

Screening Tests For Glycosuria and Proteinuria Among Schoolchildren in Turkey

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In recent years researchers have emphasized the importance of multiple screening procedures to diagnose presymptomatic disease in order to offer effective therapy.¹⁻⁴ In view of this, we attempted in this study to evaluate the efficiency of screening a sample of Turkish schoolchildren for glycosuria and proteinuria and to see if the methods we selected could be used on a nation-wide scale.

Materials and Methods

Groups of schoolchildren of both sexes, ranging in age from 10 to 12 years, attending the last year of primary school in the Etimesgut, Ergazi and Sincan districts near Ankara, were selected for examination for glycosuria from March through June, 1968. The younger children (7 to 9 years of age) attending the same schools were omitted as it was felt that they would not be able to cooperate in this study.

Each child was given a questionnaire one day prior to the examination to record, with the help of his parents, any symptoms suggesting diabetes or urinary tract disease involving the child or members of his family (Table 1). Urine samples were collected in sterile test tubes from each child two hours post-prandially. Each specimen was examined for glycosuria using Clinistix reagent strips (Ames Company), Figure 1, and for proteinuria using 20 per cent salicylsulphonic acid.⁵ A retest was done one week later on any child proved to be positive for glycosuria and proteinuria. With regard to persis-

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TABLE 1
DISTRIBUTION OF PROTEINURIA BY AGE, SEX AND HISTORY
OF URINARY DISEASE

Age	Sex	Total No. (Per cent)	Quantity of Protein			History of Urinary Disease	P
			Slight	Moderate	Heavy		
10 years	Female	28 (11.1 %)	24	4	—	5	$P < 0.005$
	Male	13 (4.5 %)	9	2	2	2	
11 years	Female	20 (10.7 %)	19	1	—	3	$P < 0.001$
	Male	6 (3.4 %)	5	1	—	—	
12 years	Female	19 (12.1 %)	11	4	4	1	$P < 0.005$
	Male	5 (2.9 %)	3	2	—	—	
Total	Female	67 (11.2 %)	54	9	4	9	$P < 0.001$
	Male	24 (3.7 %)	17	5	2	2	

tent proteinuria, follow-up studies included microscopic and bacteriologic examination of a second sample of urine, heart examination and throat culture.



Figure 1. The Clinistix reagent strips used for detection of glucose in urine.

Results

Of the 1318 children approached in this study, 1238 (596 girls and 642 boys) participated, a response of 93.9 per cent. The age and sex of the children are shown in Table 2.

Glycosuria was detected by Clinistix reagent strips in one boy aged 12 years (0.08 per cent). A retest was made one week later on a second urine sample from the same child and it was negative for glucose, suggesting transient glycosuria.

TABLE 2
SEX AND AGE OF CHILDREN

Age	Female	Male
10 years	252	292
11 years	187	178
12 years	157	172
Total	596	642

Proteinuria was detected in the urine of 91 children (67 girls and 42 boys), a total prevalence of 7.4 per cent, 11.2 per cent in females and 3.7 per cent in males ($P < 0.005$). The distribution and quantity of proteinuria detected are shown in Table 1. A retest of all patients with proteinuria ten days later showed persistence in 28, an overall prevalence rate of 2.3 per cent. In females persistent proteinuria was detected in 22 (nine aged 10 years, six aged 11 years and seven aged 12 years), a prevalence of 3.7 per cent; in males it was found in six (three aged 10 years, two aged 11 years and one aged 12 years), a prevalence of 0.9 per cent. Follow-up studies of all subjects with persistent proteinuria revealed two girls with asymptomatic pyuria: one, aged 11 years, with sterile pyuria (Figure 2) who did not cooperate in further urologic investigations; the other, aged 12 years, with pyuria accompanied by gram negative bacilli (Figure 3) whose urine on culture gave profuse growth of *E. coli* indicating significant bacilluria (Figure 4). The organisms were sensitive to Furadantin and her condition was cleared by adequate doses of this drug for ten days. Scanty growths of *Staphylococcus aureus* were detected in the urine cultures of two children (one girl aged 12 years and one boy aged 11 years). Beta hemolytic streptococci were also discovered in the throats of five, one boy aged 11 years and four girls, two aged 10, one aged 11 and one aged 12 years.

