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Original article

The relationship between glomerular filtration rate, nutrition and activities of daily living in patients with chronic kidney disease receiving homecare

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Summary. *Introduction:* The aim of this research was to evaluate the relationship among glomerular filtration rate, nutrition and activities of daily living performance in Chronic Kidney Disease patients receiving homecare services. *Materials and Method:* We conducted a retrospective examination of the Sisli Hamidiye Etfal Training and Research Hospital's Homecare records for 2016. 345 patients were included. Glomerular filtration ratewas calculated using a simplified version of the Modification of Diet in Renal Disease. Mini-Nutritional Assessmen scores were used for nutrition. Barthel Index scores were used to identify activities of daily living. P values of ≤0.05 were considered statistically significant. *Results:* 225 women (65.2%) and 120 men (34.8%), were included. Mean value ofGlomerular filtration rate was 60.83 ± 17.10 ml/min/1.73 m2. Mini-Nutritional Assessmen test mean was 19.66 ± 4.97. Barthel Index of the study group was 30.39 ± 28.99. A statistically significant correlation was found between glomerular filtration rateand the Barthel Index(p = 0.022). When glomerular filtration ratedecreased, Barthel Index scores decreased. As Mini-Nutritional Assessmen scores decreased, glomerular filtration rate values also decreased (p = 0.029). Barthel Index and Mini-Nutritional Assessmen were also related (p = <0.001). *Conclusion:* In primary care, elderly individuals (especially those receiving homecare services) should undergo assessment of activities of daily living and nutritional status. Patients with Chronic Kidney Disease were at risk for malnutrition and dependence on activities of daily living.

Keywords: renal insufficiency, aged, home care services, malnutrition, Quality of Life, chronic disease

Introduction

Chronic kidney disease (CKD) is defined as kidney damage and/or decreased kidney function, as expressed by a minimum 3-month history – with or without a fall in glomerular filtration rate (GFR), regardless of cause (1). It frequently manifests as a complication of chronic diseases and considerably influences morbidity and mortality. In a study in Turkey, CKD was seen in 15.7% of patients who appliedfor any complaint (2). Evaluation of three years of Canadian homecare data revealed that the most frequent chronic illness was chronic renal disorder (3). Also many complications associate with CKD like anemia, hyperlipidemia, nutrition problems, osteodystrophy and cardiovascular risks.

Nutrition is a critical issue in CKD patients. In a study, the incidence and severity of malnutrition increased in relation to the degree of renal function loss and were predictive of one-year mortality (4). Many mechanisms were suspected to be the cause of malnutrition. In a study indicated that low acyl-ghrelin

levels, accompanied with high levels of TNF-α and IL-6, may be implicated in loss of appetite and poor nutritional status in CKD patients (5). In another study, as patients progress through the stages of CKD, nutritional requirements are altered and metabolism of protein, water, salt, potassium, and phosphorous are affected. These changes lead to ineffective energy generation despite adequate intake of protein, carbohydrate substrates; all were cause malnutrition(6).So identifying inadequate nutritional status in CKD patients is very important.

Malnutrition not only affected mortality but also showed that the ability to perform basic activities of daily living (ADLs) decreased(7). CKD can affect the ability to perform ADLs because of complications of the disease, such as anemia and hypoproteinemia.So determining of ADLs and nutrision status will be usefull for CKD patients to effect mortality and morbidity.

Therefore we can say that CKD patients have a risk for malnutrision and bad ADLs .CKD is more frequent in homecare patients because of the age group was old and had complicated more than one illnesses.

The specific aim of this research is to evaluate the relationship among GFR, nutrition and ADL performance in CKD patients receiving homecare services.

Materials and Methods

Sample

A retrospective evaluation of SisliHamidiyeEtfal Training and Research Hospital's Homecare records between 01.01.2016 – 31.12.2016 were used as data.

Exclusion Criteria:

- Patients with end-stage CKD,
- Patients who were unconscious or bedridden,
- Patients diagnosed as malnutrition secondary to intestinal inflammatory disease or operation
- Patients for whom inadequate information was available.

