

Journal of Education, Health and Sport

**Vol 10 No 12
2020**

formerly Journal of Health Sciences

Open Access

From 2011

eISSN 2391-8306

Formerly ISSN 1429-9623 / 2300-665X

Scientific Council

prof. zw. dr hab. geo. Z. Babiński (Poland), prof. zw. dr hab. med. T. Chumachenko (Ukraine), prof. zw. dr hab. techn. R. Cichon (Poland), prof. zw. dr hab. med. N. Dragomiretskaya (Ukraine),
prof. zw. dr hab. med. V. Ezhov (Ukraine), prof. zw. dr hab. geo. J. Falkowski (Poland), prof. zw. dr hab. med. A. Gozhenko (Ukraine), prof. zw. dr hab. geo. M. Grodzynski (Ukraine),
prof. zw. dr hab. I. Grygus (Ukraine), prof. zw. dr hab. med. A. Gudyma (Ukraine), prof. zw. dr hab. med. S. Gulyar (Ukraine), prof. zw. dr hab. med. W. Hagner (Poland), prof. dr med. M. Hagner-Deregowka (Poland),
prof. zw. dr hab. med. I. Karwat (Poland), prof. zw. dr hab. med. M. Kyrlyuk (Ukraine), prof. zw. dr hab. med. Y. Limansky (Ukraine), prof. zw. dr hab. geo. A. Melnik (Ukraine), prof. zw. dr hab. med. V. Mizin (Ukraine),
prof. zw. dr hab. med. B. Nasibullin (Ukraine), prof. zw. dr hab. geo. O. Obodovskiy (Ukraine), prof. zw. dr hab. med. L. Shafran (Ukraine), prof. zw. dr hab. med. I. Shmakova (Ukraine),
prof. zw. dr hab. O. Sokolov (Ukraine), prof. zw. dr hab. med. V. Stebliuk (Ukraine), prof. zw. dr hab. S. Yermakov (Ukraine),
prof. dr hab. med. A. Avramenko, doc. PaedDr. Elena Bendiková, PhD. (Slovakia), prof. dr hab. K. Busko (Poland), dr hab. med. E. Gozhenko (Ukraine), prof. dr hab. H. Knapik (Poland), dr hab. R. Muszkietka (Poland),
prof. dr hab. med. W. Myśliński (Poland), prof. dr hab. M. Napierała (Poland), prof. dr hab. M. Pastuszko (Poland), prof. dr hab. K. Prusik (Poland), prof. dr hab. M. Zasada (Poland), prof. dr hab. W. Zukow (Poland),
dr med. L. Batskaia (Ukraine), dr I. M. Batyk (Poland), dr M. Cieślicka (Poland), dr med. M. Charynska-Gula (Poland), doc. dr n. med. V. Chernov (Ukraine), dr med. K. Cywinski (Poland),
dr med. I. Czerwinska Pawluk (Poland), dr biol. S. Dolomatov (Ukraine), dr med. M. Dzierzanowski (Poland), dr med. B. Jędrzejewska (Poland),
dr med. U. Kazmierczak (Poland), dr med. K. Kiczuk (Poland), dr A. Kostencka (Poland), dr Z. Kwaśnik (Poland), dr med. T. Madej (Poland), dr med. E. Mikołajewska (Poland), dr D. Mikołajewski (Poland),
dr med. B. Muszkieta (Poland), dr med. A. Nalazek (Poland), dr med. N. Novikov (Ukraine), dr med. K. Nowacka (Poland), dr M. Podhorecka (Poland), dr med. G. Polak (Poland), dr med. P. Prokopczyk (Poland),
dr med. A. Radzimska (Poland), dr med. L. Sierpiska (Poland), dr Daves Sinch (Republic of India), doc. dr A. Skaliy (Ukraine), dr T. Skaliy (Ukraine),
dr B. Stankiewicz (Poland), dr med. E. Trela (Poland)

Editorial Board

Stefan Adamcak (Slovakia), Pavol Bartik (Slovakia), Elena Bendiková (Czech Republic), Janusz Bielski (Poland), Krzysztof Buśko (Poland), Mirosława Cieślicka (Poland), Jerzy Eksterowicz (Poland), Włodzimierz Erdmann (Poland),
Tomasz Frolowicz (Poland), Attila Gilanyi (Hungary), Igor Grygus (Ukraine), Halina Gula-Kubiszewska (Poland), Paweł Izdebski (Poland), Sergii Iermakov (Ukraine), Tetyana Iermakova (Ukraine), Jana Jurikova (Czech Republic),
Vlastimila Karaskova (Czech Republic), Jacek Klawe (Poland), Mariusz Klimczyk (Poland), Alicja Kostencka (Poland), Frantisek Langer (Czech Republic), Eligiusz Madejski (Poland), Jiri Michal (Slovakia), Ludmila Miklankova
(Czech Republic), Emilia Mikołajewska (Poland), Viktor Mishchenko (Ukraine), Stanisław Mocek (Poland), Mirosław Mrozkowiak (Poland), Radosław Muszkietka (Poland), Anna Nalazek (Poland), Marek Napierała (Poland),
Jerzy Nowocien (Poland), Piotr Oleśniewicz (Poland), Władysław Pańczyk (Poland), Wiesława Pilewska (Poland), Mirosława Pridalova (Czech Republic), Krzysztof Prusik (Poland), Krzysztof Sas-Nowosielski (Poland), Aleksandr Skaliy
(Ukraine), Tetyana Skaliy (Ukraine), Ewa Sokolowska (Poland), Błażej Stankiewicz (Poland), Robert Stępiak (Poland), Aleksander Stula (Poland), Naoki Suzuki (Japan), Mirosława Szark-Eckardt (Poland), Maciej Świątkowski (Poland),
Hychoriy Tereschuk (Ukraine), Hryhoriy Vasjanovicz (Ukraine), Mariusz Zasada (Poland), Tetyana Zavoronodnya (Ukraine), Walery Zukow (Poland), Hanna Żukowska (Poland)

Advisory Board

Zygmunt Babiński (Poland), Yuriy Briskin (Ukraine), Laszlo Csernoch (Hungary), Kazimierz Denek (Poland), Mirosław Dutchak (Ukraine), Karol Gorner (Slovakia), Kazimierz Kochanowicz (Poland), Jerzy Kosiewicz (Poland),
Stanisław Kowalik (Poland), Tadeusz Maszczak (Poland), Mikołaj Nosko (Ukraine), Jerzy Pośpiech (Poland), Eugeniusz Prystupa (Ukraine), Robert Szeklicki (Poland), Jitka Ulrichova (Czech Republic).

Reviewers:

