The first clinical and epidemiological programme on renal disease in Bolivia: a model for prevention and early diagnosis of renal diseases in the developing countries

Raúl Plata1,2, Carlos Silva1, Juan Yahuita1, Ludmila Perez1, Arrigo Schieppati3 and Giuseppe Remuzzi3

1‘Mario Negri per L’America Latina’, Renal Diseases Project, 2Department of Nephrology and Dialysis Hospital Juan XXIII, La Paz, Bolivia and 3Nephrology Unit, Ospedali Riuniti and Negri Bergamo Laboratories, Bergamo, Italy

Abstract

Background. The prevalence and incidence of renal diseases in developing countries are not known. This lack of knowledge is an obstacle to the adoption of preventive measures which may be of great value in a social and economic environment where treatment options for end-stage renal failure are simply not available to the vast majority of the population. Urinalysis, a simple and inexpensive test, remains a cornerstone in the evaluation of the kidney and may also be easily employed in mass screening for renal abnormalities in a developing country.

Methods. An educational campaign on renal diseases was conducted in three selected areas of Bolivia. Urine samples were collected and sent to one of 21 participating clinical centers. Fresh urine specimens were screened using a dipstick for chemical analysis and by microscopic urinalysis after centrifugation. In those patients in whom urinary abnormalities were found, further investigations were carried out in order to define the diagnosis; these patients were enrolled in a 3-year follow-up program.

Results. Apparently healthy subjects (n = 14,082) were referred to the First Clinical and Epidemiological Program of Renal Diseases from rural and metropolitan areas in Bolivia. Urinary abnormalities were detected in 4,261 subjects at first screening. The most common form of urinary abnormality was hematuria, which was found in 2,010 (47% of positively screened subjects). Other renal abnormalities were leukocyturia (41%) and proteinuria (11%). Confirmatory tests and further clinical studies were then carried out in 1,019 people. On a second screening 35% of the subjects had no urinary abnormalities; in the remaining people the following diagnosis were made: asymptomatic urinary-tract infection (48.4%), isolated benign hematuria (43.9%), chronic renal failure (1.6%), renal tuberculosis (1.6%). Other diagnosis were: renal stones 1.3%, diabetic nephropathy 1% and polycystic kidney diseases 1.9%.

Conclusions. This study helped define for the first time the frequency of asymptomatic renal diseases in Bolivia. It shows that it is possible to screen a large population of patients at relatively low cost, providing the framework for further action that may help in the prevention and timely diagnosis of renal diseases.

Key words: Bolivia; developing countries; epidemiology; renal diseases

Introduction

A major question for renal medicine in developing countries is how to define strategies that can identify early enough those persons at risk of developing a renal disease later in life. This will make it possible to design population-oriented preventive measures that will limit the need for dialysis and transplantation. Prevention is more and more important in this setting given the shortage of financial resources and the fact that dialysis centers, equipment and trained personnel are simply not available to the general population. The simplest and least expensive way of screening apparently healthy subjects is urinalysis [1–3] and several studies have been made using reagent strips, documenting their effectiveness in detecting urinary abnormalities at relatively low cost [4–9]. Most of these studies, however, have been carried out on a preselected patient population [10,11]. We used dipstick methods to screen apparently healthy subjects; further studies were then performed in patients found to have urinary abnormalities on dipstick analysis. We consider this to be a preliminary stage in an articulated plan aimed at identifying early enough those persons at risk.
of developing chronic renal disease, with the final aim of setting in motion a large-scale preventive protocol which over the next few years will help reduce the number of patients in Bolivia who will reach end-stage renal failure.

**Materials and methods**

Under the auspices of the Renal Sister Center Program of the International Society of Nephrology, an educational campaign entitled 'First Clinical and Epidemiological Program of Renal Diseases' was conducted in three selected areas of Bolivia, including tropical, valley and plains areas (Figure 1). An information leaflet was distributed to 25,000 people. It explained the basic principles of kidney function and malfunction and the aims of the screening program in a very simple language and with the aid of cartoons. Participants were instructed to void a clean-urine specimen into a 200-ml vessel, which was sent to a clinical pathology laboratory. A dipstick test (Multistix, Bayer Diagnostics, Miles Inc., USA) was performed on the unspun urine specimen by trained laboratory technicians. The reagent strip is designed to react progressively, producing color changes after given intervals of time. The results were decided by careful visual comparison of the test strip with a color chart provided on the bottle label. Urine samples were then prepared for microscopic analysis by centrifuging 10 ml of well-mixed urine at 1.500 g for 5 min in a graduated plastic conical centrifuge tube, pouring off most of the supernatant by inversion of the tube, and thoroughly resuspending the sediment in the remaining supernatant. One drop of this suspension was placed on a glass slide, cover-slipped, and examined by subdued bright-field illumination at ×100 and ×400 under a light microscope.

