Asian J. Med. Biol. Res. 2016, 2 (4), 603-610; doi: 10.3329/ajmbr.v2i4.31003

Asian Journal of Medical and Biological Research
ISSN 2411-4472 (Print) 2412-5571 (Online)
www.ebupress.com/journal/ajmbr

Article

Comparison of nutritional status between patients from urban area with rural area undergoing hemodialysis in Kushtia district, Bangladesh: a cross-sectional study

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Received: 20 November 2016/Accepted: 24 November 2016/ Published: 29 December 2016

Abstract: Malnutrition is a common problem in patients with end stage kidney disease (ESKD) undergoing hemodialysis that increases morbidity and mortality rate in Bangladesh. The main objective of this cross sectional study was carried out to compare the nutritional status between urban patients with rural patients undergoing hemodialysis. End-stage renal-failure outpatients who underwent hemodialysis were recruited from Sono Hospital Limited, Kushtia, Bangladesh. Direct method of nutritional assessment including anthropometric measurement, biochemical measurement, clinical assessment and dietary method was carried out. Socio economic data were also collected. The result reveals that 69.0% of the total participants were male and 31.0% were female. The mean age of male was 46.10±13.23 years and that of female was 43.11±16.47 years. Among 142 cases 50.0% were from urban area and 50.0% were from rural area. 53.5% of the total participants were economically satisfied and 46.5% were non-satisfied. 76.3% of high socioeconomic group consisted of urban area and 23.7% consisted of rural area. Again 19.7% of low socioeconomic group consisted of urban area and 80.3% consisted of rural area. According to WHO classification for BMI 15.5% had BMI below 18.5kg/m^2 in urban and 18.3% had BMI below 18.5kg/m^2 in rural area. Of the total participants 97.2% were anemic, 66.9% had anorexia, 69.7% had depression, 63.4% had nausea, 58.5% had vomiting, 30.3% had heartburn, 47.2% had constipation, 38.0% had dizziness, 19.7% had chest pain, 5.6% had dysphagia, 34.5% had fatigue, 48.6% had headache, 26.1% had diarrhea, 50.7% had pruritus and 13.4% had shortness of breath. Mean±SD hemoglobin level of urban participants was 8.37±1.46 and that of rural participants was 8.12±1.85. The result shows that malnutrition was more prevalent among rural hemodialysis patients than that of urban. The cause of malnutrition was related to low socioeconomic condition and inadequate nutrient intake.

Keywords: end-stage kidney diseases; hemodialysis; malnutrition; body mass index; hemoglobin

1. Introduction

Chronic kidney disease is a long-term condition where the kidneys do not work effectively. It a major public health problem which affects over 500 million people worldwide (Davids, 2007). The national health and nutrition examination survey has estimated the prevalence of chronic kidney disease in the United States as 26 million (Synder *et al*., 2009). Of the 1.5 million people of South Asia, a large number live in extreme poverty in rural-urban areas and have limited access to health care. End-stage kidney disease is a devastating medical, social, and economic problem. Lacks of registries prevent an accurate assessment of the incidence or prevalence

