Medical science of Uzbekistan
published: 17 November 2025
doi.org/10.56121/2181-3612-2025-6-71-78
Received: 11 September 2025
Accepted: 20 October 2025
Published: 17 November 2025

Article/Original paper

PREVALENCE AND MAIN PROBLEMS OF ANEMIA IN CHILDREN WITH CHRONIC KIDNEY DISEASE

G.Sh.Ochilova[1] B.Sh.To‘rayev[1] A.Mingbayev[1], B.R.Xabibulloyeva[2]

1. Chirchik Branch of Tashkent State Medical University, Chirchik, Uzbekistan.
2. Tashkent State Medical University, Tashkent, Uzbekistan.

Abstract.
Relevance. In recent years, chronic kidney disease (CKD) has become a serious global health problem. Mortality due to CKD continues to rise, and according to forecasts, by 2040 these diseases may rank fifth among all causes of death. In children, anemia frequently develops against the background of CKD and is associated with cardiovascular complications and a decrease in quality of life. Moreover, untimely diagnosis and ineffective treatment of anemia accelerate the progression of CKD. Therefore, prevention and optimization of effective treatment methods for CKD-associated anemia in children are of high importance. Objective. To analyze the prevalence of anemia in children with chronic kidney disease, determine the causes of its development, assess the effectiveness of existing therapeutic approaches, and develop preventive recommendations based on these findings. Materials and methods. The analysis was conducted using international databases — PubMed, Scopus, Mendeley, CyberLeninka — and national electronic sources. The search was performed using the keywords “chronic kidney disease in children, anaemia, treatment, prevention” and “children, chronic kidney disease, anemia, prevention.” More than 175 scientific sources were reviewed, and 38 of them were analyzed in depth. Results. The global prevalence of CKD has more than doubled between 1990 and 2021. It was found that the prevalence of CKD among children is nearly comparable to that in adults. The prevalence of anemia in chronic kidney disease depends on the stage of the disease. Among children with CKD stages III–V, anemia was observed in 80–90% of cases. One of the main causes of anemia is reduced erythropoietin production by the kidneys, which occurs even at early stages of CKD. Several challenges in the management of anemia in this group of patients remain unresolved. Conclusion. Anemia is highly prevalent among children with chronic kidney disease, and its severity correlates with the stage of renal insufficiency. To prevent anemia, it is important to regularly monitor hemoglobin and ferritin levels, identify sources of infection in a timely manner, and individually select iron supplements and erythropoiesis-stimulating agents. A comprehensive and personalized approach can reduce anemia-related complications in CKD and improve the quality of life in affected children.

Key words: chronic kidney disease in children, anemia, prevalence, treatment.

Kirish. Dunyoning deyarli barcha mamlakatlarida buyrakning surunkali kasalliklari (BSK) sog‘liq saqlash tizimi oldida turgan jiddiy muammolardan biri hisoblanadi. SBK o‘lim ko‘rsatkichi yildan yilga oshib bormoqda. Mavjud ma’lumotlarga ko‘ra 1990-yilda SBKdan o‘lim ko‘rsatkichi jami o‘lim sabablari orasida 17-o‘rinda turgan bo‘lsa, 2017-yilga kelib 12 o‘ringa ko‘tarilgan. Ekspertlarning hisob kitoblariga ko‘ra agar shu tendensiya davom etadigan bo‘lsa SBK o‘lim 2040-yilga borib 5-o‘ringa chiqishi mumkin [1, 2, 3, 4]. Bundan tashqari SBK bilan og‘rigan bemorlarni davolash murakkabligi va organtransplantatsiyasining qimmatligi sababli aksariyat bemorlar davolanish imkoniyatlari chegaralanishi mumkin. Ma’lumotlarga ko‘ra Xitoyda jami sog‘liqni saqlashga qilingan xarajatlarning 6,3% SBK davolash uchun sarflanganligi uni katta iqtisodiy va ijtimoiy ahamiyati yuqori ekanligini ko‘rsatib beradi [5].

SBK qator jiddiy asoratlarga sabab bo‘lishi mumkin, ular orasida buyrak faoliyati pasayishi natijasida eritropoetin (EPO) ishlab chiqarilishining kamayishi bilan bog‘liq kamqonlik (anemiya) aksariyat bemorlarda kuzatiladi. SBK bilan bog‘liq anemiya yurakka tushadigan yuklamani oshiradi va

