

DIAGNOSTIC VALUE OF THE METHOD FOR DETERMINING GFR IN PATIENTS WITH CKD UNDER THE CONDITIONS OF THE PRIMARY LINE OF HEALTH CARE

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✓ *Resume,*

The article presents the results of observation of 217 patients with CKD with various stages in the primary health care setting, among whom there were 110 men (50.69%), and 107 women (49.31%). The age of the patients varied from 18 to 65 years. All patients were tested for cystatin C by the immunoturbidimetric method, and creatinine was determined by the kinetic test using the Creatinine FS reagent (Dia Sys Germany). Total protein, albumin and urea were analyzed by the enzymatic method. Microalbuminuria (MAU) was determined semi-quantitatively using MicroalbuFAN strips. The results of the study indicate the advantage of determining the level of GFR by the indicator of cystatin C. However, given the conduct of this study in the conditions of primary health care, due to the lack of reliability of the results, as well as the more availability of the method for measuring the level of GFR by creatinine, its use is recommended.

Key words: Chronic kidney disease, cystatin C, creatinine, albumin, GFR, primary health care.

**SOG'LIQNI SAQLASH XIZMATINING BOSHLANG'ICH CHIZIG'INING SHARTLARI
OSTIDA CKD BILAN OG'RIGAN BEMORLARDA GFRNI ANIQLASH USULINING
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Maqolada birlamchi tibbiy yordam ko'rsatishning turli bosqichlarida bo'lgan 217 KHD kasallarini kuzatish natijalari keltirilgan, ular orasida 110 erkak (50,69%) va 107 ayol (49,31%) bo'lgan. Bemorlarning yoshi 18 dan 65 yoshgacha bo'lgan. Immunoturbidimetrik usul bilan barcha bemorlar sistatin C uchun sinovdan o'tkazildi va kreatinin kinetik test yordamida kreatinin FS reagenti (Dia Sys, Germaniya) yordamida aniqlandi. Umumiy protein, albumin va karbamid fermentativ usul bilan tahlil qilindi. Microalbuminuria (MAU) MicroalbuFAN chiziqlari yordamida yarim miqdoriy aniqlandi.

Tadqiqot natijalari sistatin S indikatori bo'yicha GFR darajasini aniqlashning afzalligini ko'rsatadi, ammo natijalarni ishonchliligi yo'qligi sababli, bu tadqiqot birlamchi tibbiy yordam sharoitida o'tkazilishini hisobga olgan holda. GFR darajasini kreatinin bilan o'lchash usuli qanchalik ko'p bo'lsa, undan foydalanish tavsiya etiladi.

Kalit so'zlar: surunkali buyrak kasalligi, sistatin C, kreatinin, albumin, GFR, birlamchi tibbiy yordam.

**ДИАГНОСТИЧЕСКОЕ ЗНАЧЕНИЕ СПОСОБА ОПРЕДЕЛЕНИЯ СКФ У БОЛЬНЫХ
ХБП В УСЛОВИИ ПЕРВИЧНОГО ЗВЕНА ЗДРАВООХРАНЕНИЯ**

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✓ *Резюме,*

В статье представлены результаты наблюдения 217 больных ХБП с различными стадиями в условии первичного звена здравоохранения, среди которых мужчин было 110 (50,69%), а женщин – 107 (49,31%). Возраст больных варьировал от 18 до 65 лет. Всем пациентам определялся цистатин С иммунотурбидиметрическим методом, а также

определяли креатинин кинетическим тестом с использованием реактива Creatinine FS (фирма Dia Sys Германия). Общий белок, альбумин и мочевины исследовали ферментативным методом. Микроальбуминурия (МАУ) определялась полуколичественным методом с использованием полосок МикроальбуФАН.

Результаты исследования свидетельствуют о преимуществе определения уровня СКФ по показателю цистатина С. Однако учитывая проведение данного исследования в условиях первичного звена здравоохранения, то вследствие не достоверности результатов, а также более доступности методики измерения уровня СКФ по креатинину, рекомендовано его применение.

Ключевые слова: Хроническая болезнь почек, цистатин С, креатинин, альбумин, СКФ, первичное звено здравоохранения.

Relevance

According to recent studies, chronic kidney disease (CKD) is not a new disease, but a supranosological concept, i.e. a tool that allows for kidney diseases of different etiology to determine the stage of progression - from intact function to ESRD [1,2,10]. Providing care for patients with CKD requires high material costs [3, 4]. First of all, this concerns the implementation of renal replacement therapy - dialysis and kidney transplantation, which is vital for patients with end-stage renal failure, which develops as a result of nephropathies of various nature. Therefore, early diagnosis of CKD is of great importance [5, 6, 9]. Glomerular filtration rate (GFR) plays an important role in the early diagnosis of CKD. There are several different ways to determine GFR [7, 8]. Each of them has its own characteristics. In a primary health care setting for early diagnosis, it is necessary to use the most affordable, high-quality and effective method for determining GFR [10, 11]. Today, there is a powerful prevention system aimed at early detection of patients with chronic non-communicable diseases. For this, a whole network of medical offices and Health Centers (CH) operates, whose activities are aimed at identifying risk factors for socially significant diseases, creating a healthy lifestyle for the population and rejecting bad habits.