of end stage kidney disease, but a recent population-based study assessed the age-adjusted incidence at 232 cases per million populations per year. End stage kidney disease treatment facilities are available only in major cities, requiring many patients to travel long distances to seek care. Many patients never come to medical attention. Until recently, infection-related glomerulonephritis were considered the most common cause of end stage kidney disease (Jha, 2008). A large number presents with a short history of end stage kidney disease of undetermined etiology and often require emergency dialysis. The quality of chronic dialysis is dictated mostly by non-medical, financial factors (Jha, 2008). Hemodialysis is the long term form of mechanical renal replacement therapy, used to remove waste products from the blood of patient with end-stage renal disease (Crowley, 2009). The primary goal of hemodialysis is to restore the intracellular and extracellular fluid environment that is characteristic of normal kidney function. This is accomplished by the transport of solutes such as urea from the blood into the dialysate and by the transport of solutes for example bicarbonate from the dialysate into the blood (Locatelli *et al*., 2002). Malnutrition is still a devastating problem in certain parts of the world although proportion and absolute number of chronically under-nourished people have declined. Under-nutrition remains as a serious problem among poor families and of under-developed nations, resulting from consumption of poor diet over a long period of time (Awan, 1997). Protein energy malnutrition has been a common health problem of the third world (Khan *et al*., 1990). Nutritional assessment is the process whereby the state of nutritional health of an individual or group of individuals is determined. Nutritional status is commonly assessed by anthropometric measurement, clinical examinations for ascertaining nutritional deficiencies and also biochemical assessment (Committee on Goals of Education for Dietetics, 1969). Anemia is a common complication in patients with chronic kidney disease (CKD), particularly in hemodialysis (HD) patients. Anemia contributes to symptoms such as fatigue, dyspnea, reduced exercise tolerance, depression, and cardiovascular consequences such as left ventricular hypertrophy (Levin *et al*., 1999). Anemia is also associated with increased rates of hospitalization and mortality in patients with chronic kidney disease (Ma *et al*., 1999; Ofsthun *et al*., 2003). Many studies have shown the beneficial effects of anemia treatment such as improved quality of life, protection against cardiovascular disease, reduced mortality, and morbidity and hospitalization rates in patients with chronic kidney disease (Parfrey *et al*., 2005; Locatelli *et al*., 2004). The aim of this cross sectional study was carried out to compare the nutritional status between urban patients with rural patients undergoing hemodialysis.

2. Materials and Methods

2.1. Study area and period

The hospital based study was carried out at the dialysis unit of Sono Hospital Limited, Kushtia, Bangladesh. This descriptive cross-sectional study was focused on nutritional status and clinical presentations of end stage kidney disease undergoing hemodialysis in selected urban area (Kushtia town) and rural area (Bheramara, Mirpur, Doulatpur, Kumarakhali and Khokskha Upazilla) in Kushtia, Bangladesh. Total 142 hemodialysis patients from both sexes were selected into two groups which were urban (n=71) and rural (n=71) by using Simple Random Sampling Technique. This study was carried out to evaluate the nutritional status of end-stage kidney disease undergoing hemodialysis during the period from March 2015 to February 2016. Both direct method and indirect method of nutritional assessment had been used as prescribed by World Health Organization. Direct method of nutritional assessment including anthropometric measurement, biochemical measurement, clinical assessment and dietary method was carried out. Socio economic data and demographic data were also collected as a part of indirect method of nutritional assessment.

2.2. Data collection

Data regarding anthropometric information and socioeconomic status like occupation, marital status, education, family size, family type and monthly family income was collected by interviewing the subjects. The study subjects were first interviewed then a questionnaire was distributed among them to fill up. Patient's weight and height measurements were taken by the following anthropometric procedures (WHO, 1995). Body weight was measured with a digital weighting scale in kilogram. Height was taken with a measuring scale in centimeters. BMI was calculated by using the formula: Wt (in kg)/Ht (in m^2) = BMI (in kg/m^2). Assessment of nutritional status was done by Body Mass Index method (WHO, 1995). Respondents having BMI < 18.5 were considered as underweight, having BMI >18.5-24.9 as normal weight, having BMI 25-29.9 as over-weight, having BMI >30 as obese and having BMI >40 as morbidly obese. According to National Kidney Foundation (NKF) nutritional status was also assessed by BMI<23 and BMI>23. Because mortality and morbidity rate is high in hemodialysis patients having BMI<23. For clinical assessment, each respondent was interviewed for the uremic symptoms like anorexia, nausea, vomiting, constipation, headache and others. All of those and data on clinical

presentation of the nutritional deficiency disorders like presence of anemia, RTI, xerophthalamia, angular stomatitis and glossitis were included in the questionnaire. Data were expressed as percentages. In case of biochemical assessment blood was taken from all of the respondents. Estimation of hemoglobin level was done by the Sahli's acid Hematin Method (Ghai, 2007). According to WHO, distribution of presence of anemia is studied (WHO, 1972).

2.3. Data analysis

We have used STATA 12.0 statistical software for cleaning raw data, tabulation, cross tabulation and final estimation of the model. Descriptive statistics (mean, standard deviation, frequency and percentage) were computed for all study variables.

