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ORIGINAL ARTICLE

Prevalence of chronic kidney disease in children of school going age visiting outpatient department of A Tertiary Care Hospital in Karachi, Pakistan.

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ABSTRACT… Objective: To determine the prevalence of chronic kidney disease (CKD) among children of school-going age. **Study Design:** Cross-sectional study. **Setting:** Department of Pediatric Medicine, National Institute of Child Health, Karachi, Pakistan. **Period:** July 2023 to December 2023. **Methods:** A total of 130 children of both genders, aged between 5-15 years, visiting outpatient department of pediatric medicine were analyzed. Demographic and clinical information were noted. Laboratory investigations like urinalysis and serum creatinine were performed. CKD was diagnosed on the basis of "Kidney Disease Outcomes Quality Initiative (KDOQI)" guidelines. **Results:** In a total of 130 children, 67 (51.5%) children were male. Overall, the mean age was 8.43±2.45 years. Hypertension was diagnosed in 10 (7.7%) children. Anemia was present in 103 (79.2%) patients. The mean hemoglobin, serum creatinine, and blood urea nitrogen were 9.41±1.98 g/dl, 0.48±0.37 mg/dl, and 34.20±33.18 mg/dl, respectively. CKD was diagnosed in 10 (7.7%) children. Among these 10 children diagnosed with CKD, 7 were having CKD stage-1 whereas CKD stage-2 was noted in 3 children. Presence of hypertension ($p=0.006$), and albuminuria ($p<0.001$) were associated with CKD. **Conclusion:** The prevalence of CKD in school going age children was 7.7%. Presence of hypertension, and albuminuria were linked with CKD.

Key words: Albuminuria, Chronic Kidney Disease, Creatinine, Hemoglobin, Hypertension.

INTRODUCTION

Chronic kidney disease (CKD) is becoming more common, which is a serious public health concern.[1] Despite being very rare in children, it can be a severe illness with a number of long-term effects. Considering that CKD is clinically asymptomatic most of the time, particularly in its early stages, epidemiological statistics on the disease may understate its true incidence and prevalence.[3] Evidence currently available ascertains that children's end-stage renal disease (ESRD) is only the "tip of the iceberg" when it comes to chronic kidney disease (CKD), meaning that a greater proportion of patients are likely to be in earlier stages of the illness than attain ESRD.[4] Mostly, the CKD studies have been assessing the prevalence of moderate to severe renal disease without exploring the asymptomatic aspects of the disease.[4] It is highly recommended that early detection of CKD be made through screening programs, but regarding the significance of these screening programs for children, researchers differ in opinion.[5-7] In some parts of East Asia, urinary screening programs have been firmly established, while health providers have given the impression of not considering the importance of making early detection of asymptomatic CKD through screening the children in western countries.

Over the past 30 years, there has been an almost two-fold rise in the occurrence and a four-fold rise in the prevalence of pediatric ESRD patients.[8] Research conducted worldwide has specified that out of every one million children, there have been 3.0 to 12 cases of CKD, provided that the definition of CKD varied among these studies, with different GFR thresholds, and the derived data belonged to hospital registries involving children of different ages.[9,10] Pradeep et al revealed the prevalence of

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CKD to be 9.3% among healthy school children analyzed through a screening program.[11]

Globally, CKD prevalence in children varies in screening programs, general population, or hospital-based studies.[12] This study was aimed to determine the prevalence of CKD among children of school-going age. The current study results would be helpful in estimating the burden of CKD among children of school-going age. Moreover, further help in assessing the need for a uniform screening program for the early diagnosis of CKD among children of school-going age can be achieved through these findings.

METHODS

This cross-sectional study was accomplished at the outpatient department of pediatric medicine, "National Institute of Child Health, Karachi", Pakistan, from July 2023 to December 2023. Considering the frequency of CKD in schoolchildren as 9.3%[11] with 95% confidence level and 5% margin of error, the sample size was calculated to be 131. The inclusion criteria were children of both genders, aged between 5-15 years, visiting the outpatient department of pediatric medicine. The exclusion criteria were known cases of CKD or those who had diabetes. Children with symptomatic acute kidney injury or those with chronic ailments like chronic liver disease or chronic lung disease were also excluded. Non-probability convenient sampling technique was used.

After taking approval from "Institutional Ethical Review Board" (IERB-17/2023, dated 2-6-2023), the study was commenced. Informed and written consents were sought from the parents or guardians. Demographic and relevant clinical information were collected. Laboratory investigations like urinalysis and serum creatinine were performed through institutional laboratory as per institutional protocols. Prevalence of CKD was labeled as per operational definition. Children diagnosed with CKD were evaluated and managed further as per institutional protocols.

