Tarakanov Victor Alexandrovich, MD, PhD, Professor, Head of the Department of Pediatric Surgery;
tel.: +78612685290; e-mail: nbarova@yandex.ru

Shamsiev Jamshid Azamatovich, MD, PhD, Professor, Head of the Department of Pediatric Surgery;
tel.: +998979100041; e-mail: shamsiyevja@mail.ru

Vafin Albert Zakirovich, MD, PhD, Professor, Professor of Department of Hospital Surgery; tel.: +79034168319; e-mail: azvafin@mail.ru

Barova Natusya Kaplanovna, MD, Head of Surgery Department № 1; tel.: +79882459207; e-mail: nbarova@yandex.ru

Mashchenko Alina Nikolaevna, Post-graduate student in the Department of Pediatric Surgery;
tel.: +79633877244; e-mail: alina.mashchenko@mail.ru

Tadibe Anatoly Vladimirovich, MD, Pediatric surgeon in the surgical department of Salekhard District Clinical Hospital, Chief children's surgeon in the Health Department of Yamal-Nenets Autonomous District; tel.: +79044751716; e-mail: tadibe-av@okb89.ru

Gerasimenko Igor Nikolaevich, MD, Assistant in the Department of Pediatric Surgery; tel.: +79187704217; e-mail: igor9551@yandex.ru

INFLUENCE OF ANEMIA ON QUALITY OF LIFE IN PATIENTS WITH CHRONIC KIDNEY DESEASE ON RENAL REPLACEMENT THERAPY

Urazlina S. E., Zhdanova T. V., Nazarov A. V., Zueva T. V.

Ural State Medical University, Yekaterinburg, Russian Federation

ВЛИЯНИЕ АНЕМИИ НА КАЧЕСТВО ЖИЗНИ У ПАЦИЕНТОВ С ХРОНИЧЕСКОЙ БОЛЕЗНЬЮ ПОЧЕК, ПОЛУЧАЮЩИХ ЗАМЕСТИТЕЛЬНУЮ ПОЧЕЧНУЮ ТЕРАПИЮ

С. Е. Уразлина, Т. В. Жданова, А. В. Назаров, Т. В. Зуева

Уральский государственный медицинский университет, Екатеринбург, Российская Федерация

The influence of anemia and renal replacement therapy (RRT) on the quality of life (QOL) of patients with chronic kidney diseases (CKD) on HD, CAPD and kidney transplant recipients has been studied. 60 patients with CKD 5 were included in the study. Patients with CKD 3 were included in control group. It was found that the scores of QOL in the group of kidney transplant recipients were comparable with the scores in the group with CKD 3, and were better than in dialysis patients, not only in terms of physical health (PF and PCH), but also in the terms of the psychological component of health (VT and SF). Reliable ($p<0.05$) positive correlation have been obtained between QOL and hemoglobin levels (PF, PCH, SF, MH), hematocrit (PF, PCH, SF, MH), serum iron level (PF, RP, BP, GH, PCH, VT, SF, MH), transferrin saturation index (BP, GH, PCH, VT, MH). Scores of QOL in the group of kidney transplant recipients and in the control group were comparable and were better than in the groups of patients on dialysis. Relationship between indices of anemia and QOL in patients on RRT was revealed.

Keywords: quality of life, chronic kidney disease, renal replacement therapy, anemia

Изучено влияние анемии и заместительной почечной терапии (ЗПТ) на качество жизни (КЖ) пациентов с хронической болезнью почек (ХБП), получающих гемодиализ (ГД), постоянный амбулаторный перитонеальный диализ (ПАПД), и реципиентов аллотрансплантации почки (АТП). В исследование были включены 60 пациентов с ХБП 5, которые были разделены на группы в зависимости от метода ЗПТ. Группу контроля составили пациенты с ХБП 3. Выявлено, что КЖ в группе реципиентов АТП было сопоставимо с оценками в группе пациентов с ХБП 3 и лучше, чем у пациентов, получающих диализ, не только по показателям физического здоровья (PF и ФКЗ), но и по показателям психологического здоровья (VT и SF). Достоверная положительная корреляция была выявлена между показателями КЖ и уровнем гемоглобина (PF, ФКЗ, SF, MH), гематокрита (PF, ФКЗ, SF, MH), сывороточного железа (PF, RP, BP, GH, ФКЗ, VT, SF, MH), индекса насыщения трансферрина (BP, GH, ФКЗ, VT, MH). Показатели КЖ в группе реципиентов АТП и в контрольной группе были сопоставимы и лучше, чем в группах пациентов, получающих диализ. Была выявлена взаимосвязь между показателями анемии и КЖ у пациентов, получающих ЗПТ.