Objective: to study the effectiveness of various methods for determining the level of glomerular filtration rate (GFR) in patients with chronic kidney disease (CKD) in primary health care.

Materials and research methods

The study was conducted in 217 CKD patients with various stages in the primary health care setting, among whom there were 110 men (50.69%), and 107 women (49.31%). The age of the patients varied from 18 to 65 years. As a control group, 20 practically healthy people, matched by sex and age, were studied. The study included patients with primary diseases of the

genitourinary system, diabetes mellitus, hypertension and various forms of coronary artery disease. All patients were tested for cystatin C by the immunoturbidimetric method, and creatinine was determined by the kinetic test using the Creatinine FS reagent (Dia Sys Germany). Total protein, albumin and urea were analyzed by the enzymatic method. Microalbuminuria (MAU) was determined semi-quantitatively using MicroalbuFAN strips. In this study, two main methods for determining GFR were studied: by creatinine and by cystatin C. These methods were selected on the basis of literature data and existing recommendations: 1. according to the MDRD equation (2007) for serum creatinine: $GFR (ml / min / 1.73m^2) = 175 \times (serum\ creatinine, \mu mol / l / 88.4)^{-1.15} \times 4 \times (age, years)^{-0.203}$, for women the result was multiplied by 0.742; 2. Calculation of GFR for cystatin C according to the formula of Stevens L.A. et al. (2008): $GFR (ml / min / 1.73m^2) = 76.7 \times cystatin\ C^{-1.19}$.

Results and its discussion. In the course of a comparative analysis of the two methods, the following results were revealed. The following indicators were established in the examined patients. In 54 patients, the average blood creatinine was $78.25 \pm 2.29 \mu mol / l$, based on these levels, eGFR was calculated, the average value of which corresponded to $76.24 \pm 2.24 ml / min / 1.73 m^2$ and constituted 1 study group (2st CKD). The second group (3Ast CKD) included 53 patients with an average level of creatinine and eGFR, respectively, $98.34 \pm 1.98 \mu mol / l$ and $57.67 \pm 0.85 ml / min / 1.73 m^2$. In 58 patients, the average creatinine index was $126.32 \pm 2.86 \mu mol / l$, eGFR - $44.60 \pm 0.73 ml / min / 1.73 m^2$, this category of patients was the third group of the study (3Bst). The fourth group (4st CKD) included 52 patients with an average creatinine level and eGFR, respectively $192.14 \pm 6.6 \mu mol / l$ and $27.62 \pm 0.92 ml / min / 1.73 m^2$. The obtained GFR indices for the entire sample of patients are presented in the figure (Figure 1).

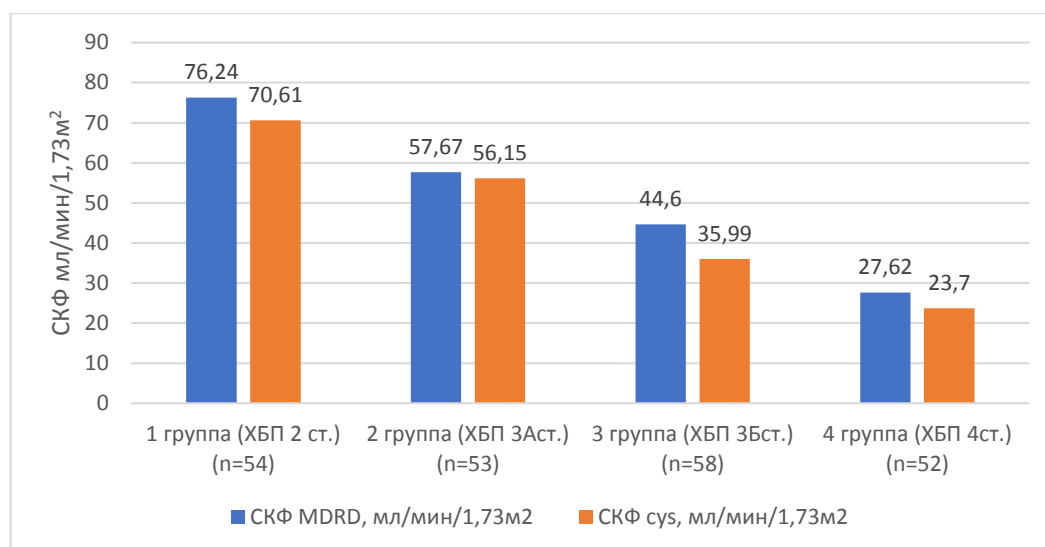


Figure 1. GFR indicators in comparison groups according to the formulas: MDRD, CKD-EPI for cystatin C (n = 217)

