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Research Article

Prevalence of Chronic Kidney Disease in Meghalaya, India: A Retrospective Study

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ABSTRACT

Objectives: To evaluate the prevalence of chronic renal disease in patients attending a tertiary care hospital in Meghalaya, India. **Materials and Methods:** A retrospective study was carried out in the dialysis unit of Civil Hospital in Shillong between January 2, 2017, and July 11, 2024, to gather data on the patients undergoing dialysis treatments. The study involved 15+ individuals with Chronic Kidney disease and Acute Kidney Injury from urban and rural areas, who regularly received dialysis at Civil Hospital from January 2017 to July 2024. The data was analyzed using Microsoft Excel, categorizing patients into age and gender groups, and presented in tables and bar graphs. **Results:** This study examined 10221 dialysis cycles of patients with Kidney Disease at Civil Hospital, with CKD being the most common. Gender distribution was male, age group, urban/rural location, and 2023 saw the highest spike. **Conclusion:** The study reveals that Chronic Kidney Disease (CKD) prevalence increases with age, particularly among males/females, and suggests lifestyle changes, early detection, and management strategies can reduce its progression.

Keywords: Chronic Kidney Disease (CKD), Dialysis, Diabetes Mellitus, Prevalence.

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INTRODUCTION

Chronic Kidney Disease (CKD) affects the kidneys and can lead to the gradual loss of kidney function and the consequences of declining kidney function. Kidney failure is a global public health problem with increasing incidence and frequency, high costs, and poor outcomes.[1] Kidneys regulate blood levels. They eliminate waste, stabilize electrolytes, regulate water and also produce hormones, red blood cells, keep bones strong and healthy and maintain blood pressure. When the kidneys are damaged, they cannot perform all of their vital functions. Patients with CKD are characterized by a Glomerular Filtration Rate (GFR) < 60 mL/min/1.73 m², albuminuria, or changes in renal structure or function.[2] GFR is the total fluid filtered through all functional nephrons in a defined amount.[3] CKD progresses through five stages of kidney damage ranging from mild dysfunction to complete kidney failure.[4] Stage 3 or 4 CKD refers to moderate to severe kidney damage. Kidney damage is classified in two stages in Stage 3: GFR values in 3A are between 45 and 59 mL/min/1.73 m² and in 3B between 30 and 44 mL/min/1.73 m². In addition, stage 4 GFR is 15-29 mL/min/1.73 m²[4,5] Patients with stage 3 or 4 CKD are at increased risk of developing End-Stage Renal Disease (ESRD) or mortality even before ESRD develops.[6,7]

Depending on the severity and duration, decreased GFR is characterized as CKD, AKD (Acute Kidney Disease), or AKI. AKI develops over a duration within 7 days, AKD happens for less than or 3 months and CKD develops for more than 3 months. AKI is a sudden decrease in kidney function whereas CKD is a gradual decrease in kidney function.[8]

CKD can develop in anyone at any age but it is mostly caused in people over the age of 60, people with diabetes, high blood pressure or hypertension, heart disease or heart failure, complications of Acute Kidney Injury (AKI), history of CKD in family.[9] Systemic diseases like Lupus and Rheumatoid Arthritis and HIV infection are also risk factors or causes of CKD. Use of medications containing NSAID and toxins present in tobacco are possible causes of CKD. Kidney stones, kidney cancer can lead to glomerulosclerosis. Women are more susceptible to CKD than men due to untreated or long-term Urinary Tract Infection (UTI). Several decades ago, glomerulonephritis was a prominent cause of kidney illness. Infections are no longer a leading cause of kidney disease. Current research reveals that hypertension and diabetes are the leading causes of renal disease globally.[10]

A number of unfavorable clinical outcomes, including cardiovascular events, kidney failure necessitating renal replacement treatment, mortality, and a generally poor quality

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of life for survivors, are linked to Chronic Kidney Disease (CKD). Cardiovascular disease, hypertension, anemia, mineral bone disorders, volume overload, electrolytes, and acid-base abnormalities are some of the complications that are easily identified and measured.[11-16]

