

Prevalence of Diabetes mellitus, Hypertension and Proteinuria in a Rural area of Bangladesh.

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Abstract

This study was designed to detect the prevalence of diabetes, hypertension and proteinuria in a rural area of Bangladesh as these are the most common causes of CKD. Result of this study may give some idea about the prevalence of these three conditions as a whole among the rural population of Bangladesh. In this prospective cross sectional study 1240 adult subjects were included. The mean age was 37.1 ± 10.9 years, 48 % were female, and 88.7 % were married. Prevalence of diabetes was about 4.9%, of them 49 % self reported and 51 % detected during the survey. Among self reported cases only 48% were on regular treatment. Prevalence of hypertension was 19.3%, of them 35% were self reported & 65% detected during the survey. Regarding proteinuria, 16.4% cases were found to have proteinuria of different grades (1+ in 11.2% ,2+ in 4.4% ,3 + in 0.8%).Among them 62.4% had hypertension, 24.8% had diabetes and 17.4% had combined diabetes and Hypertension. All these three conditions were found to be significantly higher in middle aged and elderly(40 years and above). Participants (both male and female) with single or multiple risk factors had significantly low eGFR compared to their normal counterpart. As the majority of the people remain undiagnosed, it will increase the burden of CKD and on the other hand prevalence of this three conditions will help to define strategies that can identify early enough those subjects who are at risk of developing renal failure later in life.

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Introduction

Chronic kidney disease (CKD) is becoming a major public health problem worldwide The current burden of disease might be due to change of the underlying aetiopathogenesis of CKD¹. Glomerulonephritis was the leading cause of kidney disease several decades ago². Nowadays, infections have become a less important cause for kidney disease, at least in the western world³. Moreover, current evidence suggests that hypertension and diabetes are the two major causes of kidney disease worldwide⁴. The 1999-2000 AusDiab survey showed that 2.4% of participants had proteinuria, 6.6% had albuminuria and 4.6% had haematuria, with a total of 16% having at least one indicator of kidney damage^{5,6}. Using the recently recommended formula for calculating eGFR, 13.4% of participants had some degree of CKD, with more than half (7.8%) in stages 3-5 (eGFR less than 60 mL/min/1.73 m²). CKD is strongly related to age, with nearly 30% of those aged over 65 in the stages 3-5 stages kidney disease in the estimate⁷.

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The incidence and progression of renal injury vary substantially among individuals who are at-risk of kidney disease. For example, 8% of new patients with type 2 diabetes mellitus already have proteinuria at diagnosis⁸. Among patients with type 2 diabetes mellitus who are initially free of proteinuria, the 20-yr risk of diabetic nephropathy is 41%⁸. After proteinuria occurs, the subsequent 10 years risk of progressive chronic kidney disease is 11%⁹. Thus, about half of those with type 2 diabetes will develop nephropathy and 10% of these individuals will experience progressive loss of renal function. Variable risk of impaired renal function has also been reported among hypertensive subjects. At study entry, 5.9% of the Hypertension Detection and Follow-up Program trial participants had a serum creatinine of 1.5 mg /dl or greater and 2.3 % of the 8683 participants with serial serum creatinine measurements over 5 years experienced clinically significant loss of renal function¹⁰.

