Original Article

National Health Survey on the Prevalence of Urinary Abnormalities in the Population: then and now (1975 to 2012)

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Abstract

Introduction: This paper presents the results of a community survey on urinary abnormalities which covered 1/80th of the population of Singapore in 1975. These findings were compared with the data from the Singapore National Service Registrants in 1974 as well as data from a recent survey in Singapore and that of other Asian and Western countries. Materials and Methods: The study covered 18,000 persons aged 15 years and above, representing a sampling fraction of 1/80th of the population. A total of 16,808 respondents attended the field examination centres, of whom 16,497 had their urine sample tested representing 92.7% of the sample population. Results: In the dipstick urine testing at the field examination centres, 769 subjects (4.6%) were found to have urinary abnormalities. Two hundred and eighty-two (36.7%) of these 769 subjects were found to have urinary abnormalities based on urine microscopy constituting a prevalence of 1.71%. The prevalence of proteinuria was 0.63% and for both haematuria and proteinuria was 0.73%. The prevalence for hypertension was 0.43% and renal insufficiency was 0.1%. Discussion: The consensus is that routine screening for chronic kidney disease (CKD) in the general population is not cost effective as the yield is too low. Whilst, most studies showed that screening of the general population was not cost effective, it has been suggested that screening for targeted groups of subjects could help to identify certain risk groups who may benefit from early intervention to prevent or retard the progression of CKD. Conclusion: The prevalence of urinary abnormalities in Singapore has remained the same, now and three decades ago.

Ann Acad Med Singapore 2012;41:339-46

Key words: Chronic kidney disease, Proteinuria, Screening

Introduction

In the planning of a tuberculosis prevalence survey in Singapore in 1975, it was decided to include a urine examination of the respondents using Labstix (Ames Company, Elkhart, Indiana, USA). Respondents found to have proteinuria, haematuria or both in the examination centres were then referred to the Department of Renal Medicine, Singapore General Hospital for further investigations. This data on the prevalence of urinary abnormalities in the population were presented as a paper at the 2nd Colloquium of Nephrology in Pattaya in Thailand by Dr Lim Cheng Hong in 1976.[1] Since its publication as an abstract in the Colloquium,[1] the full paper has not been published.

The average age of the whole population in 1975 was 34.5 years and that of the respondent population was the same at 34.5 years. There were 50.8% males and 49.2% females in the population compared to 48.3% males and 51.7% females among the respondents. The ethnic distribution in the population for Chinese was 77.3%, Malays 13.8%, Indians 7%, Others 1.9% compared to 77.6% for Chinese, 13.8% for Malays, 7.1% for Indians and 1.5% for Others among the respondents.

Apart from this study, there is one other study on urinary abnormalities among National Service Registrants in Singapore by Pwee et al.[2] Since 1967, all male citizens and permanent residents on reaching the age of 18 are

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liable for National Service in Singapore. Registration is mandatory along with a routine medical check up prior to induction. A screening test using Labstix is performed on the urine samples of every registrant and if abnormal, urine is rechecked using heat/acetic acid test for albumin and microscopic examination for haematuria. If confirmed to be abnormal, the registrant is referred to the Singapore General Hospital for further investigations.

In this paper, we shall present the detailed findings of the population survey of 1975 and in the discussion compare these findings with the data from the Singapore National Service Registrants[2] as well as data from a recent survey in Singapore in 2002 by Ramirez[3] and that of countries like Japan,[4] China,[5] USA,[6] Hong Kong,[7] and India.[8]

Materials and Methods

The study was aimed to cover 18,000 persons aged 15 years and above, representing a sampling fraction of 1/80th of the population in that age range. The population in Singapore at that time in 1975 was 1.507 million. A total of 16, 808 respondents attended the field examination centres, of whom 16,497 (representing 92.7% of the sample population) had their urine sample tested. Table 1 shows the age and sex distribution of the 1975 population and the survey respondents. In the spot urine testing at the field examination centres, 769 subjects (4.6%) were found to have urinary abnormalities.