prof. zw. dr hab. geo. Z. Babiński (Poland), doc. PaedDr. Elena Bendiková, PhD. (Slovakia), prof. zw. dr hab. med. T. Chumachenko (Ukraine), prof. zw. dr hab. techn. R. Cichon (Poland),
prof. zw. dr hab. med. N. Dragomiretskaya (Ukraine), prof. zw. dr hab. med. V. Ezhov (Ukraine), prof. zw. dr hab. geo. J. Falkowski (Poland), prof. zw. dr hab. med. A. Gozhenko (Ukraine),
prof. zw. dr hab. geo. M. Grodzynski (Ukraine), prof. zw. I. Grygus (Ukraine), prof. zw. A. Gudyma (Ukraine), prof. zw. dr hab. med. S. Gulyar (Ukraine), prof. zw. dr hab. med. W. Hagner (Poland),
prof. zw. dr hab. med. I. Karwat (Poland), prof. zw. dr hab. med. M. Kyrlyuk (Ukraine), prof. zw. dr hab. med. Y. Limansky (Ukraine), prof. zw. dr hab. geo. A. Melnik (Ukraine), prof. zw. dr hab. med. V. Mizin (Ukraine),
prof. zw. dr hab. med. B. Nasibullin (Ukraine), prof. zw. dr hab. geo. O. Obodovskiy (Ukraine), prof. zw. dr hab. med. L. Shafran (Ukraine), prof. zw. dr hab. med. I. Shmakova (Ukraine),
prof. zw. dr hab. O. Sokolov (Ukraine), prof. zw. dr hab. med. V. Stebliuk (Ukraine), prof. zw. dr hab. S. Yermakov (Ukraine),
prof. dr hab. med. A. Avramenko, prof. dr hab. K. Busko (Poland), dr hab. med. E. Gozhenko (Ukraine), prof. dr hab. H. Knapik (Poland), prof. zw. dr hab. geo. A. Melnik (Ukraine),
prof. dr hab. R. Muszkietka (Poland), prof. dr hab. med. W. Myśliński (Poland), prof. dr hab. M. Napierała (Poland), prof. dr hab. M. Pastuszko (Poland), prof. dr hab. K. Prusik (Poland),
prof. dr hab. M. Zasada (Poland), prof. dr hab. med. W. Zukow (Poland),
dr I. M. Batyk (Poland), dr med. L. Batskaia (Ukraine), doc. dr n. med. V. Chernov (Ukraine), dr M. Cieślicka (Poland), dr med. I. Czerwinska Pawluk (Poland), dr biol. S. Dolomatov (Ukraine), dr A. Kostencka (Poland),
dr med. N. Novikov (Ukraine), dr M. Podhorecka (Poland), dr med. A. Radzimska (Poland), doc. dr A. Skaliy (Ukraine), dr T. Skaliy (Ukraine), dr B. Stankiewicz (Poland), dr med. E. Trela (Poland)

Editors-in-Chief

Anatoliy Gozhenko

Marek Napierała

Walery Zukow

Co-editors

Associate Editors

Iwona Czerwinska Pawluk

Mariusz Klimczyk

Mirosława Cieślicka

Adam Szulc

Secretary

Barłomiej Niespodziński

© The Author(s) 2020.

This articles is published with Open Access at Journal of Education, Health and Sport formerly Journal of Health Sciences
of Nicolaus Copernicus University in Toruń, Poland

Open Access This articles is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and
reproduction in any medium, provided the original author(s) and source are credited.



Attribution — You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).

Noncommercial — You may not use this work for commercial purposes. Share Alike — If you alter, transform, or build upon this work, you may distribute the resulting work only under
the same or similar license to this one.

Declaration on the original version. Because of the parallel version of the magazine publishing traditional (paper) and of electronic (online), Editors indicates that the main version of the
magazine is to issue a "paper"

Zawartość tegoż czasopisma jest objęta licencją Creative Commons Uznanie autorstwa-Użycie niekomercyjne-Na tych samych warunkach 3.0

Redaction, Publisher and Editorial Office

Publisher and Editorial Office

Department of Physical Education,

Faculty of Earth Sciences and Spatial Management,

Nicolaus Copernicus University in Toruń, Poland

Address: Str. Lwowska 1, 87-100 Toruń, Poland

ISSN 2391-8306

Formerly ISSN:1429-9623 / 2300-665X

SUBMISSIONS

- » [Online Submissions](#)
- » [Author Guidelines](#)
- » [Copyright Notice](#)
- » [Privacy Statement](#)
- » [Author Fees](#)

ONLINE SUBMISSIONS

Already have a Username/Password for Journal of Health Sciences?

[GO TO LOGIN](#)

Need a Username/Password?

[GO TO REGISTRATION](#)

Registration and login are required to submit items online and to check the status of current submissions.

AUTHOR GUIDELINES

Instructions for authors

The quarterly **Journal of Health Sciences** carries and publishes peer-reviewed scientific original articles, review papers and case studies in all areas of medical and biological sciences from basic research to clinical and experimental study in English.

The Journal aims at establishing itself as the leading international journal in medical and biological sciences. We publish original scientific studies, review and educational articles, and papers commenting on the clinical, scientific, social, political, and economic factors affecting health. The journal will also publish information materials from the national consultants, materials discussing the activities of the medical Clubs, and news from the medical community.

We also accept conference reports, book reviews and letters to the editor. Each submission is subject to review by selected experts in the subject area. The review process is fully anonymous.

Papers should be submitted to the Editorial Office by online system:

<http://journal.rsw.edu.pl/index.php/JHS/login>

Online Submissions

Already have a Username/Password for Journal of Health Sciences (J Health Sci)?

[Go to Login](#)

Need a Username/Password?

[Go to Registration](#)

Registration and login are required to submit items online and to check the status of current submissions.

A cover letter should be included with the manuscript, containing a declaration to the effect that the manuscript has not been previously published or submitted to another journal, signed by all the authors. It should also include written approval from the head of the institution in which the study was conducted.

The text should use a font not smaller than 12 points, and should be double-spaced, with a margin of 2.5 cm on all sides (left, right, top, bottom). The pages should be numbered consecutively.

The **title page** should contain the title of the paper (in English), the full names of the authors, and their full affiliations. At the bottom of the page, the full name, academic degree, and address of the corresponding author should be given (including the telephone number, fax number and/or e-mail address).

The **abstract** (in English) should be 200-250 words in original papers, or up to 150 words in review papers and case studies. The abstract of an original paper should be adequately structured, i.e. contain the following parts: introduction, aim, materials and methods, results and conclusions. Below the abstract, no more than 5 keywords should be given in English in accordance with the Index Medicus (Medical Subject Reading).

The **body text** should be organised as follows:

1) in original papers: introduction and aim, materials and methods, results, discussion and conclusions;

2) in review papers: free structure;

3) in case studies: introduction (motivation for the study), case description, discussion of the characteristic symptoms, treatment results etc.

References. References to the works cited should be placed between square brackets, e.g. [1–4, 10, 14]. Do not use automatic numbering for references. The reference section at the end of the paper should be arranged according to the sequence of citations in the body text. In original and review papers, there should be no more than 100, and in case studies – no more than 50 references. References must only contain published works. References to journal articles should give the surnames and first name initials of the first three authors, followed by "et al." if there are more than three authors, the title of the paper, abbreviated journal title (according to Index Medicus), publication date, volume and issue number, and page numbers. Punctuation should adhere strictly to the example below:

1. Hamano H, Kawa S, Horiuchi A et al. High serum IgG4 concentrations in patients with sclerosing pancreatitis. *N Engl J Med* 2001; 344: 732-8.

2. Pijls NH, De Bruyne B. Coronary pressure. Kluwer Academic Publishers, London 2000.

3. Perri P, Cavaliere F, Boti C i wsp. Epidemiology of gastroenteropancreatic neuroendocrine tumors. In: Update in Neuroendocrinology. Baldelli R, Casanue va FF, Tamburano G (wyd.). Udine Centro UD 2004; 483-512.

Tables and figures. Tables and figures must not be included in the body text; please only indicate where they should appear in the final printed version. Tables should each be placed on separate pages and numbered consecutively using Roman numerals. Tables should be captioned in English, and should be accompanied by adequate explanatory notes.

Figures and photographs should be submitted:

1) as hard copies (numbered using Arabic numerals, and identified using the names of the authors, paper title, and a "top" marking);

2) in one of the following electronic formats: *.cdr, *.tif, *.eps or *.jpg (at a resolution of 300 dpi). Figure captions, in English, should be placed on separate pages. Please do not submit figures in MS Word *.doc files.

When publishing their work, the author(s) should bear in mind the requirements of the Declaration of Helsinki (an international medical ethics act, signed in 1975, which stipulates that it is prohibited to name the patients, give their initials or hospital record numbers). The relevant ethical committee's statement of approval for the study, along with the patients' conscious agreement to participate, should be included in the Materials and Methods section for all papers in which the diagnostic and therapeutic actions do not follow from standard procedures.

For photographs, the patient's written permission to publish must always be obtained.

Please specify the sources of funding for the study (e.g. grants, private sponsors) in a short acknowledgement note below the Discussion section.

Authors of studies presenting results of clinical studies of drugs and medical procedures are expected to describe in detail how the study was financed, what the sponsor's role was in the planning and execution of the study and in the analysis of the results, and what the influence was of the sponsoring institution on the contents of the paper.

