

Original article

Screening urinalysis for proteinuria in schoolchildren

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ABSTRACT Although asymptomatic proteinuria in children is uncommon, long-term follow-up of children who have persistent proteinuria reveals that they face risks to have significant glomerular changes followed by decreasing kidney function. Since 1970's urine screening program for asymptomatic hematuria and proteinuria in schoolchildren has been conducted regularly in some countries. So far such program has never been implemented in Jakarta. As a part of The Community Health Program of the Medical School, University of Indonesia, this epidemiologic study aimed especially to look at the urine abnormalities among schoolchildren. The target population was children in grades III, IV and V of 4 elementary schools in Eastern Jakarta. Four hundred and forty nine children (217 boys and 232 girls) were enrolled in this study, held during school time in August 1999. Their mean age was 9.35 (SD 1.2) years. Data collected were history of illness, physical examination, and complete urinalysis using a dipstick method. Proteinuria was found in 30 (6.8%) children, which in repeated urinalyses were determined as orthostatic in 2 (0.4%), transient in 20 (4.5%), and persistent proteinuria in 6 (1.4%) children. Three out of 6 children with persistent proteinuria also had hematuria. One child with persistent proteinuria was considered as having urinary tract infection. We conclude that the incidence of asymptomatic proteinuria in schoolchildren is not high, but because of significant risks that they face, a long-term follow up of them is indicated. [Paediatr Indones 2001; 41:231-233]

Keywords: asymptomatic proteinuria, urinary tract infection, screening

PERSISTENT PROTEINURIA HAS BEEN WELL-KNOWN TO BE associated with renal disease. Similar to hematuria, it is one of the most common urine abnormalities seen in children with parenchymal renal disease.¹ Early detection of such condition might play a role in understanding the natural history of chronic disease and general availability of effective treatment. Screening of asymptomatic population is one way to early detection.

Urine screening program for asymptomatic hematuria and proteinuria in schoolchildren has been conducted regularly in some countries.²⁻⁴ Long-term follow-up of those children with proteinuria shows significant glomerular changes on renal biopsies with decreasing kidney function.^{4,5} So far such program has not yet been implemented in Jakarta. This epidemio-

logic study was a part of The Community Health Program conducted by The Medical School, University of Indonesia Jakarta, which aimed to look at the database of health status of schoolchildren, especially in urine abnormalities among schoolchildren.

Methods

The study was held in four elementary schools consisted of 3 governmental schools (SD Pekayon 01, 11, and 18) and 1 private school (SD Yasmin), located at an industrial area in Pasar Rebo, Eastern Jakarta. The target population was children in grades III, IV and V from each school. The study took place during school time in August 1999. Informed consent from parents was obtained prior to the study. Data collected included previous and recent history of kidney disease, physical examination (including anthropometry and blood pressure), and laboratory tests consisted of

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complete urinalysis and urine culture. Laboratory tests were done by the team of Clinical Pathology Department. Complete urinalysis consisted of specific gravity, pH, and presence of glucosuria, proteinuria, and bilirubinuria was determined semi-quantitatively by dipstick test (Multistix SG, Bayer). Urinary blood cells were determined microscopically using Sternheimer Malbin reagent in centrifuged urine. Urine specimens collected were midstream urine. When proteinuria of more than +1 was found at the first urinalysis, repeated urinalysis was done using urine specimen taken early in the morning at home and on the spot at school on the same day.

Persistent proteinuria was defined as proteinuria >1+ detected constantly in all urine specimens. Orthostatic proteinuria was defined as proteinuria >1+ found in urine taken during school time but was not present in the morning urine, while transient proteinuria was defined when proteinuria >1+ was found inconstantly in any urine specimen. Hematuria was defined as the number of sediment urinary red blood cells >5 per high power field by microscopic examination.

Results

A total of 449 schoolchildren (217 boys and 232 girls) were enrolled in this study; their age range was between 7.4 -14.¹ (mean 9.35; SD 1.25) years. No abnormalities were found on physical examination in all children; all of them had normal blood pressure. Thirteen children failed to collect urine, so that 436 urine specimens were examined in the first screening (214 boys and 222 girls). Thirty out of 436 urine specimens (6.8%) showed proteinuria >1+. These 30 children who had proteinuria in the first screening were asked to collect two other urine specimens. Two out of 30 children were absent during the time of urine collection. All but one child had slight proteinuria (1+ = 30 mg/dl), one child had moderate proteinuria (2+ = 100 mg/dl). Among 28 children who had three urine specimens; 10 were boys, and 18 were girls.

