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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и http://www.nlm.nih.gov/bsd/uniform_requirements.html В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректур авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned
Requirements are not Assigned to be Reviewed.**

ავტორთა საქურაღებოლ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დაიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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PREDICTION OF IRON DEFICIENCY IN CHILDREN USING EASY LABORATORY TOOLS

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Abstract.

Iron deficiency anaemia is a common condition in children that can impair growth and development. This study aimed to evaluate the utility of easy, routinely available laboratory tests in predicting iron deficiency anaemia. Medical records of 55 children (mean age 4.9 ± 3.2 years) with laboratory evaluation of anaemia were analysed retrospectively. Parameters included complete blood count, serum iron, total iron binding capacity (TIBC), serum ferritin and transferrin saturation. Based on reference ranges, haemoglobin, hematocrit, serum ferritin and transferrin saturation were reduced below normal, indicating clear iron deficiency. Although within normal limits, red blood cell count, mean corpuscular volume, mean corpuscular haemoglobin and serum iron were close to lower limits, suggesting subtle deficiency. In contrast, red cell distribution width, platelet count, white blood cell count, TIBC and unsaturated iron binding capacity were unaffected. In conclusion, haemoglobin, and hematocrit from complete blood count, along with subtle changes in some of the red cell indices, can strongly suggest, iron deficiency anaemia in children. Taking into consideration the increased body demand of iron in this age group with follow-up to ensure a desirable response, with less need for more advanced iron studies. These widely available, inexpensive tests may facilitate early detection and treatment of this common pediatric condition.

Key words. Anemia, iron deficiency, hemoglobin, hematocrit, red blood cell indices, paediatrics.

Introduction.

Iron deficiency anaemia is the most prevalent nutritional deficiency worldwide, especially among infants and children [1-4]. It is defined as a decrease in the total body iron content leading to reduced haemoglobin synthesis and smaller red blood cells [5-8]. The condition is attributed to inadequate dietary iron intake, poor iron absorption or utilization, or increased iron requirements during growth periods [9-11]. Infants aged 6 to 24 months are particularly susceptible due to rapid growth combined with limited dietary sources of iron after weaning from breast milk [12-14].

The global prevalence of iron deficiency anaemia in children under 5 years old is estimated at 47.4%, with the highest rates in Africa and Asia [1,15,16]. Even in developed regions like North America and Europe, prevalence remains around 9-20% in toddlers and pre-schoolers [17,18]. Iron deficiency anaemia can impair growth, immune function, and cognitive development during critical periods of early childhood [19,20]. Therefore, early detection and prompt treatment are essential to ensure optimal health and prevent long-term consequences.

Diagnosis of iron deficiency anemia requires laboratory confirmation, in conjunction with medical history and physical

examination [12]. The gold standard tests are serum ferritin, which reflects total iron stores, and transferrin saturation, which indicates iron availability for erythropoiesis [5]. However, these advanced iron studies may not be routinely available in all healthcare settings, particularly in developing regions with a high prevalence of nutritional anaemia. Complete blood count (CBC) with red cell indices can provide valuable initial data, with low haemoglobin and hematocrit indicating anaemia. Subtle changes in red cell size and haemoglobin content may also suggest depleted iron stores [17,18]. Therefore, this study aimed to evaluate the potential of using easily available, inexpensive laboratory tests to suggest iron deficiency anaemia in children, and if a confirmation test like serum ferritin is not available, this may be replaced by response follow-up.

Materials and Methods.

Study Design and Laboratory Parameters: This retrospective study analyzed medical records of children diagnosed with anaemia at private clinics over 7 years (2014-2021). Of 1000 records screened, 55 met inclusion criteria of age under 12 years and availability of comprehensive laboratory iron studies. The mean age was 4.9 ± 3.2 years. The following parameters were recorded from laboratory reports: haemoglobin (Hb), hematocrit, red blood cell count (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), red cell distribution width (RDW), platelet count, white blood cell count (WBC), serum iron, unsaturated iron binding capacity (UIBC), total iron binding capacity (TIBC), transferrin saturation, and serum ferritin. Reference ranges were based on standard values for children ages 1-6 years (Table 1). Data were analysed as mean \pm standard deviation and compared to reference ranges to determine potential markers predictive of iron deficiency, these data were compared to reference range [21].

Data Analysis: Participant demographic and clinical characteristics were summarized using descriptive statistics. Laboratory parameters were recorded as mean \pm standard deviation and compared against reference ranges to determine potential markers predictive of iron deficiency anaemia. Data were analyzed using SPSS Statistics software (version 27).

Results.

