremia might show different outcomes.

Studies examining the predictive value of serum sodium level have concentrated largely on hyponatremia, have examined mostly patients who were hospitalized, and were usually derived from data obtained from single medical centers. Such studies have described associations of hyponatremia with a variety of adverse outcomes including all-cause mortality, length of inpatient stay, gait imbalance and falls, rhabdomyolysis, bone fractures, and higher hospitalization costs. Some of the studies examined unselected groups of patients, but others focused on groups with some underlying comorbid condition such as CHF, (7,11,14) cardiovascular disease, (9,10) or liver disease. Irrespective of the setting or the patients included, all studies have found that hyponatremia is associated with an increased risk of the studied end points. Similar associations were reported for hypernatremia as well, although in general this abnormality has been underemphasized.

In aged people there are various causes to develop hyponatremia such as weak excretory mechanism of water, taking of medications and other comorbidities that are associated with hyponatremia (15, 17). In chronic hyponatremia, the levels of sodium drop slowly (8) and gradually over 48 hours or longer and in acute hyponatremia the level of sodium drop rapidly, causes a number of complication such as rapid brain swelling, which can result in a coma and death.

## CONCLUSION

It is concluded that in most of the CKD patients, hyponatremia was developed. And also, hyponatremia is age dependent so in elder patients the hyponatremia prone to develop. So early precaution parameters will be taken to avoid such condition.

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