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Acquired Cystic Kidney Diseases in Bangladeshi Rural Populations: A Cross-Sectional Investigation

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Abstract

Acquired cystic kidney disease (ACKD) is a condition characterized by the formation of numerous cysts in the kidneys. It is frequently associated with chronic kidney disease (CKD) and dialysis. Despite its clinical significance, little is known about its prevalence and characteristics among Bangladesh's rural people. Between January and June of 2023, a cross-sectional survey was done with 120 participants from various rural areas of Mymensingh Division, Bangladesh, to observe the prevalence, risk factors, and clinical characteristics of ACKD. Participants were screened for ACKD using ultrasonography. Demographic information, medical history, and pertinent clinical indicators were gathered. Significant connections between ACKD and possible risk variables were identified by statistical analysis. The median dialysis vintage was 33.3 [range:10.6-62.98] months. Renal cysts were seen in 62.5 % (n=74) of participants, 41.6% (n=50) were bilateral. The median [25th-75th percentile] number of cysts in the right kidney was 4 (range: 2-8) and 3 (range: 2-7.3) in the left kidney. ACKD was detected in 29.17% of the study participants. Individuals with a history of CKD and those on prolonged dialysis vintage had significantly greater prevalence. Male populations over 50 years with prolonged dialysis duration were identified as key risk factors for ACKD. ACKD is a significant health hazard in Bangladesh's rural populations, particularly for elderly persons with CKD and those undergoing dialysis. This study aims to investigate the prevalence, clinical characteristics, and associated risk factors of ACKD among rural populations in Bangladesh. Additional longitudinal studies are required to investigate the long-term impact of ACKD on renal function and overall health outcomes in local communities.

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Introduction

Acquired cystic kidney disease (ACKD) is characterized by the development of multiple fluid-filled cysts in the kidneys, typically in patients with chronic kidney disease (CKD) who have been undergoing dialysis for a prolonged period. Acquired Cystic Kidney Disease (ACKD) typically develops in individuals who do not have a history of cysts in their kidneys at birth but acquire them later due to various renal and non-renal factors.[1] These cysts typically have a diameter of less than 0.5 cm but can reach up to 2-3 cm.[2]

The incidence of renal malignancies is significantly higher in end-stage renal illness and

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appears to be linked to the development of acquired cystic kidney disease. Simple cysts, complicated cysts, and solid masses in these patients are identified and evaluated using imaging investigations such as ultrasonography, computed tomography, and magnetic resonance imaging, each with advantages and limitations.[3]

It is also known that kidney cysts exist prior to HD treatment in roughly one-third of all patients. The prevalence of ACKD documented in HD patients ranges from 35% to 79%.[4] The link between ACKD and dialysis treatment is undeniable, existing data show that uremic circumstances accelerate the development of ACKD. Dialysis, as a supportive therapy technique, serves to prolong the patient's survival, allowing ACKD to develop over time.[4] It is also alarming that, patients with ACKD are 50 times more likely to develop renal cell carcinoma (RCC) than the general population.[5] Therefore, this study aims to investigate the prevalence and impact of ACKD amongst the rural population, aiming to highlight critical aspects of the disease as they pertain to less-resourced settings. Understanding the dynamics of ACKD in such a context is vital for developing targeted interventions and improving renal health outcomes in these communities.

Methods

This cross-sectional study had been conducted on 120 randomly selected patients in Dialysis Unit in the Department of Nephrology, Community Based Medical College, Bangladesh (CBMC,B), Mymensingh, and some nearby dialysis centers in Mymensingh city of Bangladesh between January and June of 2023. The study included individuals aged 18 years and older who were diagnosed with CKD and had been undergoing dialysis for at least six months. The study was conducted with fully informed consent from all participants.

Data were collected using a structured questionnaire and clinical examinations. The questionnaire included the demographic information, lifestyle factors, dialysis history, relevant clinical history and investigation report. Clinical examinations involved ultrasonography to detect the presence and characteristics of kidney cysts. Blood and urine samples were also collected to assess renal function and other relevant biochemical parameters. Statistical analysis of the results was done by using SPSS software version 25.0 (SPSS Inc, Chicago, IL, USA). The prevalence of ACKD was calculated, and logistic regression analysis was performed to identify potential risk factors associated with the development of ACKD. A p-value of less than 0.05 was considered statistically significant. A probability ‘p’ value of 0.05 or less was considered as significant.

This study was approved by the Ethical Review Committee of Community Based Medical College, Bangladesh (CBMC,B), Mymensingh, Bangladesh.

Results

We included 120 participants, 61.67% (n=74) were males and 59.17% (n=93=71) of the population aged less than 50 years (Table 1). Half of the population had been on dialysis for less than 2.5 years. The median (25th-75th percentile) dialysis vintage was 33.3 [10.6-62.98] months. Hypertension was the most prevalent comorbidity (n=103, 85.83%). Hypertension and chronic glomerulonephritis (CGN) were the main

etiologies of End-stage renal disease (ESRD). Anaemia was present in 85% (n=102) of the population, and 71.67% (n=86) of participants had no residual diuresis (Table-I).