Ключевые слова: качество жизни, хроническая почечная недостаточность, заместительная почечная терапия, анемический синдром

BP	– Bodily Pain	PF	– Physical Functioning
CAPD	– Continuous Ambulatory Peritoneal Dialysis	PsCH	– Psychological Component of Health
CKD	– Chronic Kidney Disease	QOL	– Quality of Life
GH	– General Health	RE	– Role-Emotional
HD	– Hemodialysis	RP	– Role-Physical
INT	– Iron Saturation Index for transferring	RRT	– Renal Replacement Therapy
Kt/V	– clearance of urea multiplied by dialysis duration and normalized for urea distribution volume	SF	– Social Functioning
		SF-36	– Short-Form-36 (ehe Short-Form-36 health survey)
MH	– Mental Health	VT	– Vitality
PCH	– Physical Component of Health		

Nowadays there is a dramatic growth of population of end-stage patients on renal replacement therapy (RRT). The frequency of anemia in patients with end-stage renal disease is high. The prevalence of anemia increases with impairment of renal function [10]. Monitoring of the anemic syndrome indicators and early administration of therapy is required. Anemia is a risk factor for cardiovascular complications in CKD patients. Mortality from cardiovascular diseases rise up to 58-71 %, following the drop of glomerular filtration [5]. Besides, the anemia affects the survival of the kidney transplant recipients in the early postoperative period [7].

It is known that the quality of life (QOL) also worsens in patients with CKD and it is proved that when QOL decreases, the mortality increases. In patients with CKD, especially those receiving RRT, QOL is significantly reduced, and comorbid pathology makes an additional contribution [3]. As the CKD progresses, all QOL indicators decrease, however, the worsening of components of physical health is higher [1]. There is a deterioration in the indicators of the psychological component of health in patients with CKD 5 in comparison with CKD 4 [9]. It is known that the low level of physical and psychological components of health are independent factors of dialysis patient's survival. So, the deterioration of psychological health for every 10 points is associated with an increased risk of death by 12 % [4]. Low QOL points in patients after kidney transplantation indicate an increased risk of death and graft loss in the next 10 years [8].

Protein-energy deficiency is participating in the development of cardiovascular pathology and one of the main cause of mortality. It has been shown that a low serum albumin level is associated with an increase in morbidity and mortality in patients with CKD [6]. In addition, albumin is an independent factor for the development of anemia in patients with end stage CKD [10, 11]. It is important to study the relationship between anemia and QOL in patients with CKD in the absence of protein-energy deficiency.

The aim of the study was to evaluate the influence of anemia on QOL in patients on RRT with CKD without protein-energy deficiency.

Material and Methods. We underwent the cross-sectional study including 60 end stage CKD patients. There were three group of patients depending on the method of RRT. 20 hemodialysis patients were included in the first group (age 49.58±2.30 years), 20 patients on CAPD were included in the second group (age 47.00±2.20 years), 20 kidney transplant patients were in the third group (age 43.20±2.20 years). The groups of patients on HD, CAPD patients were comparable in RRT duration (p>0.05). The control group consisted of 20 patients with CKD 3 (age 46.55±2.20 years). All groups were comparable in age (p>0.05).

Inclusion criteria: absence of laboratory and clinical signs of protein-energy deficiency, adequate dialysis (Kt/V≥1.2 for patients on HD and Kt/V≥1.7 for patients on CAPD.

Exclusion criteria: clinically manifested cardiovascular pathology, diabetes mellitus, oncological diseases, systemic inflammatory diseases, exacerbation of renal diseases and concomitant pathology during the study, nephrotic syndrome in medical history, kidney transplant recipients with a graft rejection and age over 60 years.

Laboratory tests: cell blood count and a metabolic blood tests have been made. The iron saturation index for transferrin (INT) was used to estimate the amount of iron available for erythropoiesis.

QOL was studied with SF-36 questionnaire (Short-Form-36), consisting of 8 scales (each from 0 to 100 points) followed by a general assessment of the physical component of health (PCH) and a general assessment of the psychological component of health (PsCH). PCH was assessed on 4 scales: physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), and PsCH on scales: vitality (VT), social functioning (SF), role-emotional (RE), mental health (MH). The higher scores on each scale corresponded to the best QOL.