All cases with persistent proteinuria were subjected to heart examinations and all were negative.

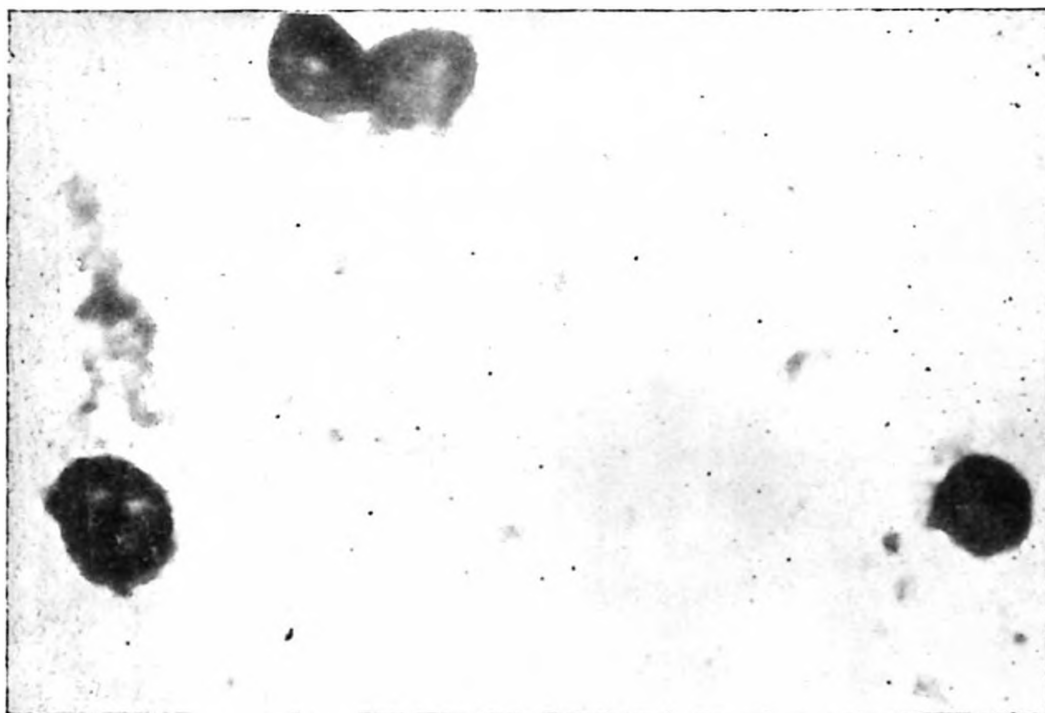


Figure 2. Gram-stained film from the centrifuged urine sample of an 11-year-old girl with persistent proteinuria showing numerous pus cells (sterile pyuria).

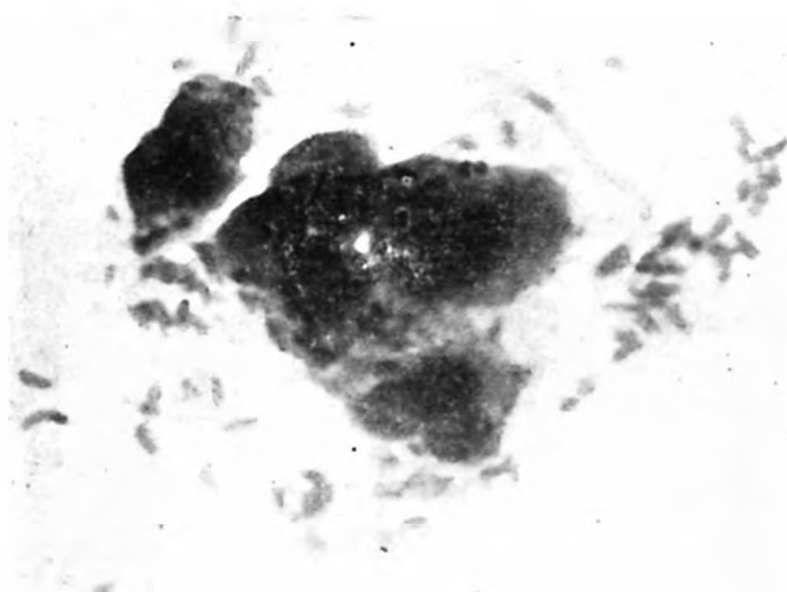


Figure 3. Gram-stained film from a centrifuged urine sample of a 12-year-old girl with persistent proteinuria showing numerous pus cells (pyuria) and gram-negative bacilli.

