Original Research

Influence of Collected Modified Risk Factors on the Development and Progression of Chronic Kidney Disease

Akhmedova Nilufar Sharipovna, Ergashov Bobir Bakhodirovich, Nuralieva Hafiza Otaevna, Safarova Gulnoza Avazkhonovna

Bukhara State Medical Institute, Bukhara, Uzbekistan.

ABSTRACT

Background: Numerous studies have shown that in patients with chronic kidney disease (CKD), the clinical manifestations of this pathology often appear in an advanced stage of the disease when the patient needs pathogenetic therapy or substitution therapy.

Introduction: In this regard, screening examinations of the functional state of the kidneys is of great importance. We analyzed the incidence of risk factors for CKD among the subjects.

Results: Of the 21 risk factors studied, the most significant were 10 factors that had a modifying nature, the detection rate per patient was, respectively, from 3.40 to 4.58 risk factors.

Conclusion: The presented comparative analysis of the obtained results shows that overweight is more common among the population aged 40–59 years, and indicates that this age with the association of overweight is one of the risk factors for the development and progression of CKD in patients.

Key Words: Chronic kidney disease, Microalbuminuria, Glomerular filtration rate (GFR), Overweight, Hyperfiltration

INTRODUCTION

Chronic kidney disease (CKD) is a common disease associated with increased risk factors for the development of this disease.[1,2] Several global, widespread, and growing chronic non-communicable diseases are high-risk factors for the development of CKD.[3,4] The criteria for the diagnosis of CKD are markers of kidney damage identified during the clinical, laboratory, and instrumental examination and persisting for more than three months, regardless of the nosological diagnosis.[5,6]

MATERIALS AND METHODS

We analyzed the incidence of risk factors for the development of CKD among the subjects. Of the 21 risk factors studied, the most significant were 10 factors that had a modifying nature, the detection rate per patient was, respectively, from 3.40 to 4.58 risk factors. Analyzes of the research results show that with the most well-known traditional risk factors (age, hypertension, diabetes mellitus, and obesity) for the development and progression of CKD in rural residents, some non-traditional risk factors are also of no small importance.[7]

RESULTS AND DISCUSSION

Frequently encountered non-traditional risk factors for the development and progression of CKD were the following: the presence of chronic foci of infection (91.48%), hyperlipidemia (60.88%), a history of nephropathy of pregnant women among women (58.4%), the abuse of nephrotoxic drugs (56, 47%), overweight (53.94%), dysuria of unknown aetiology (37.85%), bad habits (smoking, alcohol, abuse of salty and bitter foods (34.7%).

These factors are gradually becoming the leading risk factors for the development of CKD in the population. Microalbuminuria detected in the subjects was assessed as a risk factor for the progression of CKD. Considering the above, we considered it appropriate to study and analyze in more detail the frequency of occurrence of these factors in a comorbid form,

as risk factors for the development of CKD among rural residents and their impact on the functional state of the kidneys.

Analysis of the results showed that the following types of combined occurrence of risk factors for the development and progression of CKD are often identified.[7]

1. hypertension + overweight + abuse of nephrotoxic drugs + the presence of foci of chronic infection;
2. overweight + presence of foci of chronic infection + abuse of nephrotoxic drugs + history of nephropathy and/or hypertension of pregnant women in women;
3. overweight + hyperlipidemia + the presence of foci of chronic infection;
4. hypertension + overweight + dysuria of unclear aetiology + the presence of foci of chronic infection;
5. hypertension + ischemic heart disease + obesity + abuse of nephrotoxic drugs + the presence of foci of chronic infection;
6. diabetes mellitus + hypertension + obesity or overweight + the presence of foci of chronic infection.

From the above, it can be seen that there are often aggregates consisting of more than 4 components (risk factors).

Among the examined individuals (n = 317), the 1st type of cumulative occurrence of risk factors was found in 54.25 ± 3.79% (n = 172), the 2nd type of the population was found in 38.8 ± 4.39% (n = 123), 3rd type of aggregate in 36.9 ± 4.46% (n = 117), 4th type of aggregate in 34.38 ± 4.56% (n = 109), 5 and 6 species, respectively 25.23 ± 4.86% (n = 80) and 15.77 ± 5.15% (n = 50).

