Doktori (PhD) - értekezés

The role of evidence-based medicine in the education of medical and health science students and its practical application in assessing children's dietary intake

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Abbreviations

BMR: basal metabolic rate

EBM: evidence-based medicine

EBP: evidence-based practice

EFSA: European Food Safety Authority

EI: energy intake

FA: fatty acids

RDA: recommended daily allowances

SD: standard deviatio

I. INTRODUCTION

Approaches to evidence-based practice in childhood nutrition

Adequate nutrition is essential for children's growth and development. Inadequate intake of energy and nutrients may predispose children to a wide range health related problems, such as are obesity, dental caries or even poor academic achievement [1]. Non-communicable diseases (like type-2 diabetes, hypertension and cardiovascular disease) have become worldwide leading health issues during the past few decades; it has been convincingly demonstrated that these chronic diseases might be linked to childhood diet [2-6]. The dietary habits acquired in childhood often persist later in life [7]; therefore, improving children's food choices at the preschool age might be crucial to influence food choices later in life [8]. Parents are important gatekeepers in influencing and developing children's eating habits [9]. Consequently, parents represent a major target group for communication on nutritional properties and health effects of foods. Parents need a timely, consistent and **evidence-based information** in different formats for rational decision making about food choices.

Even for modern parents, it is difficult to obtain appropriate information about healthy nutrition of their children. In the past, family members and relatives helped for the young parents how to look after their children. The social structure and workstyle changed, the grandparents are later retired. There is an increased number of single-parent households, nuclear families and pregnancies at advanced age worldwide. Parents have to gain the knowledge more often alone, than before. Many parents utilize the Internet to seek information and support regarding healthy nutrition of their children and parenting. Mothers with infants and young children are often isolated, but their needs for information and advice did not disappeared. Nowadays internet fills this gap. There are many options available to collect information: web-based parents' communities, bulletin boards, email threads, blogs, mobile device applications, social networking site communities. Parents get immediate affirmation, support, and answers to their (often anonym) questions. [10]. However, it is often difficult for parents to differentiate between nonscientific opinions, anecdotes and evidence-based nutritional information. Although misinformation is present in all health disciplines, this phenomenon is even more pronounced in the area of nutrition, as everybody has first-hand experience about nutrition and food [11].

Parents have regularly contact with their regional health visitor and their pediatrician. These health care professionals have an important role to improve the parents nutritional knowledge. Health care professionals can help to filter the nutrition information that parents receive to translate it into healthy eating behaviour.

For future nutrition interventions we have to search for new ways. Furthermore, it is important health care professionals to understand their important role for effectiveness for future nutrition interventions already. This is only possible with health care professionals with evidence-based knowledge.

Decision making in nutrition should be based on available scientific evidence. Important pillars of evidence-based practice in nutrition are systematic reviews, nutrient intake recommendations and dietary guidelines, as well as clinical practice guidelines [12], food standards and health claims. Systematic reviews follow a predefined methodology to systematically collect, appraise and summarize body of evidence on a reserch question. They might provide evidence-based information about the effectiveness and potential harms of a nutritional intervention, or to estimate the burden of a nutrition-related disease. Nutrient intake recommendations define reference levels for nutrients, while dietary guidelines set the types and amounts of foods to be consumed to meet daily nutrient needs and reduce the risk of developing chronic diseases. Clinical practice guidelines translate evidence to those working in the practice.

Recommendations for nutrient intakes are important in population health risk assessment and health research. Both suboptimal and accessive nutrient intakes might have health consequences. Within any life stage group, nutrient requirements vary. Nutrient requirements differ with age, sex and physiological condition, due to differences in the velocity of growth for the younger age groups, and age-related changes in nutrient absorption and body functions and/or functional capacity later in life. Recommendations for nutrient intakes are developed for different life stage and sex groups. Dietary requirements can be used for different goals: such as a basis for diet assessment and diet planning, food labelling, and for establishing food based dietary guidelines [13]. According to a request from the European Commission, the EFSA Panel on Dietetic Products, Nutrition and Allergies delivered a Scientific Opinion on the nutrient requirements and dietary intakes of infants and young children in the European Union. This Opinion describes the dietary requirements of infants and young children, compares dietary intakes and requirements in infants and young children in Europe. These dietary requirements are considered adequate for the majority of infants and young children, and

evaluated the risk of inadequate nutrient intakes in infants and young children in living Europe [14].

In our study, each child's average daily intake was compared to the Hungarian national recommendations [15] and to the recommendations of the European Food Safety Authority [13, 14] according to age group and gender. Although both recommendations are displayed, the comparisons- since they are from the data of Hungarian children- were basically compared to the Hungarian recommendation. The EFSA recommendation only provides additional information

Role of health care professionals in evidence-based healthcare

Using evidence-based medicine (EBM) in daily medical and health care practice represents an essential element of developed health care systems. Ideally, in countries with evidence-based practice (EBP), the knowledge generated in clinical trials is timely incorporated into clinical guidelines and serves as a pillar of professional bedside decision making [16]. For successful implementation of EBP, ideas of EBM should become an integral part of the thinking of health care providers at all levels; moreover, besides their adequate knowledge of EBM it is also important that health care professionals possess the willingness and ability to use the acquired knowledge in the daily practice, when making actual decisions about the therapy of patients.

Although EBM is now an accepted part of clinical practice, there are still opposing views: while supporters emphasize facilitated and improved healthcare decisions, which result in a smaller variability in quality of health care provided by different practitioners, the critics take the position that EBM is "cookbook medicine", that it is unable to account for individual patient factors and neglects personal professional experiences [17]. Another potential problem is that health care providers are often not properly trained to implement the evidence [18, 19].

A decade ago the Hungarian EBM working group (developed into Cochrane Hungary), was one of the ten partners who participated in the EU EBM TTT project funded by the European Union. Their goal was to harmonise EBM learning and teaching across the European healthcare sector and to encourage trainers to learn effective teaching methods for tutoring application of EBM in various clinical settings [20]. Cochrane Hungary was founded in 2014 with the aim to provide postgraduate training to healthcare

practitioners and to support the understanding of the aims of Cochrane and relevance of EBM among various professionals working at all levels of healthcare.

Currently in Hungary, EBM is taught to students of medicine and health sciences mostly within the framework of facultative courses. However, during the basic, preclinical and clinical modules of healthcare education there are also several courses which do not have EBM training in their main focus. Nevertheless, these courses incorporate the principles of EBM and teach many EBM-related terms.

However, the attitudes, knowledge and skills of future health care provides, i.e. students of medical and health sciences faculties towards EBM have not been investigated so far, although proper theoretical and practical knowledge about EBM is essential for the realisation of EBP in the near future in Hungary.

II. AIMS

II./1. Dietary Energy and Nutrient Intake of Healthy Pre-School Children in Hungary

The aim of this repeated cross-sectional study was to investigate food consumption, including intakes of energy and macro- and micronutrients, in children attending a kindergarten in Hungary and compare the values observed with the current evidence-based recommendations.

II./2. Self-reported attitudes, knowledge and skills of using evidence-based medicine among students of medicine and health sciences in Hungary

Primary aim of this cross-sectional dietary survey was to evaluate the attitudes, knowledge and skills of students of medicine and health sciences shortly before they finish their studies and start to work as a health care professional. In addition, it aimed to compare data to those obtained in similar students right at the beginning of their university studies.

Secondary aim of this survey was to answer the question to what extent participation in an EBM course during the studies of medicine or health sciences can improve using EBM-related knowledge and skills in the daily health care practice and can change attitudes of students of medicine and health sciences towards evidence based medicine.

III. MATERIALS AND METHODS

III./1. Dietary Energy and Nutrient Intake of Healthy Pre-School Children in Hungary

III./1./1. Study design and setting

The data were collected in 2013 and 2016 in the baseline phase of two randomized controlled trials (2013–2014: NCT03241355 [21] and 2016–2017: NCT03457688). This way, the data correspond to a repeated cross-sectional study.

III./1./2. Participants

The parents of healthy children, who were attending a kindergarten in one of five Hungarian cities (Pécs, Győr, Mohács, Szeged and Szekszárd) and volunteering for one out of two consecutive prebiotic supplementation studies coordinated by our research group, were approached. The exclusion criteria were: congenital disease or malformation influencing the gastrointestinal system, immunodeficiency, food intolerance, food allergy or metabolic disorder requiring a special diet; regular (> three times per week) consumption of products or food supplements containing prebiotics or probiotics, antibiotic or laxative treatment; and/or any infectious disease within 14 days at the time of pre-examination. We have sent for the kindergartens poster about our study (Appendix A1). Information consent for the parents was handed out (Appendix A2).

III./1./3. Three-day food-record diary

The parents were asked to fill in a three-day food-record diary (Appendix A3) and to record the quantitative data for all foods and beverages consumed by their children on two non-consecutive working days and on one weekend day (e.g, Sunday or Saturday). The three-day diary was filled in three times during the supplementation study; however, for the purpose of the crosssectional dietary survey, we only used data from the diaries filled in at the very start of the studies. The information was collected in November to December in 2013 and in September to November in 2016.

The parents were asked not to change the eating habits of the child during the study and to record all foods and drinks consumed by the child with the precise amount of the consumed portions. In the three-day food-record diary, each day, information had to be provided on the type of foods and beverages (including water) consumed by the

child on the given day (starting from the time of waking up and proceeding chronologically until the time of going to sleep). The foods were to be described in detail, including preparation methods and brands when relevant, as well as the amounts consumed.

If necessary, a qualified, skilled dietician discussed the food item data with the parents. The nursery staff was also involved into the study in order to receive proper information about food items and portion sizes consumed during the day in the kindergarten.