3. Results and Discussion

Initially 153 respondents were enrolled, among them eleven patients (two patients from urban and nine from rural area) were dropped as they were reluctant to continue and therefore data from 142 respondents were obtained for the study.

3.1. Demographic data

A descriptive cross sectional study was carried out among the 142, patients on end stage kidney disease undergoing hemodialysis selected randomly from urban and rural area in Kushtia district. Demographic profile of urban and rural hemodialysis patients are shown in Table 1.

Table 1. Demographic profile of urban and rural hemodialysis patients (n=142).

Variable		Urban frequency (n=71)	Rural frequency (n=71)	Urban percentage (%)	Rural percentage (%)
Location		71	71	50	50
Gender	Male	38	60	53.5	84.5
	Female	33	11	46.5	15.5
Religion	Muslim	49	61	69.0	85.9
	Hindu	19	9	28.8	12.7
	Christian	3	1	4.2	1.4
Subject	Illiterate	1	14	1.4	19.7
Education	Up to Primary	18	15	25.4	21.0
	Middle (S.S.C)	15	27	21.0	38.0
	Intermediate (H.S.C)	21	8	29.6	11.3
	Graduate	9	5	12.7	7.1
	Postgraduate	7	2	9.9	2.9
Marital Status	Single/Unmarried	13	10	18.3	14.1
	Married	58	61	81.7	85.9
Family Member	<4	42	6	59.2	8.5
	4-5	16	21	22.5	29.6
	6-7	9	37	12.7	52.1
	8-9	2	4	2.8	5.6
	>9	2	3	2.8	4.2

Table1 has shown that, among 142 cases 50.0% (n=71) live in urban and 50.0% (n=71) live in rural area. 69.0% (n=98) of the total respondents were male and 31.0% (n=44) were female. Of the total respondents 53.5% (n=38) male and 46.5% (n=33) female live in urban and 84.5% (n=60) male and 15.5% (n=11) female live in rural area. The mean age of male patients in urban was 46.40±12.71 years and rural was 48.28±14.63 years. Whereas the mean age of female patients in urban was 45.92±13.83 years and rural was 33.41±14.11 years. So, the data in Table1 indicated that renal failure was more prevalent among male than in female on both urban and rural residents. Again 69.0% (n=49) of participants were Muslim and 26.8% (n=19) Hindu and 4.2% (n=3) Christian in urban area. On the other hand, most of the participants were Muslim 85.9% (n=61), while 12.7% (n=9) Hindu and 1.4% (n=1) Christian in rural area. The education level of the subjects reside in urban show that 1.4% (n=1) were illiterate, 25.4% (n=18), 21.0% (n=15), 29.6% (n=21), 12.7% (n=9) and 9.9% (n=7) had their education up to primary, middle, intermediate, graduate and postgraduate level respectively. Again the education level of the subjects reside in rural show that 19.7% (n=14) were illiterate, 21.0% (n=15), 38.0%

(n=27), 11.3% (n=8), 7.1% (n=5) and 2.9% (n=2) had their education up to primary, middle, intermediate, graduate and postgraduate level respectively. The marital status of the respondents in urban shows that 81.7% (n=58) were married, 18.3% (n=13) were single or unmarried and in rural shows that 85.9% (n=61) were married and 14.1% (n=10) were single or unmarried. Major participants in urban area, 59.2% (n=42) were contained less than four members in each family while major participants in rural area, 52.1% (n=37) were contained 6-7 family members. Thus it indicates that the nuclear family concept was more adopted in urban household compare to rural household in Kushtia district. On the other hand family size also influences nutritional status. Increased family size decreases nutritional status of the population. As a result of fact rural respondents were more prone for malnutrition than that of urban.

3.2. Socioeconomic data

Socioeconomic profile of urban and rural hemodialysis patients are shown in Table 2.

Table 2. Socioeconomic profile of urban and rural hemodialysis patients (n=142).