bemorlarning hayot sifatini pasayishiga olib keladi. O‘tkazilgan meta-tahlil natijalari Sahroyi Kabirdan janubda joylashgan Afrika mamlakatlarida SBK bilan og‘rigan bemorlarning taxminan uchdan ikki qismi anemiyadan aziyat chekishini ko‘rsatadi. Anemiya ayniqsa kardiorenal sindrom (KRS) kuzatilganda yurak-qon tomir tizimi faoliyatining buzilishini kuchaytirishda muhim rol o‘ynaydi. Anemiya qonning kislorod tashish qobiliyatining pasayishi, yurak yuklamasining ortishi va yurak bo‘lmalarining patologik o‘zgarishlariga olib kelishi orqali yurak faoliyatiga salbiy ta’sir etib, teskari mexanizm orqali yanada buyrak yetishmovchiligini kuchaytiradi. Natijada, KRS uchun xos bo‘lgan yurak va buyrak faoliyatining progressiv ravishda yomonlashish jarayoni kuzatiladi. Boshqa tadqiqotchilar guruhi SBK larininng 4-darajasi bilan kasallangan bemorlarning 40%, 5-darajasi bilan kasallanganlarning esa 60% qismi anemiya bilan kasallanishganini qayd qilishgan. Surunkali buyrak kasalliklari va anemiya ning birga kelgan bemorlarni davolash xarajatlari faqat SBK bo‘lganlarga qaraganda sezilarli darajada yuqori bo‘lishi SBK bo‘lgan bemorlar orasida anemiyani davolash va profilaktika qilish usullarini takmillashtirish sog‘liqni saqlash resurslarini tejashda iqtisodiy imkoniyatlardan biri ekanligini ko‘rsatadi [6, 7, 8, 9].

Tadqiqotning maqsadi. So‘ngi yillarda dunyoda surunkali buyrak kasalliklari bo‘lgan bolalarda anemiyaning kechishi va uni davolash bo‘yicha ilmiy adabiyotlar tahlili asosida bunday bemorlarga ko‘rsatilayotgan samarali davolash usullari va ularning natijadorligini o‘rganish.

Tadqiqot materiallari va usullari. Xorijiy adabiyotlarni o‘rganish uchun https://www.scopus.com/, https://pubmed.ncbi.nlm.nih.gov/, https://www.mendeley.com/search/, https://cyberleninka.ru/, https://www.dissercat.com/ va boshqa elektron bazalardan “anemiya, xronicheskiye bolezni pochek u detey, lecheniya, rasprostranennost, profilaktika, anaemia, chronic kidney disease in children, treatment, prevalence, prevention” kalit so‘zlari orqali qidiruv amalga oshirildi. Mamlakatimizda olib borilgan tadqiqotlarni o‘rganish maqsadida Alisher Navoiy nomidagi O‘zbekiston Milliy kutubxonasi va Sog‘liqni saqlash vazirligi kutubxonalaridan kutubxonalaridan, shuningdek https://scholar.google.com/ va boshqa ochiq elektron manbalardan “bolalarda anemiya, bolalarda surunkali buyrak kasalliklari, davolash, profilaktika, tarqalganlik” kalit so‘zlari orqali qidiruv amalga oshirilib topilgan 175 dan ortiq maqolalarning mazmuni o‘rganildi va 38 ta maqola chuqur tahlil qilindi.

Olingan natijalar va ularning muhokamasi. Dunyoda surunkali buyrak kasalliklari bilan kasallangan bemorlar 1990-yilda 300 million kishini tashkil qilgan bo‘lsa, ushbu ko‘rsatkich 2021-yilga kelib deyarli 700 million kishiga yetgan. Bunga tashxislash usullarining takomillashgani bilan bir qatorda, aholining umr ko‘rish darajasi ham ta’sir qilishini inkor qilmagan holda aytish mumkinki so‘ngi yillarda buyrak kasalliklari bilan kasallanish va undan o‘lim darajasi sezilarli oshib bormoqda [4, 10].

Tadqiqot natijalarida SBK bilan kasallanish, undan o‘lim holatlari va hayot sifatining pasayishi rivojlangan davlatlarga qaraganda aholining daromadlari o‘rtacha va past bo‘lgan mamlakatlarda ko‘proq kuzatilishi aniqlangan. Bundan tashqari SBKdavlash uchun mo‘ljallangan dori vositalarini bilmaslik, kam daromadli mamlakatlarda aholi kerakli dorilarni xarid qila olmaslik natijasida aksari holatlarda turli xil mahalliy giyohlar va dorivor o‘simliklardan davolanish uchun foydalanishadi. Bu esa kasallikni surunkali va og‘ir shakllariga o‘tib ketishiga, asoratlarning rivojlanishiga olib keladi [11, 12, 13, 14, 15].

Bolalar orasida surunkali buyrak kasalliklarining tarqalganligi bo‘yicha keng qamrovli tadqiqotlar olib borilmagan. Biroq olib borilgan qator tadqiqotlar natijasida olimlar bolalar orasida ham SBK tarqalganlik darajasi kattalarnikidan qolishmaydi degan xulosaga kelishgan [20, 21, 22, 23].