Owing to the asymptomatic nature of this illness, opportunities for prevention are neglected since CKD is rarely identified until much later in its progression. Early detection and treatment of CKD may be able to prevent or delay the progression of renal failure or other unfavorable outcomes.[17,18] Much work is currently being done to improve the detection of progressive renal disease. A practice guideline for Chronic Kidney Disease (CKD) was created in 2002 by the National Kidney Foundation (NKF) Kidney Disease Outcomes Quality Initiative (K/DOQI)[19] This guideline defines Chronic Kidney Disease (CKD) as kidney damage or Glomerular Filtration Rate (GFR) less than 60 mL/min/1.73 m^2 for three months or longer, regardless of the cause of the kidney damage.[20] Serum creatinine is used to estimate GFR using formulas as opposed to precise observations. The Cockcroft-Gault (CG) equation and the Modification of Diet in Renal Disease Study (MDRD) equation are the two most often utilized equations among the many that have been devised. In epidemiologic research, these equations are now thought to be the most accurate ways to estimate GFR for adults.[21-23]

Entire or almost total renal failure that is persistent is referred to as ESRD. When kidney function is lost entirely, the body stores excess water and waste products. This illness, referred to as uremia, if left untreated can cause coma, convulsions, and eventually death. If kidney function is lost entirely, dialysis or kidney transplantation will be required.[24]

Dialysis removes surplus water and waste from the blood. It is primarily used to replace decreased kidney function in patients suffering from renal failure. Dialysis can save lives. Dialysis comes in two main varieties: peritoneal dialysis and hemodialysis.[25] Hemodialysis uses a machine filter known as a dialyzer to eliminate waste products from metabolism, excess water and salt, and to balance the body's other electrolytes. Peritoneal dialysis uses the method of filtering waste from the body and balancing electrolyte levels uses the lining of the abdominal cavity (peritoneum).[24]

MATERIALS AND METHODS

Study area

The current research has been carried out at Civil Hospital in Shillong city. Shillong is the capital city of Meghalaya, located in the north-eastern part of India. Civil Hospital is Meghalaya's largest hospital, both in the state government and private sectors. Patients can access a variety of services at this facility, including medicine, surgery, orthopedics, E.N.T., ophthalmology, cardiology, dentistry, psychiatry, and radiology. Different services are offered by this hospital to both inpatients and outpatients. A high influx of patients both from urban and rural areas makes this hospital a good centre for research.

Study design and period of study

A retrospective study where information about the patients' past dialysis treatment was conducted between 2 January 2017 to 11 July 2024 at the dialysis unit at Civil Hospital, Shillong.

Study population

The study population included individuals aged 15 years and older both from urban and rural areas with Chronic Kidney Disease as well as Acute Kidney Injury who had regular follow ups for dialysis at Civil Hospital during the study period between 2 January 2017 to 11 July 2024.

Eligibility criteria

Inclusion criteria

Individuals aged 15 years and older both from urban and rural areas with Chronic Kidney Disease as well as Acute Kidney Injury who had regular follow ups for dialysis were included in the study. Individuals with informed places of residence and age were included.

Exclusion criteria

Individuals younger than 15 years of age and patients who didn't undergo dialysis were excluded from the study.

Specimen collection

The study was conducted at Civil Hospital which offers dialysis treatment to patients with CKD and AKI. The study participants were included in the study based on age and diagnosis with kidney disease. The total number of hemodialysis cycles carried out during the study period between 2 January 2017 to 11 July 2024 was 10221. The data was collected and compiled from the information entered in the registers by the patients at the time of registration for dialysis.

Data Management and Statistical Analysis

Raw data was entered into Microsoft Excel. A statistical analysis was carried out. The data was collected and compiled according to age groups of 15-25, 26-35, 36-45, 46-55, 56-65, 66-75, 76-85, 86-95 and gender of patients for statistical analysis. The results of statistical analysis were displayed as tables and bar graphs.