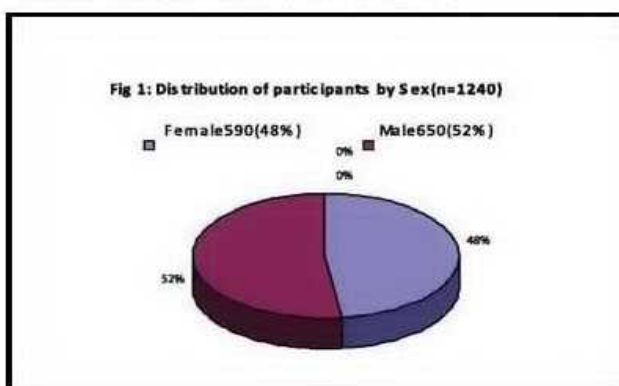
Methods

This present study was a cross sectional study. The study was carried out at rural area of Bhabakhali union of Mymensingh Sadar at Mymensingh District. Adult population residing in the above mentioned area for at least 6 months were the study population. Inclusion criteria: Persons with following characteristics were included in the study, age ranging from 18 - 65 years of either sex, Exclusion criteria: Persons with following characteristics were excluded from the study: Persons with age <18 years or >65 years, febrile illness, severe cardiac or respiratory failure, previously known kidney disease, urinary tract infection , pregnant women, menstruating women, persons denying consent. The required numbers of subjects were included in the study purposively. Sampling came from a 3-stage study. First of all, Mymensingh Sadar Upazilla of Mymensingh district was selected purposively, where there were 13 Unions. Out of this 13 Union, Bhabakhali Union was selected randomly by simple random sampling procedure, which have 12 villages. According to voter lists of Bangladesh Election commission, 18 years above population were included in the study by

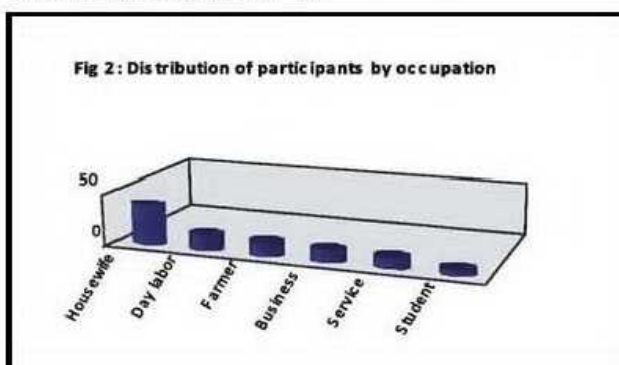
simple random sampling using computerized method. During physical examination, 65 years above population were excluded in the study. A total of 1240 individuals who had completed data collection were enrolled into the study. The demographic variables included in the study were age, sex, marital status, religion, occupation, socioeconomic status, monthly income. The clinical variable was hypertension. The risk factors were Body Mass Index (BMI), smoking habit, hypertension, diabetes mellitus. Data pertaining to biochemical investigations such as urine for albumin, serum creatinine and random serum glucose were also recorded. Blood pressure (BP) was measured twice in the right or left arm using a calibrated sphygmomanometer at heart level. The subjects were allowed to relax for 5 minutes in a sitting position before determination of blood pressure. Hypertension was defined as a systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg and/or concomitant use of antihypertensive medications by self report. BP was categorized according to the Seventh Joint National Committee Report on Detection, Evaluation and Treatment of High Blood Pressure¹¹. Diabetes mellitus was defined as symptoms of hyperglycemia and a random plasma glucose ≥ 11.1 mmol/l at any time of day without regard to last meal¹². Urinary protein excretion > 300 mg/L as evidenced by + or more in dipsticks test indicates proteinuria¹³. Spot urine sample was collected in test tubes labeled with individual registration number for each participant and dipstick test was done on the spot using Albustix reagent Strips for Urinalysis. A structured data collection form was used containing all the variables. The history and physical findings with investigation findings were recorded after informed consent of the persons. All data were collected in individual case record form. Collected data were compiled, checked. Data processing and analysis were done with the help of computer using SPSS (Statistical Package for Social Science version 12). The test statistics used to analyze the data were Chi square Test and Student's t-Test. The level of significance was set at 0.05 and $p < 0.05$ was considered significant. The summarized data were presented in the form of tables and charts.

Results:

One thousand two hundred forty residents (of which 650 were males and 590 were females aged between 18 and 65 years), after giving informed consent and with complete data were enrolled into this study. The mean age was 37.1 Years(± 10.9), and the lowest and highest ages were 18 and 65 years, respectively and 52% were male. Over half (52%) of the participants was male and the remaining 48% was female giving a male to female ratio of roughly 1:1 (Fig. 1).