At the next stages, a comparative analysis of the incidence and degree of development of CKD with different combinations of risk factors was carried out (Figure 1).
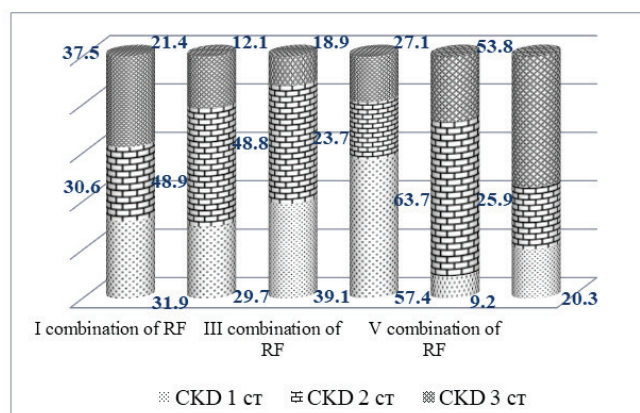

Figure 1: Degree of development and incidence of CKD in different combinations of risk factors (%). CKD, chronic kidney disease; RF, risk factor.

The distribution of CKD by stages was as follows: grade I CKD is often detected with combinations of risk factors for the development and progression of types IV and III, respec-

tively 57.7% and 39.1%; CKD II degree in combinations of V, III, II and I types, respectively, 63.7%, 48.8%, 48.9%, and 30.6%; Grade IIIA CKD is often detected in combination types VI, VII, and V, respectively 53.8%, 37.5%, and 27.1%.

Thus, the degree of development and progression of CKD not only depends on the number of influencing risk factors, but the nature of the influence of this factor on the pathogenesis of the development and progression of CKD is of great importance. The results of our studies have shown that unconventional modifying factors, such as a history of nephropathy of pregnant women among women, abuse of nephrotoxic drugs, overweight and hyperlipidemia, affect the quality of risk factors for the development of CKD. At the same time, their cumulative occurrence with traditional risk factors for CKD affects the progression of the disease.[2,8]

Recent studies have shown that kidney damage in overweight and obese patients goes through several successive stages.

1. Stage of hyperfiltration is an early and potentially reversible stage of CKD. They practically do not show specific symptoms, they are detected by accident or during preventive medical examinations.
2. Stage of normal filtration - production of type I collagen, under the influence of leptin, which increases in the blood of obese individuals. These processes stimulate the proliferation of renal vascular endothelial cells and glomerular hypertrophy. Damage to glomerular endothelial cells is associated with microalbuminuria.
3. Stage of hyperfiltration - the formation of nephrosclerosis with the development of chronic renal failure, irreversible stage of CKD.

With this research work, we wanted to study the visceral obesity index (IVO) as a diagnostic marker of kidney damage and its potential for predicting the risk of developing and progression of CKD.

These data indicate an emerging interest in the relationship between obesity and kidney disease.[4-6] To determine visceral (abdominal) obesity, VAI was calculated using the above formula. To conduct the research, the cohort group included 317 respondents who had been previously identified in screening studies in rural areas based on the detection of microalbuminuria as an early diagnostic predictor of CKD. The clinical characteristics of these subjects were shown in Table 1.

Table 1: Clinical and laboratory characteristics of the examined rural residents with CKD

Indicators		Average parameters (n = 317)
Average age, years		48.61±2.73
Gender	man	99
	woman	218
Average weight in kg		76.11±2.39

Table 1: *(Continued)*

Indicators	Average parameters (n = 317)
BMI kg / m²	32.2±1.62
WC, см	88.09±1.81
HC, см	94.05±1.32
WC/HC	0.96
WC/height	0.54
Total cholesterol mmol / l	3.7±1.06
HDL mmol / L	0.74±0.48
LDL mmol / l	1.84±0.75
TG mmol / l	1.38±0.65
VOI	1.81

Note: BMI - body mass index; WC - waist circumference; HC - hip circumference; HDL – high-density lipoprotein; LDL – low-density lipoprotein; TG - triglyceride; VOI - visceral obesity index.