Irrespective of the topic of the submission, international drug names should be used in the text.

Abbreviations used in the text should be explained at first mention (this also applies to the abstract). Other than in exceptional situations, abbreviations should not be used in the title of the submission.

The results of laboratory studies and the relevant standards and standard deviations should be expressed using SI units.

The editors shall bear no responsibility for the contents of any advertisements or announcements published.

Authors receive no payment for publishing in *Journal of Health Sciences*. Offprints for authors are not produced.

Upon receiving the proofs, the first author (or one of the co-authors) should clear it for publication within 48 hours by contacting the Publisher by electronic means (or by fax). In case a clearance is not submitted within this deadline, the Publisher will assume that the authors endorse the text as is.

For authors the bibliographic and formatting standards used for items submitted to the journal (e.g., *Publication Manual of the American Psychological Association*, 5th edition, 2001). It is often helpful to provide examples of the common citation formats for journals and books to be used in submissions. Also identify the types of appropriate Supplementary Files (e.g., data-sets, research instruments, etc.) which authors should be encouraged to upload, in addition to their submission, to enhance readers' engagement with their work.

<http://www.icmjie.org>

SUBMISSION PREPARATION CHECKLIST

1. As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.
2. The submission is published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).
3. The submission file is in LibreOffice, OpenOffice, Microsoft Word, RTF, or WordPerfect document file format.
4. Where available, URLs for the references have been provided.
5. The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
6. The text adheres to the stylistic and bibliographic requirements outlined in the *Author Guidelines*, which is found in About the Journal. To the stylistic and bibliographic requirements outlined by the International Committee of Medical Journal Editors (available at <http://www.icmjie.org>).
7. If submitting to a peer-reviewed section of the journal, the instructions in *Ensuring a Blind Review* have been followed.
8. **Suggest Reviewers**

9. Suggesting 3 reviewers are Required for Submission.

Please suggest potential reviewers for this submission.

Use the fields below to give us contact information for each suggested reviewer, and please provide specific reasons for your suggestion in the comments box for each person. Please note that the editorial office may not use your suggestions, but your help is appreciated and may speed up the selection of appropriate reviewers.

A* indicates a required field.

First Name* Last Name* Academic Degree*(s) Position Department Institution E-mail Address*

COPYRIGHT NOTICE

CREATIVE COMMONS license.

To that end, it provides **SAMPLE COPYRIGHT NOTICE WORDING** that can be cut and pasted into the space below for journals that

(a) offer open access.

PRIVACY STATEMENT

The names and email addresses entered in this journal site will be used exclusively for the stated purposes of this journal and will not be made available for any other purpose or to any other party.

AUTHOR FEES

Article Publication Fee - Journal of Education, Health and Sport: **200,- PLN**

If the paper is accepted for publication, you will be asked to pay an Article Publication Fee. Please find payment information

Dane szkoły i konta bankowego:

Uniwerytet Kazimierza Wielkiego

ul. Chodkiewicza 30

85-064 Bydgoszcz, Poland PL

NIP 554 26 47 568 REGON 340057695

Przedstawiciel Kwestury UKW Angelika Kuczyńska

Tel.: +48 52 34 19 209

<angelika.kuczyńska@ukw.edu.pl>

Rachunek bankowy w BANK ZACHODNI WBK S.A.

PL.92 1500 1360 1213 6001 8602 0000 SWIFT WBKPLPPP

W tytule przelewu należy podać nazwisko korespondującego autora i otrzymany numer identyfikacyjny artykułu (**Manuscript JoEH&S Amosova 2705**).

Scan dokumentu opłaty prosimy wysłać na adres Email:

Przedstawiciel Kwestury Angelika Kuczyńska

Tel.: +48 52 34 19 209

<angelika.kuczyńska@ukw.edu.pl>

i

<w.mikow@wp.pl>

Po otrzymaniu opłaty Kwestura UKW wystawi Fakturę VAT (Kwestura UKW).

Aby uczelnia mogła wystawić Fakturę Vat za publikację Artykułu w czasopiśmie musi wiedzieć dokładnie dane jak :

- dla kogo ? Imię Nazwisko albo nazwa firmy jeżeli ktoś prowadzi działalność gospodarczą !

- dokładny adres siedziby czy miejsca zamieszkania osoby która chce fakturę na opłatę **200 zł** za publikację.

- numer identyfikacji podatkowej NIP

- adres do korespondencji - gdyż sama wpłata nie wystarczy do tego aby wystawić fakturę.

Declaration on the original version.

Because of the parallel version of the magazine publishing traditional (paper) and of electronic (online), Editors indicate that the main version of the magazine is to issue a "electronic".

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation.

Part B item 755 (23.12.2015).

755 Journal of Education, Health and Sport (mult) 2391-8306 7

Deklaracja.

Specyfika i zawartość merytoryczna czasopiisma nie ulega zmianie.

Zgodnie z informacją MNSW z dnia 2 czerwca 2014 r., że w roku 2014 nie będzie przeprowadzana ocena czasopism naukowych; czasopismo o zmienionym tytule otrzymuje tyle samo punktów co na wykazie czasopism naukowych z dnia 31 grudnia 2014 r.

ISSN 2391-8306

formerly ISSN: 1429-9623 / 2300-665X

Archives 2011 - 2014

Redaction, Publisher and Editorial Office

Publisher and Editorial Office

Department of Physical Education,

Faculty of Earth Sciences and Spatial Management,

Nicolaus Copernicus University in Toruń, Poland

Address: Str. Lwowska 1, 87-100 Toruń, Poland

Open Access

ISSN 2391-8306

formerly ISSN: 1429-9623 / 2300-665X

Archives 2011 - 2014

<http://journal.rsw.edu.pl/index.php/JHS/issue/archiv>

The formerly journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1089 (31.12.2014).

The formerly journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1107 (17.12.2013).

The journal has had 4 points in Ministry of Science and Higher Education of Poland parametric evaluation, Part B item 683 (21.12.2012).

The journal has been approved for inclusion in ERIH PLUS.

The ERIH PLUS listing of the journal is available at <https://dbh.nds.ni.b.no/publisering/skamaler/erihplus/periodical/info/?id=485984>

Indexed in Index Copernicus Journals Master List.

<http://journals.indexcopernicus.com/Journal-of-Education-Health-and-Sport,p24782242,3.html>

ICV 2014: 89.51 **Standardized Value: 8.27**

ICV 2013: 7.32

ICV 2012: 6.41

ICV 2011: 5.48

The InfoBase Index IBI Factor for the year 2015 is 3.56 in InfoBase Index.com.
Website: www.infobaseindex.com

Universal Impact Factor 1.78 for year 2012. (<http://www.impactfactor.org/AppliedJournals.aspx>)

Indexed in Polish Scholarly Bibliography (PBN) (PBN Polska Bibliografia Naukowa) (<https://pbn.nauka.gov.pl/journals/36616>)

is a portal of the Polish Ministry of Science and Higher Education, collecting information on publications of Polish scientists and on Polish and foreign scholarly journals. Polish Scholarly Bibliography is a part of POL-on - System of Information on Higher Education. It is operated by the Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw.



Russian Science Citation Index



Indexed in Index Copernicus Journals Master List.