The results of the study were evaluated by descriptive statistics. Depending on the normality of the distribution, the data are presented as the mean and standard deviation of M (SD), or the median and interquartile range. Correlation coefficient of Spearman or Pearson was used to determine the relationship between the variables: the Pearson correlation coefficient was used for the normal distribution variables, the Spearman coefficient – for the abnormal distribution variables. The statistical significance of the results was verified with parametric and nonparametric tests, depending on the normality of the distribution and the equality of the dispersions being compared.

Results and Discussion. Significant differences were revealed on the PF, VT, SF scales and on the physical component of health by evaluation of QOL in groups with various RRT methods (Figure).
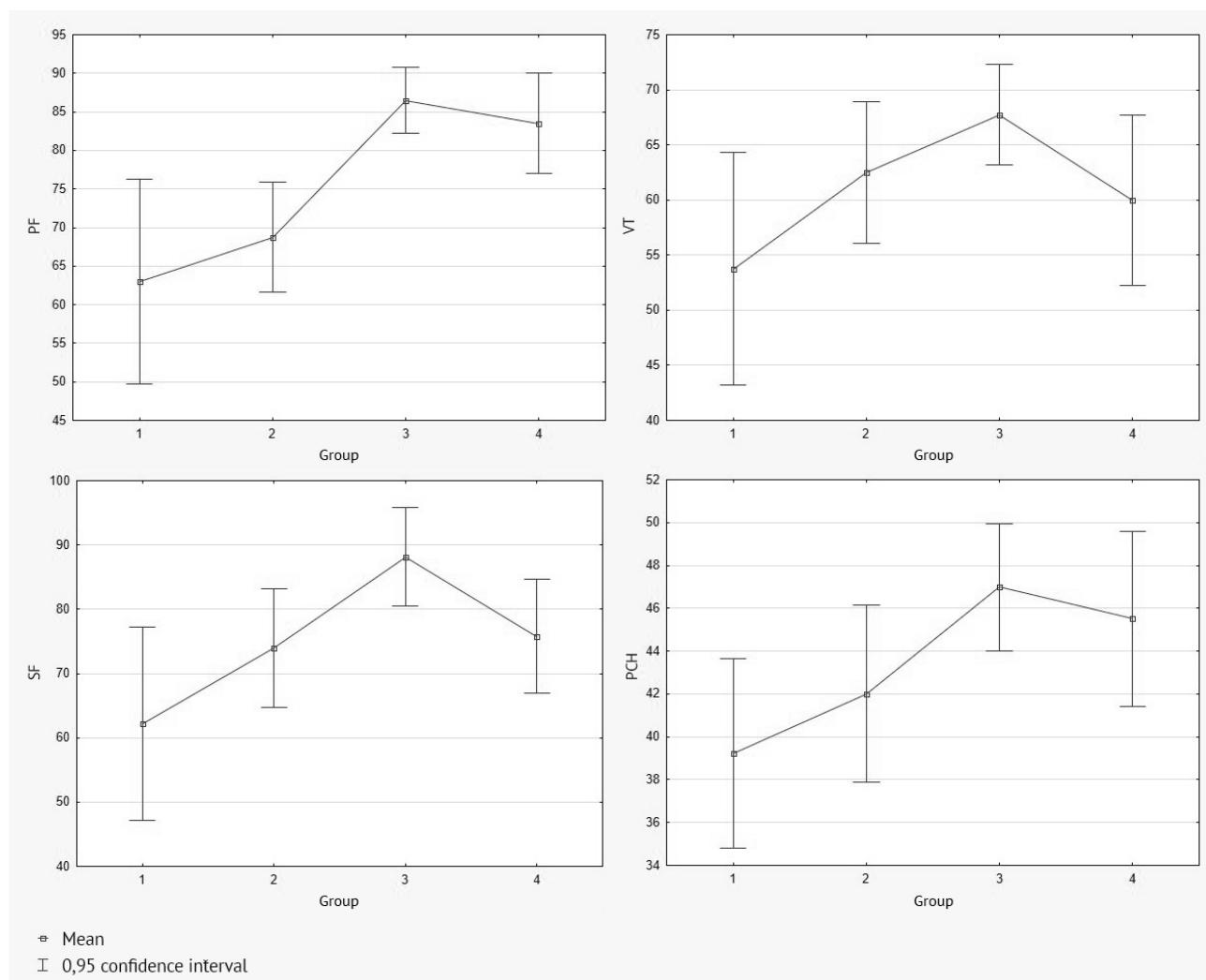
* Mean
I 0,95 confidence interval

Fig. The average value of QOL scores on the PF, VT, SF scales and in the assessment of the physical component of health (PCH)