Variable		Urban frequency (n=71)	Rural frequency (n=71)	Urban percentage (%)	Rural percentage (%)
Occupation	Farmer	0	15	0	21.1
	Business	28	37	39.5	52.1
	Govt. Private job	26	10	36.6	14.1
	Jobless/Housewife	17	9	23.9	12.7
Average Household	<4000	0	6	0	8.5
Income (monthly) in	4000-9000	3	46	4.2	64.8
Taka (BDT)	9001-14000	6	5	8.5	7.0
	14001-19000	3	11	4.2	15.5
	19001-24000	9	3	12.7	4.2
	>24000	50	0	70.4	0
Average family	<3000	0	9	0	12.7
Expenditure	3000-6000	5	49	7.0	69.0
(Monthly) in Taka	6001-9000	5	5	7.0	7.0
(BDT)	9001-12000	4	8	5.6	11.3
	12001-15000	13	0	18.4	0
	>15000	44	0	62.0	0
Socioeconomic	Satisfactory	62	14	87.3	19.7
Status	Non-satisfactory	9	57	12.7	80.3

Table 2 has explained that, in urban area the occupations of household head were business 39.5% (n=28), govt. and private service holders 36.6% (n=26), Jobless/housewife 23.9% (n=17). In rural area 21.1% (n=15) were farmer, 52.1% (n=37) had small business, 14.1 (n=10) had govt. and private job and 12.7% (n=9) were jobless/housewife. Of the total respondents 53.5% (n=76) were economically satisfied and 46.5% (n=66) were non-satisfied. 87.3% (n=62) of urban and 19.7% (n=14) of rural respondents were economically satisfied, 12.7% (n=9) of urban and 80.3% (n=57) of rural respondents were economically non-satisfied. The maximum monthly income, 70.4% (n=50) was above 24000 BDT in urban area. The highest monthly income, 64.8% (n=46) was 4000-9000 BDT and lowest monthly income, 4.2% (n=3) was 19001-24000 BDT in rural area. Maximum families, 62.0% (n=44) expended more than 15000 BDT per month in urban area. On the other hand maximum families, 69.0% (n=49) expended 3000-6000 BDT per month in rural area. So, the data in Table2 indicated that most of the respondents from urban have high socio-economic status and most of the respondents from rural have low socioeconomic status.

3.3. Patient diseases history

Patients' disease histories in urban and rural area are shown in Table 3.

Table 3. Patients disease history in urban and rural area (n=142).

Variable	Urban frequency (n=71)	Rural frequency (n=71)	Urban percentage (%)	Rural percentage (%)
Hypertension	67	64	94.4	90.1
Diabetes Mellitus	33	19	46.5	26.8
Heart Disease	24	5	33.8	7.0
ARF	6	2	8.5	2.8
CRF/ESKD	65	69	91.5	97.2
HCV +ve	18	23	25.4	32.4
No. of HD per week 1	11	17	15.5	23.9
No. of HD per week 2	56	53	78.9	74.7
No. of HD per week 3	4	1	5.6	1.4

Table 3 has revealed the disease history of the respondents. Of the total urban patients 94.4% (n=67) were hypertensive, 46.5% (n=33) were diabetic and 33.8% (n=24) were with heart disease. Again of the total rural patients 90.1% (n=64) were hypertensive, 26.8% (n=19) were diabetic and 7.0% (n=5) were with heart disease. So, the data in Table3 indicated that hypertension, diabetes and heart diseases associated with end-stage kidney disease were more prevalent among urban than rural residents. The total 94.4% (n=134) cases reached chronically end-stage renal failure and 5.6% (n=8) were of acute renal failure. Among 134 end-stage renal failure patients 91.5% (n=65) were from urban and 97.2% (n=69) were from rural area, 8.5% (n=6) patients of acute renal failure were from urban and 2.8% (n=2) were from rural area. Hepatitis-C was found in 28.9% (n=41) respondents. Among them 25.4% (n=18) were from urban and 32.4% (n=23) were from rural. Of the total 142 patients 19.7% (n=28) were taking hemodialysis therapy once a week, 76.8% (n=109) twice a week and 3.5% (n=5) thrice a week. Among them in urban area 15.5% (n=11) respondents were taking hemodialysis once a week, 78.9% (n=56) and 5.6% (n=4) respondents were taking hemodialysis twice and thrice a week respectively. Also in rural area 23.9% (n=17) respondents were taking hemodialysis once a week, 74.7% (n=53) and 1.4% (n=1) respondents were taking hemodialysis twice and thrice a week respectively.