IC Value 2011

5.48

IC Value 2012

6.41

The journal is indexed in:
InnoSpace - SJIF Scientific Journal Impact Factor

SJIF 2012: 3.83



ARIANTA
POLISH SCIENTIFIC AND PROFESSIONAL ELECTRONIC JOURNALS
Aneta Drabek i Arkadiusz Pulikowski

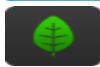


Główna Biblioteka Lekarska



Czasopisma pełnotekstowe w bazach GBL

<http://atoz.ebsco.com/Title/SearchResults/4915?SearchType=0&Find=journal+of+health+sciences&GetResourcesBy=QuickSearch&resourceType=allTitles&resourceType=&radioButtonChanged=>



ScienceAlerts.com

POPULAR ARTICLES

»EFFECTS OF TRANSCRANIAL ELECTROANALGESIA ON CONDITION OF CEREBRAL HEMODYNAMICS IN PATIENTS WITH THE SYNDROME OF VEGETATIVE DYSTONIA DIFFERENT GENESIS. Влияние транскраниальной электроанальгезии на состояние церебральной гемодинамики у больных с синдромом

13836 views since: 2013-06-15

»ROLE OF BRAINS TEM WITHIN HUMAN BODY SYSTEMS – COMPUTATIONAL APPROACH

9360 views since: 2012-01-19

»THE INFLUENCE OF PACLITAXEL TREATMENT ON SELECTED BIOCHEMICAL AND MORPHOLOGICAL BLOOD PARAMETERS IN PATIENTS DIAGNOSED WITH BREAST CANCER

8413 views since: 2011-08-21

»ASSESSMENT OF THE PNF METHOD INFLUENCE ON GAIT PARAMETERS IMPROVEMENT IN PERSONS WITH CEREBRAL PALSY

6799 views since: 2012-01-04

»ELECTIC VS. SPHERIC APPROACH WITHIN CONTEMPORARY NEUROLOGICAL PHYSIOTHERAPY

3829 views since: 2012-01-30

»BIOFEEDBACK AS THE ELEMENT OF THE NEUROREHABILITATION

3662 views since: 2012-01-30

»PATHOMORPHOLOGICAL CHANGES ACUTE LUNG INJURY

3062 views since: 2012-05-02

»FUZZY ONTOLOGICAL KNOWLEDGE REPRESENTATION FOR THE TRAINING OF MEDICAL TERMINOLOGY

2929 views since: 2013-02-24

»INCIDENCE OF NEUROGENIC HETEROTOPIC OSSIFICATIONS IN PATIENTS WITH NEUROLOGICAL DEFICITS

2700 views since: 2012-05-17

»EFFECT OF AEROBIC TRAINING ON THE HEALTH OF WOMEN FREQUENTING TO FITNESS CLUBS. Wpływ treningu aerobowego na zdrowie kobiet uczęszczających do klubów fitness

2304 views since: 2013-06-06

Introduction

We hope that a varied program of the **Journal of Education, Health and Sport formerly Journal of Health Sciences** will answer your expectations. We believe that the **Journal of Education, Health and Sport formerly Journal of Health Sciences** will contribute to raising the knowledge, skills and abilities of doctors, therapists, physiotherapists, nurses, psychologists, biologists, researchers, practitioners and health workers interested in rehabilitation, physiotherapy, tourism and recreation.

Journal of Education, Health and Sport formerly Journal of Health Sciences, corresponding to the modern challenges of global health specialists collect articles from those areas of the leading centers of renowned foreign and domestic. Many of them present state of art in their field. This will be particularly valuable for young doctors in the specialization, and students.

Welcome to familiarize yourself with this issue all relevant hazards and health, life and safety at work in tourism, recreation, rehabilitation, physiotherapy, nursing organization to work safely and missions in these conditions, the influence of environmental conditions on public health.

Authors from abroad and the country will present an overview of contemporary challenges and solutions in these areas. The issue concerns the text of the wider work for human health, tourism, recreation, physiotherapy, nursing, wellness and rehabilitation, including the economics of health care.

© The Author(s) 2020.

Faculty of Earth Sciences and Spatial Management,
Nicolaus Copernicus University in Toruń, Poland

Wstęp

Wyrażamy nadzieję, że zróżnicowany program **Journal of Education, Health and Sport formerly Journal of Health Sciences** będzie odpowiadał Państwa oczekiwaniom. Wierzymy, że **Journal of Education, Health and Sport formerly Journal of Health Sciences** przyczyni się do podnoszenia wiedzy, kwalifikacji i umiejętności lekarzy, rehabilitantów, fizjoterapeutów, pielęgniarek, psychologów, biologów, praktyków i badaczy zainteresowanych ochroną zdrowia pracowników rehabilitacji, fizjoterapii, turystyki i rekreacji.

Journal of Education, Health and Sport formerly Journal of Health Sciences, odpowiadająca na współczesne światowe wyzwania zdrowotne, gromadzi artykuły specjalistów z tych dziedzin z wiodących, renomowanych ośrodków zagranicznych i krajowych. Wielu z nich przedstawia state of art w swojej dziedzinie. Będzie to szczególnie cenne dla młodych lekarzy w trakcie specjalizacji, oraz studentów.

Mile widziani do zapoznania się z tą problematyką wszystkich zainteresowanych zagrożeniami i ochroną zdrowia, życia i bezpieczeństwa w pracy w turystyce, rekreacji, rehabilitacji, fizjoterapii, pielęgniarstwie organizacją bezpiecznej pracy i misji w tych warunkach, wpływem warunków środowiska na stan zdrowia publicznego.

Autorzy z zagranicy i kraju przedstawią przegląd współczesnych wyzwań i proponowanych rozwiązań w tych dziedzinach. Problematyka tekstów prac dotyczy szeroko rozumianego zdrowia człowieka, turystyki, rekreacji, fizjoterapii, pielęgniarstwa, odnowy biologicznej i rehabilitacji, również ekonomiki ochrony zdrowia.

Zawartość tego czasopisma jest objęta licencją
Creative Commons Uznanie autorstwa-Użycie niekomercyjne-Na tych samych warunkach 4.0

Content:

Introduction 010-010

Kowalewski Michal. Literature and theatre as support for a healthy and ill child. *Journal of Education, Health and Sport*. 2020;10(12):11-21. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.001>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.001>
<https://zenodo.org/record/4305996>

Shumynskiy Ievgen V., Kopchak Andrey V. Relation between paranasal sinuses and surrounding bone tissue. *Journal of Education, Health and Sport*. 2020;10(12):22-31. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.002>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.002>
<https://zenodo.org/record/4307777>

Levitsky A. P., Selivanskaya I. A., Stepan V. T., Pustovoi P. I. Comparative effect of different pathogens on the condition of dysbiosis in rat kidneys. *Journal of Education, Health and Sport*. 2020;10(12):32-39. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.003>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.003>
<https://zenodo.org/record/4309934>

Sokol Viacheslav K., Kolesnichenko Vera A., Grygorian Edgar. Characteristics of lower limb injuries in non-fatal road traffic accidents: a retrospective analysis of forensic medical examinations. *Journal of Education, Health and Sport*. 2020;10(12):40-46. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.004>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.004>
<https://zenodo.org/record/4311791>

Sokolova S. S. Histostructure of the thyroid gland in the sexually mature offsprings of female rats which were exposed to passive smoking during pregnancy. *Journal of Education, Health and Sport*. 2020;10(12):47-55. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.005>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.005>
<https://zenodo.org/record/4315132>

Regeda-Furdychko M. M. The role of lipid peroxidation and antioxidant protection in skin in the development of experimental contact dermatitis. *Journal of Education, Health and Sport*. 2020;10(12):56-64. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.006>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.006>
<https://zenodo.org/record/4317706>

Kulynych R. L., Rekalov D. G. Forecast and clinical-diagnostic significance of increased expression of beta-2microglobulin in the urine in the process of nephropathy formation in essential hypertension. *Journal of Education, Health and Sport*. 2020;10(12):65-79. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.007>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.007>
<https://zenodo.org/record/4317779>

Litvinov V. A., Makurina H. I. Patients with pemphigus vulgaris under pathology and on the background of prolonged use of high doses of glucocorticosteroid therapy – the possibility of influencing the glutathione system. *Journal of Education, Health and Sport*. 2020;10(12):80-92. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.008>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.008>
<https://zenodo.org/record/4317811>

Lutsenko N. S., Unguryan N. V. Patogenetic relationship between the corneal epithelial thickness and microcirculation in the conjunctiva during optical coherent tomography in healthy subjects without ophthalmopathy. *Journal of Education, Health and Sport*. 2020;10(12):93-106. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.009>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.009>
<https://zenodo.org/record/4317849>