SBK bo‘lgan kattalar va 15 yoshdan oshgan bolalarda gemoglobin konsentratsiyasi erkaklarda 130 g/l dan, ayollarda 120 g/l dan past bo‘lganda, 6 oydan 5 yoshgacha bo‘lgan bolalarda 110 g/l dan past bo‘lganda, 5–12 yoshli bolalarda 115 g/l dan past bo‘lganda va 12–15 yoshli bolalarda 120 g/l dan past bo‘lganda anemiya sifatida qaraladi. SBK bo‘lgan bolalarda anemiyaning tarqalganlik darajasini o‘rganishga qaratilgan tadqiqotlarda anemiyaning uchrash darajasi buyrak kasalligining og‘irlik darajasiga bog‘liqligi aniqlangan. SBK 1, 2, 3, 4, va 5 bosqichlarida anemiya uchrash darajasi mos ravishda 44%, 43%, 74%, 64% va 92% tashkil qilgan. SBK 3-5 darajalari bo‘lgan bolalarning deyarli 80-90% anemiya uchraydi [16, 17, 18, 19, 24].

Anemiya - yurak-qon tomir asoratlari va o‘lim xavfini oshiradigan omillardan biri bo‘lgan chap

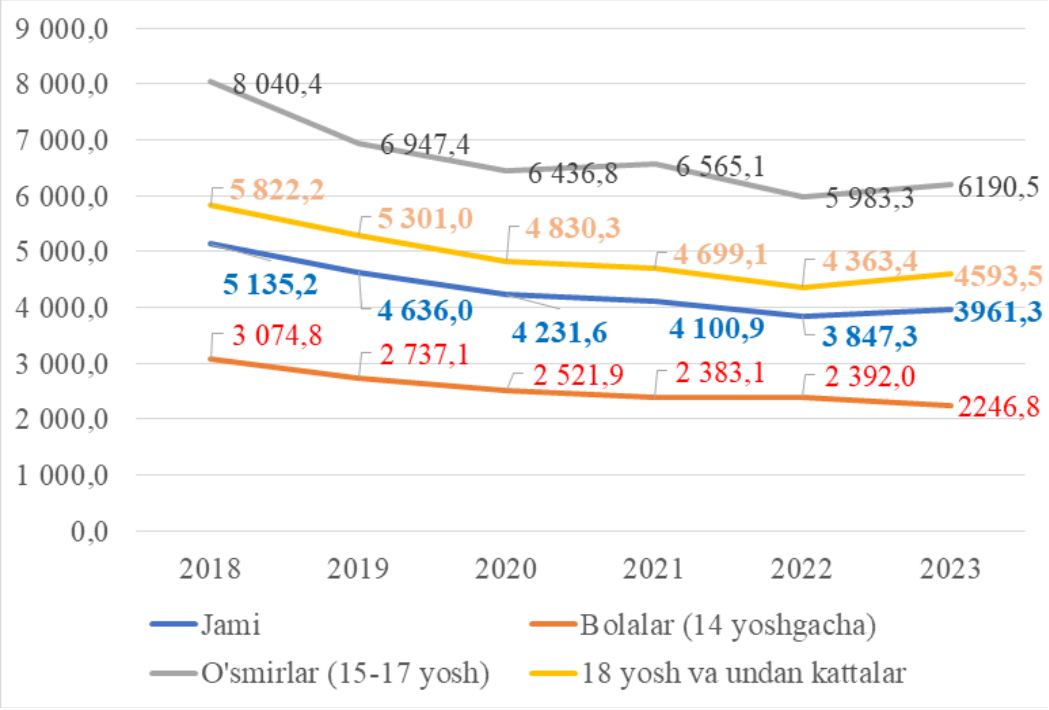
qorincha gipertrofiyasining rivojlanish sabablaridan biri hisoblanadi. SBK bo‘lgan bemorlarda anemiyaning rivojlanishida asosiy rol eritropoetin — ya’ni suyak bo‘g‘inidagi iloq hujayralarni eritroblastlarga aylanishini, globin va gemoglobin sintezi uchun zarur bo‘lgan boshqa oqsillar ishlab chiqarilishini rag‘batlantiradigan gormonning kam ishlab chiqarilishi kuzatiladi. Eritropoetin sintezining susayishi SBKning boshlang‘ich bosqichlaridayoq yuz beradi, bu esa bolalarda anemik sindromning erta shakllanish sabablaridan biri hisoblanadi [17, 18, 24]

SBK bo‘lgan bolalarda etiopatogenitik tashxislash murakkab hisoblanadi. Anemiyaga olib keluvchi aksariyat omillar bunday holatda aralash kelib, asosiy sabab eritropoetin yetishmovchiligi, temir tanqisligi, yallig‘lanish yoki oksidlovchi stresslarning qay biri asosiy ekanligini aniqlash qiyin kechadi. Bola organizmida metabolizm jarayonlarini jadal kechishi va ozuqa moddalarga bo‘lgan ehtiyojni yuqori bo‘lishi aniq sababni topishni yanada murakkablashtiradi. Bu esa o‘z navbatida samarali davolash usullarini tanlash imkoniyatlarini cheklaydi [18, 25, 26, 33].