III./1./4. Data analysis

The energy and nutrient intake calculations were performed with NutriComp Étrend Sport 4.0 software (NutriComp Health and Nutrition Co., Budapest, Hungary) This software includes a wide range of foods available on the market and consumed in Hungary; however, also, other food items can further be added to the database. The software was validated and effectively used already in other dietary surveys in Hungary [22, 23]

The average intakes over the three days were calculated to represent the observed intake distributions. The dietary data included nutrient intake estimates from foods (both naturally present and fortified) and drinks only and excluded nutrient intake estimates contributed by any dietary supplements.

The children's height and weight were recorded with children standing barefoot in light clothing. The ratio of calculated energy intake (EI) and estimated basal metabolic rate (BMR) was used to check the subjects for misreporting. BMR was calculated according to the Hungarian recommendation [24]. The record was excluded if the EI/BMR ratio was lower than 1.1 or higher than 2.7, according to the method of Goldberg et al. [25]. The statistical analysis was performed by SPSS 20.0 (IBM). Each child's average daily intake was compared to the Hungarian national recommendations [15] and to the recommendations of the European Food Safety Authority [13, 14]. Although both recommendations are displayed, the comparisons- since they are from the data of Hungarian children- were basically compared to the Hungarian recommendation. The EFSA recommendation only provides additional information.

Seventy percent of the Hungarian RDA was defined as the lower border (potentially inadequate), whereas 130 percent of the RDA was defined as the higher border (excessive intake) to determine the extreme level of daily nutrient intake of

subjects according to the method of the Institute of Medicine in the United States of America [26].

The descriptive statistics were generated and presented in order to show the mean intakes of nutrients and the proportion with adequate intakes. The results in the tables were expressed as mean, standard deviation (SD) and percentage values of the appropriate variables [27].

Two age groups were formed according to the categories of the Hungarian national nutrient recommendations: 2.5- to 4-year old children (including all children prior to four years of age at the time of the examination) and children aged 4 to 6 years (i.e., over four years but prior to seven years of age).

III./1./5. Ethical approval

The prebiotic supplementation trials where these cross-sectional data were obtained were approved by the Scientific and Research Ethics Committee of the Medical Research Council, Budapest, Hungary (STUDY I: 40564-3/2013/EKU and STUDY II: 34458-1/2016/EKU). Children were included in the study after their parents have provided written informed consent.

III./2. Self-reported attitudes, knowledge and skills of using evidence-based medicine among students of medicine and health sciences in Hungary

III./2./1. Study design and setting

This cross-sectional survey was conducted online between February and May 2019 at every Hungarian medical and health sciences faculties.

III./2./2. Participants

All medical students studying in one of the four medical faculties in Hungary–namely, 1) University of Pécs, Medical School, Pécs; 2) Semmelweis University, Faculty of Medicine, Budapest; 3) University of Debrecen, Faculty of Medicine, Debrecen and 4) University of Szeged, Faculty of Medicine, Szeged–were eligible to participate in this survey.

All students studying health sciences in seven institutions–namely, 1) University of Pécs, Faculty of Health Sciences, Pécs; 2) Semmelweis University, Faculty of Health Sciences, Budapest; 3) University of Debrecen, Faculty of Health, Nyíregyháza; 4) University of Szeged, Faculty of Health Sciences and Social Studies, Szeged; 5) University of Miskolc, Faculty of Health Care, Miskolc; 6) Gál Ferenc College, Faculty of Health and Social Sciences, Gyula; 7) Széchenyi István University, Petz Lajos Institute of Health and Social Studies, Győr–were also eligible to participate in this survey.

Although there are medical and health sciences programs available in English and German at these Hungarian universities, in the frame of the present survey we wanted to obtain information about attitudes, knowledge and skills of Hungarian students studying in the Hungarian programs. Therefore, questionnaires were mailed only to these students, in the Hungarian language. No further exclusions were made.

III./2./3. Questionnaire and outcomes

The questionnaire (Appendix B2 and Appendix B3) was developed by Szimonetta Lohner using ideas from similar questionnaires [28-33]. The content of these questionnaires was adapted to the target population of this survey and own teaching experience was also incorporated.

The questionnaire was divided into four main parts. The first part included questions regarding the background of the participating student filling in the

questionnaire, including the name of the University, the class (year of studies), information on a background with practical work in health care, participation in research activity as member of the Scientific Students' Associations or having a close family member working in health care. The question regarding the participation in a course where EBM was taught was listed among the background questions, therefore students were not aware that this question was one of the main outcomes of the study. Students were also asked which source (printed and online resources, books, journals, professional guidelines etc.) do they consider as their main source of healthcare information retrieval and which search engines have they already used for the retrieval of health care information.

In the second part, students had to self-evaluate their EBM skills, i.e. how experienced they are in identifying patient-relevant questions, locating relevant scientific literature, using online databases for searching and in critical appraisal of already located scientific literature.

In the third part of the questionnaire, important terms of EBM were listed and students had to self-evaluate their knowledge on a 5-point categorical scale. The five ratings were: (1) I understand and I could explain to others; (2) Some understanding; (3) I do not understand, but would like to understand; (4) I do not understand, but I think, it wouldn't be helpful to me to understand; (5) No idea about this.

In the fourth part, attitudes towards using EBM in their future work as a health care professional were evaluated. Statements on the importance of EBM for the practical work and for patients to receive the optimal treatment were listed, and students had to evaluate on a 5-point scale ranging from strongly disagree to strongly agree about their judgements. Statements included also considerations whether evidence-based healthcare incorporates the personal expertise of physicians and the views and preferences of patients, and what extent of burden the application of EBM might mean to health care professionals in the daily routine patient care.

III./2./4. Pilot testing of the survey

A pre-test was done in a small group (n = 8) of medical students in order to make sure that the

study population understood the questions. Study team members and students discussed questions in detail and questions were reformulated, if this was found to be necessary.

III./2./5. Recruitment, survey administration and data collection

Students were invited to participate in the survey via internal mailing systems of the universities. In the inviting e-mails they received the information that the survey was conducted by Cochrane Hungary with the main aim to receive information about the incorporation of EBM into the Hungarian medical and health sciences education. No further details were provided.

Moreover, small leaflets (Appendix B1) containing the title and the QR barcode of the questionnaire were distributed among students. In the cities of Pécs and Budapest an information day was held by the study team, where students received not only QR barcodes, but those students without smartphones were also offered the opportunity to fill in the questionnaire on paper instead of the electronic version.

Students were offered to follow a link to the questionnaire website. On the website they were asked to provide informed consent according to the EU General Data Protection Regulation. Only participants providing informed consent were allowed to fill out the questionnaire. Students of medical or health sciences faculties received different links; their questionnaire differed slightly, mainly in the introductory questions.

To encourage honest and transparent responses of the students, anonymity was ensured. Individual data were identified by assigning a unique identification number based on the time point of filling in the questionnaires.

Specific terms to be evaluated were provided in the questionnaire not only in Hungarian, but in parentheses also in English. Terms were listed in alphabetical order.

Data were captured via a Hungarian electronic surface developed for capturing online questionnaires, storing the data obtained from students and enabling a structured export of collected data to Excel and SPSS (http://online-kerdoiv.com/).

III./2./6. Data analysis

Data were first exported to Excel, in that one line represented answers of one person. Data were analysed using SPSS version 22 (SPSS INC., Chicago, IL, USA); descriptive statistics were calculated for each item. Outcomes for EBM-trained and non-trained students were compared with Mann-Whitney test after rejecting the null hypothesis of Shapiro-Wilk test of normal distribution, in case of quantitative variables. For variables expressed as percentages, Pearson Chi-square test was used. We explored possible associations between certain baseline variables and the attitudes, knowledge and skills by

logistic regression models. All results with a significance level of $p < 0.05$ were considered statistically significant.

III./2./7. Ethical approval

The study was approved by the Scientific and Research Ethics Committee of the Medical Research Council, Budapest, Hungary (60826-1/2018/EKU). Written consent was obtained from the university leaders to conduct the survey.

IV. RESULTS

IV./1. Dietary Energy and Nutrient Intake of Healthy Pre-School Children in Hungary

In 2013, from a total of 219 applicants, 209 children started the study and filled in the three-day food-record diary. Then, 16 children (eight percent) were excluded as possible under-reporters and 7 children (three percent) as possible over-reporters. Finally, 186 (85 percent) children had valid, reliable data suitable for statistical analysis. The final sample (n = 186) consisted of 51 children aged 2.5 to 4 years and 135 children aged 4 to 6 years. The gender distribution was 91 girls to 95 boys. In 2016, out of 942 applicants, 782 children started the study. Then, 19 children (two percent) were excluded as possible under-reporters and 17 (two percent) children as over-reporters. Finally, 556 participants (300 boys and 256 girls) had valid, reliable results suitable for statistical analysis. Of these children, 148 children were 2.5 to 4 years old, and 408 children were 4 to 6 years old at the beginning of the study. All the children attended kindergarten five days per week in both studies.

IV./1.1. Energy and Macronutrient Intakes

The mean daily energy and nutrient intake of children is shown in detail in Tables 1 and 2.

The percentages of children with excessive, adequate or insufficient nutrient intakes are shown in detail in Tables 3 and 4.

Table 1. Dietary energy and nutrient intake of healthy, 2.5- to 4-year-old pre-school children in Hungary.

