Original Article

Acquired Cystic Kidney Disease among End-Stage Renal Disease Patients on Hemodialysis

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ABSTRACT

Objective: To determine the prevalence of acquired cystic kidney disease in end-stage renal disease patients on hemodialysis.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Nephrology Department, Khyber teaching hospital, Peshawar from July 2021 to January 2022, for a period of seven months.

Materials and Methods: This study was conducted on 124 subjects fulfilling the inclusion criteria for end stage renal disease. The patients were sent to radiology department for the diagnosis of acquired cystic kidney disease using ultrasonography by an expert radiologist. All subjects information was stored and analyzed using IBM SPSS 20. Variables like gender, age, duration of hemodialysis was stratified with acquired cystic kidney disease. Chi Square test was used for association.

Results: This study was conducted on 124 patients presented with end stage renal disease. The mean age of the subjects was 38.63±16.81 years. There number of males were 81 (65.3%) and females were 43 (34.7%). The prevalence of acquired cystic kidney disease was 17.7%. There was no significant difference between gender and acquired cystic kidney disease ACKD ($P > 0.05$). A significant difference was observed ($P < 0.05$) between age groups and acquired cystic kidney disease. A total of 8 (10.3%) subjects had acquired cystic kidney disease in the age range of 18-35 years, while in the age range of 36-75 years; a total of 14 (30.4%) subjects had acquired cystic kidney disease. Significant difference ($P < 0.05$) was found between acquired cystic kidney disease and the duration of hemodialysis.

Conclusion: In our study the prevalence of 17.7% was recorded for ACKD among the subjects of ESRD. There was a significant relationship between the age and hemodialysis duration with ACKD.

Key Words: Acquired Cystic Kidney Disease (ACKD), End Stage Renal Disease (ESRD)

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INTRODUCTION

Kidneys are the vital organ of human body, any amount of damage to this vital organ can results in fatal consequences.

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Chronic kidney disease (CKD) is a serious condition having immediate as well as long term consequences. This disease is often diagnosed incorrectly by medical professionals due to which its impact on subjects around the globe is substantial i.e. recorded up to 16%[1,2]. Glomerular filtration rate (GFR) and albuminuria both are important and are considered quite significant in the management, diagnosis, and staging of CKD[3]. The functionality of the Kidney is commonly measured by GFR while albuminuria indicates the ongoing damage to the kidney. The readings of GFR < 60mL/min/ 1.73m^2, and albuminuria more than 30 mg/24hrs exceeding 3 months duration are considered the important markers of permanent kidney damage, depending upon the different stages of CKD and the need of immediate medical attention[4].

The relationship between CKD and conditions like diabetes and hypertension are frequently observed in different studies on CKD and it's quite prevalent in underdeveloped regions of the world as compared to developed countries[5]. The development of bilateral and multiple kidney cysts is frequently observed in CKD

subjects already on peritoneal dialysis or hemodialysis[6]. Subjects of any age group with pre-existing medical history of CKD are at higher risk of getting Acquired Cystic Kidney Disease (ACKD) which is associated with end-stage renal disease (ESRD) [7].

ACKD is characterized by different sizes of fluid-filled kidney cysts among subjects suffering from ESRD with no history of the inherited cystic disease [8]. This condition generally involves both kidneys with significant prevalence in ESRD cases. Subjects with ACKD are commonly differentiated from autosomal dominant polycystic renal disease (ADPKD) because the kidneys are small as compared to the larger kidneys found in all ADPKD cases. Amongst ACKD subject's involvement of additional body organs and family history of cystic kidney disease are not reported [9,10].

The complications usually arise as the cysts advances in number, size, and complexities i.e, such as cyst infections, renal cell carcinoma (RCC) associated with distant metastasis, intra-renal hemorrhage, and sometimes erythrocytosis. Regular surveillance is required in such cases to avert major complications and malignant transformation in such cystrs[11].

