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Pediatrics

SCREENING OF KIDNEY DISEASES IN CHILDREN : A PILOT STUDY CONDUCTED IN TEACHING HOSPITAL IN PUNE,MAHARSHTRA.

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ABSTRACT

1)BACKGROUND: Chronic Kidney Disease(CKD) is asymptomatic at early stages hence patients are detected at the stage of severe kidney damage. Thus early identification and prevention of CKD in early stages are important initial steps. Proteinuria is biomarker and strongly associated with CKD.

2) OBJECTIVES: To assess the Prevalence of proteinuria in asymptomatic children of 10-18yr age and its association with Glomerular Filtration Rate(GFR).

3) METHODOLOGY: In this cross-sectional study urine sample tested with a urinary dipstick method for proteinuria two times and those tested positive in second screening were subjected to serum creatinine estimation and GFR calculation.

4) RESULTS: Total 204 children screened, 33 were positive for proteinuria and on second screening 5 children were positive, out of 5 children 3 children have decreased GFR.

5) CONCLUSION: The urinary screening of children by dipstick is a non-invasive, inexpensive, easy to perform and feasible test for early detection of early renal dysfunction.

KEYWORDS : Chronic Kidney Disease, Proteinuria, Urine Dipstick Method

INTRODUCTION:

Kidneys are pair of organs lies in front of posterior abdominal wall. Kidneys have functional unit nephron. Nephron has different parts those are glomerulous, bowmans capsule, PCT, LH, DCT, CT. The kidneys perform important functions such as filtration and excretion of metabolic waste products (urea), regulation of electrolytes, fluid, and acid-base balance, stimulation of red blood cell production (erythropoietin), regulation of blood pressure via the renin-angiotensin-aldosterone system, and helps in calcium metabolism through vitamin D activation.

Proteinuria is the presence of excess proteins in the urine. Healthy person's urine contain very little protein; an excess is suggestive of kidney damage. There are two mechanisms for proteinuria: Permeability of glomerular capillary increases this leads to the abnormal transglomerular passage of proteins and their decreased reabsorption by the epithelial cells of the proximal tubuli (1).

Kidney Diseases (CKD) in children are commonly due to Congenital Nephropathies i.e. congenital abnormalities of kidney and urinary tract, Hereditary Disorders, Obstructive Nephropathy, Reflux Nephropathy and Acquired Glomerular Diseases.

The progression in kidney damage continues in some of these disorders. If structural and functional abnormalities continue beyond 3 months, it is labeled as Chronic Kidney Disease. The rate of progression depends on the primary disease and individual patient.

CKD is usually asymptomatic in early stages, thus many patients with CKD are detected when patient almost reached the stage of severe kidney damage. At this stage there are few opportunities to prevent adverse outcomes (2). The treatment options are limited to chronic dialysis or renal implant. Facilities for providing Renal Replacement Therapy to children with CKD are inadequate in India and it is beyond the reach of the majority.

Early identification and treatment of kidney diseases in children and adolescents are important initial steps in prevention of chronic kidney diseases (3). In Asia, Japan was first country who started National Urinary Screening Program for school children. They have got great success in the early detection of asymptomatic kidney disease (4). But in India there is no such screening program available. So we thought to undertake this study.

REVIEW OF LITERATURE:

Kidney Disease Outcomes Quality Initiative(KDOQI) working group of the National Kidney Foundation (NKF) defined CKD as "evidence of structural or functional kidney abnormalities (abnormal urinalysis, imaging studies, histology) that persists for at least three months, with or without a decreased glomerular filtration rate(GFR), as defined by a GFR of less than 60ml/min per 1.73m^2 (5).

GFR is defined as, volume of glomerular filtrate formed each minute by all the nephrons in both kidneys (6).

Study	Paediatric Population	Severe pre-terminal CKD (PMARP)= Per Million Age Related Population	
	(Millions)	Incidence/PMARP	Prevalence
Italian (Population based) (7)	16.8	12.1	74.7
France(8)	0.5	10.5	66
Spain(9)	11.3	8.7	71.1
Sweden(10)	1.7	7.7	59
Turkey(11)	24	11.9	
Iran(12)		11% Pediatric Nephrology admission (Hospital based)	
India(13)		12% Pediatric Nephrology admission (Hospital based)	

Though the incidence and the prevalence of early stages of chronic Kidney disease (CKD) in children is less, it can be a devastating illness with many long term consequences (2). Proteinuria is biomarker and strongly associated with Chronic Kidney disorders (14).

In Asia, Japan has been conducting screening program for proteinuria in school children since 1973 with great success in early detection of asymptomatic kidney diseases (4).

In Taiwan, mass urinary screening is conducted twice each year in elementary and high school students (15).

In India, 12% children suffer CKD who gets admitted in Pediatrics Nephrology unit (13). But there is no community screening program to detect kidney diseases available in India. So Such Screening Program will be helpful for early detection.

Therefore we have undertaken this pilot study in Maval Taluka i.e. rural part of Pune, Maharashtra, India.