Daily Energy/Nutrient Intake	Survey in 2013 2.5–4 Years (*n* = 51) Mean Age: 3.3 Years Min Age: 2.6 Years Max Age: 3.9 Years		Survey in 2016 2.5–4 Years (*n* = 148) Mean Age: 3.4 Years Min Age: 2.9 Years Max Age: 3.9 Years		Hungarian Recommendation 1–3 Years	EFSA Recommendation* 1–3 Years
	Mean	**SD**	**Mean**	**SD**		
Energy (kcal)	**1435**	237	1579	263	1350	4.75 MJ/day, at PAL = 1.4
Protein (g)	52	10	58	12	43	0.9 g/kg bw/d
Protein (E%)	15	3	15	3	13	-
Fat (g)	49	12	58	13	44	-
Fat (E%)	32	8	34	8	30	35–40
Carbohydrate (g)	194	35	202	40	188	121–161
Carbohydrate (E%)	55	10	52	10	57	45–60
Cholesterol (mg)	177	70	212	64	135	no data
Dietary fiber (g)	19	28	16	5	15	10
Water (mL)	1088	287	1034	719	1300	1300
Sugar (E%)	11	5	11	4	10	10
Sodium (mg)	2355	703	3162	767	500	400
Potassium (mg)	1979	469	1946	436	1000	800
Calcium (mg)	627	256	603	219	800	**450**
Phosphorus (mg)	781	183	808	172	620	250
Iron (mg)	11	33	7	2	8	**7**
Copper (mg)	0.79	0.91	0.66	0.22	0.4	1
Zinc (mg)	5	2	6	2	5	**4.3**
Magnesium (mg)	253	74	244	53	150	230
Chromium (µg)	43	17	50	23	60	no data
Manganase (mg)	1.1	0.4	1.7	2.1	1.2	0.5
Retinol equivalent. (mg)	0.65	0.83	0.46	0.29	0.4	0.25
D vitamin (µg)	1.4	0.5	1.6	1.3	10	15
α-Tocopherol (mg)	11	4	9	3	6	9
Thiamine (µg)	777	222	749	212	500	**100 µg/MJ**
Riboflavin (µg)	1071	348	1052	316	800	**600**
Vitamin B_6-Pyridoxine (µg)	1284	829	1239	386	500	**600**
Cobalamin (µg)	2.4	1.6	2.5	1.6	0.7	1.5
Vitamin C (mg)	104	66	53	32	50	**20**
Niacin equivalent (mg)	18	5	9	3	9	**1.6 (mg NE/MJ)**
Folate (µg DFE)	122	49	102	44	100	**120**
Pantothenic acid (mg)	3	1	3	1	2	4

* PRIs are presented in **bold type** and AIs in ordinary type.

Table 2. Dietary energy and nutrient intakes of healthy, 4- to 6-year-old pre-school children in Hungary.

Daily Energy/Nutrient Intake	Survey in 2013 4–6 Years (*n* = 135) Mean Age: 5.27 Years Min Age: 4 Years Max Age: 6.62 Years		Survey in 2016 4–6 Years (*n* = 408) Mean Age: 5.3 Years Min Age: 4 Years Max Age: 6.9 Years		Hungarian Recommendation 4–6 Years	EFSA Recommandation* 4–6 Years
	Mean	SD	Mean	SD		
Energy (kcal)	**1503**	270	1689	305	1700	5.4 MJ/day day at PAL = 1.4
Protein (g)	55	11	63	12	54	0.85 g/kg bw/d
Protein (E%)	16	7	16	3	13	-
Fat (g)	49	10	63	15	55	-
Fat (E%)	30	5	35	8	30	20–35
Carbohydrate (g)	207	49	215	43	236	154–206
Carbohydrate (E%)	55	6	52	11	57	45–60
Cholesterol (mg)	192	79	232	75	170	no data
Dietary fiber (g)	14	5	18	10	19	14
Water (mL)	1092	298	1037	508	1600	1600
Sugar (E%)	12	5	10	4	10	10
Sodium (mg)	2497	730	3469	852	700	500
Potassium (mg)	1997	567	2096	505	1400	1100
Calcium (mg)	620	215	635	225	800	**800**
Phosphorus (mg)	783	177	855	179	620	440
Iron (mg)	14	39	8	2	8	**7**
Copper (mg)	0.7	0.5	0.7	0.3	0.6	1
Zinc (mg)	6	1	6	2	6	**5.5**
Magnesium (mg)	253	61	262	59	200	230
Chromium (µg)	46	22	53	22	80	no data
Manganase (mg)	1.1	0.4	1.7	1.2	1.7	1
Retinol equivalent (mg)	0.5	0.4	0.5	0.4	0.5	0.3
D vitamin (µg)	1.4	0.9	1.5	0.7	10	15
α-Tocopherol (mg)	17	46	9	3	7	9
Thiamine (µg)	816	259	781	220	700	**100 µg/MJ**
Riboflavin (µg)	1077	350	1104	339	1000	**700**
Vitamin B_6-Pyridoxine (µg)	1210	376	1349	441	600	**700**
Cobalamin (µg)	3.2	6.2	2.6	1.9	1	1.5
Vitamin C (mg)	87	67	56	34	50	**30**
Niacin equivalent (mg)	19	6	22	5	11	**1.6 (mg NE/MJ)**
Folate (µg DFE)	114	54	105	40	130	**140**
Pantothenic acid (mg)	3	2	3	1	3	4

* PRIs are presented in **bold type** and AIs in ordinary type.

Table 3. Percentage of children with excess, adequate or insufficient nutrient intake I.

Daily Energy/Nutrient Intake	Survey in 2013 2.5–4 Years (*n* = 51) Mean Age: 3.3 Years Min Age: 2.6 Years Max Age: 3.9 Years			Survey in 2016 2.5–4 Years (*n* = 148) Mean Age: 3.4 Years Min Age: 2.9 Years Max Age: 3.9 Years		
	Low	**Normal**	**High**	**Low**	**Normal**	**High**
Energy	0	100	0	1	72	27
Protein	0	61	39	0	46	54
Fat	6	63	31	1	45	54
Carbohydrate	0	94	6	1	88	11
Cholesterol	8	47	45	1	30	69
Dietary fiber	25	62	14	9	75	16
Daily fluid intake	22	75	4	44	54	2
Sugar	20	53	27	9	53	39
Sodium	0	0	100	0	0	100
Potassium	0	8	92	0	7	93
Calcium	39	57	4	46	49	5
Phosphorus	0	59	41	1	53	46
Iron	25	73	2	16	78	6
Copper	0	18	82	1	22	76
Zinc	12	73	16	5	67	28
Magnesium	2	18	80	0	18	82
Chromium	55	43	2	49	35	16
Manganase	24	65	12	14	51	35
Retinol equivalent	22	33	45	21	56	23
Vitamin D	100	0	0	99	1	1
Tocopherol	4	18	78	1	41	58
Thiamine	2	27	71	1	36	64
Riboflavin	2	53	45	5	48	47
Pyridoxine	0	0	100	0	5	95
Cobalamin	0	6	94	0	4	96
Vitamin C	8	24	69	32	39	28
Niacin equivalent	0	8	92	0	3	97
Folate	12	55	33	20	38	43
Pantothenic acid	2	45	53	5	50	45

Low: <70% reference value; Adequate: 70–130% reference value; High:> 130% reference value.

In 2013, the total mean daily energy intakes in 2.5- to 4-year-old children were fully appropriate when compared to the Hungarian recommended values adjusted for age. Three years later, in 2016, more than one fourth of the 2.5- to 4-year-old children had excessive daily energy intakes. Among the 4- to 6-year-old children, in 2016, approximately three times more children had high daily energy intakes than in 2013, according to the Hungarian recommendations.

Table 4. Percentage of children with excess, adequate or insufficient nutrient intake II.

Daily Energy/Nutrient Intake	Survey in 2013 4–6 Years (*n* = 135) Mean Age: 5.27 Years Min Age: 4 Years Max Age: 6.62 Years			Survey in 2016 4–6 Years (*n* = 408) Mean Age: 5.3 Years Min Age: 4 Years Max Age: 6.9 Years		
	Low	**Normal**	**High**	**Low**	**Normal**	**High**
Energy	10	88	2	3	90	7
Protein	4	89	7	0	74	26
Fat	14	84	2	3	73	25
Carbohydrate	20	75	5	12	86	2
Cholesterol	16	58	27	3	50	47
Dietary fiber	50	48	2	22	73	5
Daily fluid intake	59	39	1	68	31	1
Sugar	11	49	40	18	59	23
Sodium	0	0	100	0	0	100
Potassium	1	40	59	0	31	69
Calcium	43	54	3	39	55	6
Phosphorus	1	59	41	0	42	58
Iron	21	71	8	8	81	11
Copper	4	71	25	3	68	29
Zinc	16	75	9	10	76	14
Magnesium	1	59	41	0	51	48
Chromium	70	27	2	60	36	4
Manganase	65	34	1	29	58	13
Retinol equivalent	36	42	22	32	53	16
Vitamin D	100	0	0	100	0	0
Tocopherol	3	41	56	4	46	50
Thiamine	11	55	34	7	68	25
Riboflavin	7	75	19	9	65	26
Pyridoxine	1	7	92	0	6	94
Cobalamin	1	12	87	1	10	89
Vitamin C	23	30	47	28	41	31
Niacin equivalent	2	16	82	0	4	96
Folate	42	41	17	40	55	5
Pantothenic acid	25	66	9	19	69	12

Low: <70% reference value; Adequate: 70–130% reference value; High:> 130% reference value.

In both the age groups and in both the years investigated (2013 and 2016), the mean protein intakes were higher than the Hungarian recommended values. However, the high consumption of protein decreased with increasing age: in 2016, among the 2.5- to 4-year-old children, every second child and one quarter of the 4- to 6-year-old children had a high protein intake, respectively.

The fat consumption as a percentage of energy (E%) was between approximately 30–35 for both the age groups in both studies.