Table 1. Age and Sex Distribution of General Population and Survey Respondents in Year 1975

Age	General Population ('000)		Respondents	
	Male	Female	Male	Female
15 to 19	147.9	140.0	1534	1666
20 to 29	227.9	219.9	2277	2491
30 to 39	133.9	133.2	1386	1534
40 to 49	110.0	100.1	1237	1221
50 to 59	77.2	68.8	775	825
60+	69.6	79.0	759	792
Total	766.5	741.0	7968	8529
Grand Total	**1507.5**	**16,497**		

Subsequent investigations in the hospital on these subjects consisted of examination using Labstix, boiling/acetic acid test for albumin, urine microscopy, serum creatinine, creatinine clearance test and total urinary protein. Based on history and physical examination including blood pressure measurements, other tests like urine culture and sensitivity, intravenous pyelogram and renal biopsies were performed.

Results

Among the 16,497 subjects who had their urine tested by Labstix, 769 subjects (4.6%) were found to have abnormalities while the other 15,728 tested negative.

Table 2 shows the age specific prevalence of Labstix abnormality of the 769 subjects. Two hundred and eighty-two (36.7%) of these 769 subjects were found to have urinary abnormalities based on urine microscopy (Urine FEME). Of the other 490 (63.7%) patients, 434 patients were found to have normal urine FEME and were not investigated further. Another 40 refused investigations. In 2 patients, case notes were lost and another 11 had normal repeat Labstix test and were discharged without further investigations.

The urine of the 282 patients was further tested with urine microscopy, boiling test for albumin and total urinary protein, serum creatinine and creatinine clearance. These 282 patients with urinary abnormalities based on urine

Table 2. Age-Specific Prevalence of Urinary Abnormalities among Subjects in the Population Survey

Parameters	Age (Years)						Total	Prevalence
	15 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60+		
Labstix abnormality	127	135	93	122	108	184	769	4.70%
Urinary abnormality	28	38	42	48	49	77	282	1.70%
Haematuria	5	4	4	7	8	10	38	0.23%
Proteinuria	8	13	20	16	15	32	104	0.63%
Haematuria and Proteinuria	17	19	16	22	22	25	121	0.73%
Pyuria	9	14	24	15	17	28	107	0.65%
Positive urine culture	1	3	2	3	1	5	15	0.09%
Hypertension	2	1	9	12	17	38	79	0.48%
Renal insufficiency	1	0	3	3	3	7	17	0.10%

microscopy, in relation to the survey population of 16,494 (responders), constitute a prevalence of 1.71% with urinary abnormalities (Table 2). There were 135 males (135/282) or 47.9% and 147 females (147/282) or 52.3%. The prevalence of males in the survey population was 135/8110 or 1.69% and among the females, the prevalence was 147/8397 or 1.72%. There is a preponderance of females over males with urinary abnormalities in the population. This is consistent with initial Labstix testing which also showed a female preponderance.

Among the 282 patients with urinary abnormalities, 228/282 or 80.1% were Chinese, 43/282 or 15.2% were Malay and 11/282 or 3.9% were Indian. The data on ethnic distribution were consistent with the population census of Singapore in 1975 where 77.3% were Chinese, 13.8% were Malay and 7% were Indians with 1.9% Others.

The prevalence of urinary abnormalities in the survey population was 228/12,992 or 1.75% for Chinese, 43/2319 or 1.85% for Malay and 11/1176 or 0.94% for Indian. There were no significant differences among the 3 ethnic groups.

Table 2 also shows the age specific prevalence of haematuria in subjects.

Haematuria was defined as urine red blood cells more than 3 per high power field (hpf) on microscopic examination of the urine. Thirty-eight of the surveyed population had haematuria alone and prevalence rate was 0.23%. The prevalence of haematuria in males and females was the same at 0.23%. The peak was from 40 to 69 years with a steady rise with age.

Proteinuria was defined as significant when it exceeded 100 mg/day. Table 2 shows the age specific prevalence of proteinuria. In the survey, 104 patients were found to have significant proteinuria, with a prevalence of 0.63% amongst a total of 16,497 subjects surveyed. The range of proteinuria was from 0.1 gm to 8 gm per day, the peak incidence in the age group 30 to 39 years and another peak in the 60 to 69 years group. Most subjects had proteinuria in the range between 100 mg and 500 mg per day.