Of the entire contingent of the surveyed (n = 317), overweight was detected in 171 patients (53.94 ± 4.98%), and obesity was detected in 52 respondents (16.40 ± 3.70%). These identified individuals, depending on the parameters of BMI, were divided into 2 groups: group 1 - overweight (BMI = 25.0–29.9 kg / m² - n = 171; Group 2 - patients by whom obesity was determined (BMI> 30 kg / m² - n = 52. The parameters of the given survey groups were studied in a comparative aspect (Table 2).

Table 2: Comparative characteristics of the clinical and laboratory parameters of BMI in the examined with overweight and obesity

Indicators		1st group (BMI = 25.0-29.9 kg / m²) n = 171	2nd group (BMI> 30 kg / m²) n = 52
Age, Years	17-40	44/25.73±3.34	5/9.62±4.10* ↓
	41-59	79/46.19±3.81	23/44.23±6.88 ↔
	60 лет и старше	48/28.07±3.44	24/46.15±6.91* ↑
Gender	man	55/32.16±3.57	17/32.69±6.60 ↔
	woman	116/67.8±3.57	35/67.31±6.50 ↔
BMI, кг/м²		27.27±3.4	34.2±6.57 * ↑
WC, см		90.48±2.24	111.86± 2.15 *↑
HC, см		93.89±1.81	110.5± 2.12 *↑
WC/HC		0.95	0.97 ↔
WC/height		0.55	0.70↑
Abdominal obesity		83.38±2.70	100
Frequency of occurrence % VOI		1.67	1.93↔
MAU≥30mg/l		125/73.10±3.39	42/80.69±5.47 *↑

Note: absolute in the numerator, relative (%) indicators in the denominator: * - a sign of a significant difference in the parameter; ↑↓ and ↔ - increase, decrease, or no difference between the indicator and the compared group.

Analysis of the data presented in Table 2 shows that the anthropometric parameters of the comparative groups differ statistically significantly. The average BMI, WC, HC, and WC / height were significantly higher in the 2nd group (p <0.05). Comparison of the incidence of overweight and obesity between the study groups by age shows that the prevalence of obesity increased in parallel with increasing age (9.62 ± 4.10%; 44.23 ± 6.88% and 46.15 ± 6.91%).

If overweight was more common at the age of 17–40 years (25.73 ± 3.34 versus 9.62 ± 4.10), then this trend changes with age, we note the opposite picture. If at the age of 41-59 we note the absence of significant differences (respectively for the groups 46.9 ± 3.81 and 44.23 ± 6.88), then in persons 60 years and older there is a significant percentage on the side of the 2nd group (respectively 28.07 ± 3.44 and 46.15 ± 6.91) - (p <0.05). Prevalence parameters with an aspect of sex difference show that overweight and obesity are more common among women (67.8 ± 3.57 and 67.31 ± 6.50).

The intergroup difference by sex, where there was no significant difference (p> 0.05), practically did not manifest itself, however, within each group, women outnumbered men (p <0.05). If in the 1st group the superiority of women was 2.11 times (respectively 67.8 ± 3.57 and 32.16 ± 3.57), then in the 2nd group these figures were also close to each other (respectively 67.8 ± 3.57 and 67.31 ± 6.50). MAU parameters show that the incidence of microalbuminuria, which was determined above normal values, was more often detected in the 2nd group (MAU ≥30 mg / l 73.10 ± 3.39% and 80.69 ± 5.47, respectively), although the parameters are not reliable (p > 0.05).