Diagnosis of CKD and its staging was made as per "Kidney Disease Outcomes Quality Initiative (KDOQI)" guidelines.[13] Albuminuria 1+ and above (through urine dipstick) was considered as present.[14] Hypertension was considered positive when both systolic and diastolic blood pressure readings at rest were equal to or exceeded the 95th percentile, taking into account sex, age, and height. Anemia was labeled as hemoglobin below 11 g/dl. A urine dipstick was utilized to semi-quantitatively measure urine albumin in each child. Two ml of blood was sent to institutional laboratory for serum creatinine evaluation. All the study data will be noted on a specific proforma designed for this study.

All collected data on special proforma was entered and analyzed through "IBM-SPSS Statistics", version 26.0. Qualitative data were highlighted as frequency and percentages while quantitative data were represented as mean and standard deviation (SD). Effect modifiers were controlled through stratification and were compared to see their effect on the outcome (presence of CKD). Comparison of qualitative data were made adopting chi-square test whereas quantitative variables were compared using independent sample t-test. P value < 0.05 will be taken as of statistical significance.

RESULTS

In a total of 130 children, 67 (51.5%) children were male. Overall, the mean age was 8.43 ± 2.45 years (ranging between 5-14 years). Hypertension was diagnosed in 10 (7.7%) children. Anemia was present in 103 (79.2%) patients. The mean hemoglobin, serum creatinine, and blood urea nitrogen were 9.41 ± 1.98 g/dl, 0.48 ± 0.37 mg/dl, and 34.20 ± 33.18 mg/dl, respectively.CKD was diagnosed in 10 (7.7%) children. Among these 10 children diagnosed with CKD, 7 were having CKD stage-1 whereas CKD stage-2 was noted in 3 children (Table-I).

Presence of hypertension ($p=0.006$), and albuminuria ($p<0.001$) were associated with CKD. Serum creatinine ($p<0.001$), and blood urea nitrogen ($p=0.011$) were significantly raised among children with CKD (Table-II).

Characteristics			Number (%)
Gender	Male		67 (51.5%)
	Female		63 (48.5%)
Age (years)	5-7		58 (44.6%)
	8-12		68 (52.3%)
	13-15		4 (3.1%)
Hypertension			10 (7.7%)
Anemia			103 (79.2%)
Family history of chronic kidney disease			14 (10.8%)
Albuminuria present			17 (13.1%)
Chronic kidney disease	Yes	Stage-1	7 (5.4%)
		Stage-2	3 (2.3%)
	No		120 (92.3%)

Table-I. Characteristics of children (n=130)

Characteristics		Chronic Kidney Disease		P-Value
		Yes (n=10)	No (n=120)	
Gender	Male	3 (30.0%)	60 (50.0%)	0.224
	Female	7 (70.0%)	60 (50.0%)	
Age (years)	5-7	2 (20.0%)	56 (46.7%)	0.183
	8-12	8 (80.0%)	60 (50.0%)	
	13-15	-	4 (3.3%)	
Hypertension		3 (30.0%)	7 (5.8%)	0.006
Anemia		10 (100%)	93 (77.5%)	0.092
Hemoglobin		8.89±1.75	9.45±2.00	0.390
Family history of chronic kidney disease		10 (100%)	106 (88.3%)	0.253
Albuminuria present		10 (100%)	7 (5.8%)	<0.001
Serum Creatinine		1.53±0.89	0.45±0.28	<0.001
Blood urea nitrogen (mg/dl)		59.40±55.87	31.82±29.53	0.011

Table-II. Association of CKD with characteristics of children

DISCUSSION

As this research was planned to investigate the burden of CKD in school-age children and it was found that CKD was diagnosed in 7.7% of the participants. The prevalence rate of CKD in this study is in line with international estimates, emphasizing the global burden of pediatric kidney disease. Global data reports the prevalence of CKD among children ranging between 1-6%.[15-18] Data from neighboring Iran report the prevalence of school going age children as 1.3%.[19] A mass screening program from Korea involving school going children revealed much higher prevalence of CKD (36.9%).[20] These differences could be linked to methodological variations in defining CKD, variations in cut-off values for renal disease, and geographic disparities in reporting CKD in children influenced by environmental, racial, genetic, and cultural factors.