Haematuria and proteinuria is defined as when the subject had both significant haematuria (more than 3 RBC/hpf) and significant proteinuria (more than 100 mg per day). In the survey population, 121 subjects had haematuria and proteinuria with a prevalence rate of 0.73%.

Urinary Tract Infection (UTI)

The criterion for UTI was when there were 5 or more white blood cells per hpf in the urine or when urine cultures grew organisms or both. The age distribution of subjects with pyuria is reflected in Table 2. In the survey population, 107 subjects were found to have UTI, a prevalence rate of 0.46%. Of these 107 subjects, 15 had positive cultures and the rest pyuria only, i.e. only 14% had positive cultures. Three of these 15 subjects with positive urine cultures had no pyuria (20 %), one of these 3 had received antibiotics by her general practitioner while the other 2 were asymptomatic. None of the patients with sterile pyuria were found to have

Table 3. Subjects with Bacteriuria with Positive Urine Culture

Subject No.	Age	Sex	Race	Urine RBC (phpf)	Urine WBC (phpf)	Total Urinary Protein (gm/day)	Casts (phpf)	Organism	IVP	Symptoms
1	40	F	Chinese	Occ	10 to 20	0.09	Nil	*Pseudomonas pyocyaneus*	Not Done	No
2	36	F	Chinese	2 to 4	20 to 25	2.40	Nil	*Proteus mirabilis*	Normal	Yes
3	48	F	Malay	60 to 70	15 to 20	1.00	Nil	Mixed Growth	Stone	Yes
4	26	F	Malay	12 to 18	6 to 10	2.60	Gran.	*E. Coli*	Not Done	No
5	56	F	Chinese	Occ	Full Field	0.03	Nil	*Klebsiella*	Pyelonephritis	No
6	27	F	Malay	8 to 10	40 to 45	0.24	Nil	*E. Coli*	Not Done	Yes
7	16	M	Chinese	Occ	1 to 3	0.44	Nil	Group D Streptococci	Not Done	Yes
8	39	F	Chinese	Nil	20 to 25	0.41	Nil	*Klebsiella aeroginosa*	Medullary Sponge Kidney	No
9	62	F	Malay	Nil	2 to 4	0.94	Nil	*E. Coli*	Normal	Yes
10	63	F	Malay	1 to 2	20 to 0	0.77	Nil	*E. Coli*	Not Done	Yes
11	74	F	Chinese	Occ	Full Field	0.36	Nil	*E. Coli*	Not Done	Yes
12	21	M	Chinese	5 to 6	2 to 3	0.10	Nil	Alpha Streptococci	Not Done	Yes
13	72	F	Malay	Occ	Full Field	0.09	Nil	*E. Coli*	Not Done	No
14	49	F	Chinese	Nil	30 to 40	0.11	Nil	Alpha Streptococci	Normal	Yes
15	69	F	Chinese	1 to 2	40 to 50	0.14	Nil	*E. Coli*	Not Done	No

Occ: occasional; RBC: red blood cell; WBC: white blood cell

tuberculosis.

Thirteen of the 15 subjects with positive urine culture were females (86.6%) and the other 2 (13.3%) were males (Table 3). There was a marked female preponderance of UTI in all age groups except for the age group 15 to 19 years where there was a male preponderance. There were 2 peaks observed, both with female preponderance at age group 30 to 39 years and at 60 to 69 years.

Table 3 also shows the 15 subjects with bacteriuria with positive urine cultures. Seven out of the 15 subjects had *Escherichia coli*, 3 had Streptococci, 2 had *Klebsiella*, 1 had *Proteus*, 1 had *Pseudomonas* and the remaining 1 had a mixed growth, probably due to contamination. Six out of the 15 subjects had intravenous pyelogram (IVP) performed. Of these 6 subjects, 1 had a renal stone, 1 had chronic pyelonephritis and the remaining 1 had medullary sponge kidneys.

Hypertension occurred in 79 of the subjects with urinary abnormalities. Table 2 shows the age distribution of hypertension in these patients. Hypertension was defined in any subject having either a systolic blood pressure >150 mmHg or a diastolic blood pressure >90 mmHg. The prevalence rate for hypertension was 0.43% in the survey population, 0.42% for males and 0.45% for females. There was a rising incidence from 40 years onwards with a peak in the age range 60 to 69 years. There were no significant differences between the 2 sexes.