The cholesterol intakes were far above the Hungarian recommended values: 45 percent of the 2.5- to 4-year-old children had a high cholesterol intake in 2013 and 69 percent in 2016. In 2013, a total of 27 percent, and in 2016, a total of 47 percent of the 4- to 6-year-old children had a high cholesterol intake, respectively. Among the 2.5- to 4-year-old children, the mean daily fluid intakes were 22 percent lower than the recommendations; moreover, 44 percent of the 2.5- to 4-year-old children (2016) had insufficient daily fluid intakes (according to both Hungarian and EFSA recommendations.) While the Hungarian and EFSA recommendations on daily fluid intakes for 4- to 6-year-old children are obviously higher (1600 mL/day) than those for 2.5- to 4-year-old children (1300 mL/day), the mean intakes were almost exactly the same low in this age group (in 2013: 59 percent, in 2016: 68 percent).

In 2013, the sugar consumption was high by 27 percent, and in 2016, by 39 percent of the 2.5- to 4-year-old children. The result was not much better at the age of 4 to 6 years. In 2013, a total of 40 percent, and 23 percent of the children in 2016, had a high sugar intake (the Hungarian and EFSA recommendations for sugar intake are the same).

IV./1.2. Macroelements

All preschool children, without exception, had higher daily sodium intakes than the Hungarian and the EFSA recommendations. The sodium intakes in 2.5- to 4-yearold children in 2013 were almost five times higher than the corresponding Hungarian recommended daily sodium intakes (Table 1); in 2016, the corresponding values were more than six times higher than the recommendation (500 mg/day). In 4- to 6-year-old children in 2013, the mean daily sodium intakes were 3.5 times higher than the recommended daily intakes (700 mg/day), whereas in 2016, the corresponding values were approximately five times higher than the Hungarian recommendations.

Over nine out of ten of the 2.5- to 4-year-old children achieved the recommended daily potassium intakes in both studies according to both recommendations (Hungarian

and EFSA). In the 4- to 6-year-old age group, the mean daily potassium intakes in 2013 were higher than the recommendations in more than half of the children, whereas in 2016, the corresponding value was higher. In contrast, the daily calcium intakes were far below the Hungarian recommendation of 800 mg/day (for both the age groups) in both of the studies (Table 1). In 2016, in the 2.5- to 4-year-old children, the mean daily calcium intakes were low for 46 percent of them, whereas in the 4- to 6-year-old children, the corresponding value was 39 percent. The intakes of phosphorus were above the recommended value (EFSA and HRDA), and with increasing age, a slight increase in those exceeding the recommended daily intake was observed. In 2016, the mean daily intakes of magnesium were higher than the recommendation by 82 percent in the 2.5- to 4-year-old children and 48 percent in the 4- to 6-year-old children.

IV./1.3. Microelements

In 2016, the intakes of iron in over three quarters of the children in both age groups achieved the national recommendations. In 2016, the mean daily copper intakes of 76 percent of the 2.5- to 4-year-old children were higher than the Hungarian recommended intakes (0.4 mg/day). In over 29 percent of 4- to 6-year-old children, the intakes of copper were higher than the HRDA (0.6 mg/day). The results for 2013 were very similar to those seen in 2016. The mean daily zinc intake values were satisfactory at above 67 percent in each group in both studies compared to the Hungarian recommendations.

IV./1.4. Fat Soluble Vitamins

The recommendation for vitamin A (retinol) is formulated as the retinol equivalent (recently, the retinol activity unit): 1 RAU is equal to 1 μg retinol or 12 μg β-carotene. In 2016, the mean daily intakes for both 2.5- to 4-year-old and 4- to 6-year-old children met the recommendations; however, the individual daily intakes were low in 2016 for approximately 21 percent and were high for approximately 23 percent of the 2.5- to 4-year old children (Table 3) compared to the Hungarian recommendations. The corresponding values were 32 percent (low) and 16 percent (high) in the 4- to 6-year-old children (Table 4).

In 2013, we observed similar results. The mean daily intakes of calciferols were low for nearly the entity of the 2.5- to 4-year-old children and 100% of the 4–6-year-old children according to the Hungarian recommendations (Tables 3 and 4). In 2016, higher than the Hungarian recommended intakes of vitamin E (-tocopherol) were observed in 58

percent of the 2.5- to 4-year-old children. In 2013, approximately 78 percent of the 2.5- to 4-year-old children and 56 percent of the 4- to 6-year-old children had high intakes of vitamin E (Tables 3 and 4).

IV./1.5. Water Soluble Vitamins

While the mean intakes of the water soluble vitamins thiamine, riboflavin, pyridoxine, and cobalamin considerably exceeded the recommendation, the ascorbic acid intakes were around the recommended levels in each age group in both studies according to both recommendations (Tables 1 and 2).

IV./2. Self-reported attitudes, knowledge and skills of using evidence-based medicine among students of medicine and health sciences in Hungary

IV./2.1. Participant characteristics

A total of 1080 Hungarian students of medicine and 911 Hungarian students of health sciences participated in the survey, which means approximately 17% of Hungarian medical students and 11% of health sciences students currently studying in Hungary. Their baseline characteristics are presented in Table 5.

Medical students. About one fourth of the medical students filling in the questionnaire have already participated in an EBM teaching course, most of them during the clinical half of medical training (12.7% of the first-year, 13.6% of the second year, 22.2% of the third year, 37.0% of the fourth year, 34.7% of the fifth year and 31.1% of the sixth year respondents).

Only 4.92% of medical students who received training in EBM found the training course inadequate, while all other students were satisfied with its content. Of the 821 medical students who did not participate in an EBM teaching course yet, 94.4% gave the answer that participation in such a course would be helpful for their later practical work as a medical doctor. As to the place of the course in the curriculum, 10.38% of medical students thought that an EBM course would be effective in the first two years of medical education, 50.93% would like to have such a course during the third or fourth year of medical studies, while 38.69% of the respondents answered that they would find a training in EBM effective during the fifth or sixth year of education.

Table 5. Baseline characteristics of students who completed the online survey in the Hungarian faculties of medicine and health sciences.

Variable	Medical faculty students (n = 1080) %	Health sciences faculty students (n = 911) %
Location of the university		
Budapest	38.24	29.09
Pécs	31.57	39.63
Szeged	18.89	9.77
Debrecen	11.30	-
Nyjregyháza	-	5.38
Miskolc	-	9.98
Gyula	-	5.38
Győr	-	0.77
Class		
1st year	19.63	34.58
2nd year	19.72	23.05
3rd year	16.30	19.32
4th year	13.52	15.04
5th year/ MSc 1st year	16.02	5.16
6th year/MSc 2nd year	14.81	2.85
Gender (male %)	37.22	11.96
Practical experience (worked at least 1 year in health care)	10.1	25.14
Participating in student research as member of the Scientific Students' Associations	34.54	9.66
Near family member (parent, sibling, spouse) **working in health care**	36.57	39.96
Frequency of reading professional journals		
Daily	2.87	5.60
Weekly	21.57	25.25
Monthly or less frequent	53.61	54.88
Never	21.94	14.27
Private computer	98.80	98.24
Access to internet	99.72	99.74
Free internet access	65.56	57.52
Participated in a teaching course with EBM training	23.98	30.08

Out of the 1080 medical students, 695 declared that they are reading both Hungarian and English medical sources, while 120 students were reading medical resources not only in English and Hungarian, but also in other foreign languages. While

243 medical students answered that they prefer reading medical literature in Hungarian, only a small minority, i.e. 22 students declared their preference of reading medical literature in English.

Students of health sciences. Most of the students of health sciences filling in the survey questionnaire were participating in BSc education, with diverse specialisations. BSc specialisations representing at least 1 percent of participants were as follows: physiotherapists (27.97%), nurses (16.31%), dieticians (10.76%), paramedic officers (9.51%), health visitors (8.15%), medical diagnostic assistants (4.30%), midwifes (4.08%), health tourism managers (3.51%), public health supervisors (3.28%), radiographers (2.38%), recreation and health promotion managers (1.13%). Master specialisations representing at least 1% of participating students of health sciences were: nurses (1.59%), physiotherapists (1.25%), teacher of health sciences and health cares (1.13%) and nutritionists (1.02%).

Out of the 911 students of health sciences filling in the online questionnaire, 274 already participated in an EBM teaching course: 19.4% during the first-year, 26.7% during the second year, 34.7% during the third year and 38.7% during the fourth year among BSc students as well as 58.9% of the MSc students. The large majority of these students, i.e. 94.62% found the course useful for their later work as a health care professional. The vast majority of non-participants (95.06%) would find a training in EBM helpful for their later professional work (36.79% with preference during the 1st or 2nd year of education, while 63.24% with preference during the third or fourth year).

Among participating health sciences faculty students, 46.10% answered reading scientific literature both in the Hungarian and English language, while 45.44% answered reading scientific literature only in the Hungarian language. A small minority (7.35%) of students of health sciences reported reading medical resources also in other foreign languages, while only a very small minority (1.1%) preferred scientific literature in English.

IV./2.2. Questionnaire characteristics

Of the 1991 questionnaires only 7.8% were filled out by the students on paper; the study team members converted these questionnaires into electronicversion.

The consistency testing demonstrated good internal consistency for both the skills questions (Cronbach's alpha = 0.85) and the knowledge-evaluating part (Cronbach's

alpha = 0.89), and acceptable internal consistency for the attitude-evaluating part (Cronbach's alpha = 0.71).

IV./2.3. Self-reported skills in EBM

The majority of medical students rated the following skills as average: finding medical literature, searching in online databases, critical appraisal of papers on clinical research and identifying patient-relevant clinical questions. Majority of medical students reported limited experience in critical appraisal of available scientific literature, while ability to identify knowledge gaps were reported to be poor (Table 6). Only a minority (under 10% of medical students for all the investigated categories) reported having advanced EBM-related skills (Table 6).

Table 6. Responses on a 5-point scale to the question: "How would you rate your skills in the following areas?".

