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Acquired Cystic Renal Disease in Patients Receiving Hemodialysis: A Cross Sectional Study Highlighting the Association of Cyst with Hematological and Demographic Parameters

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Abstract

Background: Acquired renal cyst is a condition, resulting from chronic kidney disease of any cause and is usually defined as more than three to five macro cysts in each kidney of a patient who does not have a hereditary cause of cystic kidney disease. It occurs in patients who receive long-term Hemodialysis or continuous ambulatory peritoneal dialysis and depends on the duration of dialysis.

Objective: To detect cystic masses in kidney using ultrasound in patients who have been on dialysis for long time and to determine the association between various demographic and hematological parameters and presence of cysts.

Methods: An observational study was carried out at Tabba Kidney Institute from January to August, 2017. Using convenience sampling technique, a total of 125 patients were enrolled in these studies that were on maintenance Hemodialysis for five or more years. 8 patients were excluded from the study because of incomplete data and noncooperation. The data were collected by means of a structured questionnaire while base line blood work up was done as well. The presence of cyst was observed by ultrasonography. Data was analyzed by using SPSS version 20. Chi-square test was employed with the significance level set at 0.05.

Results: out of the total of 117 patients: The study results showed a significant association of age and duration of Hemodialysis with presence of cysts where those patients who were between 26-50 years of age (p=0.031) and had Hemodialysis for 6-10 years (p=0.001) were more likely to develop cysts. Out of 70 patients who were having cysts 38(54.3 %) patients were having the hemoglobin level of less than 12gm %, whereas 32(45.7 %) patients were having the hemoglobin level of more than 12 gm %. No significant association was found between gender, hemoglobin levels and mean corpuscular hemoglobin concentration and presence of cysts.

Conclusion: This study results reveal that patients who were older or had longer duration of dialysis were more likely to develop renal cysts which increase in number and laterality with time. Both genders were equally prone to develop renal cyst after dialysis. Conversely around 50 % of the patients with increase hemoglobin levels were having the cyst.

Key words: Acquired cystic renal disease; Hemodialysis patients; cross-sectional study.

Introduction

Acquired cystic renal disease was first described by Dunnil et al. in 1977[1]. It is an asymptomatic disease, arising from chronic condition of any cause and is usually defined as more than three to five macro cysts in each kidney of a patient who does not have a hereditary cause of cystic kidney disease. End-stage renal disease is associated with an increased incidence of renal cell neoplasms following acquired cystic kidney disease secondary to long-term Hemodialysis [2-5]. Among these, recent studies have identified tumors with unusual histological patterns that do not fit into the categories recognized in the current classification system. These tumors often occur in kidneys with acquired cystic disease and are composed mainly of large eosinophilic cells arranged in solid, cribriform, acinar, or papillary patterns [2]. Different types of renal cell epithelial neoplasms have been described in association with end-stage renal disease, with a high prevalence of papillary renal cell carcinomas and clear-cell renal carcinomas [6–11]. It occurs in patients who receive long-term Hemodialysis or continuous ambulatory peritoneal dialysis and has also been demonstrated in patients with mild chronic failure not yet requiring dialysis [12,13]. The number of patients with End-Stage Renal Disease (ESRD) accepted for renal replacement therapy including Hemodialysis, peritoneal dialysis, and kidney transplantation increases each year and imposes a major social and economic burden on countries [14]. As reported in a review, only 14 % of the patients developed symptoms, with hematuria being the most common, followed by lumbar pain and urinary tract infection [15]. The prevalence of Acquired Cystic Kidney Disease (ACKD) is variable in renal disease patients and depends on the duration of dialysis. The stated prevalence is low for predialysis patients (7 %) and high in patients who have received Hemodialysis for 10 years or greater (80 %) [16].

The aim of this study was to detect cystic masses in kidney using ultrasound in patients who have been on dialysis for long time and to determine the association between various demographic and hematological parameters and presence of cysts.

Methods

An observational study was carried out at Tabba Kidney Institute from January to August, 2017 after taking ethical approval. Using convenience sampling technique, a total of 125 patients enrolled in this study after obtaining their informed consent. 8 patients were excluded from the study because of incomplete data and noncooperation.

The patients who were on maintenance Hemodialysis for five or more than five years were included in the study. The presence of cyst was observed through ultrasound. The demographic information such as age, and gender and dialysis related information such as its duration and frequency of Hemodialysis were inquired

Patients were also evaluated for the possible consequences of acquired cystic kidney disease and the base line blood work up was done as well. For the confirmation of acquired cysts all 117 patients were screened by ultrasonography conducted in the Tabba Kidney Institute and number and laterality of cysts were noted. Patients with known polycystic kidney disease, renal transplant, bilateral nephrectomy and incomplete information were excluded from the study.