Renal Stones

Among the population in the survey, 62 subjects had intravenous pyelograms (IVP) performed for investigation of haematuria, stones and other causes like infection and among those in the older age group to exclude renal tumours and the rest for the purpose of performing renal biopsies. Of the 62 subjects, 29 (46.77%) were males, prevalence rate 0.36% and the other 33 were females (53.22%) constituting a prevalence of 0.37%.

Seventeen or 26.2% of the 62 IVPs were abnormal. Seven of these abnormal IVPs were found in males and the other 10 were found in females.

Eleven of the 62 IVPs showed renal stones, 7 in males (prevalence 0.09%) and 4 in females (prevalence 0.05%). The overall stone prevalence was 0.09% in the survey population.

Abnormal IVPs in males were all due to stones (7 subjects), but in females, of the 9 abnormal IVPs, only 4 were due to stones and of the remaining 5 IVPs, 2 showed renal cysts, 2 showed contracted kidneys probably due to chronic glomerulonephritis (GN) and the remaining 1 showed medullary sponge kidneys. The serum calcium, serum phosphate, serum alkaline phosphatase, serum uric acid were all normal in the patients who had renal stones. However, PTH assays were not preformed and neither were idiopathic hypercalciuria and hyperuricosuria excluded as causes of stone formation.

Among the 11 patients with stones, only 2 patients presented with haematuria and renal colic due to renal stones. One-third of the patients gave a history of passing stones but the IVP showed no abnormality. Ten of these 11 patients with stones had haematuria, 2 with gross haematuria and 8 with microscopic haematuria. Six out of 11 of these patients had associated hypertension (54.5%).

Renal Impairment

The main criterion used to define renal impairment or renal failure was a serum creatinine >136 micromol/L. In those days, gender difference in normal ranges were not taken into account. Males tend to have higher serum creatinine whereas females tend to have lower serum creatinine levels. Such an arbitrary cut-off value for what is considered raised serum creatinine would have caused less females to be diagnosed with renal impairment. The blood urea per se was not satisfactory as in a few patients, all tests were normal except for mildly raised blood urea over 40 mg/dL, in which case dehydration or other pre renal elements could not be excluded. Similarly, incomplete collection of urine might render the creatinine clearance test (CCT) erroneous. However, in most of the patients with renal insufficiency, the blood urea was elevated and the CCT impaired.

Table 2 shows the age distribution of subjects with renal impairment. There were 17 patients in the survey population or prevalence rate of 0.1% with renal insufficiency. Prevalence rate for males was 0.16% and for females was less at 0.05% (P <0.001).

The severity of renal impairment ranged from serum creatinine of more than 143 to 177 micromol/L which was found in 11 patients (64.7% of the 17 patients). The highest was in one female patient with serum creatinine 1830 micromol/L.

Table 4 shows the profile of the 17 patients with renal impairment. The age range of the patient was from a young 18-year-old to an 80-year-old man. There were 12 (70.58%) patients who were Chinese, 4 (23.53%) Malay and 1 (5.88%) Indian. Prevalence rates for different ethnic groups were 0.09% for Chinese, 0.17% for Malay and 0.08% for Indian.

Of the 17 patients featured in Table 4, 10 had glomerulonephritis, as shown by the presence of haematuria and proteinuria. These 10 patients had proteinuria exceeding 0.5 gm/day. The remainder had renal impairment of unknown aetiology. Only 2 of the 17 patients had renal biopsy, one showed minimal change GN and the other diffuse