	Poor	Limited experience	Average	Above average	Excellent	Students with EBM training	Students without EBM training	
	(1)	(2)	(3)	(4)	(5)	Mean score (SD)	Mean score (SD)	p
Medical students (n = 1080)						**n = 259**	**n = 821**	
Locating professional literature	5.37%	18.06%	44.26%	25.83%	6.48%	3.46 (0.89)	2.99 (0.94)	<0.001
Searching online databases	5.19%	16.94%	40.09%	28.89%	8.89%	3.42 (1.01)	3.12 (0.98)	<0.001
Critical appraisal of a scientific publication reporting findings from clinical research	22.96%	31.2%	30.09%	13.33%	2.41%	2.79 (1.02)	2.29 (1.03)	<0.001
Identifying knowledge gaps in practice (fields where not enough scientific literature is available to answer a specific clinical question)	38.89%	32.31%	20.46%	6.76%	1.57%	2.34 (1.08)	1.89 (0.95)	<0.001
Critical appraisal of available scientific literature	16.2%	30.37%	30.56%	19.35%	3.52%	2.94 (1.09)	2.54 (1.05)	<0.001
Identifying patient-relevant clinical questions	6.02%	16.11%	36.39%	32.5%	8.98%	3.45 (1.01)	3.15 (1.01)	<0.001
Health sciences faculty students (n = 911)						**n = 274**	**n = 637**	
Locating professional literature	4.28%	14.49%	50.05%	24.81%	6.37%	3.23 (0.83)	3.09 (0.92)	0.06
Searching online databases	3.40%	11.42%	42.15%	29.97%	13.06%	3.42 (0.89)	3.36 (1.00)	0.47
Critical appraisal of a scientific publication reporting findings from clinical research	20.97%	35.13%	33.48%	8.45%	1.98%	2.55 (0.97)	2.22 (0.94)	<0.001
Identifying knowledge gaps in practice (fields where not enough scientific literature is available to answer a specific clinical question)	36.33%	34.80%	22.83%	4.50%	1.54%	2.20 (0.95)	1.87 (0.93)	<0.001
Critical appraisal of available scientific literature	13.94%	30.63%	37.32%	15.48%	2.63%	2.84 (0.94)	2.50 (0.99)	<0.001
Identifying patient-relevant clinical questions	3.62%	14.82%	38.31%	33.59%	9.66%	3.58 (0.96)	3.17 (0.95)	<0.001

Medical students who participated in an EBM course rated all the six items of their skills in searching and evaluating medical literature significantly better than students who did not receive training in EBM (Table 6). However, this difference was not as marked in the subgroup Evidence-based medicine in medical and health sciences

education of Hungary of first and second year medical students, where such students participating in an EBM course rated only their skills in critical appraisal of the content of a scientific publications ($p = 0.007$) and in identifying knowledge gaps ($p = 0.025$) significantly better as compared to student who have not yet participated in such a course. Among third and fourth year medical students, all the six investigated skills (Table 6) were evaluated as significantly better in the subgroup of EBM course participants as compared to non-participants. The same was also true for the subgroup of fifth and sixth year medical students.

The distribution of answers to certain questions was similar among students of health sciences to that seen in the case of medical students, with the majority of students of health sciences rating their skills as average in locating professional literature, searching in online databases, in critical appraisal of papers on clinical research and in identifying patient-relevant clinical questions. Students had limited experience in critical appraisal of available scientific literature and rated their skills in identifying knowledge gaps as poor (Table 6). With the exception of searching in online databases, students of health sciences with EBM training had significantly higher ratings than had EBM non-trained students.

IV./2.4. Sources and methods of healthcare information retrieval

The percentage distribution of answers to the question "Which source would you rate as the primary source of healthcare information retrieval?" among medical students who either participated or not in an EBM course are compared on Fig 1. Medical students not yet trained in EBM were significantly more likely to choose printed books as the main source of healthcare information retrieval, while medical students who already participated in an EBM course choose online journals and professional guidelines to a significantly higher extent compared to those who did not participate in EBM course.

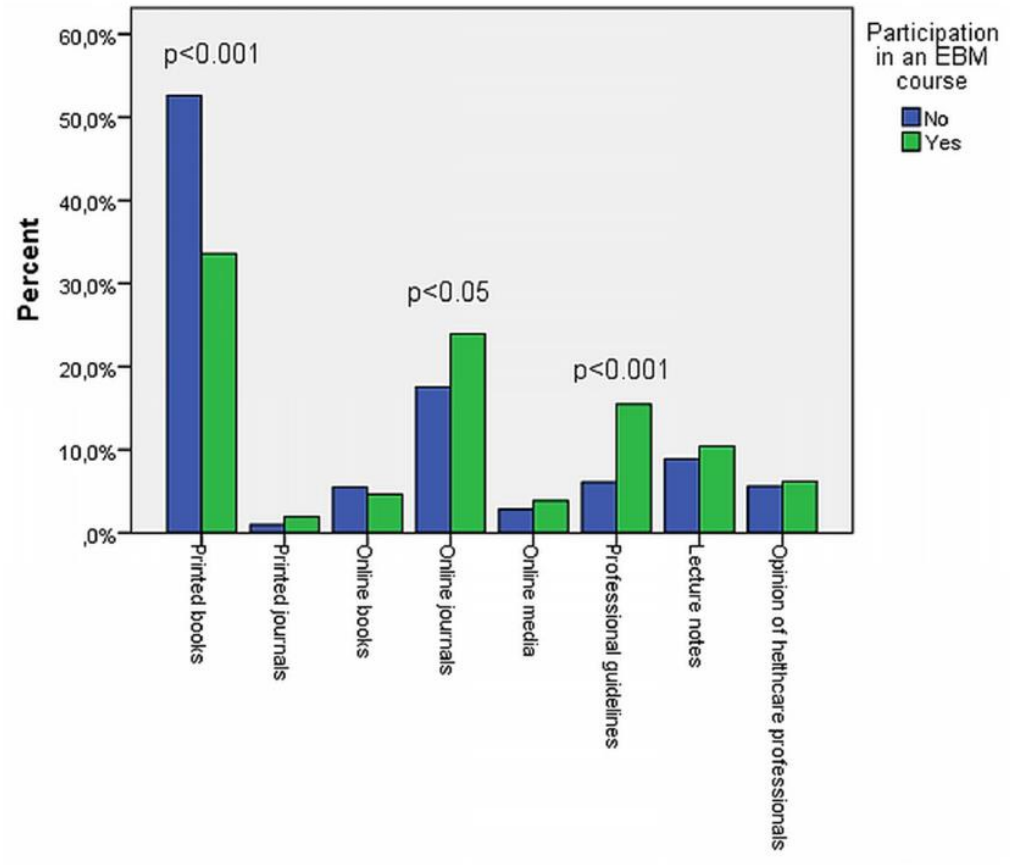

Fig 1. The opinion of Hungarian medical students regarding the most important source of healthcare information retrieval.

Among students of the faculty of health sciences who were trained in EBM choose printed books to a significantly lower extent (28.8% vs 37.8%; p = 0.01) and professional guidelines to significantly higher extent (10.2% vs 3.6%; p <0.001) than those students who did not participate in EBM course. No other significant difference was seen between the two groups.

Search engines used for healthcare information retrieval are shown in Table 7. (Here results were available for 1465 students only, as due to a technical problem not all students answered the question “Which search engines have you already used for healthcare information retrieval?” as a multiple choice, but as a single choice question. Only data from students answering the question as multiple choice were analysed.)

Table 7. Popularity of different search engines among Hungarian students of medicine and health sciences faculties.

Medical students (n = 697)	
Google	94.12%
Google Scholar	27.12%
Wikipedia	72.45%
Pubmed/ Medline	63.99%
Medscape	22.38%
Cochrane library	5.02%
Health sciences faculty students (n = 768)	
Google	90.63%
Google Scholar	20.57%
Wikipedia	52.60%
Pubmed/ Medline	49.35%
Medscape	17.45%
Cochrane library	4.69%

Google was the most popular search engine, followed by Wikipedia and Pubmed/Medline.

Medscape and especially the Cochrane Library were used by only a minority of students for the retrieval of scientific literature (Table 7).

When conducting a subgroup analysis comparing EBM trained and non-trained medical students, we found that Pubmed/Medline (84.0% vs. 57.9%, [EBM trained vs. EBM nontrained], $p<0.001$), Medscape (36.2.0% vs. 18.2%, $p<0.001$), and the Cochrane Library (12.3% vs. 2.8%, $p<0.001$) were used to a significantly higher extent for healthcare information retrieval by EBM trained than non-trained medical students. There were no significant differences in the use of Google (92.6% vs. 94.6%, $p = 0.35$), Google Scholar (30.7% vs. 26.0%, $p = 0.27$) and Wikipedia (73.8% vs. 68.1%, $p = 0.16$) between the EBM trained and non-trained medical students.

Although the use of Pubmed, Medscape and Cochrane Library were generally lower among students of health sciences than among medical faculty students, subgroup analysis comparing EBM trained and non-trained health sciences students had comparable results to those seen in the case of medical students: Pubmed/Medline (62.7% vs. 43.6%, [EBM trained vs. EBM nontrained], $p<0.001$), Medscape (25.3.0% vs. 14.0%, $p<0.001$), and Google scholar (26.6% vs. 17.9%, $p = 0.01$) were used to a significantly higher extent by EBM trained than non-trained health sciences faculty students, while there were no significant differences in the use of Google (90.6% vs. 90.7%, $p = 1.00$) and Wikipedia (51.9% vs. 52.9%, $p = 0.81$). Among students of thE faculty of health

sciences, the use of the Cochrane Library did not significantly differ between EBM trained and non-trained students (6.4% vs. 3.9%, p = 0.14).