Tendency to higher scores was revealed in the group of patients on CAPD, in comparison with scores in the group of patients on HD, but there were no significant differences between these groups. PF scores were significantly lower in the group of patients on CAPD than in the group with kidney transplant (70.00 (21.25) vs. 90.00 (7.50), p<0.05). The other scores were similar in these two groups. There were higher scores in the group of kidney recipients than in the group of patients on HD not only in terms of physical health parameters: PF and PCH (72.50 (51.25) and 90.00 (7.50), 39.23 (9.43) and 46.99 (6.37), p<0.05), but also in the psychological component of health: VT and SF (55.00 (30.00) and 70.00 (10.00), 75.00 (47.00) and 100.00 (21.88), p<0.05). In this case, the PsCH in the group of patients on HD was comparable to that in the kidney recipient group (46.57 (19.58) and 47.00 (14.08), p>0.05).

Significant differences from the control group were detected only in the group of patients on HD on a PF scale (72.50 (51.25) and 85.00 (20.00), p<0.05).

Thereby, the parameters of QOL (the physical component of health and some parameters of the psychological component of health) were higher in the group of kidney transplant recipients than in the group of patients on HD.

Laboratory signs of anemia were assessed in the groups. The results are presented in Table 1.

The level of hemoglobin in the group of kidney transplant recipients was significantly higher (p<0.05) than in patients on HD and CAPD, and there were no significant differences with the control group (p>0.05). The number of blood erythrocytes in the groups on HD was significantly lower (p<0.05) than in the group of kidney transplant recipients. In addition, significant differences were found between the control group and the group of patients on HD (p<0.05).

The hematocrit in the group of kidney transplant recipients was significantly higher than in the groups on HD and in the control group (p<0.05). The hematocrit was significantly higher in the group of kidney transplant recipients than in the groups of patients on HD and in the control group (p<0.05).

The mean volume of erythrocytes was within the optimal values in all groups, but significant differences (p<0.05) were revealed in the group of patients on HD and the control group. The average content of hemoglobin in the erythrocyte also was within the optimal values in all groups. The mean quantity of hemoglobin in the erythrocyte was within the optimal values in all groups. But, it was significantly higher (p<0.05) in the group of patients on HD than in the group of kidney transplant recipients, which is most likely due to the use of heparin during the HD procedure and the destruction of erythrocytes.

Table 1

Laboratory signs of anemia in groups of patients on RRT and in group of patients with CKD 3

Laboratory indicators	Group 1 (patients on HD) n=20	Group 2 (patients on CAPD) n=20	Group 3 (recipients of kidney transplantation) n=20	Group 4 (patients with CKD 3) n=20	p
Hemoglobin (g/l)					
M(SD)	108.90 (16.12)	114.43 (12.20)	130.25 (19.15)	120.50 (16,37)	$p_{1,3}<0.05$ $p_{2,3}<0.05$
Median	112.50	113.0	130.0	120.5	
Red Blood Cells (10^{12}/l)					
M(SD)	3.57 (0.61)	3.96 (0.52)	4.59 (0,69)	4.14 (0.62)	$p_{1,3}<0.05$ $p_{1,4}<0.05$ $p_{2,3}<0.05$
Median	3.49	3.83	4.62	4.13	
Hematocrit (%)					
M(SD)	31.04 (4.37)	33.68 (3,89)	39.22 (5,56)	34.28 (5.03)	$p_{1,3}<0.05$ $p_{2,3}<0.05$ $p_{3,4}<0.05$
Median	31.30	33.30	38.90	34.3	
Mean volume of red blood cells (mkm^3)					
M(SD)	87.60 (5.89)	85.15 (4.52)	85.66 (5.71)	78.77 (17.56)	$p_{1,4}<0.05$
Median	87.45	84.55	86.15	82.4	
Mean quantity of hemoglobin in red blood cell (pg)					
M(SD)	30.75 (2.87)	29.02 (1.72)	28.45 (2.21)	29.47 (1.84)	$p_{1,3}<0.05$
Median	30.50	28.80	28.45	29.30	
Coefficient of variation of red blood cell volume (%)					
M(SD)	16.52 (2.57)	14.93 (1.48)	14.99 (2.24)	15.24 (1.57)	$p_{1,2}<0.05$
Median	15.85	14.85	15.05	15.30	
Serum iron (mkmol/l)					
M(SD)	11.64 (4.65)	10.53 (3.52)	15.44 (5.80)	13.77 (6.48)	$p_{2,3}<0.05$
Median	11.90	10.20	16.65	13.05	
Transferrin saturation index (%)					
M(SD)	25.59 (12.35)	24.39 (8.34)	28.46 (11.72)	26.02 (14.22)	p>0.05
Median	29.47	23.00	28.50	22.68	

The coefficient of variation in the volume of erythrocytes was slightly higher than the optimal values, especially in the group of patients on HD, which indicates anisocytosis, and it was significantly higher (p<0.05) than in the group on CAPD.