Maksymowicz Marcela, Machowiec Piotr Artur, Ręka Gabriela, Niemirski Dominik, Pieciewicz-Szczęśna Halina. Use of mobile phones by youth regarding the potential health consequences – a survey study. Journal of Education, Health and Sport. 2020;10(12):107-117. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.010>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.010>
<https://zenodo.org/record/4319888>

Lutkovskiy Ruslan. Quality of life of patients with surgical treatment of abdominal hernias. Journal of Education, Health and Sport. 2020;10(12):118-124. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.011>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.011>
<https://zenodo.org/record/4321294>

Potapenko S. V. Determination of significant prognostic factors in the development of magnesium deficiency in children and adolescents with gastroesophageal reflux disease. Journal of Education, Health and Sport. 2020;10(12):125-137. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.012>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.012>
<https://zenodo.org/record/4321363>

Potapenko S. V. Determination of significant prognostic factors in the development of magnesium deficiency in children and adolescents with gastroesophageal reflux disease. *Journal of Education, Health and Sport*. 2020;10(12):125-137. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.012>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.012>
<https://zenodo.org/record/4321363>

The journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. § 8. 2) and § 12. 1. 2) 22.02.2019.

© The Authors 2020;

This article is published with open access at Licensee Open Journal Systems of Nicolaus Copernicus University in Torun, Poland

Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike. (<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 09.11.2020. Revised: 25.11.2020. Accepted: 14.12.2020.

UDK 616.333-008.6-053.2-07-06

DETERMINATION OF SIGNIFICANT PROGNOSTIC FACTORS IN THE DEVELOPMENT OF MAGNESIUM DEFICIENCY IN CHILDREN AND ADOLESCENTS WITH GASTROESOPHAGEAL REFLUX DISEASE

S. V. Potapenko

Zaporizhzhia State Medical University, Zaporizhzhia, Ukraine

Potapenko S. V., MD, Assistant of the Department of Children Diseases, Zaporizhzhia State Medical University, Ukraine; 28A, Novgorodskaia street, Zaporizhzhia, 69076;
Tel.: +380673552554, e-mail: sergeypot@gmail.com; ID orcid 0000-0002-2511-9257

Abstract

The aim of the work is to determine the factors of the course of GERD in children and adolescents which are important for predicting the development of magnesium deficiency.

Materials and methods of research. For the study 77 people aged 9 to 14 years, who have gastroesophageal reflux disease with endoscopically positive diagnostic result, were examined. All children who were involved in the study underwent laboratory tests of serum magnesium, intracellular (erythrocyte) magnesium, and calcium levels. The ratio of calcium and intracellular magnesium was also considered as an indicator of latent magnesium deficiency. Magnesium level in patients with GERD were compared with control group, which consisted of 20 children without GERD. The odds ratio and confidence intervals for a large number of anamnestic, clinical and instrumental factors of GERD were calculated to

determine significant prognostic factors for the development of magnesium deficiency, after which the indicators of the relative risk and the minimum and maximum predictive coefficients for these factors were determined. Based on the indicators of the minimum and maximum prognostic coefficient, a range of the probability of magnesium deficiency in patients with GERD was formed.

Results. Based on the determination of the level of serum, erythrocyte magnesium, and the ratio of $\text{Ca}/\text{Mg}_{\text{erythrocyte}}$ in children of the control group, who were practically healthy, the standard deviation (δ) was calculated, and the corridors of laboratory parameters corresponding to the normal level of magnesium, indicators of latent deficiency (from δ to 2δ) and indicators of deficiency of magnesium (more than 2δ) were determined. In the group with GERD normal magnesium levels were discovered in 41.6% of children. A total of 19.5% of patients had latent magnesium deficiency and 39% of children had magnesium deficiency. For the analysis were selected: hyperacidity (pH 0.86-1.59), which had an odds ratio of 3.47; the reflux esophagitis 2-3 stages with an odds ratio of 68.64; an increase in LF and HF values day and night, an increase in the daytime LF/HF ratio, an increase in the stress index, an increase in PAPR and average circadian index values. Based on the indicators of the minimum and maximum prognostic coefficient, a range of the probability of magnesium deficiency in patients with GERD was formed. With the sum of the predictive coefficients of each significant factor from 13.3 to 31.0, the probability of magnesium deficiency is low; the range from 31.1 to 48.8 corresponds to the average probability, and the range of 48.9 to 66.5 indicates a significant possibility of a magnesium deficiency in a patient with GERD.

Conclusion. It was determined that the factors of hyperacidity and the reflux esophagitis, some indicators of heart rate variability (LF and HF day and night, an increase in the daytime LF/HF ratio, an increase in the stress index, an increase in PAPR and average indicators of the circadian index) can be used to predict the development of magnesium deficiency in children with GERD. The practical application of the predictive coefficients of the given factors will make it possible to timely correct magnesium deficiency and will positively affect the quality of GERD treatment in children and adolescents.

Key words: prognosis; magnesium deficiency; children; adolescents; GERD.

**ВИЗНАЧЕННЯ ПРОГНОСТИЧНО ЗНАЧУЩИХ ФАКТОРІВ РОЗВИТКУ
МАГНІСВОГО ДЕФІЦИТУ У ДІТЕЙ ТА ПІДЛІТКІВ З
ГАСТРОЕЗОФАГЕАЛЬНОЮ РЕФЛЮКСНОЮ ХВОРОБОЮ**

С.В. Потапенко

Запорізький державний медичний університет, Запоріжжя, Україна

Резюме

Мета роботи. Визначити фактори перебігу ГЕРХ у дітей та підлітків, що мають значення для прогнозування розвитку дефіциту магнію.

Матеріали та методи дослідження. Було обстежено 77 осіб віком від 9 до 17 років у яких було діагностовано ендоскопічно-позитивну гастроєзофагеальну рефлюксну хворобу. Всім дітям, що брали участь у дослідженні проводилось лабораторне визначення сироваткового магнію, внутрішньоклітинного (еритроцитарного) магнію та рівня кальцію. Також було враховано співвідношення кальцію та внутрішньоклітинного магнію, як показника латентного дефіциту магнію. Показники магнію у пацієнтів з ГЕРХ порівнювались з аналогічними показниками групи контролю, що складалася з 20 дітей без ГЕРХ. Для визначення прогностично значущих факторів розвитку дефіциту магнію було розраховано відношення шансів та довірєні інтервали для великої кількості анамнестичних, клінічних та інструментальних факторів ГЕРХ, після чого було визначено показники відносного ризику та мінімальний і максимальний прогностичні коефіцієнти для цих факторів. На підставі показників мінімального та максимального прогностичного коефіцієнту було сформовано діапазон вірогідності наявності дефіциту магнію у пацієнтів з ГЕРХ.

Результати. На підставі визначення у дітей групи контролю, що були практично здоровими, рівня сироваткового, еритроцитарного магнію, а також співвідношення $\text{Ca/Mg}_{\text{сритр}}$, розраховано стандартне відхилення (δ), та визначені коридори лабораторних показників, що відповідали нормальному рівню магнію, показникам латентного дефіциту (від δ до 2δ) та показникам дефіциту магнію (більше 2δ). В групі з ГЕРХ виявлено 41,6% дітей з нормальним рівнем магнію. Пацієнти з латентним дефіцитом магнію склали 19,5%, діти з дефіцитом магнію зустрічалися у 39%. Для аналізу нами було відібрано: гіперацидність (рН 0,86-1,59), що мала показник відношення шансів 3,47; наявність рефлюкс-езофагіту 2-3 ст. з відношенням шансів

68,64; підвищення показників LF та HF вдень та вночі, підвищення денного співвідношення LF/HF, підвищення показника стрес-індексу, підвищення PAPR та середні показники циркадного індексу. На підставі показників мінімального та максимального прогностичного коефіцієнту було сформовано діапазон вірогідності наявності дефіциту магнію у пацієнтів з ГЕРХ. При сумі прогностичних коефіцієнтів кожного значущого фактору від 13,3 до 31,0 вірогідність наявності дефіциту магнію слабка; діапазон від 31,1 до 48,8 відповідає середній вірогідності, а потрапляння в діапазон 48,9-66,5 свідчить про значну вірогідність наявності у пацієнта з ГЕРХ дефіциту магнію.