Mamlakatimizda SBK bo‘lgan bolalarda anemiyaning kechishi va uni davolashga qaratilgan tadqiqotlar olib borilmoqda. Masharipov O.O. va hammualliflar tomonidan olib borilgan tadqiqotda 27 % holatlarda fokal-segmentar glomerulosklerоz aniqlangan, 25 % holatlarda — minimal o‘zgarishlar kasalligi va mezangioproliferativ glomerulonefrit, 6,9 % holatlarda — membranoproliferativ glomerulonefrit, 13,2 % holatlarda esa irsiy nefrit qayd etilgan. Biroq mualliflar kuzatuv birliklarini kam olishgan [32, 35, 36].

Bugungi kunda SBK bo‘lgan bolalarda anemiyani davolash uchun turli xil dori vositalaridan foydalanilmoqda. Bunday davolash usuli orqali SBK 2-4 bosqichlarida samaraga erishilganligi bo‘yicha ma’lumotlar mavjud. Boshqa tadqiqotlarda esa oral temir preparatlari 30% bolalarda natija bermaganligi qayd qilingan. Bolalarda temir preparatlarini qo‘llashda preparatning optimal miqdorini aniqlash ham qiyinchiliklar tug‘diradi. Chunki turli bolalarda ta’sir qiluvchi doza miqdori yosh va vazn o‘xshash bo‘lgan holatlarda ham bir biridan farq qiladi. Temir preparatlarini ortiqcha qo‘llash ion balansini buzilishiga olib kelishi mumkin [27, 28, 29, 30, 31, 34]

Eritropoezni rag‘batlantiruvchi dori vositalari rekombinant eritropoetin (epoetin alfa, darbepoetin alfa, methoxy polyethylene glycol-epoetin beta) SBKning II–III bosqichidan boshlab profilaktik qo‘llanilishi mumkin. Ular gemoglobin darajasini barqaror saqlab turadi va yurak-qon tomir asoratlar xavfini kamaytirishga yordam beradi.



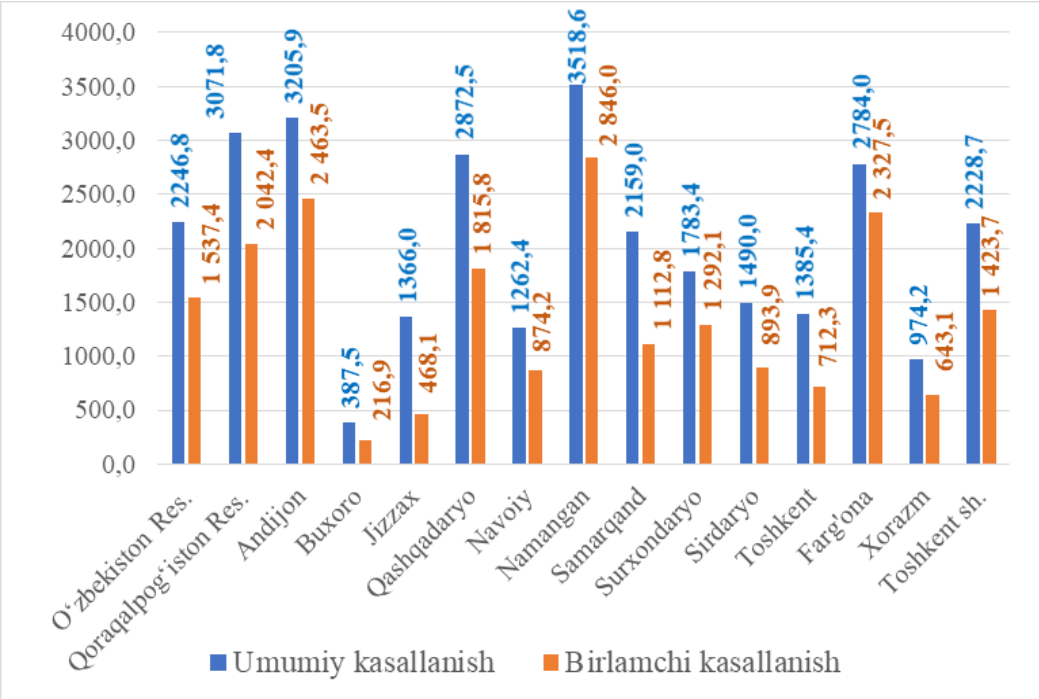
1-rasm. Siydik tanosil tizimi kasalliklari bilan kasallanish dinamikasi, O‘zbekiston Respublikasi, 2023-yil (har 100 ming aholiga nisbatan).