Table-I: Socio-demographic and clinical characteristics in the study population (N=120)

Variables	Frequency	Percentage
Age ranges (years)		
<50	71	59.17
≥50	49	40.83
Gender		
Male	74	61.67
Female	46	38.33
Dialysis vintage ranges (months)		
3-36	63	52.50
36-120	48	40.00
≥120	9	7.50
Comorbidities		
Diabetes mellitus	16	13.33
Hypertension	103	85.83
Heart failure	20	16.67
Macroscopic hematuria	9	7.50
Smoking	2	1.67
Etiology of ESRD		
Hypertension	43	35.82
Chronic interstitial nephritis	10	8.33
Diabetes mellitus	12	9.99
CGN	27	22.5
Unknown	19	15.83
Ischemic nephropathy	6	5.00
Cortical necrosis	3	2.50
Complications of ESRD		
Anemia	102	85.00
Anuria	86	71.67
2° hyperparathyroidism	22	18.33
None	8	6.67
Adynamic bone disease	4	3.33

Table-II: Sonographic renal findings in the research population (N=120)

Variables	Number (n)	Percentage (%)
Patients with cysts	74	62.5
Bilateral cysts	50	41.6
Unilateral cyst	26	21.6
Mean (SD) pole-to-pole length of the kidneys (mm)		
Left 83.2 (17.4)		
Right 80.5 (16.8)		
Median [25th-75th percentile] number of cysts		
Right kidney: 4[2-8]		
Left kidney: 3[2-7.3]		

Fig-1: Complicated cyst characteristics in study population with ACKD

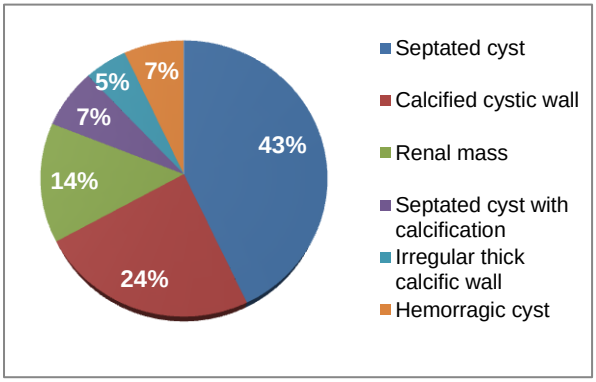

Table 3: factors associated with ACKD (multivariate analysis)

Variables	OR (95% CI)	AOR	95% CI	P-value
Male sex	2.5 (1.3 – 5.7)	2.4	1.1 - 5.5	0.032
Anuria	3.8 (1.4 – 9.5)	1.1	0.3 - 2.9	0.859
Dialysis vintage>36	7.2(3.3 – 15.7)	5.5	2.3 – 12.7	<0.001
2° hyperpara-thyrodism	2.8 (1.3 – 6.7)	2.2	0.8 - 6.2	0.103

OR: odds ratio, CI: confidence interval, AOR: adjusted odd ratio

Discussion

The frequency of ACKD in this rural Bangladeshi population is consistent with other studies conducted in similar settings, underscoring the disease's severe burden among patients with a prolong dialysis experience. In this study, we wanted to examine the prevalence of ACKD and identify risk factors in patients on maintenance hemodialysis at the Department of Nephrology, CBMCB, and some nearby dialysis units in Mymensingh. We found a 29.17% (n=35) prevalence of ACKD and a patient with superimposed renal mass. The Dialysis vintage >3 years (OR 5.5, p<0.01) and male sex (OR 2.4, p=0.03) were independently linked with ACKD.

The prevalence of ACKD can be varies between 8.2-92%, depending on the sensitivity of the diagnostic procedure, the characteristics of the study population, the study design, and the criterion used to make the diagnosis.[6] It is higher when CT scans or pathological analysis are employed as screening tools, in prospective studies, or when the population investigated has been on hemodialysis for an extended period of time.[6] A similar study done by Park JH (2000) with a similar design and demographic found a nearly identical incidence (31%).[7] However, this incidence exceeds the 8.2% and 10% prevalence reported in cross-sectional studies conducted in Iran and the United States, respectively.[8,9] The difference could be explained by the fact that our population had been on dialysis for a longer period of time (median duration on hemodialysis [25th-75th percentile] of 33.3 [10.6-62.98] months) than the aforementioned studies, in which 75% of patients had been on maintenance hemodialysis for less than a year and the mean dialysis vintage was 27 months. Two different cross-sectional studies conducted in Brazil and the United States found a prevalence of 80% and 59%, respectively. However, both studies only included patients who had been on dialysis for at least 5 years and employed a CT scan as a screening approach.[10,11] It is well known that ultrasound (the screening modality utilized in our study) may be insensitive for detecting cysts smaller than 2 cm in a tiny sclerotic kidney.[7]