Ethical considerations

This study was conducted without ethical clearance due to its retrospective nature. Only the immediate research team members had access to all confidential records. The patients name were kept confidential during the study.

RESULTS

A total of 10,221 dialysis cycles of patients presenting with kidney disease at Civil Hospital were considered in this study. Out of the 10,221 cycles, 10,005 cycles were diagnosed with Chronic Kidney Disease (CKD). With respect to gender 42.71% of these patients were male and 57.29% were female. According to age group, patients of age group 46-55 presented with the highest number of CKD reports accounting for 27.63%. The other age groups such as 15-25 presenting 10.95% of CKD cases, 26-35 presenting 20.47%, 36-45 presenting 20.55%, 56-65 presenting 9.12%, 66-75 presenting 9.65%, 76-85 presenting 1.53%. Patients of 86-95 years account for only 0.1%. Majority of the cases were reported from patients residing in urban areas with 50.77%, while patients of rural areas presented the lesser population with 49.23%. The year 2023 showed the highest spike in CKD cases with a total of 2720 (27.19%) dialysis cycles out of 10005 cycles. With 57.29% of the patients being female, it signifies the susceptibility of females to CKD than men.

DISCUSSION

According to estimates, 7% of people worldwide suffer from stage 3-5 Chronic Kidney Disease (CKD). In addition, the prevalence of chronic kidney disease, particularly End-Stage Renal Disease (ESRD), is steadily rising as society ages.[26] This retrospective study analyzed the prevalence of Chronic Kidney Disease (CKD) among different age groups, gender and residential settings (urban or rural). The result of this study shows that, over the years, the prevalence of CKD was the highest in the age group 46-55 years with a prevalence rate of 27.63% (Table 1). Our findings show that the CKD prevalence in males increases in older age (>55 years) (Figure 1). It was found that most of the individuals with CKD were more in the rural areas compared to urban areas from the year 2017-2022, irrespective of age and gender (Figure 2). As shown in Figure 3, the prevalence rate of females was the highest in the years 2017, 2018, 2020, 2022, 2023 and 2024 compared to their male counterparts. The highest prevalence rate of 27.19% was seen in the year 2023 whereas 2017 shows the lowest prevalence rate of 4.64% (Table 2). According to our research, the prevalence of CKD increased with age particularly from the age group of 26-35 years up to 46-55 years (Table 1). The number of older individuals receiving renal dialysis has increased, which is consistent with the high prevalence of CKD.[27] Studies included in this analysis defined Chronic Kidney Disease (CKD) using either the Kidney Disease: Improving Global Outcomes (KDIGO) clinical criteria or the National Kidney Foundation

Table 1: Prevalence of CKD based on age group.

Age group	Prevalence rate
15-25	10.95%
26-35	20.47%
36-45	20.55%
46-55	27.63%
56-65	9.12%
66-75	9.65%
76-85	1.53%
86-95	0.1%