3.4. Anthropometric measurements

The post dialysis body mass index (BMI) of the respondents has presented in Table 4.

Table 4. Post dialysis BMI of urban and rural patients (n=142).

Variable	Ranges	Urban frequency (n=71)	Rural frequency (n=71)	Urban percentage (%)	Rural percentage (%)
Post-dialysis BMI (WHO ranges)	<18.5	11	13	15.5	18.3
	18.5-24.9	41	44	57.8	62.0
	25.0-29.9	10	8	14.1	11.3
	30.0-34.9	5	3	7.0	4.2
	35.0-39.9	3	1	4.2	1.4
	>40.0	3	0	4.2	0
	<23.0	42	51	59.2	71.8
	>23.0	29	20	40.8	28.2

According to WHO classification for BMI 15.5% (n=11) had BMI below 18.5kg/m^2 in urban and 18.3% (n=13) had BMI below 18.5kg/m^2 in rural area. The BMI of 57.8% (n=41), 14.1% (n=10), 7.0% (n=5), 4.2% (n=3) and 4.2% (n=3) had their BMI in the range of 18.5-24.9 kg/m^2, 25.0-29.9 kg/m^2, 30.0-34.9 kg/m^2, 35.0-39.9 kg/m^2 and 40.0 kg/m^2 and above respectively in urban area. On the other hand the BMI of 62.0% (n=44), 11.3% (n=8), 4.2% (n=3), 1.4% (n=1) and 0% (n=0) had their BMI in the range of 18.5-24.9 kg/m^2, 25.0-29.9 kg/m^2, 30.0-34.9 kg/m^2, 35.0-39.9 kg/m^2 and 40.0 kg/m^2 and above respectively in rural area. Table 4 has also presented that most of the patients from both urban and rural area were at risk of malnutrition. About 59.2% (n=42) patients of urban and 71.8% (n=51) patients of rural area of this study have a BMI of less than 23 and 40.8% (n=29) patients of urban and 28.2% (n=20) patients of rural have a BMI of more than 23.

3.5. Clinical findings

Clinical presentation of urban and rural hemodialysis patients status are shown in Table 5.

Table 5. Clinical presentation of urban and rural hemodialysis patients.

Variable	Urban frequency (n=71)	Rural frequency (n=71)	Urban percentage (%)	Rural percentage (%)
Anemia	68	70	95.8	98.6
Anorexia	46	49	64.8	69.0
Nausea	43	47	60.6	66.2
Vomiting	38	45	53.5	63.4
Heart Burn	17	26	23.9	36.6
Constipation	31	36	43.7	50.7
Dizziness	31	23	43.7	32.4
Chest Pain	19	9	26.8	12.7
Dysphagia	3	5	4.2	7.0
Fatigue	22	27	31.0	38.0
Headache	39	30	54.9	42.3
Diarrhea	20	17	28.2	23.9
Pruritus	25	47	35.2	66.2
Shortness of Breath	13	6	18.3	8.5
RTI	26	46	36.6	64.8
Xerophthalmia	24	28	33.8	39.4
Glossitis	14	6	19.7	8.5
Angular Stomatitis	5	5	7.0	7.0
Chronic Uremia	48	61	67.6	85.9