IV./2.5. Knowledge of EBM-related terms

There were large differences in the understanding of different EBM-related terms (Table 8). The most known term among medical students was ’sample size’; about two third of medical students answered that they could explain meaning of the term to others. In contrast, only 7% of medical students thought that they could explain the meaning of the term ’intention-totreat analysis’. When evaluating answers as if they were scores on a 5-point-scale and comparing the range of scores between EBM-trained and non-trained medical students, we found that those participating in an EBM course rated their knowledge regarding EBM-related terms to be significantly better than students who did not receive a training in EBM yet (with $p<0.001$ for all investigated terms).

We also calculated a mean score based on the 13 scores (listed in Table 4) evaluating knowledge of individual students and conducted a multifactorial logistic regression analysis to reveal factors having an influence on better or worse scores (i.e. a mean score higher or lower than 2.0). Healthcare work experience (OR = 1.59; 95% CI = 1.01–2.52, p = 0.048), conducting student research as member of the Scientific Students’ Associations (OR = 2.02; 95% CI = 1.45– 2.82, $p<0.001$), upper year university students (OR = 1.65; 95% CI = 1.37–1.98, $p<0.001$) and participation in an EBM teaching course (OR = 3.32; 95% CI = 2.32–4.76, $p<0.001$) proved to have a significant positive influence on the knowledge of EBM related terms among medical students, while gender (OR = 1.22; 95% CI = 0.93–1.61, p = 0.15) and having a close family member working in healthcare (OR = 0.96; 95% CI = 0.73–1.26, p = 0.75) had no significant effect.

Among students of health sciences, the most known term was ’case study’, while the least known was ’confidence interval’ (Table 4). Also health sciences faculty students with EBM training rated their knowledge on most of the EBM-related terms significantly better than students without EBM training, although there was no significant difference in the knowledge of trained and non-trained students in case of the terms ’lost to follow-up’ (p = 0.15) and ’number needed to treat’ (p = 0.05). Upper year university students (OR = 1.47; 95% CI = 1.05–2.05, $p <0.05$) and participation in an EBM teaching course (OR = 1.69; 95% CI = 1.47–1.93, $p <0.001$) were factors that significantly influenced EBM-related knowledge.

Table 8. Self-reported understanding of evidence-based healthcare-related terms among Hungarian medical and health sciences faculty students.

	I understand and I could explain to others	Some understanding	Do not understand, but would like to understand	Do not understand, but I think, it wouldn't be helpful to me to understand	No idea about this
Medical students (n = 1080)					
Evidence-based medicine	43.33%	38.98%	15.83%	0.28%	1.57%
Intention-to-treat analysis	6.96%	25.65%	60.65%	3.43%	3.33%
Sample size	65.09%	25.19%	6.94%	0.83%	1.94%
Case study	59.07%	33.61%	4.91%	0.83%	1.57%
Cohort study	30.74%	30.74%	33.70%	2.04%	2.78%
Confidence interval	33.61%	37.22%	23.80%	3.80%	1.57%
Controlled clinical study	44.44%	37.04%	16.48%	0.74%	1.30%
Lost to follow-up	37.59%	31.67%	26.20%	2.04%	2.50%
Meta-analysis	25.46%	24.44%	43.70%	3.70%	2.69%
NNT (number needed to treat)	14.26%	27.13%	51.94%	3.43%	3.24%
Randomisation	53.61%	31.57%	12.50%	1.02%	1.30%
Practical guideline	58.15%	30.74%	9.35%	0.56%	1.20%
Systematic review	28.80%	38.70%	28.89%	1.48%	2.13%
Health sciences faculty students (n = 911)					
Evidence-based medicine	39.85%	39.96%	16.47%	1.43%	2.31%
Intention-to-treat analysis	10.10%	33.04%	48.85%	4.28%	3.73%
Sample size	53.35%	29.09%	11.96%	2.31%	3.29%
Case study	54.77%	31.17%	9.11%	1.65%	3.29%
Cohort study	16.90%	27.11%	47.31%	3.29%	5.38%
Confidence interval	8.89%	21.62%	57.08%	6.59%	5.82%
Controlled clinical study	31.94%	38.97%	23.82%	2.31%	2.96%
Lost to follow-up	44.24%	28.76%	22.50%	1.98%	2.52%
Meta-analysis	18.66%	24.70%	48.74%	3.62%	4.28%
NNT (number needed to treat)	9.44%	21.41%	58.84%	4.61%	5.71%
Randomisation	41.93%	32.27%	21.41%	1.76%	2.63%
Practical guideline	54.34%	33.26%	9.22%	1.32%	1.87%
Systematic review	33.59%	39.30%	21.30%	2.85%	2.96%

IV./2.6 Attitudes towards using EBM in health care practice

All medical students agreed that EBM is important for the practical work of physicians and wished to improve their skills in applying EBM (Table 9). However, students trained in EBM were more likely to answer "strongly agree" instead of "agree", which resulted in significant difference between the EBM-trained and non-trained groups in the 8 out of 11 parameters compared (Table 9).

Table 9. Response frequency and means of ratings to the question: "On a scale ranging from 'strongly disagree' to 'strongly agree' how would you rate your opinion about the following statements?" among Hungarian medical students (n = 1080).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Students with EBM training (n = 259)	Students without EBM training (n = 821)	
	(1)	(2)	(3)	(4)	(5)	mean range (SD)	mean range (SD)	p
Evidence based medicine (EBM) is important for the practical work of physicians	0.56%	0.83%	12.87 %	45.00%	40.74%	4.50 (0.68)	4.17 (0.75)	<0.001
During my studies, I would like to improve my skills in applying EBM during my practical work as a medical professional	0.28%	0.83%	16.76 %	49.35%	32.78%	4.31 (0.76)	4.08 (0.72)	<0.001
EBM is important for patients to receive the optimal treatment	0.28%	0.74%	14.54 %	49.91%	34.54%	4.42 (0.67)	4.10 (0.71)	<0.001
EBM facilitates decisions about individual patient's care	0.37%	0.74%	14.35 %	48.06	36.48%	4.46 (0.69)	4.11 (0.72)	<0.001
EBM considers the personal expertise of physicians	2.78%	18.43%	43.80 %	26.39%	8.61%	3.18 (1.06)	3.20 (0.89)	0.83
EBM considers views and preferences of patients regarding their own therapy	4.07%	23.43%	44.07 %	22.04%	6.39%	2.94 (1.08)	3.06 (0.88)	0.07
It is important to incorporate research results into healthcare practice	0.28%	0.19%	5.65%	42.87%	51.02%	4.53 (0.63)	4.42 (0.64)	0.01
All types of studies are of equal value	19.07%	53.61%	19.26 %	7.13%	0.93%	2.00 (0.90)	2.23 (0.83)	<0.001
EBM means an unrealistic burden to health care professionals in the daily routine patient care	7.96%	42.13%	42.13 %	6.94%	0.83%	2.41 (0.88)	2.53 (0.74)	0.01
Textbooks are the most optimal source of information, when a question regarding the care of patients should be answered	3.7%	29.26%	38.7%	25.74%	2.59%	2.84 (0.93)	2.98 (0.88)	0.06
As a future healthcare practitioner, I find life-long learning as vital	0.37%	0.93%	5%	30.93%	62.78%	4.66 (0.56)	4.51 (0.70)	0.01

The degrees of agreement with the statements that "EBM is important for patients to receive the optimal treatment" and that "EBM facilitates decisions about individual patient's care" were also significantly higher in the EBM-trained medical student group

than in those without EBM training. The majority of medical students were unable to decide whether EBM considers also the personal expertise of physicians as well as the views and preferences of patients regarding their own therapy; in this context there were no differences between EBM-trained and non-trained medical students. Medical students were also unsure whether textbooks are the most optimal source of information when questions regarding the care of individual patients should be answered (Table 9). Life-long learning was seen as very important in both groups, but scores representing the strength of agreement were significantly higher among EBM trained medical students (Table 9). Among students of health sciences there were 6 out of 11 statements with significant difference between the opinion of EBM-trained and non-trained students (Table 9).

V. DISCUSSION

V./1. Dietary Energy and Nutrient Intake of Healthy Pre-School Children in Hungary

Our study showed that in Hungarian preschool children, sugar, protein, fat, cholesterol, sodium, potassium and phosphorus intakes were, in general, high, whereas intakes of calcium, vitamin D, pantothenic acid and folic acid were low. Water consumption was not satisfying in either of the age groups. Moreover, among the 2.5- to 4-year-old children, every third child had an excessive intake of energy according to the recommendations of either HRDA or EFSA.

The importance of dietary intervention programs for preschool children to influence theirs food choice at an early age in order to prevent several childhood and adulthood health problems is evident. In Hungary, kindergartens provide pre-school education and full day care for children aged 2.5 to 6 years as part of the public education system. Kindergarten education and care is free in all public institutions; moreover, at the time of this survey, approximately one third of the Hungarian 3- to 6-year-old children received meals in kindergarten for free (parents only have to pay for the meals if their income is above a certain level). Children consumed not only one hot meal (lunch) in the childcare institution but also two other cold meals (one in the morning hours and one in the afternoon). This means that the foods and beverages consumed in the kindergarten are core parts of the children's diets.

All the kindergartens included into the present study were maintained within the Hungarian public education system, i.e., privately-owned kindergartens offering various special services for an extra fee were not included. Since in public kindergartens, both the admission criteria of the children and the fees to be covered by the families are regulated on a nation-wide basis, it can be assumed with good reason that the socio-economical backgrounds of the families in the present study were evenly distributed and representative for the 2.5- to 6-year-old urban pediatric population in Hungary.

The energy intake data seen in our dietary survey indicate that a positive energy balance is already present in a considerable percentage of kindergarten-aged children in Hungary. Worldwide, over 200 million children (one in three children under five) are either undernourished or overweight. The proportion of overweight children (5 to 19 years old) rose from one in ten to almost one in five in roughly one generation's time between 2000 and 2016 [34]. This also underlines the importance of the early start of

dietary intervention programs to prevent obesity. In Hungary, the public kindergarten system may offer an excellent place for carrying out obesity prevention programs.