Table 4. Prevalence of Renal Insufficiency

Subject No.	Age	Sex	Race	Serum Creatinine (umol/L)	Haemoglobin (mmol/L)	Urine RBC (phpf)	Urinary Protein (gm/day)	Urine WBC (phpf)	Casts	Blood Pressure (mmHg)
1	79	M	India	143	6.8	0 to 2	0.14	4 to 6	Nil	150/90
2	64	F	Chinese	159	6.6	0 to 2	3.50	8 to 10	Nil	160/80
3	72	M	Chinese	143	7.3	10 to 15	0.33	Occ	Occ Granular	210/110
4	33	M	Chinese	168	10.3	0 to 2	3.46	0 to 3	Gran	170/130
5	77	M	Chinese	141	6.8	1 to 2	0.52	Occ	Nil	200/90
6	41	M	Chinese	141	7.1	20 to 30	0.36	4 to 5	Occ Granular	140/80
7	50	F	Chinese	1830	4.0	20 to 30	1.20	20 to 30	Nil	200/110
8	35	F	Chinese	239	6.8	Nil	0.61	Nil	Nil	150/70
9	71	M	Chinese	150	8.8	Occ	0.18	2 to 4	Nil	160/90
10	65	M	Chinese	155	6.6	Occ	0.41	0 to 1	Gran	150/90
11	40	M	Malay	336	6.2	Half Field	8.80	10 to 20	Nil	170/90
12	18	M	Chinese	177	6.7	Full Field	1.29	10 to 15	Nil	120/70
13	54	F	Chinese	212	7.3	Occ	0.29	Full Field	Nil	120/80
14	56	M	Malay	159	5.3	0 to 2	2.83	2 to 8	Gran	130/80
15	41	M	Malay	141	8.0	50 to 80	0.07	4 to 6	Nil	105/70
16	33	M	Chinese	172	10.6	1 to 3	1.05	0 to 2	Nil	110/70
17	80	M	Malay	203	6.4	Occ	1.60	0 to 4	Occ Hyaline	200/110

RBC: red blood cell; WBC: white blood cell; Occ: occasional

mesangial proliferative GN. Eight out of the 17 patients had hypertension, constituting 47% or a prevalence of 0.05%.

Glomerulonephritis

Nineteen patients eventually had renal biopsies performed during 1975 and 1976, constituting 0.1% of the survey population of 16,497 respondents. Fourteen renal biopsies were in males (prevalence rate 0.15%) and the other 5 in females (prevalence rate 0.05%).

Ten of the 14 males had diffuse mesangial proliferative GN (71.4%) and of the remaining 4 patients (28.5%), 2 males had focal proliferative GN, 1 had minimal change disease (MCD) and the remaining one patient had chronic pyelonephritis with arteriosclerosis.

Of the 5 female patients who had renal biopsies, 4 showed diffuse mesangial proliferative GN (80%) and the remaining patients (20%) had MCD.

The total overall prevalence of diffuse mesangial proliferative GN was 0.084% in the survey population (14/16,497), prevalence in males was 0.06% and in females was 0.024%.

Impaired renal function or chronic renal failure was present in a male subject, aged 33 years who had MCD and another male, aged 18 years who had diffuse mesangial proliferative GN. All the other patients had normal renal function as evidenced by the normal serum creatinine.

Discussion

This population survey on renal disease was performed in 1975 to 1976, about 35 years ago. Only 282 subjects, on further examination of the urine with urine microscopy and boiling test for albumin, were confirmed to have urinary abnormalities. These 282 subjects in relation to the survey population of 16,497 responders constituted a prevalence of 1.71% with urinary abnormalities. In this study, using a fixed serum creatinine cut-off level of 136 micromol/L to define renal failure does not take into account gender difference in the serum creatinine which could lead to an underestimation of the number of females with renal impairment as females tend to have lower serum creatinine. This may contribute to some extent the male preponderance of males with renal impairment. However, it has been shown by other studies that males in Singapore do have a higher prevalence of IgA nephritis contributing to renal impairment.[2] Since this survey is part of a nationwide tuberculosis survey, it is relevant to mention that none of the patients with sterile pyuria in this study were diagnosed to have renal tuberculosis. At that time, patients with all forms of tuberculosis were treated by the Tuberculosis Unit housed within the Medical Department in Tan Tock Seng Hospital. This included patients with tuberculosis of the kidneys.

The only comparable study for that period was a paper by Pwee[2] based on the national service registrants in Singapore. In Pwee's study,[2] 1410 out of 67,695 national

service registrants or 2.08% were found to have haematuria and/or proteinuria. The proportion in Lim's[1] population study of 282 subjects out of 16,497 (1.71%) over a 1-year period in 1975 is comparable to Pwee's[2] study of 1419 out of 67,695 (2.08%) over a period of 19 months.