The study population showed clear iron deficiency anaemia based on reduced haemoglobin, hematocrit, serum ferritin and transferrin saturation compared to reference values (Table 1). Although RBC, MCV, MCH and serum iron remained within normal limits, levels were close to the lower thresholds, indicating a subtle decline suggestive of depleted iron stores. In contrast, RDW, platelet count, WBC, UIBC and TIBC were within normal ranges and unaffected by iron deficiency in this cohort.

Table 1. Hematological parameters of children with iron deficiency anaemia.

Measured parameters	Children (mean ± SD) (n=55)	Reference range (1-6 years) [21]
Age (years)	4.9±3.2	
Hb (g/dL)	10.7±1.9	11.5-14.5
Hematocrit (%)	32.7±4.8	35-44
RBC (x10 ¹² /L)	4.4±0.78	3.9-5.3
MCV (fL)	75.4±9.3	74-90
MCH (pg)	24.8±4.5	24-30
MCHC (g/dL)	32.68±2.6	32-36
RDW (%)	14.8±2.7	12-16
Platelets (x10 ³ /μL)	317.8±148.1	150-450
WBC (x10 ⁹ /L)	8.6±3.1	6-17
Serum iron (μg/dL)	22.9±32.8	50-120
UIBC (μg/dL)	327.8±100.8	150-375
TIBC (μg/dL)	372.8±88	250-425
Transferrin saturation (%)	13.8±13	20-50
Serum ferritin (ng/mL)	3.77±0.90	12-60

Discussion.

This study demonstrates the potential value of complete blood count including red cell indices in predicting iron deficiency anemia in children, in suggesting IDA to be confirmed by clinical and lab response without the need for more complex iron studies. Haemoglobin, hematocrit, RBC, MCV, MCH and serum iron showed varying degrees of decline compared to reference ranges, suggesting subtle to severe iron deficiency.

Haemoglobin and hematocrit were substantially decreased, reflecting the well-established utility of these simple CBC parameters for detecting anaemia [1,12]. The significant reduction below normal levels indicate clear iron deficiency anaemia based on depleted haemoglobin synthesis. Previous studies have consistently identified low haemoglobin and hematocrit as sensitive markers of iron deficiency in infants and children [17,18]. These findings reinforce the value of CBC as a universally available, inexpensive first-line test that can raise suspicion for nutritional anaemia.

Additionally, lower RBC and red cell size indices including MCV and MCH provide evidence of depleted iron stores. Although still within population reference ranges, the subtle decline towards lower limits is suggestive of reduced haemoglobin content and smaller cell volume characteristic of iron deficiency [5]. Research has demonstrated that falling RBC, MCV and MCH precede development of overt anaemia, and may indicate iron deficiency in the absence of frank anaemia [18,22,23]. Therefore, careful attention to these red cell parameters on CBC can provide early warning of impending iron deficiency anaemia.

Serum iron levels were also noted to be low-normal in the study population. Although not specific to iron deficiency, declining serum iron reinforces the pattern of reduced iron availability for erythropoiesis [9,24]. Monitoring trends in serum iron along with red cell indices may enhance the detection of early or mild iron deficiency. Overall, the constellation of low-normal haemoglobin production markers, before the development of overt CBC abnormality, highlights the subtle changes that precede established nutritional anaemia.

In contrast, RDW, platelets, WBC and markers of iron binding capacity were unchanged, suggesting they are unaffected by iron depletion in children and do not provide discriminative information to aid diagnosis. Specifically, RDW is a less sensitive indicator in childhood iron deficiency anaemia compared to thalassemia syndromes or other causes of more severe red cell distortion [25,26]. Research also shows no clear effect of iron deficiency on platelet count, white cell production or markers of iron binding like UIBC and TIBC [27,28]. Therefore, these indices may not contribute significantly to suggesting iron deficiency anaemia in children.

Overall, the pattern of results demonstrates the promise of using widely available, low-cost laboratory haematology tests to detect iron deficiency anaemia in children without the need for more complex iron markers. The combination of overt CBC changes like low haemoglobin and hematocrit, along with a subtle decline in the precursor for red cell formation expressed by low reticulocyte response for the degree of anaemia, can identify evolving iron-restricted erythropoiesis with reasonably high sensitivity using only basic, inexpensive, and accessible technology. These findings are supported by previous studies demonstrating high sensitivity of similar CBC markers for suggesting tissue iron deficiency, comparable or superior to more expensive and intricate iron tests [18,19,29-31].