OBJECTIVES:

a) To assess the Prevalence of proteinuria in asymptomatic children in age group of 10 -18 years.
b) Association of proteinuria with Glomerular Filtration Rate.

METHODOLOGY:

This was a cross sectional study. The study was conducted at MIMER medical college and BSTR hospital, Talegaon. The entire experimental protocol was approved by Institutional ethics committee. The subjects consist of Children in age group of 10-18 years. A total of 204 children were screened over a period of three months. Inclusion criteria were the Children in age group of 10-18 years and free from known Kidney disease. Exclusion criteria were children who were Diagnosed cases of kidney disorders and Children with serious bacterial infections.

Informed Assent was taken from Child and permission from parents/guardian. Their weight and height were measured. BMI was calculated. Children and their parents/ guardian were instructed in their local language about procedure of urine sample collection. Midstream fresh urine sample about 5 ml. was obtained in a clean sterile container, which was tested initially with a urinary dipstick method. Those children who were tested positive were rescreened within a week and those tested positive in second screening were subjected to blood test for serum creatinine estimation and GFR was calculated by formula (16).

Uristicks/Dipsticks were of Siemens company and the estimation of Serum Creatinine was done by Jaffes method on Fully automatic analyzer. Data was analyzed.

RESULTS:

The mean age of children was 12.55 years. The male to female ratio was 1.06:1.

Out of 204 children 105 were boys and 99 were girls, 33 had proteinuria in the first screening, out of those only 5 children tested positive for proteinuria in second screening, as shown in table 1.

TABLE 1: Children showing proteinuria among studied group

Total children(n=204)	First screening	Second screening
Children with Proteinuria	33	5

TABLE 2: showing gender wise distribution of children with proteinuria

Gender	Number of children screened	Children tested +ve for proteinuria (Second Screening)	Percentage
Male	105	2	1.90%
Female	99	3	3.03%

Table 3: showing number of children with proteinuria and value of GFR.

Sr. No.	GFR(ml/min per 1.73 m2 BSA)	Number of Children
1	≥90	2
2	60-89	3

GFR calculated by using formula given by Schwartz GJ, Brion LP, Spitzer A (16).

DISCUSSION:

Our study consisted of 204 children who were screened for proteinuria out of which 33 were found positive during first screening and 5 children were tested positive in second screening. Urinary screening test for early detection of renal diseases in asymptomatic school children and adolescents is important in the detection of silent renal diseases. Screening urine for protein is one of the strategies to detect asymptomatic kidney disease.

In our study, the male to female ratio was 1.06:1. Urinary abnormalities were more common in females than males (17, 18). Lin et al. (19) found abnormalities in more males than females. However Vehaskari et al. (20) found that the prevalence of proteinuria was not gender dependent.

In our study 3 children found to have reduced GFR which may suggest some renal damage. But despite of proteinuria, GFR of 2 children were normal.

The urinary screening of children by dipstick is a non-invasive and feasible test for early detection of silent renal diseases(21). Most common method used now days is dipstick method for detecting proteinuria which may suggest kidney damage in asymptomatic children (22). We also used similar dipsticks for screening. In our study, it was found that in 1st screening 16.17% children were tested positive and on subsequent 2nd screening 2.45% children were found positive for urinary protein. In Egypt 1.3% school children were with positive result and on 2nd screening 0.72% were tested positive (23). In Malaysian study, on 1st screening 1.9% children were positive. But in only 0.12% children proteinuria persisted on 2nd screening (24). Shajari et al. (22) found that 4.7% of children tested positive in their first screening and only 1.4% in their second screening.

Mass urinary screening programs are well established in countries like Korea, Japan and Taiwan but there is no such program in India.

Limitations for our study were like this was short duration study, so our sample size is small.

CONCLUSION:

The urinary screening of children by dipstick is a non-invasive, inexpensive, easy to perform and feasible test for early detection of early renal dysfunction. At present there is no clear consensus for developing countries on whether screening programs for CKD in children and adolescents should be undertaken. Early detection and taking appropriate steps for prevention is important in clinical practice to help in decreasing burden of renal disease. Considering large pediatric population of India mass screening may not be cost effective but community based programs should be implemented in high risk group.

SUMMARY:

Proteinuria is biomarker of kidney disease. Therefore urinary screening for proteinuria is very important in asymptomatic children. Children in age group 10 to 18 years were screened twice for urinary proteins by dipstick method after obtaining informed assent from child and permission from parents/guardian.

In our study, the prevalence of proteinuria was 16.17% among the 204 children subjected for urinary screening. However a lower prevalence of 2.45% was found subsequently in repeat screening. Out of 5 children 3 had reduced GFR suggestive of some kidney damage.

Urine screening for proteinuria is simple and feasible method for detection of silent kidney damage, which requires periodical follow up to diagnose and assess the progression of kidney damage, as the treatment of end stage kidney disease is difficult option due to heavy cost and unavailability of treatment facilities in rural area.

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