Table 5 has revealed the clinical findings of hemodialysis patients. In urban area about 95.8% (n=68) respondents had anemia, 64.8% (n=46) had anorexia, 60.6% (n=43) had nausea, 53.5% (n=38) had vomiting, 23.9% (n=17) had heart burn, 43.7% (n=31) had constipation, 43.7% (n=31) had dizziness, 26.8% (n=19) had chest pain, 4.2% (n=3) had dysphagia, 31.0% (n=22) had fatigue, 54.9% (n=39) had headache, 28.2% (n=20) had diarrhea, 35.2% (n=25) had pruritus, 18.3% (n=13) had shortness of breath, 36.6% (n=26) had respiratory tract infection (RTI), 33.8% (n=24) had xerophthalamia, 19.7% (n=14) had glossitis, 7.0% (n=5) had angular stomatitis and 67.6% (n=48) had chronic uremia. On the other hand in rural area about 98.6% (n=70) respondents had anemia, 69.0% (n=49) had anorexia, 66.2% (n=47) had nausea, 63.4% (n=45) had vomiting, 36.6% (n=26) had heart burn, 50.7% (n=36) had constipation, 32.4% (n=23) had dizziness, 12.7% (n=9) had chest pain, 7.0% (n=5) had dysphagia, 38.0% (n=27) had fatigue, 42.3% (n=30) had headache, 23.9% (n=17) had diarrhea, 66.2% (n=47) had pruritus, 8.5% (n=6) had shortness of breath, 64.8% (n=46) had respiratory tract infection (RTI), 39.4% (n=28) had xerophthalamia, 8.5% (n=6) had glossitis, 7.0% (n=5) had angular stomatitis and 85.9% (n=61) had chronic uremia. So, the data in Table5 indicated that anorexia, nausea, vomiting, heart burn, constipation, pruritus, respiratory tract infection, xerophthalamia and chronic uremia were more prevalent among rural residents than urban residents.

Mean blood hemoglobin level of urban and rural hemodialysis patients statuses are shown in Table 6.

Table 6. Mean blood hemoglobin level of urban and rural hemodialysis patients.

Variable	Urban frequency (n=71)	Urban mean Hb (g/dl)	Rural frequency (n=71)	Rural mean Hb (g/dl)
Mean Hb (g/dl)	71	8.37±1.46	71	8.12±1.85

Table 6 also has presented the biochemical results of the respondents. The mean value of hemoglobin in urban and rural subjects was 8.37±1.46 g/dl and 8.12±1.85 g/dl respectively.

As the results from the DOPPS suggest, large variations in anemia management may be observed among the different countries. Indeed, the mean hemoglobin concentrations in prevalent hemodialysis patients varied widely across the studied countries, ranging from 10.1 g/dL to 12.0 g/dL (101 g/L to 120 g/L). The percentage of patients with a hemoglobin value lower than 11 g/dL (110 g/L) (ie, below the target recommended by both the K/DOQI guide-lines and the European Best Practice Guidelines) also ranged widely, from 23% to 77%, depending on the country. Our findings are consistent with the Pisoni *et al*. (2004) and Madore *et al*. (1997) study. The lower relative risks in our study may actually reflect an under underestimation, since hematocrit level determined by measurement of mean cell size is less precise compared with the direct hemoglobin concentration method (Madore *et al*., 1997).

The distribution of presence of anemia of the respondents has shown Table 7.

Table 7. Distribution of anemia in urban and rural hemodialysis patients.

Variable	Urban frequency (n=71)	Rural frequency (n=71)	Urban percentage (%)	Rural percentage (%)
Non-anemic	3	1	4.2	1.4
Mild-anemic	4	5	5.6	7.0
Moderate-anemic	25	32	35.2	45.1
Severe-anemic	39	33	55.0	46.5

In urban subjects 4.2% (n=3) were non-anemic, 5.6% (n=4) were mild anemic, 35.2% (n=25) and 55.0% (n=39) were moderate and severe anemic respectively. In rural subjects 1.4% (n=1) were non-anemic, 7.0% (n=5) were mild anemic, 45.1% (n=32) and 46.5% (n=33) were moderate and severe anemic respectively. So this table demonstrate, almost all patients on hemodialysis from both urban and rural were anemic.

4. Conclusions

In this study it was recognized that renal failure was more prevalent among male than in female on both urban and rural residents. Most of the patients from both urban and rural area were at risk of malnutrition. Due to increased family size and low socioeconomic status rural respondents were more prone for malnutrition than that of urban. Hypertension, diabetes and heart diseases associated with end-stage kidney disease were more prevalent among urban patients than rural. The study also shown that almost all patients on hemodialysis from both urban and rural area were anemic and anorexia, pruritus, respiratory tract infection, chronic uremia was more prevalent among rural residents than urban residents. But the high rate of Hepatitis-C positive for kidney patients was debatable and is very rare in cases so further study is must be needed to find the actual rate and causes.

Conflicts of interest

None to declare.

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