Discussion

The prevalence rate of glycosuria was found to be 0.08 per cent, a lower figure than those given by other writers from different parts

of the world. Kunin et al ⁶ in Virginia (U.S.A.) reported 0.4 per cent and Revington ⁷ in England, 0.2 per cent. Besides, El-Garhy and Richardson ³ in Scotland reported a rate of 1.1 per cent and El-Garhy ⁸ in Egypt found 0.4 per cent among their studied groups of schoolchildren. The discrepancy in the results may be due to environmental, as well as to racial differences. There is still much debate on the significance of transient glycosuria among normal subjects and this should be assessed by long-term follow-up studies.⁹



Figure 4. MacConkey plate showing a colony count of *E. coli* indicating significant bacilluria obtained from the urine of the same patient (Figure 3).

Proteinuria was detected during the first examination in 11.2 per cent of the females and 3.7 per cent of the males, an overall prevalence rate of 7.4 per cent. Follow-up urine examination of all positive cases revealed persistent proteinuria in 3.7 per cent of the girls, 0.9 per cent of the boys and 2.3 per cent of the entire studied population. The difference in rates between girls and boys with proteinuria was found to be statistically significant and can be attributed to the sex difference. These findings could be compared with those of Kunin et al, ⁶ Finlay,¹⁰ Hart,¹¹ Mou and Feldman ¹² and Randolph and Greenfield ¹³ who reported rates varying from 1.1 per cent to 6.7 per cent among their studied groups of normal subjects and schoolchildren.

Beta hemolytic streptococcus was isolated from the throats of five (17.5 per cent) of the subjects with persistent proteinuria, all of whom had negative urine results by both microscopic and bacteri-

ologic examinations. This might be attributed to asymptomatic, mild glomerulonephritis resulting from a throat infection which had passed undiagnosed clinically.

Scanty growths of *Staphylococcus aureus* were detected in the urine of three children (10.7 per cent) without pyuria but diagnosed as having persistent proteinuria. This might have been due to contamination.

There is, however, sufficient evidence from previous work suggesting that proteinuria in young adults, in the absence of renal disease and/or pyuria^{17 18} is a good indication for further bacteriologic and urologic investigations. However, long-term follow-up study of such cases requires a high degree of understanding and cooperation between the school doctor, the child and its parents.

In terms of time and cost for carrying out such screening procedures on a large scale, both are minimal when the Clinistix reagent strips are used. The writers agree with others^{5 10 19} that the salicylsulphonic acid test be replaced by Albustix reagent strips for the detection of proteinuria as they are cheap and consequently more applicable.

As a result of this experience, it is felt that simple screening procedures among school populations do not require the services of a doctor. The range of examination offered to these children was certainly within the competence of a qualified, pre-oriented nurse.

Finally, the magnitude and prevalence of glycosuria and proteinuria detected by mass screening has been prospectively evaluated in an apparently healthy group of schoolchildren in the hope that such procedures be adopted to identify others among the school population throughout the country.

Summary

Of the 1238 schoolchildren examined, glycosuria was detected by Clinistix reagent strips in one boy, a prevalence of 0.08 per cent; retest showed that the case was a transient one. Proteinuria was detected in the first urine sample of 11.2 per cent of the females and 3.7 per cent of the males, 7.4 per cent of all examined children. Persistent proteinuria was found in 2.3 per cent of all positive cases on retest, an incidence of 3.7 per cent and 0.9 per cent among females and males respectively. Follow-up studies and treatment of patients with persistent proteinuria are discussed. Since the number of

children studied in this communication is insufficient to give reliable statistical results, it is proposed that the screening test procedures used in this study for the detection of glycosuria and proteinuria be applied on a large scale among the Turkish school population.

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