At the same time, for the entire sample, the examined patients had average blood creatinine values of $123.76 \pm 3.43 \mu\text{mol} / \text{L}$, while its minimum and maximum values were 58 and 292 $\mu\text{mol} / \text{L}$, respectively. Based on this indicator, the average eGFR was $51.53 \pm 1.18 \text{ ml} / \text{min} / 1.73 \text{ m}^2$. When determining the level of cystatin C in the examined patients, it was found that the average indicator for the entire sample of patients was $1.59 \pm 0.05 \text{ mg} / \text{l}$, and its minimum value was 0.65 mg / l , and the maximum value was 2.79 mg / l . At the same time, during the calculation of GFR for cystatin C, a redistribution of patients was observed in the direction of decreasing stage of the disease. The following distribution of patients by stages of CKD was established: stage 1 (GFR 90 and higher $\text{ml} / \text{min} / 1.73 \text{ m}^2$) consisted of 5 patients 5 patients

(2.3%), stage 2 (GFR 60-89 $\text{ml} / \text{min} / 1.73 \text{ m}^2$) was determined in 52 (23.9%) patients; Stage 3A (GFR 45-59 $\text{ml} / \text{min} / 1.73 \text{ m}^2$) - in 52 (23.9%); Stage 3B (GFR 30-44 $\text{ml} / \text{min} / 1.73 \text{ m}^2$) was detected in 57 (26.26 %) patients and stage 4 (GFR 15 -29 $\text{ml} / \text{min} / 1.73 \text{ m}^2$) - in 51 (23.5%) of the patient. At the same time, the following average GFRcys indices were noted in 4 groups of the examined: in group 1 - $70.61 \pm 3.83 \text{ ml} / \text{min} 1.73 \text{ m}^2$; in group 2 - $56.15 \pm 2.31 \text{ ml} / \text{min} 1.73 \text{ m}^2$; in group 3- $5.99 \pm 1.36 \text{ ml} / \text{min} 1.73 \text{ m}^2$ and in group 4 - $23.70 \pm 0.93 \text{ ml} / \text{min} 1.73 \text{ m}^2$.

It should be noted that the MDRD equation tends to underestimate GFR, especially at low creatinine concentrations. The average GFR values according to 2 formulas for comparison groups are presented in the table (table 1).

Indicators of renal function in examined patients by comparison groups (n = 217)

Investigations (M±m)	1 group (CKD 2 ст.) (n=54)	2 group (CKD 3Аст.) (n=53)	3 group (CKD 3Бст.) (n=58)	4 group (CKD 4ст.) (n=52)
Urea, mg/dl	7,13±0,25	7,65±0,22	8,76±0,33 ^{°ff}	15,10±0,75*#xx
Creatinine , mg/dl	78,25±2,29	98,34±1,98л л	126,32±2,86 ^{°ff}	192,14±6,6*#xx
Men	85,41±2,15	109,23±2,15 л л	141,33±3,12 ^{°ff}	213,45±7,6*#xx
Women	72,12±2,13	89,34±1,25 л л	109,22±2,15 ^{°ff}	169,45±9,6*#xx
Cystatin C, mg/l	1,15 ± 0,06	1,21 ± 0,03	1,71 ± 0,05 ^{°ff}	2,32±0,07xx
Men	1,14 ± 0,12	1,23 ± 0,05	1,81 ± 0,06 ^{°ff}	2,37 ± 0,08*#xx
Women	0,93 ± 0,06	1,14 ± 0,03 л	1,53 ± 0,06 ^{°ff}	2,18 ± 0,8*#xx
СКФ MDRD,мл/мин/1,	76,24±2,24	57,67±0,85 л л	44,60±0,73 ^{°ff}	27,62±0,92*#xx
СКФ сус,мл/мин/1,73м²	70,61±3,83	56,15±2,31 л	35,99±1,36 ^{°ff}	23,70±0,93*#xx

*Note. The statistical significance of the differences: * $p < 0.001$ - compared to group 4 with group 1; # $p < 0.001$ - compared to group 4 with group 2; $x p < 0.01$, $xx p < 0.001$ - compared to group 4 with group 3; $\text{£ } p < 0.01$, $\text{££ } p < 0.001$ - compared to group 3 with group 2; $L p < 0.01$, $llr < 0.001$ - compared to group 2 with group 1; $^{\circ} p < 0.001$ - compared to group 3 with group 1.*

It should be noted that the revealed difference in the distribution of patients by the stage of CKD development, although different, is not reliable. Since the determination of the level of GFR by cystatin C is more complicated and expensive, and also due to the inaccessibility of this technique in the conditions of primary health care, it is recommended to use the determination of the level of GFR by creatinine to identify the stage of CKD.

Conclusions

Thus, this study helped to identify the advantages of determining the level of GFR in terms of cystatin C. However, it should be noted that in order to study this parameter in a primary health care setting, it is necessary to give preference to a more accessible method for determining the level of GFR in terms of blood creatinine. At the same time, one should always remember about the proportion of error due to the presence of factors that can affect the creatinine value. Thus, in our study, the GFR values according to the Stevens L.A. et al. for cystatin C for the entire sample of patients were not significantly higher than the GFR values according to the MDRD formula by 4.6% ($p < 0.05$). Since this study was carried out in a primary health care setting, due to the unreliability of the results, as well as the more availability of the method for measuring the level of GFR by creatinine, its use is recommended.

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