The frequency of ACKD was observed at 13% world-over in subjects with ESRD [12]. However, multiple studies from different places have reported variable number of cases manifesting as ACKD in ESRD patients on hemodialysis as well as on peritoneal dialysis[13].

As the ACKD is a burden on healthcare setup along with risk of life threatening complications for the patients, its early diagnosis and management is a challenge and inevitable for medical practitioners. Due to the insufficient amount of literature available on this topic our primary aim is to establish the frequency of acquired cystic kidney disease (ACKD) among subjects with end-stage renal disease (ESRD) and to develop sound protocols for the prevention and surveillance of acquired cystic kidney disease.

MATERIALS AND METHODS

The cross sectional type of the study was carried after taking approval from ethical committee of the health institute (ABC hospital). The duration of the study six months, it was conducted from July 2021 to January 2022. Subjects were asked to give a written consent for participation in the study. In this study, subjects with both gender, in the age range of (18-75) years, identified as end-stage renal disease subjects on one hemodialysis session once in a week during last 6 months were enrolled. Subjects presenting with Autosomal dominant polycystic kidney disease (ADPKD) and Medullary sponge kidney (MSK) disorder were excluded from this study. Acquired Cystic Kidney Disease (ACKD) was diagnosed by an experience radiologist.

A sample size of 124 subjects was calculated using sample size calculator available at https:// www. openepi.com, with anticipated proportion of 13.3%[12], margin of error 6% and confidence interval 95%.

All the collected data was analyzed with IBM SPSS 20. The determination of frequencies and percentages were accomplished for qualitative data. The determinations of Mean + Standard Deviation were achieved for quantitative data. Chi-Square test was performed for association, keeping the P value at ≤ 0.05.

RESULTS

This study involved 124 subjects presenting suffering from end stage renal disease. The mean age of the subjects was 38.63±16.81 years. The hemodialysis mean duration was 3.12±1.81 years. The prevalence of male subjects was higher with 81 (65.3%) than female subjects which were 43 (34.7%) in number (FIG 01).

The prevalence of acquired cystic kidney disease was 17.7%. No significant difference between acquired cystic kidney disease and gender was observed ($P > 0.05$).

A significant difference ($P < 0.05$) was observed regarding age groups and acquired cystic kidney disease, a significant difference ($P < 0.05$). Age range 18 to35 years, 8 (10.3%) subjects had acquired cystic kidney disease, while in the age range 36 to 75 years 14 (30.4%) subjects had acquired cystic kidney disease (Table 1).

We also found significant difference ($P < 0.05$) between the acquired cystic kidney disease and duration of hemodialysis and. The prevalence of subjects having more than 4 years of hemodialysis was higher than those between 1 and 3 years (37.5% vs 8.3%) (Table 2).

Table No.1: Stratification of ACKD with Age

Acquired Cystic Kidney Disease	Age Groups		Total	P value
	18 to 35	36 to 75		
Yes	8	14	22	0.004
	10.3%	30.4%	17.7%	
No	70	32	102	
	89.7%	69.6%	82.3%	
Total	78	46	124	
	100.0%	100.0%	100.0%	

Table No.2: Stratification of ACKD with Duration of Hemodialysis

Acquired Cystic Kidney Disease	Hemodialysis Duration		Total	P value
	1 to 3 years	> 4 years		
Yes	7	15	22	0.0001
	8.3%	37.5%	17.7%	
No	77	25	102	
	91.7%	62.5%	82.3%	
Total	84	40	124	
	100.0%	100.0%	100.0%	