Temir moddasini nazorat qilish uchun siydik orqali temir yo‘qotilishi va kam so‘rilishi sababli,

peroral temir preparatlari (fumarate, sulfate, gluconate) yoki venoz temir (iron sucrose, ferric carboxymaltose) miqdorini nazorat qilish kerak bo‘ladi. SBK fonidagi sust yallig‘lanish anemiyani kuchaytiradi. Shuning uchun infeksiya manbalarini barvaqt aniqlash va davolash ushbu patologik holatlarga qarshi kurashishda katta ahamiyatga ega. Gemoglobin va ferritinni har 3–6 oyda tekshirib turish anemiyaning erta aniqlash va oldini olish choralarini ko‘rishga yordam beradi. [28, 29, 31, 38].

Mamlakatimizda siydik tanosil tizimi kasalliklarini tarqalqanlgini o‘rganish uchun rasmiy statistik ma’lumotlarning tahlili olib borildi. Ma’lumotlarga ko‘ra 14 yoshgacha bo‘lgan bolalar orasida siydik va tanosil a’zolari bilan kasallanish ko‘rsatkichi 2023-yilda har 100 ming kishiga nisbatan 2246,8 ta holatni tashkil qilgan. Shu bilan birga 14 yoshgacha bolalar orasida ushbu sinf kasalliklari katta yoshlilarga qaraganda deyarli 2-marta kamligi qayd qilingan (mos ravishda har 100 ming kishiga 2246,8 va 4593,5). Kasallanish dinamikasi o‘rganilganda so‘ngi yillarda ijobiy tendensiya kuzatilayotganligi qayd qilindi (1-rasm).

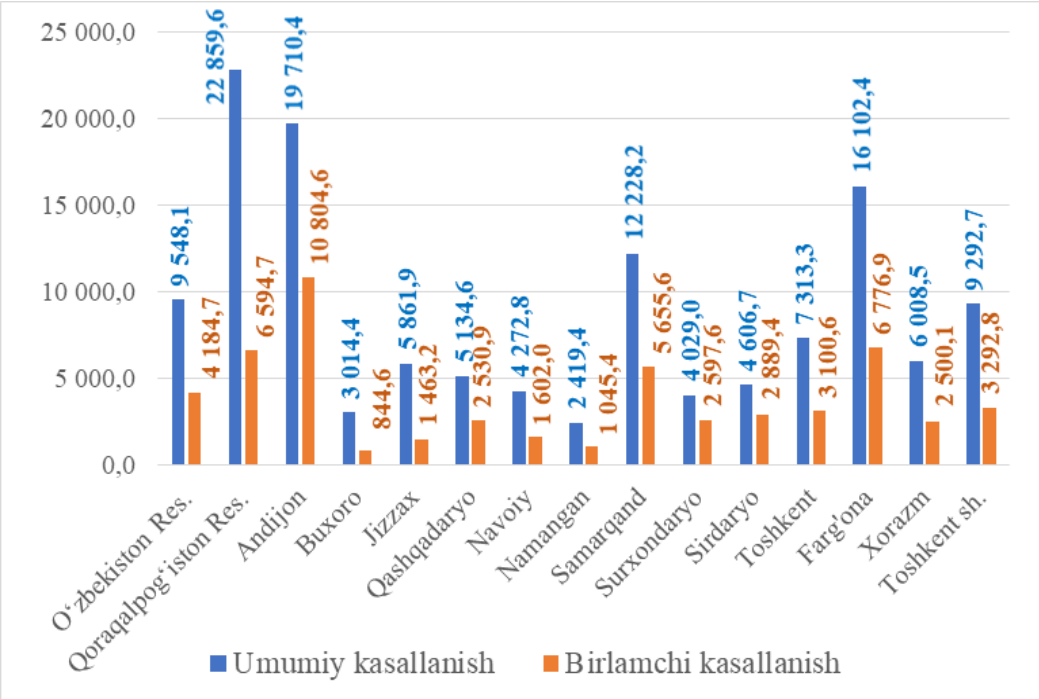
Hududlar kesimida tahlil qilinganda 14 yoshgacha bolalar orasida siydik tanosil tizimi kasalliklari bilan kasallanish ko‘rsatkichi Qoraqalpog‘iston Respublikasi, Qashqadaryo, Farg‘ona, Andijon va Namangan viloyatlarida respublika o‘rtacha ko‘rsatkichidan yuqori ekanligi qayd qilindi. Respublika bo‘yicha eng past ko‘rsatkich Jizzax, Buxoro va Navoiy viloyatlarida kuzatildi (p<0,001) (2-rasm).



2-rasm. Siydik tanosil tizimi kasalliklari bilan 14 yoshgacha bolalar kasallanishi, 2023-yil (har 100 ming kishiga nisbatan).