Adequate protein and essential amino acid intakes are important for normal child growth and development; however, a high protein intake has no known benefit but carries an additional possible risk of obesity development. The background of this phenomenon might be explained by the "Early Protein Hypothesis": excessive intakes of protein stimulates the secretion of insulin and insulin-like growth factor I (IGF-1) and increases the plasma concentration of insulin-releasing amino acids [35]. The high protein intakes observed in the present study may contribute to susceptibility for overweight and obesity.

Long periods of adequate Ca intake in childhood increase bone mineral density (BMD) and reduce osteopenia risk [36]. Both in the present Hungarian dietary questionnaire study and in a similar study among 6-year-old Polish children, intakes of calcium did not reach the recommended level, and inadequate intakes of vitamin D and potassium with excessive intakes of sodium were observed [37]. The observation that a dietary pattern characterized by a relatively high consumption of dairy products and whole grains with cheese and eggs is positively associated with childhood higher bone mineral density [38] might offer the possibility of dietary intervention.

Studies indicated that the early introduction to starchy table foods resulted in an increased affinity for the taste of salt at the preschool age [39]. Sugar-sweetened beverage consumption was described to be positively associated with salt intake; each additional 1 g/day salt intake was associated with 17 g/day sugar-sweetened beverage consumption in a study [40]. Consequently, reducing the salt intake might have a preventive role in both later hypertension and childhood obesity.

Although in our investigation, the energy percentage derived from protein, fat and carbohydrates were in their normal ranges, the energy percentage of added sugar was one to two percent higher than recommended. A high intake of sugar-added beverages is associated with an increased risk of overweight and obesity [41-43]. Furthermore, it might result in higher diastolic blood pressure and elevated triglycerides levels and elevated cardiovascular risks later in life [44].

Excessive salt intake causes extracellular volume increase, resulting in an elevation of blood pressure [45].

The uppermost recommended daily intake of sodium is 0.5 g for 1- to 3-year-old children and 0.7 g for 4- to 6-year-old children (according to HRDA). The current intakes of sodium in the present study were three to five times higher than the Hungarian

recommended daily sodium intake for preschool children. The Public Catering Act-EMMI (Ministry of Human Capacities) Decree 37/2014. (IV.30) [46] maximized the quantity of added salt and decreased it to 2.5 times lower than before. This regulation ("Canteen reform") has been mandatory for kindergartens, primary and secondary schools, in-patient care and any other public catering in Hungary since September 2015. During implementation, it is important to keep in mind that most of the sodium originates from processed foodstuffs, not mainly from table salting.

Excessive refined sugar and sodium intake and suboptimal calcium were described not only in other Hungarian cross-sectional surveys involving children from other age groups [47, 48] but also in other countries [36, 37] involving children from the age groups investigated in our study. This also underlines the extent of the problem and strengthens the importance of the early healthy-eating interventions among the kindergarten and preschool children.

Dietary fiber has vital role in providing optimal growth conditions for a healthy gut microbiota. Diets high in fibre- specifically from cereal or vegetable sources and rich in insoluble type fibre- are significantly associated with lower risk of coronary heart disease and cardiovascular disease and reflect recommendations to increase intake. [49] Dietary fiber has many benefits and physiological effects: reduced cardiovascular disease risk, reduced risk of colorectal and breast cancers, improved body mass index, reduced type two diabetes risk ,interfering with fat and cholesterol absorption, improved fecal bulk, reduced postprandial glucose concentrations, and altering bacteria populations in the gut microbiome. Among children, satisfaying dietary intake lowering the risk of developing diabetes, heart disease, obesity and constipation [50].

Constipation is defined in pediatrics as a fecal retention, a delay in or resistance to evacuate. According to definition, there are two or fewer bowel movements per week associated with pain during bowel movement. A vicious cycle is created because of the fear of/ refusal to evacuate, the greater the stool retention, which will dry out and increase in volume, thus causing more discomfort. Functional constipation is, when the pediatric patient has no intestinal or extraintestinal disorder which to constipation leads. Worldwide, the prevalence of constipation ranges from 3% to 29.6%. Frequently observed in the pediatric age group. Constipation is the main complaint in 3– 5% of consultations with pediatricians and in 25% of consultations with pediatric gastroenterologists. A low dietary fiber intake has been considered a risk factor for the development of functional constipation. The increase in fiber consumption is an important

factor in prevention and treatment. [51] According to the European Society for Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) guideline, a balanced diet, normal fluid intake is recommended for children with functional constipation. To support the routine use of fiber supplementation is not provided because there is still no clear evidence. To ensure and achieve the benefits of different dietary fibers, children should consume a variety of fibers from fruits, vegetables, legumes, seeds, nuts and cereal grains. [52] Our study showed us, that 9% of the 2.5-4 years old and 22% of the 4-6 years old participating children had a low intake of dietary fiber in 2016. Furthermore, daily fluid intake was low for every second 2.5-4 years old and for 68% of the 4-6 years old children It is a warning sign, because low fluid and dietary fiber intake together can lead to further health problems.

Our present study has some limitations. Some of the data originated from the kindergarten teachers, who completed the filling out of the questionnaires in addition to their other work duties, which could have resulted in inaccuracies in data intake and later during the evaluation. The dietary data included nutrient intake estimates from foods (both naturally present and fortified) and drinks only and excluded nutrient intake estimates contributed by eventual dietary supplements. The differences in the results of the two studies may be due to the larger sample size in 2016.

Children acquire dietary habits during early life. It should be, therefore, a high priority to provide evidence-based and parent-focused practical support for parents and emphasize the importance of healthy eating among the staff members of kindergarten kitchens [53]. Inappropriate diets and eating habits in childhood lead to an increasing number of overweight and obese children and adolescents, although there is an increasing awareness of the adverse effects of non-communicable diseases. In Hungary, the obesity rate is high; among children, it is 40 percent, and among adolescents, it is 32 percent [54]. Family and public catering systems (e.g., preschool, school) have a predominant place in the formation of nutritional behavior. There are several risk behaviors, e.g., elevated energy and fat intake, the overconsumption of simple carbohydrates, excess salt intake, low vegetable and fruit consumption, low calcium intake and the consumption of sugarsweetened beverages among kindergarten and school children. The objective is reducing the prevalence of obesity and non-communicable diseases, making the healthier option the easier option.

V./2. Self-reported attitudes, knowledge and skills of using evidence-based medicine among students of medicine and health sciences in Hungary

The present study attempted to provide an overall picture about the extent to which concepts of EBM are incorporated into medical and health sciences education in Hungary and to answer the question whether evidence-based education in the present form is effective enough to improve skills and knowledge and build a generally positive attitude towards EBM among students.

In the international scientific literature several studies are available that assess the attitudes, knowledge and skills of medical and healthcare professionals [29, 55-61], and describe generally positive attitudes, however with skills of very different level in using EBM in practice. Moreover, in countries, where EBM courses are already incorporated into the curriculum, surveys have assessed the attitudes, knowledge and skills of both educators [28] and educated students [62-65]. These studies consistently reported positive attitudes toward EBM among undergraduate students participating in EBM education.

The uniqueness of our study is that it compares attitudes, knowledge and skills of students who participated in an EBM training course and those who are not EBM course attendees studying in the same institutions and faculties. Therefore we think, that our findings may also be adaptable and useful to countries where, as in Hungary, only a part of students receive focused EBM education or where EBM concepts are just in progress to be introduced into curriculum.

In the present study, the attitude towards EBM was generally positive among both medical and health sciences students; however, only a small minority of students rated their EBM related skills as advanced, and there were large differences in the understanding of different EBM-related terms. General terms, like ’evidence-based medicine’ or ’sample size’ were better understood than more specific terms, like ’intention-to-treat analysis’, ’confidence interval’ or ’number needed to treat’. This difference might be related simply to the fact that general terms are more likely to appear also during the education of subjects other than EBM. These results suggests that a list of EBM-related terms which is constructed at faculty level, handed out and recommended for medical and health sciences faculty students during their studies might improve the transmission of EBM-related knowledge.

Importance of targeted EBM training is strongly underpinned in our study by the results on sources and methods used by students for scientific information retrieval. Of

course, for a large majority of university students printed books represent the most important source of information. However, EBM training seems to be an important tool to educate students of the importance of using up-to-date scientific information (e.g. those published in online journals) for supporting healthcare decisions. The significant difference in the use of PubMed/Medline and the more than fourfold difference in the use of the Cochrane Library seen in this study in medical students who participated in EBM courses as compared to those who did not highligh the importance of teaching how to use these data retrieval systems for medical decision making.

Among both medical and health sciences faculty students, upper year students and participating in research activities were important factors contributing to EBM-related knowledge. Because the percent of EBM-trained student was also increasing in parallel with the number of years of studies, this observation might underpin further the important role of incorporating EBM education into other courses besides targeted EBM training.

Students of health sciences were generally characterised by more self-confidence, especially when self-evaluating their EBM-related skills. However, differences between EBM-trained and EBM non-trained students from the faculty of health sciences were less pronounced than in the case of medical students. These slight differences between students of medicine and health sciences might not necessarily reflect the lower effectiveness of EBM training among students of health scientific, but might rather indicate that the number of non-EBM-trained students overestimating their knowledge was higher in our sample among students of the faculties of health sciences.

It is interesting that the large majority of medical students were neutral regarding the statements ’EBM considers the personal expertise of physicians’ and ’EBM considers views and preferences of patients’ with no significant differences between EBM-trained and non-trained students. This observation indicates that medical students, at least in Hungary, are unsure about the way how EBM should be implemented in the daily practice. There is considerable potential for improvements to move away from “cookbook medicine” towards a sciencebased, but individualised medicine that involve both professional expertise and individual patient factors.