Persistent proteinuria was found in 6 children (1.4%), orthostatic proteinuria in 2 children (0.4%), and transient proteinuria in 20 children (4.5%). Three out of 6 children with persistent proteinuria also had hematuria. A boy with persistent proteinuria also had 12-15 leukocytes per high power field in the urine which then showed significant bacteriuria in the culture done twice, i.e. *Proteus mirabilis* and *Escherichia*

coli >10⁵ /ml for each microorganism. This boy also complained of dysuria, so that he was considered as having urinary tract infection. Other children had no symptoms. Asymptomatic persistent proteinuria in this study was found in 5 children (1.1%).

Discussion

Screening program is aimed to early detect chronic disease and to understand the natural history of such disease. Schoolchildren is a captive, relatively homogenous population, representative of a total community in whom significant chronic disease might be expected to be detected at early stage.²

The accuracy of dipstick method used in our study as well as in most epidemiologic studies for detecting proteinuria is well documented.^{3,6} Very few sources of nonspecific reaction have been described, i.e., caused by alkaline in the urine or bacterial growth,⁶ which is unlikely play a role in our results. Examination of protein concentration in random urine specimens ignores the effect of urinary dilution and concentration,⁶ but measuring protein excretion rates in timed urine collections is not feasible for screening program. It is possible that mild proteinuria was missed in some specimens taken during school time because of dilute urine, but this is not true for morning specimens which were concentrated. In this study specific gravity urine specimen were in a range between 1.010 - 1.030, while pH were between 5 - 8.

Asymptomatic proteinuria is the term applied when abnormal rate of excretion of protein occurs in a subject who has no other abnormal history, physical, or laboratory findings pointing to disease of kidney or urinary tract. A urine screening program for asymptomatic hematuria and proteinuria in schoolchildren has been conducted yearly since 1970's in some countries with great success in the early detection of asymptomatic renal disease.^{2,3,5} In the program proteinuria was found about 10.7%,³ and varied by age, sex, and definition of proteinuria used.² The occurrence of proteinuria increases progressively with increasing age for both boys and girls and was significantly greater at all age groups for girls.² In this study we found asymptomatic persistent proteinuria in 1.1% of 449 children studied, where girls outnumbered boys. The occurrence of proteinuria in three out of three consecutive specimens is much less than proteinuria in one out of three consecutive specimens (Table 1).

TABLE 1. NUMBER OF SCHOOLCHILDREN WITH PROTEINURIA

Proteinuria >1+	Total	Boys	Girls
1 out of 3	17	5	12
2 out of 3	5	1	4
3 out of 3	6	4	2
Total	28 (6.4%)	10 (4.7%)	18 (8.1%)

Long observation of children with asymptomatic isolated proteinuria found in school screening program, who have constant proteinuria lasting longer than 6 months, reveals that 47% of them shows significant glomerular changes, and 53% has minimal glomerular changes in renal biopsy.⁴ Among specimens which show significant glomerular changes, focal segmental glomerulosclerosis is the most common finding, followed with IgA nephropathy, diffuse mesangial proliferative glomerulonephritis without IgA deposition, and membranous glomerulonephritis.^{4,5} Focal segmental glomerulosclerosis (FSGS) associated with asymptomatic proteinuria is common in children and that the prognosis for asymptomatic FSGS is as poor as that for FSGS associated with nephrotic syndrome,⁷ where chronic renal impairment developed in half of these children with FSGS.⁴ The prognosis of IgA nephropathy in children seems to be favorable, but a study demonstrated that persistent proteinuria in children with IgA nephropathy leads to progression of glomerular sclerosis.⁸ After a long-term follow-up of 6-9 year period it is demonstrated a quarter of these children with asymptomatic constant proteinuria have normal urine, while the rest still show proteinuria. The occurrence of normal urine is more likely in the group of children with minimal glomerular changes.⁴

Among children with asymptomatic proteinuria and / or hematuria found in school screening program, 10.5% had high cholesterol serum level (>200 mg/dl), associated mostly with IgA nephropathy, FSGS, minimal changes, and non IgA GN in fewer number. Measurement of serum cholesterol level may be useful in urinary screening for renal disease.⁹ Children with both proteinuria and hematuria have serious glomerular diseases with potentially poor prognosis.¹⁰ In our study 3 out of 5 children with persistent proteinuria were accompanied with hematuria, indicated that they were very likely to have glomerulopathy.

We conclude that the occurrence of asymptomatic proteinuria in schoolchildren is rare. However, because of the high incidence of significant glomerular changes and the high rate of progression to chronic renal impairment among these children, early detection and long-term follow-up of this condition is needed.

Acknowledgments

This study was a part of a pilot program named the Community Health Program conducted by Medical University of Indonesia Jakarta, sponsored and coordinated by Clinical Pathology Department-Cipto Mangunkusumo General Hospital, in collaboration with Japan Society for Promoting Sciences (JSPS). We are grateful to Prof. Dr. Sri Margono from Parasitology Department, Faculty of Medicine University of Indonesia for coordinating the study.

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