Implementing these simple, inexpensive laboratory tools may be especially valuable for enhancing early detection of iron deficiency anaemia in regions with high childhood prevalence but inadequate access to advanced diagnostic facilities. Haematology analysis with CBC provides a universally available technology across urban and rural settings in low-resource countries, enabling screening based on haemoglobin, hematocrit, and red cell indices with reasonably high accuracy. Early identification can facilitate timely treatment through dietary modification or iron supplementation to replenish stores, restoring iron availability for erythropoiesis and preventing progression to advanced or severe anaemia with growth and developmental consequences [31-36]. From a broader public health perspective, enhancing screening and treatment access using basic laboratory tools may help reduce the burden of nutritional childhood anaemia in high-prevalence regions and in children with chronic diseases [37].

However, certain limitations to this analysis warrant consideration. The retrospective, cross-sectional design provides only a single snapshot in time, without the ability to characterize longitudinal trends that may help differentiate mild iron depletion from overt iron deficiency anaemia. The lack of serial monitoring of individual children from early iron repletion through evolving deficiency to established anaemia also limits the characterization of the full natural history. Additionally, the modest sample size and lack of healthy iron-replete controls for comparison may affect the generalizability of red cell reference ranges. Further large-scale studies should evaluate temporal changes in candidate CBC markers relative to gold standard iron tests through the full spectrum from iron sufficiency to deficiency to overt anaemia. Larger samples with healthy controls will also help accurately determine the age-adjusted sensitivity and specificity of these potential screening tests.

In summary, this study supports the potential value of inexpensive, widely available blood count tests to confirm iron deficiency anaemia in children without the need for complex iron studies. Low haemoglobin, hematocrit, and subtle red cell changes on routinely performed CBC can identify evolving iron-restricted erythropoiesis with reasonable accuracy. Incorporating these simple, low-cost laboratory tools into pediatric screening protocols, particularly in high-prevalence regions, can promote early detection and intervention to mitigate lifelong consequences of nutritional childhood anaemia.

Conclusion.

This study demonstrates inexpensive, globally accessible blood count tests can strongly suggest iron deficiency anaemia in children, with less need for more expensive iron markers in under-resourced communities. Low haemoglobin, hematocrit, and declining red cell indices on routinely performed CBC along with age and clinical features were reasonably sensitive suggesters of evolving iron deficiency. These findings support wider implementation of basic laboratory tools to enable early detection and treatment of this prevalent pediatric condition, especially important in regions with high childhood anaemia prevalence but inadequate access to complex diagnostics.