Qon va qon yaratish a’zolari bilan kasallanish dinamikasi o‘rganilganda 14 yoshgacha bo‘lgan bolalar orasida umumiy kasallanish ko‘rsatkichi Respublikamizda 2018-yilda har 100 ming bolaga nisbatan 16449,4 ni tashkil qilgan bo‘lsa, 2023-yilga kelib 42% ga kamayib, 9548,1 gacha pasaygan. Qon va qon yaratish a’zolari kasalliklarining 99% ga yaqin qismini anemiya tashkil qildi. Qon va qon yaratish a’zolari kasalliklarida birlamchi kasallanish ko‘rsatkichi umumiy kasallanish ko‘rsatkichining 30-50% qismini tashkil qiladi. Hududlar kesimida tahlil qilinganda Qon va qon yaratish a’zolari kasalliklari bilan kasallanish Qoraqalpog‘iston Respublikasi, Andijon va Farg‘ona viloyatlarida Respublika o‘rtacha ko‘rsatkichidan yuqori ekanligi kuzatildi. Qon va qon yaratish a’zolari kasalliklari yuqori bo‘lgan hududlarda siydik tanosil tizimi kasalliklari ham boshqa hududlarga qaraganda yuqori ekanligi aniqlandi (r=0,54).

Adabiyotlarni o‘rganish va statistik ma’lumotlar tahlili mamlakatimizda buyrak kasalliklari bilan birga kechuvchi anemiya holatlarini o‘rganish, ushbu kasalliklarni oldini olish va davolashga qaratilgan ishla olib borish zarurligini ko‘rsatadi.



3-rasm. Qon va qon yaratish a’zolari kasalliklari bilan 14 yoshgacha bolalar kasallanishi, 2023-yil (har 100 ming kishiga nisbatan).

Xulosa

Tadqiqot natijalari shuni ko‘rsatadiki, dunyo bo‘yicha surunkali buyrak kasalliklari (SBK) bilan kasallanish va undan o‘lim holatlari so‘nggi o‘n yilliklarda keskin oshgan bo‘lib, bu ayniqsa o‘rta va past daromadli mamlakatlarda yaqqol kuzatilmoqda. Bolalar orasida ham SBK tarqalganlik darajasi kattalarnikidan kam emas, ammo bu yo‘nalishdagi yetarlicha tadqiqotlar olib borilmagan. SBK bo‘lgan bolalarda anemiya keng tarqalgan va uning og‘irlik darajasi buyrak yetishmovchiligi bosqichiga to‘g‘ridan-to‘g‘ri bog‘liq. Davolashdagi asosiy muammolar temir preparatlarining samarasizligi, dozani aniqlashdagi qiyinchiliklar va dori vositalariga nisbatan individual farqlar bilan bog‘liq. Umuman olganda, bolalarda SBK bilan bog‘liq anemiyaning oldini olish va davolash kompleks, individual va muntazam nazoratga asoslangan yondashuvni talab qiladi.

List of references

[1] Bikbov B, Purcell CA, Levey AS, Smith M, Abdoli A, Abebe M, et al. Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet [Internet]. 2020 Feb 1;395(10225):709–33. Available from: https://doi.org/10.1016/s0140-6736(20)30045-3

[2] McGrath JJ. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet [Internet]. 2018 Nov 1;392(10159):1859–922. Available from: https://doi.org/10.1016/s0140-6736(18)32335-3

[3] Foreman KJ, Marquez N, Dolgert A, Fukutaki K, Fullman N, McGaughey M, et al. Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: reference and alternative scenarios for 2016–40 for 195 countries and territories. The Lancet [Internet]. 2018 Oct 16;392(10159):2052–90. Available from: https://doi.org/10.1016/s0140-6736(18)31694-5

[4] Qi Q, Hu Y, Shen Q, Tang K, Yu J, Xu Y, et al. Global, regional, and national burden of chronic kidney disease and its associated anemia, 1990 to 2021 and predictions to 2050: an analysis of the global burden of disease study 2021. BMC Nephrology [Internet]. 2025 Aug 27;26(1). Available from: https://doi.org/10.1186/s12882-025-04398-4

[5] Wang F, Yang C, Long J, Zhao X, Tang W, Zhang D, et al. Executive summary for the 2015

Annual Data Report of the China Kidney Disease Network (CK-NET). Kidney International [Internet]. 2019 Feb 20;95(3):501–5. Available from: https://doi.org/10.1016/j.kint.2018.11.011

[6] Taderegew MM, Wondie A, Terefe TF, Tarekegn TT, GebreEyesus FA, Mengist ST, et al. Anemia and its predictors among chronic kidney disease patients in Sub-Saharan African countries: A systematic review and meta-analysis. PLoS ONE [Internet]. 2023 Feb 2;18(2):e0280817. Available from: https://doi.org/10.1371/journal.pone.0280817

[7] McCullough PA. Anemia of cardiorenal syndrome. Kidney International Supplements [Internet]. 2021 Mar 19;11(1):35–45. Available from: https://doi.org/10.1016/j.kisu.2020.12.001