Inclusion Criteria:

- Patients who were CKD (except end Stage CKD),
- Patients who were not unconscious or bedridden,
- Patients who were not have any disease or operation that cause malnutrition,
- Patients who have the records of BI, MNA and GFR in files in the same visit.

Ethics Statement

Before collecting data, research approval was obtained from the Ethics Committee of SisliHamidiyeEtfal Training and Research Hospital (Date: 04.04.2017 / Number: 1492). The investigation conformed to the principles outlined in the Declaration of Helsinki. The researcher provided information from SisliEtfal Training and Research Hospital Homecare Unit.

Instruments

Data were collected from the files of SisliEtfal Training and Research Hospital Homecare Unit.
4 parts was recorded:
1-Demographic information:
Age, Gender were noticed.
2- Glomerular Filtration Rate (GFR):

GFR was calculated using a simplified version of the Modification of Diet in Renal Disease (MDRD) formula.GFR≥90 ml/min/1.73 m^2 and GFR<15 ml/min/1.73 m^2 were excluded from study.Patients were separated into two groups according to GFR;Patients whose GFR was between 60–89 ml/min/1.73 m^2 (CKD Stage 2) were classified as Group 1 and those whose GFR was <60 ml/min/1.73 m^2 (CKD Stages 3 and 4) were classified as Group 2.

3- Mini-Nutritional Assessment(MNA):

To identify the nutrition status, Mini-Nutritional Assessment (MNA) test was used. The MNA was first developed in 1991 and published in 1994 in Nutrition Reviews (8). It is an 18-item questionnaire that incorporates anthropometric measurements, dietary intake and global and self-assessment components.

We used the Mini-Nutritional Assessment (MNA) test as a screening tool for malnutrition. In MNA, Malnutrition Indicator Score cut-off points were as follows:

- **24–30 points:** normal nutritional status
- **17–23.5 points:** at risk of malnutrition
- **less than 17 points:** malnourished

4-Barthel Index (BI):

To identify ADLs, BarthelIndex(BI) was used. The Barthel Index has also been used to examine ADL

Table 1. Mean and median values of age, MNA Scores, GFR and Barthel Index regarding gender

	WOMEN	MEN	P
	Median (25%-75%)	Median (25%-75%)	
GFR	59 (46-72)	66(52,8-77.75)	0.001
Age	84(78-87.5)	82(73-88)	0.151
MNA	20.5(17.5-23.5)	20.5(16-23.5)	0.434
Barthel ındex	35(0-50)	30(0-50)	0.204

performance in geriatric patients since 1955. In 1955; the acute care hospitals in Maryland have used the Barthel Index to assess patients' ability to complete ADLs (9).

The index assesses the following ten items: presence or absence of fecal and urinary incontinence; help needed with grooming; toilet use; feeding; transfers (e.g. from chair to bed); walking; dressing; climbing stairs; and bathing. The Barthel Index scores are expressed as multiples with a range of 0 (completely dependent) to 100 (independent for basic ADLs). Higher scores were reflective of a higher degree of independence.

In the Barthel Index:

- **0-20 point:** totally dependent
- **21-60 point:** high-level dependent
- **61-90 point:** mid-level dependent
- **91-99 point:** low-level dependent
- **100 point:** totally independent

Take care of the patient's GFR, MNA and Barthel Index datas were from the same visits.

Data Analysis

To analyze the data obtained in the study, descriptive statistics (number and percentage distribution, means, standard deviations) were calculated first. Our study featured an abnormal distribution ($p < 0.001$) according to Shapiro–Wilk test. Consequently, the Mann–Whitney U-test was used to compare the two groups. Chi-square was used to explore goodness of fit.Spearman Correlation Analysis was performed to determine the level and direction of the relationship between the dependent and independent variables. Linear regression was performed to show the correlation is strong.P values of ≤0.05 were considered statistically significant.