Our findings highlighted an association between CKD and hypertension, anemia, and albuminuria. The elevated creatinine and blood urea nitrogen levels in CKD patients align with expectations, reflecting impaired kidney function. The higher prevalence of anemia in CKD patients underscores the impact of kidney dysfunction on erythropoiesis. The observed association with hypertension is consistent with existing literature highlighting the relationship between elevated blood pressure and CKD development in pediatric populations.[21,22] While hypertension is not explicitly defined as chronic kidney disease (CKD), it is imperative to acknowledge its significant association, often acting as both a consequence and an initial indicator of CKD in children and adolescents. This recognition aligns with the bidirectional relationship between hypertension and kidney dysfunction, emphasizing their interdependence.[23] Intriguingly, CREDIT study described hypertension to be association with lower mean glomerular filtration rate levels and a raised prevalence of CKD stages 3–5.[24] This correlation underscores the intricate interplay between hypertension and kidney function, a phenomenon observed consistently across various age groups. The link between hypertension and CKD underscores the well-established connection between elevated blood pressure and the progression of renal disease.[24] Recognizing hypertension as a potential indicator of underlying kidney issues is critical for early detection and management, emphasizing the importance of monitoring blood pressure as part of comprehensive healthcare for individuals at risk of CKD. The higher prevalence of anemia in this population warrants further exploration and consideration of regional factors contributing to these findings.

This research is of paramount importance for

various reasons. Firstly, it addressed a critical gap in understanding the public health impact of CKD in a specific population. The study provided insights into the prevalence rates, allowing healthcare policymakers to assess the magnitude of the issue and formulate targeted interventions. Early detection and intervention are crucial in pediatric CKD, and this research contributed to the identification of risk factors such as hypertension, anemia, and albuminuria. By focusing on a specific region like Karachi, the study took into account regional and cultural factors that may influence the prevalence of CKD, ensuring that healthcare strategies are contextually relevant. Moreover, the findings guide resource allocation within healthcare facilities, enabling them to plan effectively for the diagnosis, management, and follow-up care of children with CKD. Lastly, the research contributed valuable information to the scientific literature on pediatric nephrology, fostering global collaboration in addressing the challenges associated with CKD in children.

Limitations of the study include its cross-sectional design and reliance on a single tertiary care hospital, potentially limiting the generalizability of the results. Future research should explore additional risk factors, consider a more diverse population, and investigate potential regional variations in the presentation of pediatric CKD.

CONCLUSION

The prevalence of CKD in school going age children was 7.7%. Presence of hypertension, and albuminuria were linked with CKD.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Haileamlak A. **Chronic kidney disease is on the rise.** Ethiop J Health Sci. 2018; 28(6):681-82. doi:10.4314/ejhs.v28i6.1
2. Aier A, Pais P, Raman V. **Psychological aspects in children and parents of children with chronic kidney disease and their families.** Clin Exp Pediatr. 2022; 65(5):222-29. doi:10.3345/cep.2021.01004
3. Kovesdy CP. **Epidemiology of chronic kidney disease: An update 2022.** Kidney Int Suppl (2011). 2022; 12(1):7-11. doi:10.1016/j.kisu.2021.11.003
4. El Shafei AM, Soliman Hegazy I, Fadel FI, Nagy EM. **Assessment of quality of life among children with end-stage renal disease: A cross-sectional study.** J Environ Public Health. 2018; 2018:8565498. doi:10.1155/2018/8565498
5. Rai PK, Rai P, Bedi S. **Prevalence and risk factors of chronic kidney disease: A single day screening on World kidney day for four consecutive years in Varanasi.** Urol Nephrol Open Access J. 2018; 6(5):167-71.
6. Okpechi IG, Caskey FJ, Gaipov A, Tannor EK, Noubiap JJ, Effa E, et al. **Early identification of CKD-A scoping review of the global populations.** Kidney Int Rep. 2022; 7(6):1341-53. doi:10.1016/j.ekir.2022.03.031
7. Okpechi IG, Caskey FJ, Gaipov A, Tannor EK, Hamonic LN, Ashuntantang G, et al. **Assessing the impact of screening, early identification and intervention programmes for chronic kidney disease: Protocol for a scoping review.** BMJ Open. 2021; 11(12):e053857. doi:10.1136/bmjopen-2021-053857
8. Baum M. **Overview of chronic kidney disease in children.** Curr Opin Pediatr. 2010; 22(2):158-60.
9. Qader A, Uddin GM, Rahman H, Hanif M, Roy RR, Begum A, et al. **Renal diseases in children attending pediatric nephrology centers of Dhaka City.** J Pediatr Nephrol. 2016; 4(3):86-91.
10. Sajid NK, Ahmad S, Sarwar I. **Chronic renal failure in children; Etiology and presentation.** Prof Med J. 2014; 21(2):280-89.
11. Pradeep RK, Punam R, Sonam B. **Prevalence patterns of chronic kidney disease among school children and adolescents in a school in Varanasi, India.** J Urol Nephrol. 2019; 4(1):000154. doi: 10.23880/oajun-16000154
12. Orantes-Navarro M, Herrera-Valdes R, Almaguer-Lopez M, Brizuela-Diaz EG, Alvarado-Ascencio NP, de Morales JF, et al. **Chronic kidney disease in children and adolescents in Salvadoran Farming Communities: NefroSalva Pediatric Study (2009-2011).** MEDICC Rev. 2016; 18(1-2):15-21.