[8] Sofue T, Nakagawa N, Kanda E, Nagasu H, Matsushita K, Nangaku M, et al. Prevalence of anemia in patients with chronic kidney disease in Japan: A nationwide, cross-sectional cohort study using data from the Japan Chronic Kidney Disease Database (J-CKD-DB). PLoS ONE [Internet]. 2020 Jul 20;15(7):e0236132. Available from: https://doi.org/10.1371/journal.pone.0236132

[9] Jha V, Al-Ghamdi SMG, Li G, Wu MS, Stafylas P, Retat L, et al. Global Economic Burden Associated with Chronic Kidney Disease: A Pragmatic Review of Medical Costs for the Inside CKD Research Programme. Advances in Therapy [Internet]. 2023 Jul 26;40(10):4405–20. Available from: https://doi.org/10.1007/s12325-023-02608-9

[10] James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet [Internet]. 2018 Nov 1;392(10159):1789–858. Available from: https://doi.org/10.1016/s0140-6736(18)32279-7

[11] Beaney T, Schutte AE, Stergiou GS, Borghi C, Burger D, Charchar F, et al. May measurement month 2019. Hypertension [Internet]. 2020 May 18;76(2):333–41. Available from: https://doi.org/10.1161/hypertensionaha.120.14874

[12] Tannor EK, Sarfo FS, Mobula LM, Sarfo-Kantanka O, Adu-Gyamfi R, Plange-Rhule J. Prevalence and predictors of chronic kidney disease among Ghanaian patients with hypertension and diabetes mellitus: A multicenter cross-sectional study. Journal of Clinical Hypertension [Internet]. 2019 Aug 29;21(10):1542–50. Available from: https://doi.org/10.1111/jch.13672

[13] Rao J, Peng T, Li N, Wang Y, Yan C, Wang K, et al. Nephrotoxicity induced by natural compounds from herbal medicines – a challenge for clinical application. Critical Reviews in Toxicology [Internet]. 2022 Oct 21;52(9):757–78. Available from: https://doi.org/10.1080/10408444.2023.2168178

[14] Yang B, Xie Y, Guo M, Rosner MH, Yang H, Ronco C. Nephrotoxicity and Chinese herbal medicine. Clinical Journal of the American Society of Nephrology [Internet]. 2018 Apr 3;13(10):1605–11. Available from: https://doi.org/10.2215/cjn.11571017

[15] Bello AK, Okpechi IG, Levin A, Ye F, Damster S, Arruebo S, et al. An update on the global disparities in kidney disease burden and care across world countries and regions. The Lancet Global Health [Internet]. 2024 Feb 15;12(3):e382–95. Available from: https://doi.org/10.1016/s2214-109x(23)00570-3

[16] Thapa BK, Bhatia P, Meena J, Dawman L, Tiewsoh K. Prevalence and risk factors for functional iron deficiency in children with chronic kidney disease. Clin Exp Nephrol. 2023 Jan;27(1):66-71. doi: 10.1007/s10157-022-02281-2. Epub 2022 Oct 3. PMID: 36192566.

[17] Amanullah F, Malik AA, Zaidi Z. Chronic kidney disease causes and outcomes in children: Perspective from a LMIC setting. PLoS ONE [Internet]. 2022 Jun 8;17(6):e0269632. Available from: https://doi.org/10.1371/journal.pone.0269632

[18] Riyami MSA. Anemia in Children with Chronic Kidney Disease. Asian Journal of Pediatric Nephrology [Internet]. 2024 Jul 1;7(2):34–9. Available from: https://doi.org/10.4103/ajpn.ajpn_18_24

[19] Bhagat N, Dawman L, Naganur S, Tiewsoh K, Kumar B, Pratyusha K, et al. Impact of anemia on the cardiovascular status in children with chronic kidney disease: A pilot study. Clinical Nutrition ESPEN [Internet]. 2021 Dec 1;47:283–7. Available from: https://doi.org/10.1016/j.clnesp.2021.11.031

[20] Romagnani P, Remuzzi G, Glassock R, Levin A, Jager KJ, Tonelli M, et al. Chronic kidney disease. Nature Reviews Disease Primers [Internet]. 2017 Nov 22;3(1). Available from: https://doi.

org/10.1038/nrdp.2017.88

[21] Jager KJ, Kovesdy C, Langham R, Rosenberg M, Jha V, Zoccali C. A single number for advocacy and communication—worldwide more than 850 million individuals have kidney diseases. Kidney International [Internet]. 2019 Sep 30;96(5):1048–50. Available from: https://doi.org/10.1016/j.kint.2019.07.012

[22] Becherucci F, Roperto RM, Materassi M, Romagnani P. Chronic kidney disease in children. Clinical Kidney Journal [Internet]. 2016 Jun 5;9(4):583–91. Available from: https://doi.org/10.1093/ckj/sfw047