To assess the decline in renal function in those surveyed with overweight and obesity, GFR was determined using a calculation method based on creatinine. The conducted studies have proved the fact that the use of the Cockcroft – Gault formula for calculating GFR led to a significant overestimation of the indicator in patients with a BMI ≤40 kg/m². In this regard, in the future, the use of this formula for calculating the GFR was considered unreasonable. We calculated GFR using the CKD-EPI method (ml/min/1.73 m²), taking into account the serum creatinine level, gender and age of patients involved in research work. To determine the relationship between the development of CKD and BMI, a comparative analysis was carried out between the examined groups according to the level of development of the stages of CKD (Figure 2). The obtained results showed that among the obese subjects (n = 52) CKD was observed in 44.23 ± 6.88% (n = 23) cases, and among the examined with overweight (n = 171) it was observed in 30.4 ± 3.51% (n = 52) cases.

Comparative analysis showed that in the general trend of CKD development in obesity is higher than in overweight compared with obesity; in terms of developmental stages 1 and 3, stages of CKD development were more detected

in patients with overweight, respectively 2.3% and 1.9%; 7.01% and 3.8%. To determine the relationship between the development of CKD and BMI, a comparative analysis was performed between the examined groups in terms of the level of microalbumin and GFR.
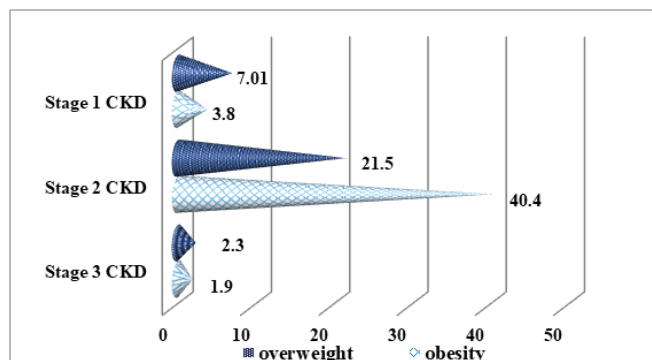

Figure 2: The relationship between the development of the stage of CKD with obesity (n = 52) and overweight (n = 171) (%).

The results obtained show that the parameters gradually decrease with an increase in MAU in the urine in overweight patients (Figure 3).

Practically the same results were obtained in the obese group. It should be emphasized that the downward trend in GFR was similar, but the intensity of the decline was more noticeable in the representatives of the 2nd group. For OB and OT, the parameters of the 2nd group were also higher, a similar picture was observed for BMI. In both cases, the relationship between BMI parameters and an increase in MAU parameters was less noticeable, although a gradual increase in BMI parameters was observed.[2,4,8]

When comparing both groups, it was revealed that an increase in the level of microalbuminuria was accompanied by a decrease in GFR with both methods of determination. There are insignificant differences between the BMI indicators in the comparative groups (respectively, in the 1st group - 26.2 kg/m^2; 27.4 kg/m^2 27.8 kg/m^2 and in the 2nd group - 33.7 kg/m^2 34, 2 kg/m^2 35.2 kg/m^2.

The difference in mean OT data (a parameter showing the level of abdominal obesity) is less pronounced in the 1st group (respectively 82.6 cm; 86.9 cm and 90.5 cm) than in the 2nd group (respectively 104.6 cm; 106.8 cm vs. 115.2 cm). It was found that among those surveyed with overweight (n = 171), abdominal obesity was observed in 83.38 ± 2.70% (n = 146) cases, and among those surveyed with obesity in 100% (n = 52) cases (p <0.05) (Figure 3).
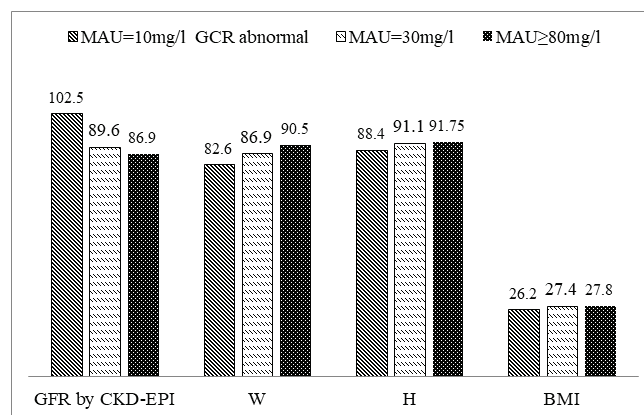

Figure 3: Parameters of comparative analysis – the ratio of BMI and GFR according to the level of microalbuminuria in overweight individuals.