About 39% of participants was housewife followed by 15.2% day labour, 13.1% farmer, 12.1% business man, 11% service holder, 5.8% student, 2.9% rickshaw puller and 0.9% unemployed (Figure 2).



Over three-quarter (77.7%) of the patients was normal weight in terms of BMI. Eighty participants (6.5%) were underweight and 197 (15.8%) were overweight and obese. Figure 1 showed the behavioral risk factor like smoking was also predominant among the surveyed population (39%). Hypertension and diabetes comprised of 19.3% and 4.9% of the participants (Fig 3).

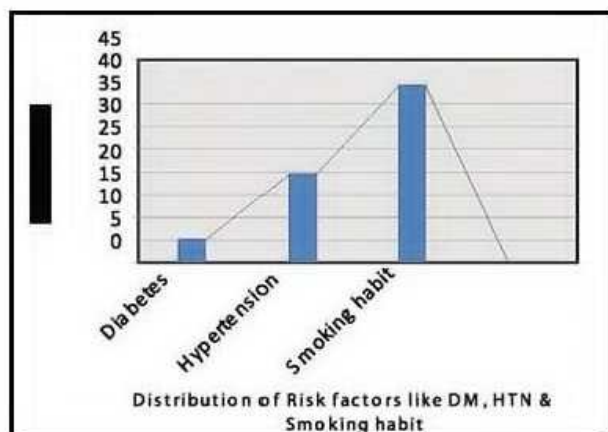


Fig.3 : Distribution of risk factors among the participants (n = 1240)

All the participants were subjected to dipstick test for albuminuria. Of them 1037 (83.6%) did not exhibit albuminuria, 139 (11.2%) had '+', 54 (4.4%) had '++' and 10 (0.8%) had '+++ albuminuria (Table.1). Thirty three (5.1%) of 650 males had serum creatinine > 1.5 mg/dl and 20 (3.4%) of 590 females had serum creatinine > 1.3 mg/dl. About 6% of participants had random blood sugar > 180 mg/dl.

Table.1: Distribution of participants by Urinary albumin (n = 1240)

Urine albumin	Frequency	Percentage
Nil/Trace	1037	83.6
+	139	11.2
++	54	4.4
+++	10	0.8

Comparison of renal function in two different age groups showed that the mean serum creatinine was significantly higher those who were more than 60 years of age compared those were 60 years or less than 60 years (1.4 ± 0.6 vs. 1.0 ± 0.7 mg/dl, $p < 0.001$). While, CCr was two-times higher in participant aged ≥ 60 years than who were < 60 years (83.5 ± 31.7 vs. 46.3 ± 16.1 ml/min/1.73m², $p < 0.001$). Thirty three (5.1%) of 650 males had serum creatinine > 1.5 mg/dl and 20 (3.4%) of 590 females had serum creatinine > 1.3 mg/dl. About 6% of participants had random blood sugar > 180 mg/dl.

Table 2. Distribution of participants by biochemical investigations (n = 1240)

Serum creatinine (mg/dl)	Frequency	Percentage
Male (n = 650)	617	
≤1.5	33	94.9
>1.5		5.1
Female (n = 590)	570	
≤ 1.3	20	96.6
> 1.3		3.4
RBS (> 11.1 mmol/l) (n = 1240)	73	5.9

Table 3 shows that the mean serum creatinine was almost similar in diabetic and hypertensive patients (1.5 ± 0.5 and 1.5 ± 0.2 mg/dl respectively). However, mean CCr was higher in diabetic patients than that in hypertensive patients (46.2 ± 15.8 and 42.4 ± 7.1 ml/min/1.73m² respectively).

Table 3: Renal functional status of different groups in study population.