REFERENCES

1. Chaparro CM, Suchdev PS. Anaemia epidemiology, pathophysiology, and aetiology in low-and middle-income countries. *Annals of the New York Academy of Sciences*. 2019;1450:15-31.
2. Lutter CK. Iron deficiency in young children in low-income countries and new approaches for its prevention. *The Journal of Nutrition*. 2008;138:2523-8.
3. McLean E, Cogswell M, Egli I, et al. Worldwide prevalence of anaemia, WHO vitamin and mineral nutrition information system, 1993–2005. *Public Health Nutrition*. 2009;12:444-54.
4. Petry N, Olofin I, Boy E, et al. The effect of low dose iron and zinc intake on child micronutrient status and development during the first 1000 days of life: a systematic review and meta-analysis. *Nutrients*. 2016;8:773.
5. Thomas DW, Hinchliffe RF, Briggs C, et al. Guideline for the laboratory diagnosis of functional iron deficiency. *British Journal of Haematology*. 2013;161:639-48.
6. Camaschella C. Iron-deficiency anemia. *New England Journal of Medicine*. 2015;372:1832-43.
7. Johnson-Wimbley TD, Graham DY. Diagnosis and management of iron deficiency anemia in the 21st century. *Therapeutic Advances in Gastroenterology*. 2011;4:177-84.
8. Lopez A, Cacoub P, Macdougall IC, et al. Iron deficiency anaemia. *The Lancet*. 2016;387:907-16.
9. Zimmermann MB, Hurrell RF. Nutritional iron deficiency. *The Lancet*. 2007;370:511-20.
10. Pavord S, Myers B, Robinson S, et al. UK guidelines on the management of iron deficiency in pregnancy. *British Journal of Haematology*. 2012;156:588-600.
11. Breyman C. Iron deficiency anemia in pregnancy. *In Seminars in Hematology*. 2015;52:339-347.
12. Baker RD, Greer FR, Committee on Nutrition. Diagnosis and prevention of iron deficiency and iron-deficiency anemia in infants and young children (0–3 years of age). *Pediatrics*. 2010;126:1040-50.
13. Domellöf M, Braegger C, Campoy C, et al. Iron requirements of infants and toddlers. *Journal of Pediatric Gastroenterology and Nutrition*. 2014;58:119-29.
14. Yang Z, Lönnerdal BO, Adu-Afarwuah S, et al. Prevalence and predictors of iron deficiency in fully breastfed infants at 6 mo of age: comparison of data from 6 studies. *The American Journal of Clinical Nutrition*. 2009;89:1433-40.
15. Stevens GA, Finucane MM, De-Regil LM, et al. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data. *The Lancet Global Health*. 2013;1:e16-25.
16. Kassebaum NJ, GBD 2013 Anemia Collaborators. The global burden of anemia. *Hematology/Oncology Clinics of North America*. 2016;30:247-308.
17. Guivarch C, Sacri AS, Levy C, et al. Clinical Prediction of Iron Deficiency at Age 2 Years: A National Cross-sectional Study in France. *The Journal of Pediatrics*. 2021;235:212-9.
18. Ullrich C, Wu A, Armsby C, et al. Screening healthy infants for iron deficiency using reticulocyte hemoglobin content. *Jama*. 2005;294:924-30.
19. Brugnara C. Iron deficiency and erythropoiesis: new diagnostic approaches. *Clinical Chemistry*. 2003;49:1573-8.
20. Yadav D, Chandra J. Iron deficiency: beyond anemia. *The Indian Journal of Pediatrics*. 2011;78:65-72.
21. Dacie JV. *Dacie and Lewis practical haematology*. Elsevier Health Sciences; 2006.
22. Amer A, Abu Madi M, Dabbagh M, et al. Early diagnosis of iron deficiency in school children: a Qatari experience. *International Journal of Laboratory Hematology*, 2012;34:106-106.
23. Looker AC, Dallman PR, Carroll MD, et al. Prevalence of iron deficiency in the United States. *Jama*. 1997;277:973-6.
24. Åsberg A, Thorstensen K, Mikkelsen G, et al. The diagnostic accuracy of unbound iron binding capacity (UIBC) as a test for empty iron stores. *Scandinavian Journal of Clinical and Laboratory Investigation*. 2013;73:208-13.
25. Patel KV. Red cell distribution width and mortality in older adults: A meta-analysis. *J Gerontol A Biol Sci Med Sci*. 2010;65:258-65.
26. Sherali A, Ahad A, Tikmani SS, et al. Screening of Iron Deficiency Anemia in Children Using Mentzer Index in Pakistan: A Cross Sectional Study. *Global Pediatric Health*. 2023;10:2333794X221130986.
27. Asif N, Ijaz A, Rafi T, et al. Diagnostic accuracy of serum iron and total iron binding capacity (TIBC) in iron deficiency state. *J Coll Physicians Surg Pak*. 2016;26:958-61.
28. Sanad M, Gharib AF. Urinary hepcidin level as an early predictor of iron deficiency in children: A case control study. *Italian Journal of Pediatrics*. 2011;37:1-8.
29. Domellöf M, Dewey KG, Lönnerdal B, et al. The diagnostic criteria for iron deficiency in infants should be reevaluated. *The Journal of Nutrition*. 2002;132:3680-6.

30. Thorpe SJ, Heath A, Sharp G, et al. A WHO reference reagent for the Serum Transferrin Receptor (sTfR): international collaborative study to evaluate a recombinant soluble transferrin receptor preparation. *Clinical chemistry and laboratory medicine*. 2010;48:815-20.
31. Skikne BS, Flowers CH, Cook JD. Serum transferrin receptor: a quantitative measure of tissue iron deficiency.
32. Stoltzfus RJ. Iron deficiency: global prevalence and consequences. *Food and nutrition bulletin*. 2003;24:S99-103.
33. Brabin BJ, Premji Z, Verhoeff F. An analysis of anemia and child mortality. *The Journal of nutrition*. 2001;131:636S-48S.
34. Grantham-McGregor S, Ani C. A review of studies on the effect of iron deficiency on cognitive development in children. *The Journal of nutrition*. 2001;131:649S-68S.
35. Pasricha SR, Drakesmith H, Black J, et al. Control of iron deficiency anemia in low-and middle-income countries. *Blood, the Journal of the American Society of Hematology*. 2013;121:2607-17.
36. Allen LH. Anemia and iron deficiency: effects on pregnancy outcome. *The American journal of clinical nutrition*. 2000;71:1280S-4S.
37. Mustafa BS, Al-bayati AA, Abdulrazzaq GM, et al. Pediatric subtypes of ventricular septal defects with percent closure at Ibn-Sena teaching hospital in the city of Mosul-Iraq. *Military Medical Science Letters/Vojenské Zdravotnické Listy*. 2022;91.