After coding, the data were entered and analyzed using SPSS version 20.0. Descriptive analysis was performed by generating frequencies and percentages for categorical variables such as gender and means and standard deviations for continuous variables such as age. For inferential analysis chi-square test was employed with the significance level set at 0.05. The duration of study was six months.

Results

The study results revealed that the mean age of the study participants was 44.14 ± 13.08 years whereas 52.1 % of them were females. The mean duration of Hemodialysis was 9.72 ± 5.16 years whereas the frequency of Hemodialysis was 2.98 + 0.37 times/week. The mean hemoglobin of the patients was found to be to be 11.84 gm ± 1.72/dl, mean MCV was 90 ± 8.38 fl, mean white cell count was 7.57 ± 2.39x10^9/mm^3 whereas mean platelet count was 188.12 ± 62.57x10^9/L. 24.8 % of them were found to have hepatitis C whereas 28.2 % of them were

Table 1: Baseline characteristics of the patients

Variable (n=117)		**Mean + S. D/ Frequency (%)**
Age (Years)		44.14+13.08
Gender	Male	56 (47.9)
	Female	61 (52.1)
Hemodialysis	Duration (Years)	9.72+5.16
	Frequency (n/week)	2.98+0.37
Hemoglobin (gm/dl)		11.84+1.72
Mean Corpuscular Volume (fl)		90.04+8.38
White Blood cells (cells/ mm3)		7.57+2.39
Platelets (cells/mm3)		188.12+62.57
Frequency of Hepatitis C		29 (24.8%)
Frequency of Hepatitis B		33 (28.2%)
Erythropoietin	Yes	83 (70.9%)
	No	34 (29.1%)
Cyst	Yes	70 (59.8%)
	No	47 (40.2%)
Laterality	Unilateral Cyst	30 (25.6%)
	Bilateral Cyst	40 (34.2%)
Number of Cyst	1-3	36 (30.7%)
	>3	34 (29.1%)

found to have hepatitis B. Erythropoietin treatment was given to70.9 % of them. The renal cysts were seen in 59.8 % of them on ultrasonography with 34.2 % of them having bilateral cysts. 30.7 % of them had 1-3 cysts whereas 29.1% of them had >3 cysts on ultrasonography (table 1).

The study results further showed a significant association of age and duration of Hemodialysis with presence of cysts where those patients who were between 26-50 years of age were more likely to have cysts than those who were 1-25 years old (70.0 % vs. 11.4 %, p=0.031) and those patients who were having Hemodialysis for 6-10 years were more likely to develop cysts than those who were having it for 1-5, 11-15 and 16-25 years (23.9 % vs. 6.9 %, 16.2 % and 12.9 % respectively, p=0.001). Cyst was found in 70(59.8 %) patients. (figure1) Out of them 38(54.3 %) patients were having the hemoglobin level of less than 12gm %, whereas 32(45.7 %) patients were having the hemoglobin level of more than 12 gm %. Out of the 70 patients who were having cysts 47(67.1 %) were receiving erythropoietin and 23(32.9 %) did not. Out of these 47 patients 35(74.5 %) were having the hemoglobin of less than 12 gm % and 12(25.5 %) were having more than 12 gm% hemoglobin. Likewise out of the 23 patients who did not receive erythropoietin 11(47.8 %) were having the hemoglobin level of less than 12gm % and 12(52.2 %) were having the hemoglobin level of more than 12 gm %. That is one of the major manifestations of acquired cystic disease. No significant association was found between other study variables and presence of cysts (table 2).

Table 2: Relationship between presences of cysts with different parameters

Variable (n=117)		Cyst		P value
		Yes	No	
Age (Years)	1-25	8 (11.4%)	3 (6.4%)	0.031
	26-50	49 (70.0%)	25 (53.2%)	
	51-76	13 (18.6%)	19 (40.4%)	
Gender	Male	35 (29.9%)	21 (17.9%)	0.57
	Female	35 (29.9%)	26 (22.2%)	
Erythropoietin	Yes	47 (40.2%)	36 (30.8%)	0.27
	No	23 (19.7%)	11 (9.4%)	
Duration of Hemodialysis (Years)	1-5	8 (6.9%)	16 (13.7%)	0.001
	6-10	28 (23.9%)	25 (21.4%)	
	11-15	19 (16.2%)	4 (3.4%)	
	16-25	15 (12.9%)	2 (1.7%)	
Hemoglobin (gm %)	8.10-10.00	6 (8.6%)	8 (17%)	0.142
	10.1-12	32 (45.7%)	18 (38.3%)	
	12.1-14	22 (31.4%)	19 (40.4%)	
	14.1-16	10 (14.3%)	2 (4.3%)	
Mean Corpuscular volume (femtolitres)	Low (<79)	2 (2.9%)	3 (6.4%)	0.45
	Normal (80-99)	62 (88.6%)	42 (89.4%)	
	High (>100)	6 (8.6%)	2 (4.3%)	