Group	Mean serum creatinine (mg/dl)	Mean CCr (ml/min/1.73m ²)
Diabetic patients	1.5 ± 0.5	46.2 ± 15.8
Hypertensive patients	1.5 ± 0.2	42.4 ± 7.1

Table 4 shows the comparison of modifiable risk factors between participants with and without CKD. The variables selected to be studied were obesity, smoking, diabetes, hypertension, and combined DM and HTN. All the factors demonstrated their significant presence among participants with CKD than those without CKD ($p < 0.05$).

Table 4. Comparison of risk factors participants with and without CKD using MDRD equation.

Modifiable risk factors	Group		p-value
	CKD (n = 242)	Normal (n = 998)	
Overweight & obese (≥ 25 kg/m ²)	50(20.7)	142(14.2)	0.013
Smoking	113(46.7)	371(37.2)	0.006
DM (self-reported + RBS 11.1 mg/dl)	60(24.8)	20(2.0)	<0.001
HTN (self-reported + newly-diagnosed)	151(62.4)	88(8.8)	<0.001
Combined DM & HTN	42(17.4)	7(0.7)	<0.001

Data were analyzed using Chi-squared (2) Test.

Figures in the parentheses indicate corresponding percentage.

Discussion

One thousand two hundred forty residents (of which 650 were males and 590 were females, aged between 18 and 65 years), after giving informed consent and with complete data, were enrolled into this study. In the present study, mean age of the participants was 37.1 10.9 years and over half (52%) of the participants was male giving a male to female ratio of roughly 1:1. Over three-quarter (77.7%) of the patients was normal weight in terms of BMI, 6.5% underweight and 15.8% overweight and obese. Chen et al. reported mean age 58.4 ± 15.3 years; ranged between 18 and 104 years and female to male ratio was 1.8:114. Rahim and his associates reported that 48% of patients with normal BMI, 46% underweight and 15% obese¹⁵. This finding is inconsistent with our finding

which might be due to non homogeneity of population.

In the present study, we observed that smoking was also predominant among the surveyed population (39%) and other risk factors were hypertension (19.3%) followed by diabetes (4.9%) and other diseases (1.3%). About 7% of the participants had family history of hypertension and 4.4% diabetes. A negligible proportion of population informed that their close relations had kidney diseases (0.005%). Haroun et al. reported that BP, cigarette smoking, gender, and diabetes status as risk factors of CKD¹⁶. Satko reported in their study that family history of kidney disease significantly associated with renal impairment¹⁷.

Majority (83.6%) of the patients did not exhibit albuminuria, 139(11.2%) had '+', 54(4.4%) had '++' and 10(0.8%) had '+++ albuminuria. In America¹⁸, the prevalence of albuminuria is 9.3% and 7.2% , respectively. In Japan, it is 4.7% and 3.5% for males and females, respectively¹⁹. Examining albuminuria in the routine analysis, not only a relatively simple, non-invasive and cost effective measure to give the qualitative and quantitative assessment of the early stage of CKD, and to reveal those at high risk of developing CKD, but also is informative in the prediction of hypertension, diabetes and cardiovascular disease²⁰. For those with established renal disease, proteinuria is an important predictor of the risk of progression²¹ and mortality²². Thirty three (5.1%) of 650 males had serum creatinine > 1.5 mg/dl and 20(3.4%) of 590 females had serum creatinine > 1.3 mg/dl. The NHANES III found diabetes, hypertension, older age and male sex associated with increased likelihood of elevated serum creatinine levels²³. These findings were consistent with our findings.

About 6% of participants had random blood sugar > 11.1 mmol/l. Chadban et al also observed in AusDiab kidney study where the prevalence of reduced GFR <60 ml/min/1.73 m² was 3 fold higher in those with diabetes compared with those without diabetes²⁴ So our study is not consistent with the study. This might be because of most of our CKD population belongs to GN rather than DM & comes from poor hygienic conditions.

Participants (both male and female) with single or multiple risk factors had significantly

low eGFR compared to their normal counterpart. As the majority of the people remain undiagnosed it will increase the burden of CKD and on the other hand prevalence of this three conditions will help to define strategies that can identify early enough those subjects who are at risk of developing renal failure later in life.

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