Subjects with positive urinalysis were enrolled on a 3-year follow-up program with two to four laboratory and clinical checks each year. Complete urinalysis, biochemistry, micro-

**Results**

The study was conducted by 21 clinical centers distributed in three areas of the country (Figure 1) which represent three different geographical and socio-economic environments.

Figure 2 shows diagrammatically the design of the study. Apparently healthy people (14,082) were enrolled over a period of 7 months. The mean (±SD) and median age of the population were respectively 20.25±17.75 and 12.25; there were 6,759 (48%) males and 7,323 (52%) females. The age distribution of the study population is shown in Figure 3.

Urinary abnormalities were found at first screening in 4,261 patients; the distribution of the urinary abnormalities is given in Table 1. Patients were then invited

![Fig. 1. Map of Bolivia. The shaded areas indicate the regions where the study took place.](image)

![Fig. 2. Illustration of the subsequent phases of the study.](image)

![Fig. 3. Age distribution of the study population.](image)
to come back for a confirmatory urinalysis and for further investigations, if needed. Only 1019 patients, 23.9% of the group with a positive dipstick test, were available for follow-up. On the second urinalysis 35% of subjects had no abnormalities.

In this group of subjects further investigations included biochemistry, microbiology, ultrasound and intravenous pyelography, where indicated. The final diagnosis, as reported in Table 2, was urinary tract infection (48.4%); isolated hematuria (43.9%); chronic renal failure (1.6%); renal tuberculosis (1.6%); miscellaneous diagnosis 4.3% (kidney stones, 1.3%; diabetic nephropathy, 1%, and polycystic kidney diseases, 1.9%).

**Discussion**

This study is the first attempt to conduct a large-scale campaign of screening and sensitization on renal diseases in Bolivia. It shows that through an extended information campaign, mass screening of the population for renal ailments is feasible in a developing country, and can provide useful information on the frequency of renal diseases. The campaign was conducted by doctors, nurses and social workers with the aid of brochures which explained in a simple language the aims of the study. A significant proportion of the Bolivian population is illiterate, therefore an effort was made to also explain the study to those people who could not read.

However, the difficulties of such a large-scale study emerged when we tried to test for a second time those patients who had a positive dipstick at the first check. Among the rural population traditional medicine is still much diffused and followed. The ‘YATIRI’, or sorcerer quack doctor, needs to visit the patient only once for diagnosis and treatment prescription. It is not in the custom to go back again for the same problem. Moreover we were looking for *asymptomatic* renal abnormalities, and the people’s concern was small. Therefore only 24% of positive subjects returned for a second check.

Our results show, however, that among apparently healthy subjects in rural and metropolitan areas of Bolivia, there is a considerable incidence of renal abnormalities, as reflected by the abnormal dipstick findings. Further work confirmed that urinary tract infection and isolated hematuria were by far the most common renal ailments. These patients then entered a 3-year follow-up program. These results indicated the need for educational and prevention programs for renal diseases in developing countries such as Bolivia. This effort will help identify subjects at risk of developing renal diseases later in life and will, it is hoped, provide the basis for building a nationwide prevention strategy.

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**Table 1. Urinary findings at first screening**

<table>
<thead>
<tr>
<th>Urinary finding</th>
<th>No. of subjects</th>
<th>% of population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematuria</td>
<td>2010</td>
<td>14.3%</td>
</tr>
<tr>
<td>Leukocyturia</td>
<td>1765</td>
<td>12.5%</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>298</td>
<td>2.1%</td>
</tr>
<tr>
<td>Proteinuria and glycosuria</td>
<td>37</td>
<td>0.3%</td>
</tr>
<tr>
<td>Proteinuria and hematuria</td>
<td>15</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

**Table 2. Final clinical diagnosis in study group**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. of subjects</th>
<th>% of study group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary tract infection</td>
<td>324</td>
<td>48.4%</td>
</tr>
<tr>
<td>Isolated hematuria</td>
<td>294</td>
<td>43.9%</td>
</tr>
<tr>
<td>Chronic renal insufficiency</td>
<td>11</td>
<td>1.6%</td>
</tr>
<tr>
<td>Renal TB</td>
<td>11</td>
<td>1.6%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>29</td>
<td>4.3%</td>
</tr>
</tbody>
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References