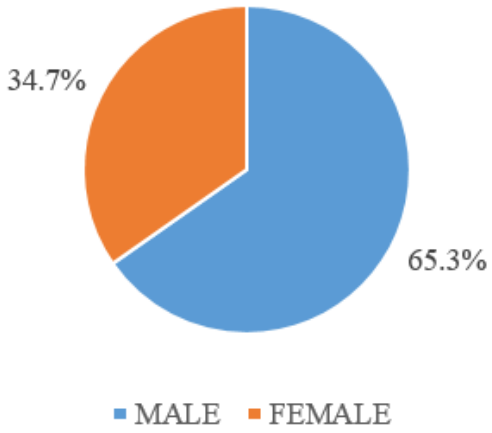

Figure No.1: Gender Distribution

DISCUSSION

Numerous studies were conducted on dialysis subjects to record the prevalence and complications of acquired cystic kidney disease among these patients [14]. Dunnill et al. in their study primarily described acquired cystic kidney disease (ACKD) after doing autopsies in 30 subjects suffering from chronic kidney disease that had been on long-term dialysis. Numerous renal cysts were found in large portion of these specimens[15]. The prevalence of ACKD among hemodialysis subjects in our study was observed in 17.7%, which is comparable with most of reports published worldwide. For example, the prevalence of ACKD in domestic surveys was 10% in Pakistan and 20.3% in Iran[16,17]. Another study from Pakistan showed the prevalence of ACKD 13.3%[12]. A small number of studies revealed several examination techniques i.e. computed tomography or autopsy, results in a greater ACKD prevalence in contrast to ultrasound[12].

A significant association has been observed in age and ACKD. Subjects in age range of 18 - 35, 8 (10.3%) subjects had ACKD, while in the age group of 36 -75, 14 (30.4%) had ACKD. This infers that the higher rate of ACKD is associated with advancement in age. Our finding are comparable to one of the local study[12] which reported similar prevalence.

In different studies it has been observed quite consistently that the incidence of ACKD increased with duration of CKD[18, 19]. In our study we saw similar pattern of presentation, 8.3% of subjects were observed with acquired cystic kidney disease on hemodialysis for the duration of less than four years while 37.5% of subjects with hemodialysis greater than four years. This was also backed by Matson et al,[20] who observed that the prevalence of ACKD was only 10–20% after one to three years of hemodialysis, rising in 3-5 years of regular hemodialysis to 40–60% cases, and after 5-10 years of hemodialysis more than 90% of subjects had ACKD. In a different study, the prevalence of ACKD among 54 children on peritoneal dialysis for around four years, five to nine years, and greater than 10 years were 9%, 50%, and 80%, respectively[19].

Acquired cystic kidney disease is frequent in both genders, but cystic variations are highly prevalent among male subjects. Ishikawa et al[14] in their study observed the higher incidence of ACKD among males because of gender-specific elements. As compared to Ishikawa et al, we had similar results; in our research the ACKD prevalence was higher among males as compared to female subjects, though the number of male patients were higher in our study. In a study by Gnionnahe et al[21] they found a insignificance for the higher prevalence of ACKD in men. By race, African American men and women are at higher risk for ACKD than women or white race.

Renal cell carcinoma is a dreadful consequence of ACKD, with a 0.18% annual frequency compared to 0.005% in the overall population. In roughly half of all cases with acquired renal cyst disease, renal carcinomas are multicentric, and in around 10 % of cases they are bilateral[22]. During long term dialysis, malignancy frequently develops approximately after eight to ten years[12]. Therefore renal ultrasonography is indicated in all ESRD subjects who are on dialysis for more than 3 years duration for early detection of precancerous lesions. In cystic kidney disease patients suspected of malignancy, the most sensitive test is a CT scan with contrast medium[16,12].

CONCLUSION

The study conducted in our setup showed the prevalence of ACKD to be 17.7% among ESRD subjects, which is comparable to various national and international studies[10,12,16,17]. We observed a significant association between age and ACKD, with increasing age the incidence of ACKD in ESRD subjects also increased.

Another important finding in our study was duration of Dialysis with ACKD. It shows a significant association with prolong duration of hemodialysis. We recommend further studies to be conducted in various tertiary care hospitals and renal setups to explore the incidence ACKD and its association with malignancy.

Author's Contribution:

Concept & Design of Study:	Aimal Khan
Drafting:	Hassan Sajjad, Sayed Anwar Hussain
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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