Results

A total of 1105 patient visits were noted throughout the year. After exclution; total of 345 patients, 225 women (65.2%) and 120 men (34.8%), were included in our study sample. Age mean of the total sample was 81.47 ± 9.26 and mean value of GFR was 60.83 ± 17.10 ml/min/1.73 m^2. MNA test mean was 19.66 ± 4.97. Barthel Index of the study group was 30.39 ± 28.99.

The distribution of gender, GFR, MNA and BI values are displayed in Table 1 and Figure- 1. Age, MNA, the Barthel Index and gender were not related according to student t test ($p = 0,151$; 0.434; 0.204). Although women's age mean were older than men ; women's BI and MNA were better than those observed in men. Only men's GFR means was good from womens and there was a significantregression between gender and GFR(r^2=0,28; $p = 0.002$).This will not show only the relation between gender and GFR but also will show the relation between age and GFR. Smilarly with this according to our study there was a negative correlation and significantregression between GFR and age (r^2=0,20; $p = 0.009$).

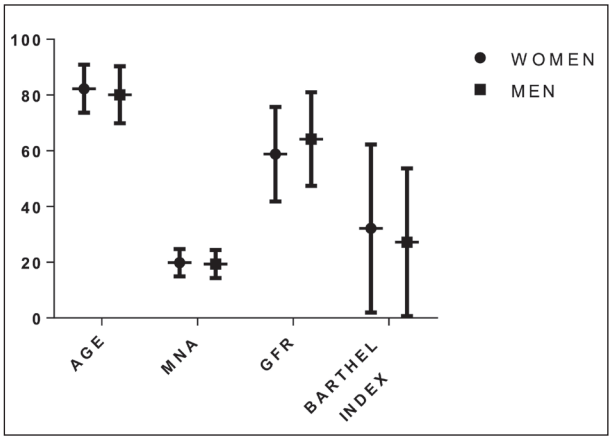

Figure 1. The distribution of gender and GFR, MNA, MNA-SF,BI values

According to MNA, 25.2% (n = 87) of the study group were malnourished and 52.8% (n = 182) were at risk of malnutrition. According to BI, 2.3% (n = 8) were totally independent; 2% (n = 7) were low-level dependent, 8.7% (n = 30) were mid-level dependent, 42.4% (n = 146) were high-level dependent; and 44.6% (n = 154) were totally dependent. Although MNA and BI increased with age, there was no relationship between age, MNA and Barthel Index scores (p = 0.506; 0.134).

A statistically significant correlation was found between GFR and the Barthel Index (p = 0.022). When GFR decreased, BI scores decreased (indicating increased dependence). As MNA scores decreased and nutrition worsened, GFR values also decreased(p = 0.029). BI and MNA were also related (p = <0.001)

Regarding GFR Groups, 182 (52.8%) patients were classified as Group 1 and 163 (47.2%) as Group 2. Group characteristics are displayed in Table 2. Age and GFR distrubutions were statistical significance (p = 0.004; p=0.00). Although nutrition and ADLs were worse in group GFR < 60 ml/min/1.73 m^2; there were no significant differences between two groups (p=0.212;0.067).

Discussion

According to the Turkish Statistical Institute (TSI), the elderly population was 6,651,503 in 2016, representing 8.3% of the entire population. Males comprised 43.9%, and females 56.1% (10). As exhibited in the general population, women comprised a greater percentage of our study cohort than men, which is expected given that life expectancies are greater for women than men.

A previous study in the USA revealed the prevalence of stage 1–4 CKD to be 13.1% (11). In Turkey, it was 15.7% (and observed mostly in women) (2). In our study, the relationship between age, gender and GFR was statistically significant and the female GFR were worse than those of the men (r2=0,28; p = 0.002) ; age was negatif related with GFR (r2=0,20; p = 0.009)and also women were older than men. This may be attributable to longer life expectancy in women, along with lower GFR as the complications of aging and chronic diseases manifest in the elderly. Conversely, younger women have an increased risk of urinary tract infections, a potential cause of CKD in adults and may cause this difference in elderly(12).