Renal cell carcinoma is the most worrying consequence of ACKD because cysts act as nidus for malignant transformation. We found One person out of 35 with ACKD had a kidney tumour.[13-15] The similar observation has been reported in Iran.[9] International collaborative investigations found that 3% of ACKD patients got kidney cancer throughout a 2.5-year follow-up period.[12] In agreement with prior research; we found that the higher dialysis duration and male sex were linked with ACKD.[13] This could be explained by the likelihood of increased tubular renal cell hyperplasia caused by androgens, which leads to cyst formation and hence predisposes males to cyst development.[14,15]

Conclusion

This study highlights a significant prevalence of ACKD among CKD patients undergoing dialysis in rural Bangladesh where majority of the patients with prolong HD presented with at least a single cyst, while others presented with multiple bilateral cysts as second major condition. To determine a temporal link, we recommend conducting additional longitudinal studies with a bigger sample population and a longer time frame of HD. Early intervention, regular monitoring, and comprehensive management of comorbid conditions like diabetes could reduce the burden of ACKD and improve the quality of life for affected individuals.

References

1. *Beladi Mousavi SS, Sametzadeh M, Hayati F, Fatemi SM. Evaluation of acquired cystic kidney disease in patients on hemodialysis with ultrasonography.Iran J Kidney Dis. 2010;4(3):223-6.*
2. *Grantham JJ.vAcquired cystic kidney disease. Kidney Int. 1991;40(1):143-52*
3. *Rahbari-Oskoui F, O'Neill WC. Diagnosis and Management of Acquired Cystic Kidney Disease and Renal Tumors in ESRD Patients. Semin Dial. 2017;30(4):373-9.*
4. *Bokhari SRA, Bokhari MR, Syed MN, Ahmad HI, Khalid SA, Aseer ZK, et. al. Pak J Kidney Dis. 2019;3(1):7-13.*
5. *Schwarz A, Vatandaslar S, Merkel S, Haller H. Renal cell carcinoma in transplant recipients with acquired cystic kidney disease. Clin J Am Soc Nephrol. 2007;2(4):750−6.*
6. *Teuwafeu DG, Dongmo A, Fomekong SD et al. Acquired cystic kidney disease in patients on maintenance hemodialysis, prevalence, and associated factors: a cross-sectional study. Pan Afr Med J. 2023;45:175.*
7. *Park JH, Kim YO, Park JH, Kim BS, Yoon SA, Yang CW et al. Comparison of acquired cystic kidney disease between hemodialysis and continue ambulatory peritoneal dialysis. Korean J Intern Med. 2000;15(1):51-5.*
8. *Gnionsahe DA, Lagou DA, Tia WM. Prevalence of acquired cystic disease in black Africans on hemodialysis in West Africa. Saudi J Kidney Dis Transpl. 2007;18(1):114-6.*
9. *Dunnill MS, Millard PR, Oliver D. Acquired cystic disease of the kidneys: a hazard of long-term intermittent maintenance haemodialysis. J Clin Pathol. 1977;30(9):868-77.*
10. *Bezerra HM, Maia GP, Bezerra Neto FA, Serra M, de Almeida JB. Severity of acquired cystic kidney disease determines improvement in chronic kidney failure anemia. 1997;43(1):4-8.*
11. *Matson MA, Cohen EP. Acquired cystic kidney disease: occurrence, prevalence, and renal cancers. Medicine (Baltimore). 1990;69(4):217-26.*
12. *Denton MD, Magee CC, Ovuworie C, Mauiyyedi S, Pascual M, Colvin RB, et al. Prevalence of renal cell carcinoma in patients with End Stage Kidney Disease pre-transplantation: A pathological analysis. Kidney Int. 2002;61(6):2201-9.*
13. *Yamaguchi S, Fujii H, Kaneko S, Yachiku S, Anzai T, Inada F, et al. Ultrasonographic study on kidneys in patients with chronic renal failure. Part I. Ultrasonic measurement of renal size and analysis of renal ultrasonotomograms. Nihon Hinyokika Gakkai Zasshi. [Article in Japanese]. [Abstract]. Japanese J Urol. 1990;81(8):1175-82.*
14. *National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). National Institutes of Health, USA. Acquired Cystic Kidney Disease. Available at: https://www.niddk.nih.gov/health-information/kidney-disease/acquired-cystic-kidney-disease (Accessed January 11, 2023).*
15. *Torres VE, Grantham JJ. Cystic diseases of the kidney. In: Taal MW, ed. Brenner & Rector's The Kidney. 9th ed. Philadelphia: WB Saunders; 2011. p.1626-67.*