[23] Harambat J, Madden I. What is the true burden of chronic kidney disease in children worldwide? Pediatric Nephrology [Internet]. 2022 Nov 21;38(5):1389–93. Available from: https://doi.org/10.1007/s00467-022-05816-7

[24] Harada R, Hamasaki Y, Okuda Y, Hamada R, Ishikura K. Epidemiology of pediatric chronic kidney disease/kidney failure: learning from registries and cohort studies. Pediatric Nephrology [Internet]. 2021 Jun 6;37(6):1215–29. Available from: https://doi.org/10.1007/s00467-021-05145-1

[25] Badura K, Janc J, Wąsik J, Gnitecki S, Skwira S, Młynarska E, et al. Anemia of Chronic Kidney Disease—A Narrative Review of its Pathophysiology, Diagnosis, and Management. Biomedicines [Internet]. 2024 May 27;12(6):1191. Available from: https://doi.org/10.3390/biomedicines12061191

[26] Jamil A, Gruner B, Jamil J, Bach A, Severance T, Ebersol K, et al. Anemia management in Pediatric Chronic kidney Disease: Current challenges and treatment strategies. Indian Journal of Hematology and Blood Transfusion [Internet]. 2025 Jan 8;41(2):228–37. Available from: https://doi.org/10.1007/s12288-024-01955-z

[27] Meza K, Biswas S, Talmor C, Baqai K, Samsonov D, Solomon S, et al. Response to oral iron therapy in children with anemia of chronic kidney disease. Pediatric Nephrology [Internet]. 2023 Jul 17;39(1):233–42. Available from: https://doi.org/10.1007/s00467-023-06048-z

[28] Sugahara M, Tanaka T, Nangaku M. Future perspectives of anemia management in chronic kidney disease using hypoxia-inducible factor-prolyl hydroxylase inhibitors. Pharmacology & Therapeutics [Internet]. 2022 Aug 27;239:108272. Available from: https://doi.org/10.1016/j.pharmthera.2022.108272

[29] Atkinson MA, Furth SL. Anemia in children with chronic kidney disease. Nature Reviews Nephrology [Internet]. 2011 Sep 6;7(11):635–41. Available from: https://doi.org/10.1038/nrneph.2011.115

[30] Yang Y, Chen Y, Yang Y, Bai H, He B, Liu D. Compassionate use of roxadustat for treatment of refractory renal anemia in an infant. Pediatric Nephrology [Internet]. 2023 Dec 13;39(3):911–4. Available from: https://doi.org/10.1007/s00467-023-06240-1

[31] Meza K, Biswas S, Talmor C, Baqai K, Samsonov D, Solomon S, et al. Response to oral iron therapy in children with anemia of chronic kidney disease. Pediatric Nephrology [Internet]. 2023 Jul 17;39(1):233–42. Available from: https://doi.org/10.1007/s00467-023-06048-z

[32] Машарипов О.О.и др. Опасность патологии почек у детей и подростков // Наука, техника и образование. 2021. №1 (76). URL: https://cyberleninka.ru/article/n/opasnost-patologii-pochek-u-detey-i-podrostkov (дата обращения: 16.10.2025).

[33] Сомонова О.В. Елизарова А. Л. Современные возможности лечения анемии при хронической болезни почек: оценка эффективности и безопасности // Лечебное дело. 2024. №1. URL: https://cyberleninka.ru/article/n/sovremennye-vozmozhnosti-lecheniya-anemii-pri-hronicheskoy-bolezni-pochek-otsenka-effektivnosti-i-bezopasnosti.

[34] Асланова Д. и др. Влияние анемии на биохимические показатели при хронической болезни почек у детей //Журнал проблемы биологии и медицины. – 2016. – №. 2 (87). – С. 29-31.

[35] Каримджанов И.А., Исраилова Н.А. Хроническая болезнь почек у детей (обзор литературы). Здоров'я дитини. Том 12, № 7, 2017. 832–40. Available from: https://doi.org/10.22141/2224-0551.12.7.2017.116190

[36] Раимберганова Г. Ш., Мадаминова А.К. Распространенность болезни почек и мочевыводящих путей у детей и подростков в аральском регионе // Проблемы Науки. 2025. №4 (203).

URL: https://cyberleninka.ru/article/n/rasprostranennost-bolezni-pochek-i-mochevyvodyaschih-putey-u-detey-i-podrostkov-v-aralskom-regione.

[37] Даминов Б.Т. Фазилбекова З.Н. Взаимосвязь временных показателей вариабельности ритма сердца с показателями почечной паренхимы у больных с хронической болезнью почек. Eurasian journal of medical and natural sciences. Volume 5 Issue 4, April 2025. Ст 122-127.

[38] Clinical Practice Guideline for Anemia in CKD. Kidney Int Suppl. 2021;11(1):1–46. DOI: 10.1016/j.kisu.2020.12.001