Pwee et al[2] focussed mainly on a group of patients referred to hospital for the purpose of renal biopsy to investigate for asymptomatic haematuria and proteinuria. This excluded patients with stones, urinary tract infection, etc referred to other medical or surgical units. In contrast, Lim et al's[1] patients were part of a National Health Survey where 93% had asymptomatic haematuria and proteinuria, 3.9% had renal stones and the rest (3.1%) had urinary tract infection and renal impairment.

Comparing the data from Lim's study,[1] prevalence of haematuria alone was 0.23%, proteinuria alone was 0.63% and haematuria and proteinuria was 0.73%. In Pwee's study,[2] it was 0.7% for haematuria alone, 0.75 % for proteinuria alone and 0.23 % for haematuria and proteinuria. Total haematuria and proteinuria in Lim's study[1] was 1.59% and for Pwee's study[2] was 1.68%. Data from both these studies are comparable.

The 2 studies by Lim[1] and Pwee[2] were performed 3 decades ago and it would be appropriate to compare these with a more recent study by Ramirez et al in 2003[3] who screened 213,873 subjects from 5000 companies at their work place as part of NKF's community effort at health promotion from January 1999 to December 2000. Of these, data from 189,117 subjects were available for analysis. The methods used were labstix proteinuria and labstix haematuria. There was no follow-up data with urine microscopy.

Urine FEME for haematuria or boiling test for albumin were performed in the studies conducted by Lim[1] and Pwee.[2] Data from Ramirez's[3] study indicated that the prevalence of haematuria was 9.1%, proteinuria was 0.8% and haematuria and proteinuria was 0.3%. The data from Ramirez's study, though 3 decades later, showed that the prevalence rate of proteinuria alone and haematuria together with proteinuria were comparable with Lim's[1] and Pwee's [2] data. But the data on haematuria from Ramirez[3] prevalent at 9.1% appears to be quite different. From Lim's study,[1] during labstick testing, the prevalence for haematuria alone was only 4.6%, which is still less than the figure of 9.1% for haematuria alone in Ramirez's study.[3] However, in Ramirez's study,[3] there was a statement that many women among the 9.1% of subjects with haematuria in the study should be excluded because they were menstruating at the time of urine sampling. This then appears to explain the discrepancy of the excessive subjects with haematuria in Ramirez's study.[3]

Whatever the reasons may be, this review confirms that the prevalence of urinary abnormalities in the Singapore population today is comparable to that of 3 decades ago. The prevalence of proteinuria in Lim's study[1] was 0.63%, Pwee's study was 0.75%[2] and Ramirez's was 0.8%.[3] The prevalence of haematuria and proteinuria in Lim's study[1] was 0.73%, Pwee's study[2] was 0.23% and Ramirez's[3] was 0.3%. In recent studies on the incidence of glomerulonephritis in Singapore by Woo et al,[9,10] the annual incidence of primary glomerulonephritis (GN) was 4.1 in 100,000/year from 1976 to 19869 and it decreased to 1.6 in 100,000/year from 1998 to 2008.[10] The incidence of end stage renal disease (ESRD) in Singapore had stabilised from 2007. Over the last 3 years from 2006 to 2008, the incidence of end stage renal failure (ESRF) has remained at 238, 264 and 245 per million population (pmp).[11] One of the main reasons was the decrease in the incidence of ESRF due to glomerulonephritis.

Comparing the data from population-based epidemiological studies of chronic kidney disease (CKD) in Asia,[12] the prevalence of proteinuria defined as labstick analysis of urine protein ≥1+ was 1.1% for Singapore among 189,117 working adults, 3 3.2% among 1201 adults for Hong Kong,[7] 2.25% among 5252 adults for India,[8] 2.8% among 9412 adults for Indonesia1[3] and 5.04% among 8398 adults for Nepal.[14]

Comparing the data from other countries, the prevalence of proteinuria in USA adults >60 years with neither hypertension nor diabetes mellitus was 0.8%,[6] while in Japan, the prevalence for a similar group was 1.8%.[4] Furthermore, the prevalence of proteinuria in USA adults with hypertension was 2.2% whilst that for Japanese adults was 3.3%.[4] Iseki et al[15] reported that the positive rate of proteinuria in screened subjects was as high as 5.3% among 106,177 subjects in Okinawa, Japan. This high prevalence of proteinuria in the overall Japanese population lent support to the idea that annual urinalysis screening for the whole population in Japan might be cost effective. A striking difference between the Japanese population and USA population is the high prevalence of proteinuria in Japanese adults with neither hypertension nor diabetes. These subjects had no symptoms and the only abnormality was asymptomatic urinary abnormality.[4]