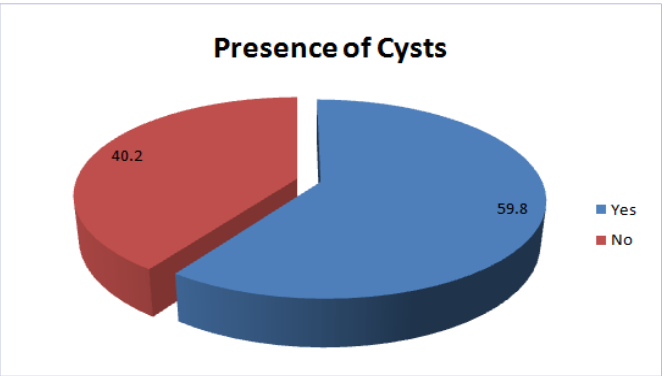

Figure 1: Presence of Cysts

Discussion

According to a study, the incidence of ACKD ranges from 10 %-95 % where men are more affected by this than women and blacks are affected more than Caucasians [17]. In our study women and men had equal occurrence 35 (29.9 %) of acquired cystic kidney. Literature reveals similar findings 16, 18 though contrary findings have also been reported [16,18]. There appears to be a greater prevalence of ACKD in Black as compared to White patients with ESRD and men and African Americans are shown to be on higher risk side [16,18, 19,20].

The study results revealed the average age of patients at time of diagnosis of ACKD to be 44 years. The patients had been on dialysis for 9 or more years on average. The ACKD incidence has been reported to increase as the duration of dialysis is increased. 20 According to a study, the prevalence of ACKD was found to be 20.3% at mean age of 60.6 years and with mean Hemodialysis duration of 44.2 months. The patients on Hemodialysis for greater than 3 years had greater chances of developing ACKD (p=0.001). In one study age, male gender and duration of dialysis were noted as being more prone to developing ACKD [22]. Another study reported the majority of the patients with ACKD to be >60 years old having ESRD for 20-39 years of age and on dialysis for greater than 27 months [21]. According to a review, the prevalence of ACKD is dependent on the duration of dialysis

[18]. The patients having dialysis for greater than 5 years have been found to become more inclined to have ACKD than those with less than 1 year of dialysis [19].

The development of Acquired Cystic Kidney Disease in patients undergoing dialysis is of major concern as the cyst serves as a nidus for renal cell carcinoma. The ACKD patients have 80 % higher incidence of developing renal cell cancer. It has also been shown that ACKD affects at least a third of patients on Hemodialysis for >3 years and that around 20 % of them develops renal cell carcinoma.20

In our study, 59.8 % of the patients had cysts, 34.2 % had them in both kidneys whereas 29.1 % of them had multiple cysts on ultrasonography. It was also seen that those with 6-10 years of dialysis were most likely to have cysts. In one study, the incidence of multiple cysts was documented to be 7 % in those having chronic renal failure and 22 % in patients undergoing maintenance dialysis. In addition, 30 %-50 % of the patients were found to have 1-3 renal cysts, indicating an early form of disease. According to a study, those patients who had dialysis for 15 months had no cysts, those who had dialysis for 28 months had 1-3 cysts while those who had dialysis for greater than 49 months had multiple cysts. According to another study, 50 %-80 % of patients are affected if they have received dialysis for >10 years [20]. The frequency of ACKD has been reported to increase with Hemodialysis and number of cysts also increases as treatment time increases. Also, patients who have greater number of cysts have higher hemoglobin levels and need smaller doses of erythropoietin [23].

In our study, patients with ACKD had mean hemoglobin of 11.8gm/dl, MCV 90fl, white blood cells $7.57x10^9$/L and platelet count $188.12x10^9$/L. In one study, the patient with ACKD had hypochromic anisocytosis anemia with Hb 4.8gm/dl whereas WBCs and platelet were found to be normal though serum creatinine and BUN were elevated [24]. A case report on ACKD showed the patient to have normocytic normochromic anemia (Hb 7.1gm/dl, hematocrit 22%), elevated WBCs and normal platelet count but creatinine and urea were markedly elevated [17].

Though the study results reveal an association between duration of dialysis and occurrence of renal cyst, further studies should be conducted to ascertain the complications arising in these cysts. This study is a step forward in providing local evidence that patients need to be screened earlier in order to prevent complications. The limitation of this study is its relatively small sample size due to resource and time constraints. It is also acknowledged that the study results may suffer from recall bias, an inherent weakness of a cross-sectional study design.

Conclusion

This study results revealed that patients who were older or had longer duration of dialysis were more likely to develop renal cysts which increase in number which was associated with the duration of dialysis. Both genders were equally prone to develop renal cyst after dialysis. Conversely around 50 % of the patients with increase hemoglobin levels were having the cyst.

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