13. Ketteler M, Block GA, Evenepoel P, Fukgawa M, Herzog CA, McCann L, et al. **Executive summary of the 2017 KDIGO Chronic Kidney Disease-Mineral and Bone Disorder (CKD-MBD) Guideline Update: What's changed and why it matters [published correction appears in Kidney Int.** 2017;92(6):1558]. Kidney Int. 2017; 92(1):26-36. doi:10.1016/j.kint.2017.04.006

14. Pottel H, Hoste L, Delanaye P. **Abnormal glomerular filtration rate in children, adolescents and young adults starts below 75 mL/min/1.73 m(2).** Pediatr Nephrol. 2015; 30(5):821-28.

15. Fuhrman DY, Schneider MF, Dell KM, Tom DB, Mark R, Saland JM, et al. **Albuminuria, Proteinuria, and Renal Disease Progression in Children with CKD.** Clin J Am Soc Nephrol. 2017; 12(6):912-20. doi:10.2215/CJN.11971116

16. Lee YM, Baek SY, Kim JH, Kim DS, Lee JS, Kim PK. **Analysis of renal biopsies performed in children with abnormal findings in urinary mass screening.** Acta Paediatr. 2006; 95(7):849-53. doi:10.1080/08035250600652005

17. Tan SY, Naing L, Han A, Khalil MA, Chong VH, Tan J. **Chronic kidney disease in children and adolescents in Brunei Darussalam.** World J Nephrol. 2016; 5(2):213-19. doi:10.5527/wjn.v5.i2.213

18. Olowu WA, Adefehinti O, Aladekomo TA. **Epidemiology and clinicopathologic outcome of pediatric chronic kidney disease in Nigeria, a single cenetr study.** Arab J Nephrol Transplant. 2013; 6(2):105-13.

19. Gheissari A, Kelishadi R, Roomizadeh P, Abedini A, Haghjooy-Javanmard S, Abtahi SH, et al. **Chronic kidney disease stages 3-5 in Iranian children: Need for a schoolbased screening strategy: The CASPIAN-III study.** Int J Prev Med. 2013; 4:95-101.

20. Cho BS, Kim SD, Choi YM, Kang HH. **School urinalysis screening in Korea: Prevalence of chronic renal disease.** Pediatr Nephrol. 2001; 16(12):1126-28.

21. Gallibois CM, Jawa NA, Noone DG. **Hypertension in pediatric patients with chronic kidney disease: Management challenges.** Int J Nephrol Renovasc Dis. 2017; 10:205-13. doi:10.2147/IJNRD.S100891

22. Wilson AC, Flynn JT. **Blood pressure in children with chronic kidney disease: Lessons learned from the chronic kidney disease in children cohort study.** Pediatr Nephrol. 2020; 35(7):1203-09. doi:10.1007/s00467-019-04288-6

23. Reynolds BC, Roem JL, Ng DKS, Mina M, Flynn JT, Furth SL, et al. **Association of time-varying blood pressure with chronic kidney disease progression in children.** JAMA Netw Open. 2020; 3(2):e1921213. doi:10.1001/jamanetworkopen.2019.21213

24. Soylemezoglu O, Duzova A, Yalçinkaya F, Arinsoy T, Süleymanlar G. **Chronic renal disease in children aged 5-18 years: A population-based survey in Turkey, the CREDIT-C study.** Nephrol Dial Transplant. 2012; 27 Suppl 3:iii146-iii151. doi:10.1093/ndt/gfs366

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Erum Parker	Critical revisions, Drafting, Responsible for data.	
2	Mashal Khan	Concept and Designing, Proof Reading, Proof reading, Critical Revisions.	
3	Bilqis Abroo	Concept and designing, Proof reading, Critical revions.	