In Japan, since 1972, every child and worker have been screened with urine labstix for proteinuria and since 1983, every resident over 40 years has been similarly screened. The reason to justify screening was the high prevalence of glomerulonephritis, especially IgA nephritis in Japan. Many had no symptoms apart from urinary abnormality, hence urine analysis is the only method for early detection. The aim was to reduce the prevalence of ESRD through early detection and treatment.[4]

The presence of proteinuria is associated with

cardiovascular disease (CVD) and mortality. Anyone diagnosed to have proteinuria or chronic kidney disease (CKD) has increased risk of CVD morbidity and mortality.[16] These individuals are considered to have cardiorenal syndrome with the risks of cardiac and renal failure. In view of the growing evidence that the presence of relatively low levels of urine protein can be an early marker of increased risk of progressive kidney disease with poor CVD outcome and death, there is the suggestion that early diagnosis through screening and prescription of ACEI/ARB in these persons may decrease both progression to ESRD and CVS events and death.[6] A cost effectiveness analysis for screening for proteinuria in USA adults was conducted by Boulware et al[6] in 2003 and the conclusion was that early detection of urine protein to slow progression of CKD and decrease mortality is not cost effective unless selectively directed towards the high-risk groups (older persons and persons with hypertension) or conducted with an infrequent interval of 10 years.[6]

In China, a community-based screening for CKD among those older than 40 years in Beijing by Zhang[5] in 2002 showed the value of such targeted screening. Among a total of 5593 subjects who were eligible, 2353 or 42.1% volunteered to participate. The tests included albumin-to-creatinine ratio (ACR) as well as estimation of Glomerular Filtration Rate (eGFR) using urine and blood samples. The prevalence of albuminuria was 5.3%, and haematuria was 2.9%. Reduced eGFR (less than 60 mL/min) or stage 3 CKD was found in 11.1% of the subjects. Considering the large population of China, it is estimated that there could be 48 million subjects older than 40 years suffering from CKD in China. If 1% of these progress to ESRD, the cost of renal replacement therapy would be $6 billion which would be 25 times the annual government healthcare budget in 2004 in China.[5]

So, how does one address the issue of screening for urinary abnormalities in order to diagnose early chronic kidney disease (CKD) as has been reported in Japan[4] and other countries like China[5] and USA?[6] The consensus is that routine screening for CKD in the general population is not cost effective as the yield is too low. The prevalence of proteinuria in studies performed in Singapore in the 1970's was 0.63% in Lim's study[1] and 0.75% in Pwee's study.[2] A recent study in Singapore by Ramirez[3] shows the prevalence of proteinuria at 0.8%. Other countries in Asia and the West like USA,[6] UK[17] and Australia,[18] have shown that since the prevalence of proteinuria in the general population is low, it does not justify screening for the general population as it is not cost effective.

Whilst, most studies showed that screening of the general population was not cost effective,[4-6] the consensus is to have targeted screening towards people with hypertension or diabetes mellitus, those with family history of kidney disease, those receiving potentially nephrotoxic agents, those with history of acute kidney injury (AKI) and those over 65 years.[7] In a study of school children in Singapore by Yap et al,[19] suggested that as an alternative to the universal school children screening which is not cost effective, perhaps we should consider selective screening of children with low birth weight and those with lower weights as these children may have increased risk of proteinuria.[19] In these children, early detection could allow treatment to prevent the onset of renal insufficiency.[20] Hence, screening for targeted groups of subjects could help to identify certain risk groups who may benefit from early intervention to prevent or retard the progression of CKD. This is even more important since there is evidence to show that patients with CKD have a higher risk of CVD morbidity and mortality. Early detection and therapy of CKD can prevent and retard progression to ESRD and CVD mortality in these targeted groups.[16]

Conclusion

The prevalence of urinary abnormalities in Singapore has remained the same, now and three decades ago.

Acknowledgements

We would like to thank Dr Tye Cho Yoke for statistical support and Ms Irene Ow for administrative support.

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