Comparative analysis showed that all GFR indices were increased in obese patients compared with the data in the overweight group, however, the downward trend compared with an increase in the level of microalbuminuria remained unchanged: with MAU 30 mg / l - 96.5 ml/min / 1.73 m^2 in obese patients; 89.6 ml/min / 1.73 m^2 in patients with overweight; with MAU ≥80 mg / l 80.3 ml/min / 1.73 m^2 in obese subjects and 89.9 ml/min / 1.73 m^2 in overweight subjects (Figure 4).

Increased GFR in obesity confirms that the mechanism of glomerular hyperfiltration in abdominal obesity will lead to an insufficient diagnosis of the stage of CKD and the aforementioned use of tactics for secondary prevention of chronic kidney damage and this is fraught with further progression of CKD in the patient, deterioration of his quality of life and low medical and economic efficiency.
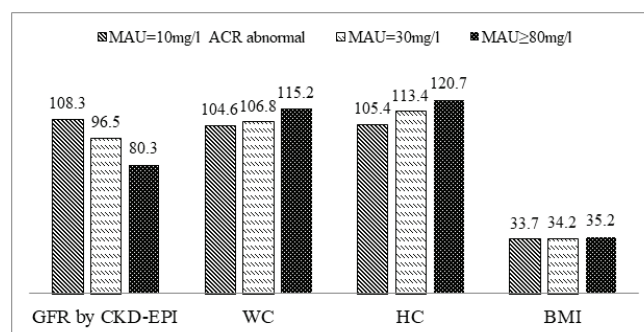

Figure 4: Parameters of comparative analysis – the ratio of BMI and GFR by the level of microalbuminuria in obese subjects.

CONCLUSIONS

The presented comparative analysis of the obtained results shows that overweight is more common among the popula-

tion aged 40–59 years, and indicates that this age with the association of overweight is one of the risk factors for the development and progression of CKD in patients. Overweight is a more significant risk factor for the development of CKD, and in the early diagnosis of this condition, the definition of microalbuminuria as a near predictor of diagnosis plays an important role and is considered more reliable for clarifying the stage of CKD than the determination.

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REFERENCES

1. Duncan L, Heathcote J, Djurdjev O, Levin A. Screening for renal disease using serum creatinine: who are we missing? Nephrol Dial Transpl 2001;16(5):1042-1046.
2. Vaziri ND. Disorders of lipid metabolism in nephrotic syndrome: mechanisms and consequences. Kidney Int 2016;90(1):41-52.
3. Seng JJB, Tan JY, Yeam CT, Htay H, Foo WYM. Factors affecting medication adherence among pre-dialysis chronic kidney disease patients: a systematic review and meta-analysis of literature. Int Urol Nephrol 2020;52(5):903-916.
4. Sharipovna AN. The importance of proteinuria as a predictor of diagnosis and a risk factor for the development of chronic kidney disease. Eur Sci Rev 2018;(7-8):84-85.
5. WorkGroup CK. Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int 2013;12:30-150.
6. Levey AS, Coresh J, Bolton K, Culleton B, Harvey KS, Ikizler TA, et al. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis 2002; 39(2):5-11.
7. Damtie S, Biadgo B, Baynes HW, Ambachew S, Melak T, Asmelash D, Abebe M. Chronic kidney disease and associated risk factors assessment among diabetes mellitus patients at a tertiary hospital, Northwest Ethiopia. Ethio J Health Sci 2018;28(6):58-62.
8. Kobalava ZD, Villevalde SV, Bagmanova NKh BM, Orlova GM. The prevalence of markers of chronic kidney disease in patients with arterial hypertension, depending on the presence of diabetes mellitus: the results of an epidemiological study of chronographs. Russ J Cardiol 2018;2(154):1-01.