Progressive lowering of GFR can occur, independent of overt pathology in the elderly (13). In our study, GFR decreased as age increased.

In our study, women's nutrition was better than that of men but this did not rise to the level of statistical significance. In a 1999 study, having cooking skills enabled people to prepare meals, but may also have provided a degree of knowledge about ready-prepared meals. Traditionally, shopping for preparing and cooking food has been primarily the responsibility of women, with many older men never having mastered the art of cooking (14). Similarly, although the Barthel Index and gender were not related; women were more independent then men.

In a study performed in Ankara on elderly individuals, 5% were malnurished and 67% were at risk of malnutrition (15). A 2006 review of literature revealed

Table 2. The relations between gender, age, MNA, MNA-SF, BI and GFR groups

	Group 1 (GFR89-60 ml/min/1.73 m^2)		Group 2 (GFR < 60 ml/min/1.73 m2)		p
	N	%	N	%	
Gender					
Female	105	57.7	120	73.6	0.002
Male	77	42.3	43	26.4	
	Median		Median		P
Age	82(74-87)		85(78-90)		0.004
MNA	20.50(17-24)		20.25(16-23)		0.067
Barthel index	30(0-50)		30(0-50)		0.212
GFR	74.5(66-83)		47.6(38-54)		0.000

a similar pattern in out-patients and elderly individuals receiving home care (25 studies, n =3119 elderly), the prevalence of malnutrition was 9%and an additional 45% were at risk of malnutrition(16). Another study including 1,834 adults with predialysis CKD and protein-energy wasting found prevalences of 2.2%, 4.4%, 8.3%, 6.2%, 15.6% and 24.6% in CKD stages 1, 2, 3a, 3b, 4 and 5, respectively (17). In our study, 25.2% (n = 87) of our patients were malnourished and 52.8% (n = 182) were at risk of malnutrition. Our percentage is higher than other studies because the GFR of our study group was <90 ml/min/1.73 m^2 or low economic level of our study group.

There was a relation between GFR and MNA(p = 0.029). Nutrition is a very important consideration in CKD patients. Dietary metabolites are closely related to CKD progression (18), and CKD progression improves when nutrition improves (19). In our study, nutrition worsened with decreased GFR values. This may occur secondary to reduced protein and energy intake and lost protein with albuminurea in those with CKD. The degree to which appetite is lost is associated with decreases in GFR.

But when patients were separated in two groups according to GFR. MNA score was good in GRF 60–89 ml/min/1.73 m^2;however, this did not rise to the level of statistical significance. This may occur as a result of secondary (comorbid) diseases with CKD effects.

There were many studies about the relation between GFR and ADLs. In a study; GFR category and Barthel Index are independent risk markers for survival in older rehabilitation patients (20). This underscores the importance of observing and measuring ADLs in the elderly. In another study there was no relationship between the Barthel Index and the disability severity in CKD patients (21). This shows that there was no direct relation or there were some secondary things that effect the relation between GFR and BI. In our study, GFR and BI were related. But when we separated the patients in to two groups according to GFR level, there was no relationship between the BI and GFR groups. This may be because ADLs are multi-factorial and homecare patients frequently exhibit many other comorbid diseases, with CKD.

In a study said that BI can help patients at risk of malnutrition (22). In another; nutritional status, according to MNA, is related to ADL performance in geriatric patients (23). There was a strong relationship between MNA and the Barthel Index in our study too. Decreases in the MNA indicate increases in functional dependence.

Conclusions

Malnutrition is an important risk factor for CKD patients. MNA may help identify CKD patients who are malnourished or at risk of malnutrition. ADLs and GFR were related according to the Barthel Index. In elderly as the malnutrition increases also the GFR value increases and daily activities decrease. BI may be useful for determining the risks of poor nutrition and functional decline in CKD patients. In primary care, elderly individuals (especially those receiving homecare services) should undergo assessment of ADLs and nutritional status.

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