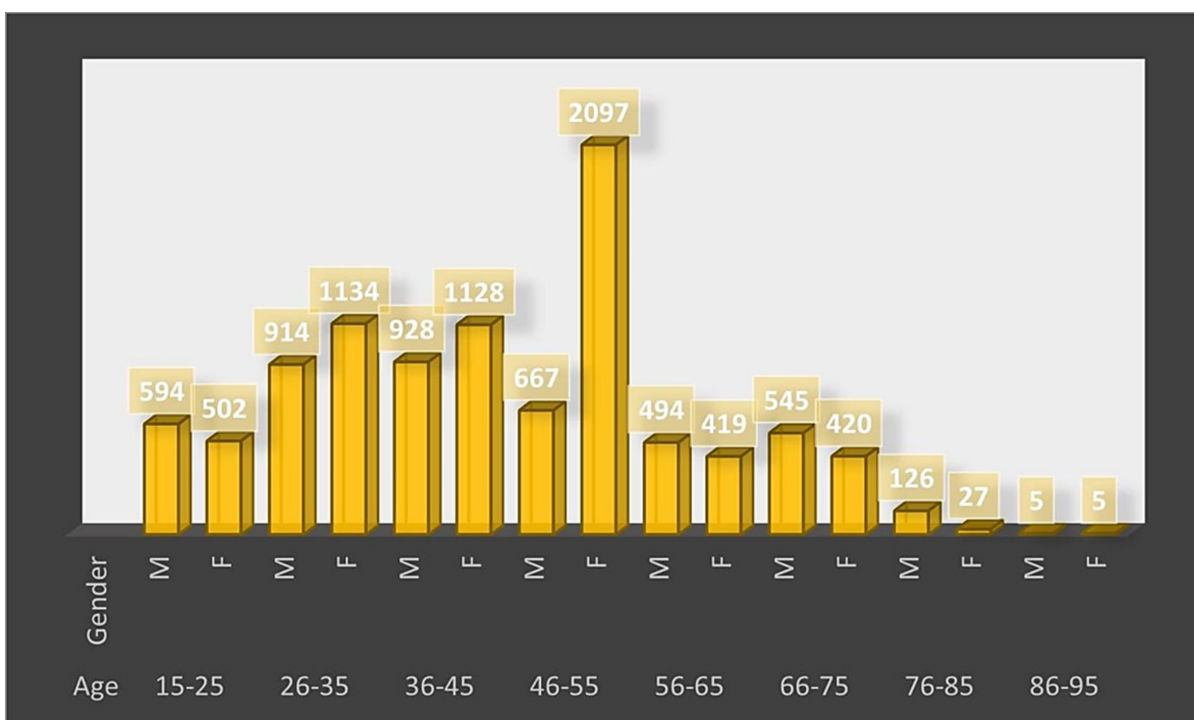

Figure 1: Diagram showing number of dialysis cycles based on age groups and gender.

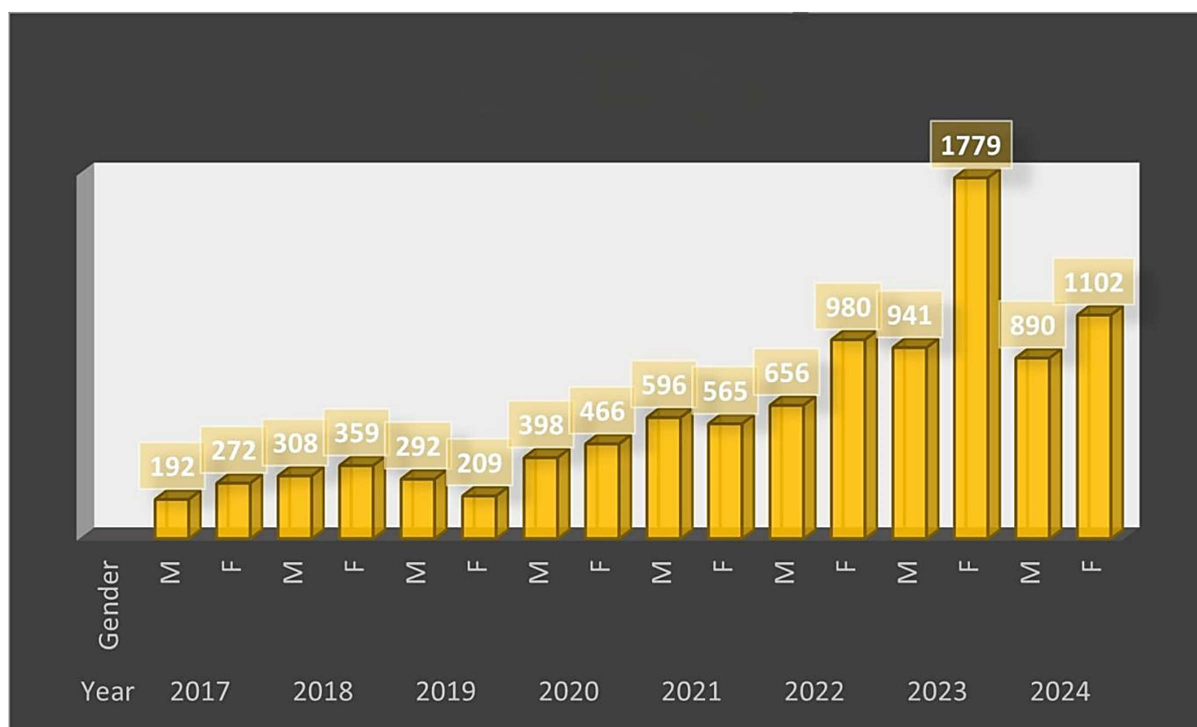

Figure 2: Diagram showing number of dialysis cycles of patients based on gender and year.