Serum iron was within the target range in all groups. At the same time, serum iron was significantly higher in the kidney transplant group than in the group of patients on CAPD. There were no significant differences in other groups.

Transferrin saturation index was not significantly different in all groups (p>0.05), but there was a trend towards higher values of the proportion of iron available for erythropoiesis in the kidney transplant group compared to the group of patients on dialysis, especially group of patients on CAPD.

The relationship between QOL parameters and anemia was determined in patients on RRT. The results are shown in Table 2.

Table 2

The relationship between QOL parameters and anemia in groups of patients on RRT, r

SF-36	Hemoglobin	Red blood cells	Hematocrit	Serum Iron	Transferrin saturation index
PF	0.45***	0.40***	0.42**	0.32*	0.23
RP	0.22	0.20	0.22	0.30*	0.30*
BP	0.23	0.18	0.21	0.33**	0.26*
GH	0.19	0.06	0.17	0.38**	0.29*
PCH	0.36**	0.30*	0.36**	0.45**	0.35**
VT	0.22	0.15	0.24	0.39**	0.36*
SF	0.32*	0.36**	0.36**	0.27*	0.25
RE	0.07	0.04	0.09	0.20	0.19
MH	0.33*	0.23*	0.33*	0.26*	0.27*
PsCH	0.17	0.09	0.18	0.22	0.22

*– p<0.05; **– p<0.01; ***– p<0.001.

Reliable positive moderate correlations were found between the hemoglobin level and the QOL indices in the following scales: PF, SF, MH and PCH. Significant positive correlations were determined between the hematocrit level and QOL values on the PF, SF, MH scales and PCH. Significant moderate positive correlations were between serum iron level and parameters of QOL: PF, RP, BP, GH, PCH, VT, and weak correlation with SF, MH were also revealed. Reliable positive moderate correlation between the level of transferrin saturation index and QOL were determined: RP, PCH, VT, and weak correlations with BP, GH, MH.

Thus, QOL values in the group of kidney transplant recipients were comparable with values in the group patients with CKD 3 and it was better than in dialysis patients, not only in parameters of the physical component of health (PF and PCH), but also in parameters of the psychological component of health (VT and SF).

Hemoglobin, red blood cells, hematocrit and serum iron were higher in the group of kidney transplant recipients than in the group of patients on RRT, and comparable with the group of patients with CKD 3. This is, probably, due to decreasing uremia in most patients after kidney transplantation [2].

In the study, a reliable positive correlation was found between the indicators of anemia and the parameters of not only the physical component of health, but also some indicators of psychological health.

Reliable positive correlation relationships were obtained between parameters of QOL and hemoglobin (PF, PCH, SF, MH), hematocrit (PF, PCH, SF, MH), serum iron (PF, RP, BP, GH, PCH, VT, SF, MH), and the level of INT (BP, GH, PCH, VT, MH). Most likely, this is explained by the fact that the improvement of physical parameters leads to a greater activity of patients and less fatigue, which positively reflect on well-being and increase positive emotions.

Conclusions. Thus, a reliable correlation between anemia and QOL points was revealed in patients without a syndrome of protein-energy deficiency receiving RRT. Parameters of QOL and laboratory data of anemia were comparable and better in the group of patients with the kidney transplant and in the control group than in the groups patients on CAPD and on HD. Taking into account the correlation of the anemia indicators with QOL of patients receiving RRT, it can be concluded that timely detection of anemia, maintenance of the target hemoglobin and the serum iron level will improve QOL, which would reduce the risk of development and progression of cardiovascular pathology and mortality in patients with CKD.

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The authors declare no conflict of interest.

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About authors:

Urazlina Svetlana Evgenievna, MD, Associate professor of chair propedeutic of internal disease;
tel.: +73432669699; e-mail: urazlina70@mail.ru

Zhdanova Tatiana Vladimirovna, MD, DMSc, Professor, Chief of chair propedeutic of internal disease;
tel.: +73432669699; e-mail: nephrocentre@inbox.ru

Nazarov Andrey Vladimirovich, MD, DMSc, Professor of Medical Clinic; tel.: +79226080665; e-mail: renal@mail.ru

Zueva Tatiana Vladimirovna, CMSc, Associate professor of chair propedeutic of internal disease;
tel.: +73432669699; e-mail: zt_2008@mail.ru