Висновок. Визначено, що фактори гіперацидності та наявність рефлюкс-езофагіту, деякі показники варіабельності серцевого ритму (LF та HF вдень та вночі, підвищення денного співвідношення LF/HF, підвищення показника стрес-індексу, підвищення PAPR та середні показники циркадного індексу) можуть бути використані для прогнозування розвитку дефіциту магнію у дітей з ГЕРХ. Практичне застосування прогностичних коефіцієнтів наведених факторів дозволить своєчасно корегувати дефіцит магнію, що позитивно відобразиться на якості лікування ГЕРХ у дітей та підлітків.

Ключові слова: прогноз; дефіцит магнію; діти; підлітки; ГЕРХ.

ОПРЕДЕЛЕНИЕ ПРОГНОСТИЧЕСКИХ ЗНАЧИМЫХ ФАКТОРОВ РАЗВИТИЯ МАГНИЕВОГО ДЕФИЦИТА У ДЕТЕЙ И ПОДРОСТКОВ С ГАСТРОЭЗОФАГЕАЛЬНОЙ РЕФЛЮКСНОЙ БОЛЕЗНЬЮ

С. В. Потапенко

Запорожский государственный медицинский университет, Запорожье, Украина

Резюме

Цель работы. Определить факторы течения ГЭРБ у детей и подростков, имеющих значение для прогнозирования развития дефицита магния.

Материалы и методы. Было обследовано 77 человек в возрасте от 9 до 17 лет, у которых было диагностирована эндоскопически-положительная гастроэзофагеальная рефлюксная болезнь. Всем детям, которые принимали участие в исследовании, проводилось лабораторное определение сывороточного магния, внутриклеточного

(эритроцитарного) магния и уровня кальция. Также было учтено соотношение кальция и внутриклеточного магния, как показателя латентного дефицита магния. Показатели магния у пациентов с ГЭРБ сравнивались с аналогичными показателями группы контроля, которая состояла из 20 детей без ГЭРБ. Для определения прогностически значимых факторов развития дефицита магния было рассчитано отношение шансов и доверенные интервалы для большого количества анамнестических, клинических и инструментальных факторов ГЭРБ, после чего были определены показатели относительного риска и минимальный и максимальный прогностические коэффициенты для этих факторов. На основании показателей минимального и максимального прогностического коэффициента был сформирован диапазон вероятности наличия дефицита магния у пациентов с ГЭРБ.

Результаты. На основании определения у детей группы контроля, которые были практически здоровыми, уровня сыворотки, эритроцитарного магния, а также соотношение $Ca/Mg_{\text{эритроц}}$, рассчитано стандартное отклонение (δ), и определены коридоры лабораторных показателей, соответствующих нормальному уровню магния, показателям латентного дефицита (от δ до 2δ) и показателям дефицита магния (более 2δ). В группе с ГЭРБ выявлено 41,6% детей с нормальным уровнем магния. Пациенты с латентным дефицитом магния составили 19,5%, дети с дефицитом магния встречались в 39% случаев. Для анализа нами были отобраны: гиперацидность (рН 0,86-1,59), имевшая показатель отношения шансов 3,47; наличие рефлюкс-эзофагита 2-3 ст. с отношением шансов 68,64; повышение показателей LF и HF днем и ночью, повышение дневного соотношения LF/HF, повышение показателя стресс-индекса, повышение PAPR и средние показатели циркадного индекса. На основании показателей минимального и максимального прогностического коэффициента был сформирован диапазон вероятности наличия дефицита магния у пациентов с ГЭРБ. При сумме прогностических коэффициентов каждого значимого фактора от 13,3 до 31,0 вероятность наличия дефицита магния слабая; диапазон от 31,1 до 48,8 соответствует средней вероятности, а попадание в диапазон 48,9-66,5 свидетельствует о значительной вероятности наличия у пациента с ГЭРБ дефицита магния.

Вывод. Определено, что факторы гиперацидности и наличие рефлюкс-эзофагита, некоторые показатели вариабельности сердечного ритма (LF и HF днем и ночью, повышение дневного соотношения LF/HF, повышение показателя стресс-индекса, повышение PAPR и средние показатели циркадного индекса) могут быть использованы для прогнозирования развития дефицита магния у детей с ГЭРБ.

Практическое применение прогностических коэффициентов приведенных факторов позволит своевременно корректировать дефицит магния, что положительно отразится на качестве лечения ГЭРБ у детей и подростков.

Ключевые слова: прогноз; дефицит магния; дети; подростки; ГЭРБ.

Introduction. Magnesium deficiency is a syndrome caused by a decrease of the magnesium level in various organs and systems, which has many symptoms that indicate a multi-organ functional disorder.

Symptoms of magnesium deficiency can be general: tiredness, chronic fatigue, irritability, anxiety, sleep disorder, attention and memory impairment. By the cardiovascular system: heartache, tachyarrhythmias, blood pressure lability; by the nervous system: tics, skin sensitivity disorders; by the respiratory system: bronchial spasms; by digestive system: nausea, abdominal pain, dyspepsia.

The development of magnesium deficiency in the body is due to social conditions and lifestyle, environmental conditions and dietary habits, various stressful situations and diseases.

The degree of absorption disorders depends on the rate and reversibility of the damage during the digestive tract. The development of the pathology of the gastrointestinal tract in its pathogenesis goes the way from minimal, reverse, functional disorders to organic pathological changes. According to specialized literature, the autonomic imbalance of the body is an important pathogenetic component in the development of many functional and organic disorders of the digestive system. Thus, the identification of magnesium deficiency and its effect on the development of autonomic dysfunction can help in the early correction of these disorders and reduce the frequency of chronic diseases of the gastrointestinal tract in children.

Considering the large biological role of magnesium and its participation in many biochemical processes of the body, timely detection and correction of magnesium deficiency allows preventing the development of severe course and complications of existing pathological conditions, including GERD.

Materials and methods. For the study 77 people aged 9 to 14 years, who has gastroesophageal reflux disease with endoscopically positive diagnostic result, were examined. All children who were involved in the study underwent laboratory tests of serum magnesium, intracellular (erythrocyte) magnesium, and calcium levels. The ratio of calcium and intracellular magnesium was also considered as an indicator of latent magnesium deficiency. Magnesium levels in patients with GERD were compared with control group,

which consisted of 20 children without GERD. The odds ratio and confidence intervals for a large number of anamnestic, clinical and instrumental factors of GERD were calculated to determine significant prognostic factors for the development of magnesium deficiency, after which the indicators of the relative risk and the minimum and maximum predictive coefficients for these factors were determined. Based on the indicators of the minimum and maximum prognostic coefficient, a range of the probability of magnesium deficiency in patients with GERD was formed.

The aim of the work. To identify the factors of GERD in children and adolescents that are important for predicting the development of magnesium deficiency.

Results. Levels of serum, erythrocyte magnesium and $\text{Ca/Mg}_{\text{erythrocyte}}$ ratio in children who were in good health ($n = 20$) were used to calculate the standard deviation (δ), and to determine the corridors of laboratory parameters (Table 1), which corresponded to normal magnesium levels, indicators of latent deficiency (from δ to 2δ) and indicators of magnesium deficiency (more than 2δ). The erythrocyte magnesium index in the control group was 2.11 ± 0.4 mmol/l, and the Ca/M ratio was 1.18 ± 0.18 .