Table 2: Prevalence of CKD based on year.

Year	Prevalence rate
2017	4.64%
2018	6.67%
2019	5.01%
2020	8.63%
2021	11.60%
2022	16.35%
2023	27.19%
2024	19.91%

Kidney Disease Outcomes Quality Initiative (NKF KDOQI).[28,29] Kidney function is generally steady from childhood into late adulthood.[30] In healthy individuals, GFR decreases by 1 mL/min/1.73 m^2 annually beyond the age of thirty.[31] Renal function reduction may be due to age-related changes in the anatomy of the kidney.[32] Based on age groups, males were found to have a higher prevalence of Chronic Kidney Disease (CKD) than females, and this gender disparity was especially noticeable in older age groups(>55 years) according to our study. These results contradict with extensive, nationally representative research conducted in China, Finland, and the United States.[33-35] Compared to men, CKD was more common among females. Women have less muscle mass, and muscle mass is a key factor in determining the serum creatinine concentration.[36] Furthermore, the gender gap may be significantly influenced by the variations in glomerular shape, glomerular hemodynamics, and hormone metabolism between males and females.[37] The prevalence of Chronic Kidney Disease (CKD) is higher in women than in men, according to data from the US National Health and Nutrition Examination Survey (NHANES), the Modification of Diet in Renal Disease (MDRD) equation, the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) creatinine-based equation, and the CKD-EPI cystatin C-based equation.[38] However, men are much more likely than women to have ESRD, both in terms of incidence and prevalence. A plausible explanation for this disparity could be that men's CKD advances more quickly than women's to End Stage Renal Disease (ESRD).[39] According to our research, urban centers have a greater incidence of Chronic Kidney Disease (CKD) than do rural ones. This higher prevalence may be due to the increased frequency of established clinical and socio-demographic risk factors for the development of CKD and its progression to End-Stage Renal Disease (ESRD).[40] However, over the course of eight years (2017-2024) it was found that 50.77% of the patients were from urban areas and 49.23% were from rural areas. The difference in lifestyle habits and the study being conducted in a hospital located in an urban setting is likely to account for the high percentage of patients from urban areas.

Strength and Limitations

The large sample size and thorough data collection are two of strengths of this study, as they increase the validity of the conclusions. However, potential biases present in retrospective research, such as insufficient medical data are the limitations. Furthermore, the study's inability to account for all confounding

Figure 3: Diagram showing prevalence of CKD in urban and rural areas with respect to the years 2017-2024.

factors, including dietary practices and genetic predispositions, stems from its dependence on secondary data.

CONCLUSION

This study is aimed at determining the prevalence of Chronic Kidney Disease across different age groups and gender within a defined population. Our findings show that CKD prevalence increases with age, with the patients/individuals of (that age group) having the highest rates. Specifically, the males/females of that age group demonstrating a higher prevalence compared to the females/males of that age group. Adapting healthy lifestyle habits through regular physical activities, dietary adjustments, and smoking cessation helps to reduce the risk of CKD. Early detection and monitoring and management of conditions that contribute to CKD like diabetes control and hypertension management and education and awareness are some multifaceted approaches that reduce the progression of CKD.

ABBREVIATIONS

M&CH: Maternal and Child Health; **HIV:** Human Immunodeficiency Virus; **NSAID:** Nonsteroidal Anti-inflammatory Drug; **UTI:** Urinary Tract Infection; **E.N.T.:** Ear, Nose, and Throat.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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