Table 1 - Corridors of determining the level of erythrocyte magnesium and the ratio of $\text{Ca/Mg}_{\text{erythrocyte}}$

	Norm	Latent magnesium deficiency	Magnesium deficiency
Erythrocyte Mg (mmol/l)	1.71-2.51	1.31-1.7	1.3 and less
$\text{Ca/Mg}_{\text{erythrocyte}}$ ratio (conv. unit)	1-1.36	1.37-1.54	1.55 and more

Based on these data in children with GERD, the level of magnesium in the body was analyzed.

51% of children with normal magnesium levels, 22% of children with latent deficiency and 27% of children with magnesium deficiency were found (Fig. 1).

After analyzing children with GERD in the ratio of $\text{Ca/Mg}_{\text{erythrocyte}}$ (Fig. 2), the following data were obtained.

The number of patients with a normal magnesium level is 42% (as opposed to 51% compared with erythrocyte magnesium level), 19% with $\text{Ca/Mg}_{\text{erythrocyte}}$ ratio, which correspond to latent magnesium deficiency (as opposed to 22%), and 39% children with magnesium deficiency (27% compared with erythrocyte magnesium).

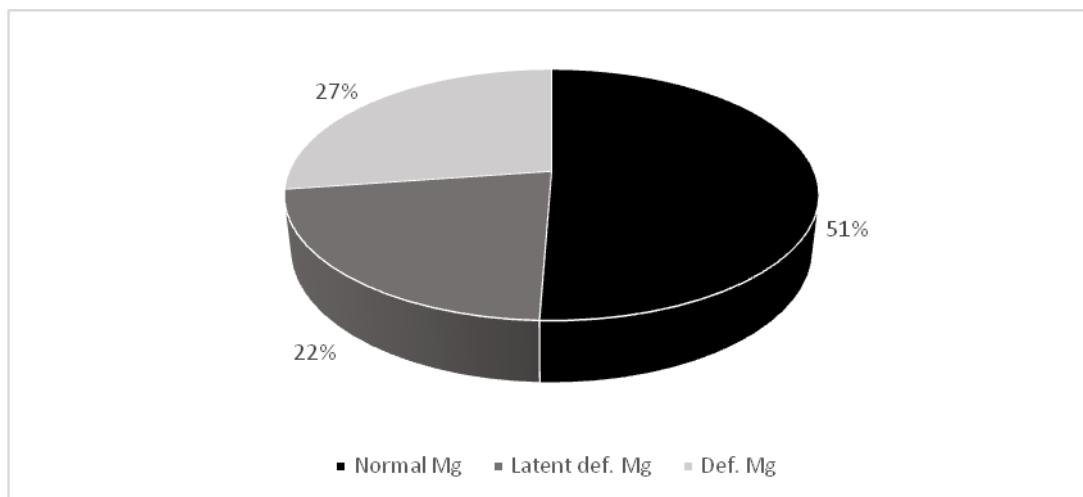


Fig. 1 - The ratio of the number of children in the main group with normal levels, latent deficiency and magnesium deficiency in parameters of erythrocyte magnesium

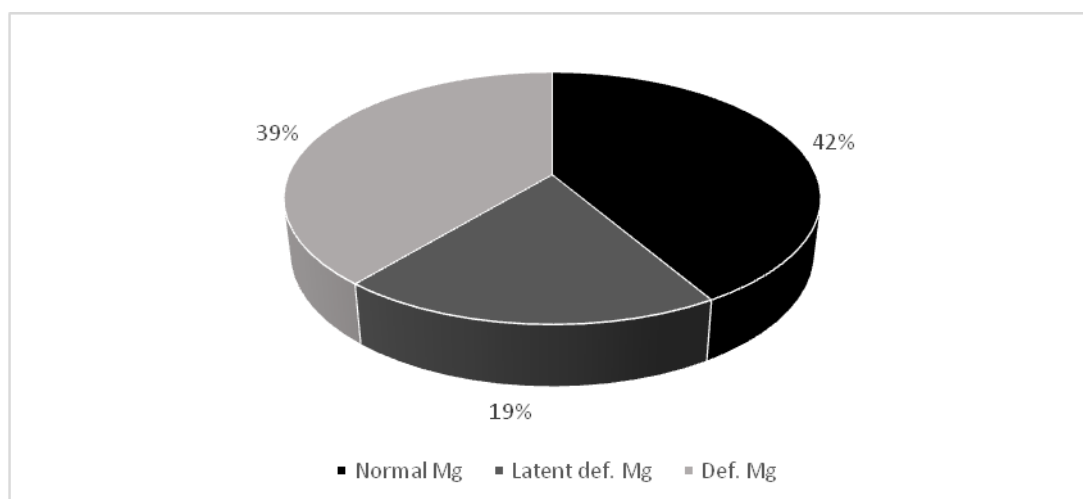


Fig. 2 - The ratio of the number of children in the main group with normal levels, latent deficiency and magnesium deficiency in the analysis of the ratio of $Ca/Mg_{erythrocyte}$.

Thus, based on the obtained and literature data on the accuracy of the use of the ratio $Ca/Mg_{erythrocyte}$ to assess the latent and evident magnesium deficiency, we used this indicator in the study.

To predict the development of magnesium deficiency in children with GERD, the odds ratio and trusted intervals for many factors were calculated (Table 2). Sex, age of the patient, the main symptoms of gastroesophageal reflux disease and their numerosity, results of instrumental research methods (EGD, pH-metry test, ECG) were considered in the study.

Table 2. The ratio of the chances of developing magnesium deficiency in children of the main group

	Children with GERD (n=77)				Odds ratio	TI-	TI+
	Normal Mg level (Ca/Mg _{erythrocyte} 1.0 – 1.36) n=32		Latent and evident magnesium Mg deficiency (Ca/Mg _{erythrocyte} > 1.36) n=45				
	Yes	No	Yes	No			
1	2	3	4	5	6	7	8
Sex:							
Girls	12	20	20	25	1.33	0.53	3.37
Boys	20	12	25	20	0.75	0.3	1.89
Age:							
9-14 years old	14	18	14	31	0.58	0.23	1.49
15-17 years old	18	14	31	14	1.72	0.67	4.41
Symptoms:							
Heartburn	25	7	39	6	1.82	0.55	6.05
Nausea	14	18	25	20	1.61	0.64	4.0
Eructation	15	17	17	28	0.69	0.27	1.73
Lump in the throat	5	27	4	41	0.53	0.13	2.14
Heaviness in the abdomen	4	28	12	33	2.55	0.74	8.78
Stomach ache	5	27	15	30	2.7	0.87	8.42
Astheno-neurotic symptoms	20	12	19	26	0.44	0.17	1.11
Number of complaints:							
1-2 complaints	14	18	19	26	0.94	0.38	2.35
3-4 complaints	17	15	22	23	0.84	0.34	2.09
5-7 complaints	1	31	4	41	3.02	0.32	28.42
Acidity:							
Normoacidity	22	10	19	26	0.33	0.13	0.86
Hyperacidity	6	26	20	25	3.47	1.2	10.05
Hypoacidity	4	28	6	39	1.08	0.28	4.18
Esophageal damage:							
1 grade of reflux esophagitis	31	1	14	31	0.01	0.001	0.12
2-3 grade of reflux esophagitis	1	31	31	14	68.64	8.5	554.41
Catarrhal gastritis	31	1	39	6	0.21	0.02	1.83
Erosive gastritis	1	31	5	40	3.88	0.43	34.89
Duodenogastric reflux	6	26	13	32	1.76	0.59	5.27
H.pylory	12	20	18	27	1.11	0.44	2.82

1	2	3	4	5	6	7	8
Duration of illness:							
The disease was detected for the first time	5	27	6	39	0.83	0.23	3.0
Duration 1-3 years	17	15	32	13	2.17	0.84	5.6
3 and more years	10	22	7	38	0.41	0.13	1.22
BMI (body mass index):							
P 25-75	14	18	19	26	0.94	0.38	2.35
Less than P 25	4	28	8	37	1.51	0.41	5.54
More than P 75	14	18	18	27	0.86	0.34	2.15
QTc interval							
Up to 420 mc	28	4	35	10	0.5	0.14	1.77
More than 420 mc	4	28	10	35	2.0	0.57	7.06

Among the many factors listed, the following were selected for further analysis: hyperacidity (pH 0.86 - 1.59), which had odds ratio of 3.47 and reflux esophagitis of 2-3 grades with an odds ratio of 68.64. Patients with erosive gastritis were not considered (although this symptom had odds ratio of 3.88). Patients with erosive gastritis were considered in the group of children with hyperacidity.

The calculation of the odds ratio of developing magnesium deficiency was also performed for main temporal and spectral indicators of HRV analysis (Table 3). For further analysis, HRV indicators were used, which had odds ratio higher than 3.0. These indicators were: increase in LF and HF during the day and night, increase in the daily LF/HF ratio, increase in the stress index, increase in PAPR and average circadian index.

Table 3 - The ratio of the odds of indicators of HRV in the development of magnesium deficiency in children of the main group

	Children with GERD (n=77)				Odds ratio	TI-	TI+
	Normal Mg level (Ca/Mg _{erythrocyte} 1.0 - 1.36) n=32		Latent and evident magnesium Mg deficiency (Ca/Mg _{erythrocyte} > 1.36) n=45				
	Yes	No	Yes	No			
1	2	3	4	5	6	7	8
LF day							
LF day <64.15	19	13	12	33	0.25	0.09	0.65
LF day 64.16-67.33	4	28	8	37	1.51	0.41	5.54
LF day >67.34	9	23	25	20	3.19	1.21	8.42

1	2	3	4	5	6	7	8
LF night							
LF night <40.35	5	27	1	44	0.12	0.01	1.11
LF night 40.36-45.91	7	25	1	44	0.08	0.01	0.07
LF night >45.92	20	12	43	2	12.9	2.64	63.14
HF day							
HF day <27.16	5	27	18	27	3.6	1.17	11.09
HF day 27.17-41.36	19	3	23	22	0.17	0.04	0.64
HF day >41.37	8	24	4	41	0.29	0.08	1.08
HF night							
HF night <50.9	21	11	40	5	4.19	1.29	13.66
HF night 51.0-56.84	4	28	2	43	0.33	0.06	1.9
HF night >56.85	7	25	3	42	0.26	0.06	1.08
LF/HF day							
LF/HF day <1.89	18	14	6	39	0.12	0.04	0.36
LF/HF day 1.9-2.21	9	23	11	34	0.83	0.3	2.31
LF/HF day > 2.22	5	27	28	17	8.89	2.88	27.5
LF/HF night							
LF/HF night < 0.8	7	25	1	44	0.08	0.01	0.7
LF/HF night 0.81-0.9	6	26	1	44	0.1	0.01	0.86
LF/HF night >0.91	19	3	43	2	3.39	0.52	22.0
SI day							
SI day <32.9	16	6	5	40	0.05	0.01	0.18
SI day 33-40.3	9	23	6	39	0.39	0.12	1.25
SI day > 40.4	7	25	34	11	11.04	3.75	32.48
SI night							
SI night < 14.8	2	30	4	41	1.46	0.25	8.52
SI night 14.9-16.6	2	30	4	41	1.46	0.25	8.52
SI night > 16.7	28	4	37	8	0.66	0.18	2.42
PAPR day							
PAPR day <33	13	19	6	39	0.22	0.07	0.68
PAPR day 33.1-36.7	13	19	8	37	0.32	0.11	0.89
PAPR day >36.8	6	26	31	14	9.6	3.23	28.52
PAPR night							
PAPR night <21.5	3	29	6	39	1.49	0.34	6.45
PAPR night 21.6-24.1	1	31	6	39	4.77	0.55	41.73
PAPR night >24.2	28	4	33	12	0.39	0.11	1.36
CI							
Less than 1.2 conv. unit	10	22	7	38	0.41	0.13	1.22
1.2-1.4 conv. unit	17	15	35	10	3.09	1.15	8.29
More than 1.4 conv. unit	5	27	3	42	0.39	0.09	1.75

After determining the GERD factors that had the highest odds ratio for predicting the development of magnesium deficiency, the relative risk indicators and the minimum and maximum prognostic coefficients for these factors were determined (Table 4).

Table 4 - Selected factors for the prediction of magnesium deficiency during GERD

Factor	OR	Xmin	Xmax
Hyperacidity	3.47	1.3	3.12
2-3 grade of reflux esophagitis	68.64	1.7	36.5
LF day > 67.34	3.19	1.3	2.5
LF night > 45.92	12.90	1.2	1.8
HF day < 27.16	3.60	1.3	3.4
HF night < 50.9	4.19	1.1	1.5
LF/HF day > 2.22	8.89	1.5	5.8
SI day > 40.4	11.04	1.4	4.9
PAPR day > 36.8	9.60	1.4	5.3
CI 1.2-1.39	3.09	1.2	1.7

Based on the indicators of the minimum and maximum prognostic coefficient, the range of probability of magnesium deficiency in patients with GERD from 13.3 to 66.5 was formed. This range was divided into the three parts (Table 5).

Table 5 - Ranges of probability of magnesium deficiency in GERD

Probability	Points
Mild	13.3-31.0
Medium	31.1-48.8
High	48.9-66.5

With the sum of the prognostic coefficients of each significant factor from 13.3 to 31.0, the probability of magnesium deficiency is weak; the range from 31.1 to 48.8 is the average probability, and the range from 48.9 to 66.5 indicates a significant probability that a patient with GERD has magnesium deficiency.

Conclusions. Among the children with GERD who participated in the study in almost half of the cases magnesium deficiency with varying grades was found. It is noteworthy that the analysis of erythrocyte magnesium showed a latent deficiency in 22%, and a significant magnesium deficiency in 27% children with GERD, while using the ratio $\text{Ca}/\text{Mg}_{\text{erythrocyte}}$, the latent deficiency in 19% and a significant deficiency in 39%. The obtained data testified to the greater accuracy of using the $\text{Ca}/\text{Mg}_{\text{erythrocyte}}$ ratio to assess latent and evident magnesium deficiency.

There was also a significant prevalence of magnesium deficiency in children with GERD. Factors of the course of GERD that can be used as prognostic factors for magnesium deficiency have been identified. Such factors include hyperacidity (pH 0.86 - 1.59), the reflux

esophagitis 2-3 grades, increase in daytime and night time LF and HF, increase in the daily ratio of LF/HF, increase in stress index, increase PAPR and circadian index averages.

The indicators of the minimum and maximum prognostic coefficient for these factors were calculated and the range of probability of magnesium deficiency in patients with GERD was formed, which was divided into mild, medium and high probability of magnesium deficiency.

Financing. The study has been performed in the framework of the planned research scientific work of the Children's Diseases Department of ZSMU titled "The peculiarities of the development of diseases and the elaboration of the programs of rational nutrition, of therapeutic and rehabilitation measures improvement, and of prevention of distresses in children of different age, who reside in an industrial city" state registration № 114U001397.

Conflict of interests: none.

References

1. Marushko Yu.V and co-authors. Correction of lack of magnesium in children and adolescents with asthenic syndrome and primary arterial hypertension. Rational pharmacotherapy №3. 2016; (40):35-48.
2. Beketova G, Gnatenko T. Magnesium and health of children: what is the news? Shupyk National Medical Academy of Post-Graduate Education, Kyiv, Ukraine. 2016;4(4):604-620.
3. Boiarskaia L.N., Potapenko S.V. Optimization of pathogenetic therapy of gastroesophageal reflux disease in children. Modern pediatrics. 2017;4(84):86-90; doi 10.15574/SP.2017.84.86.
4. Kryuchko T.O. Features of extraesophageal manifestations of gastroesophageal reflux disease in children. Child health. 2013; 4(47): 16-19.
5. DiNicolantonio J.J., O'Keefe J.H., Wilson W. Subclinical magnesium deficiency: a principal driver of cardiovascular disease and a public health crisis. Open Heart. 2018;5:e000668. doi: 10.1136/openhrt-2017-000668.