Although attempts were made to maximize the rate of filling out the questionnaire by a representative number of students by sending out invitations and reminders to participate several times, the participation rate from different universities does not fit the proportion of the students studying there. Consequently, students with more active attitudes towards scientific or public life might be overrepresented in the sample.

Moreover, first and second year students were more eager to participate in the survey, therefore their opinion might be overrepresented against the opinion of students from upper university years. We cannot fully exclude response bias and should be cautious with self-reported information [66].

In the present survey we have not asked detailed information about the characteristics (e.g. hours, content) of the EBM course attended by the students. Additionally, the possible differences in EBM education among faculties and specialisations were not studied and their impact were not analysed.

During the university studies there is a unique opportunity to form attitudes of future healthcare providers and to pass over EBM-related knowledge, however in our findings, i.e. attitudes, knowledge and skills of undergraduate medical and health sciences faculty students do not necessarily reflect the real use these students will make of EBM later as a health professional.

VI. NOVEL FINDINGS AND PRACTICAL APPLICATIONS

VI./1. Dietary Energy and Nutrient Intake of Healthy Pre-School Children in Hungary

1. Sodium and refined sugar intake, which are known risk factors of obesity and hypertension, should be better controlled already in kindergarten children.
2. Increased consumption of dairy products might be advised to increase the calcium intakes.
3. The average daily intake of vitamin D proved to be insufficient for every preschool child in our present study in Hungary.
4. Phosphorus intake was high in half of the children in both age groups.
5. Pantothenic acid intake was low in every fifth 4-6 years old children.
6. Folic acid intake was low in 20% of the 2.5-4 years old children, and low in 40% of the 4-6 years old children.
7. Dietary fiber consumption was satisfying in three quarters of the children in both age groups, and was low in over 20% of the 4-6 years old children.
8. The daily fluid intake was low in 44% of the 2.5-4 years old children and low in 68% among the 4-6 years old children.
9. While the total energy and carbohydrate intakes were appropriate among 2.5- to 4-year-old preschool children, every third child had an excessive intake of energy. Morover, protein, fat and cholesterol intakes were, in general, also high.
10. Sodium intake was enormously high, while potassium intake also exceeded the recommended value in both studies. Consequently, the sodium/potassium ratio was rather unfavorable in the present study.
11. Children acquire dietary habits during early life. It should be, therefore, a high priority to provide evidence-based and parent-focused practical support for parents and emphasize the importance of healthy eating among the staff members of kindergartens.
12. Evidence-based nutritional interventions targeting Hungarian preschool children should be focused on the promotion of increased intake of fruits, vegetables and plain water. Furthermore, decrease in saturated fat and added sugar intakes are also should be recommended.

VI./2. Self-reported attitudes, knowledge and skills of using evidence-based medicine among students of medicine and health sciences in Hungary

1. The present study demonstrated that substantial proportion of students of the medical and health sciences faculties would like to acquire EBM-related knowledge and skills during their university studies.
2. Although the attitude towards EBM is generally positive, only a small minority of students rated their EBM-related skills as advanced in the present survey.
3. There were large differences in the understanding of different EBM-related terms. These results suggest that a list of EBM-related terms which is constructed at faculty level, handed out and recommended for medical and health sciences faculty students during their studies might improve the transmission of EBM-related knowledge.
4. Self-reported EBM-related knowledge and skills are higher among students who already received an EBM-training, an observation which underlines the importance of targeted EBM education in both medical and health sciences education.
5. EBM training seems to be an important tool to educate students of the importance of using up-to-date scientific information for supporting healthcare decisions.
6. Our observation indicates that medical students, at least in Hungary, are unsure about the way how EBM should be implemented in the daily practice. There is considerable potential for improvements to move away from “cookbook medicine” towards a sciencebased, but individualised medicine that involve both professional expertise and individual patient factors.
7. During the university studies there is a unique opportunity to form attitudes of future healthcare providers and to pass over EBM-related knowledge.
8. Targeted EBM training seems to be more effective following the second education year, when medical students have already acquired basic knowledge in medicine. Increased EBM-related knowledge and skills among higher year medical students highlight the importance of integrating EBM concepts also into other courses of the basic, preclinical and clinical modules.

LIST OF PUBLICATIONS

Number of publications that form the basis of this dissertation: **2**
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Publications related to the thesis

Csertő, M., Mihályi, K., Mendl, E., Lőcsei, D., Daum, V., Szili, N., Decsi, T., & Lohner, S. (2023). Dietary Energy and Nutrient Intake of Healthy Pre-School Children in Hungary. **Nutrients**, *15*(13), 2989. https://doi.org/10.3390/nu15132989

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Abstracts not related to the thesis in journal

Csertő M., Marosvölgyi T., Turonyi T.A., Csókási K., Pusztafalvi H. (2018) Study of disability related attitude among parents with toddler and childless adults. **NÉPEGÉSZSÉGÜGY**, 96(2), 144.
„Népegészségügyi Képző- és Kutatóhelyek Országos Egyesületének XII. Konferenciája" 29.08.2018. -31.08.2018. Budapest

Csertő, M. Kercsmár L., Boncz I., Pusztafalvi H. (2017) Patient Reported Outcome Of Celiac Disease, **VALUE IN HEALTH** 20(9) p. A637. ISPOR 20th Annual European Congress 04.11.2017. -08.11.2017. United Kingdom / Scotland

Publications not related to the thesis

Polyák, É., **Csertő, M.,** Gubicskóné, K.A., Bonyárné, M.K., Szekeresné, S. S., Faludy, A., Figler, M. (2011)
„Commercially available citrus species and changes in vitamin C content at different storage methods."
Kereskedelmi forgalomban kapható citrusfélék és leveik c-vitamin tartalmának változása különböző tárolási módok során. ÚJ DIÉTA, 5.

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APPENDICES

Appendix A

Appendix A1: Poster for kindergartens

Appendix A2: Information consent for the parents

PÉCSI TUDOMÁNYEGYETEM
Klinikai Központ
Gyermekgyógyászati Klinika

Tájékoztató

„Prebiotikus oligoszacharidok keverékének a hatása a fertőző megbetegedések gyakoriságára 3-6 éves gyermekekben: kettősen vak, randomizált (placebo-kontrollált) vizsgálat"

Kedves Szülők/Gondviselők!

Ez úton szeretnénk Önöket felkérni a Pécsi Tudományegyetem, Klinikai Központ, Gyermekgyógyászati Klinika által szervezett orvostudományi kutatásban való részvételre.

A kutatás célja

A táplálkozástudományi vizsgálat során a **prebiotikumok** (inulin és oligofruktóz) hatását szeretnénk megvizsgálni a fertőzéses megbetegedések gyakoriságára, illetve szerepüket a fertőzések megelőzésében, 3-6 éves óvodás gyermekek körében. A vizsgálat során a prebiotikumok hatásait egy placebót szedő kontroll csoport eredményeivel hasonlítjuk össze. A vizsgálat célja, hogy pontosabban megismerjük az inulin és az oligofruktóz immunrendszerre és az egészségügyi állapotra kifejtett hatásait.

Mik azok a prebiotikumok?

A prebiotikumok (mint az inulin és az oligofruktóz) emészthetetlen szénhidrátok (ballasztanyagok), melyek a vastagbélben elősegítik a probiotikus hatású (jótékony) baktériumok (Bifidus, Lactobacillus) növekedését. Egyidejűleg gátolják a patogén (betegséget előidéző) baktériumok megtelepedését.

Az anyatejben a prebiotikus hatású szénhidrátok nagy koncentrációban vannak jelen, ez bizonyítottan kiemelt szerepet játszik az anyatej fertőzéseket megelőző hatásában. (Ennek ismeretében terjedtek el az elmúlt évtizedekben a prebiotikum tartalmú anyatejpótló és követő tápszerek.)

Nem csak csecsemőkben, hanem felnőttekben lefolytatott vizsgálatok is alátámasztják, hogy a prebiotikumokkal történő étrendi kiegészítés hatására javul a széklet minősége, ritkább a székrekedés. Emellett kutatók a gyomor-bélrendszeri gyulladásos megbetegedések és az atópiás bőrgyulladás csökkent rizikójáról számoltak be a prebiotikummal történő étrendi kiegészítés hatásaként. Más humán vizsgálatok eredményei arra utalnak, hogy a prebiotikumok jótékonyan befolyásolják az immunrendszer működését és elősegítik az ásványi anyagok táplálékból történő felvételét, így pl. hozzájárulnak a csontok egészségéhez.

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Három évvel ezelőtt, a mostanival azonos összetételű prebiotikus étrendi kiegészítővel, pécsi óvodás gyermekek körében folytattunk le egy vizsgálatot, ahol a prebiotikumot szedő gyermekekben a lázas megbetegedések alacsonyabb előfordulási gyakoriságát észleltük. Jelen vizsgálat célja ezen ígéretes eredmények igazolása.

A vizsgálat menete

A vizsgálatba 1000 óvodás gyermek bevonását tervezzük, 5 magyar városban.

Amennyiben beleegyeznek gyermekük részvételébe, és a gyermek megfelel a beválasztási kritériumoknak, véletlenszerűen osztjuk be (randomizáció) a prebiotikumot vagy a placebót (maltodextrint) szedő csoportba. A prebiotikumot vagy a placebót szedő csoportba való kerülés esélye azonos valószínűségű. Az étrendi kiegészítőt hat hónapon keresztül, naponta egy alkalommal kell majd a gyermeknek adni.

A vizsgálatban étrendi kiegészítőként használt ***Orafti® inulin/oligofruktóz*** hivatalosan élelmiszernek minősül, amit pl. bébiétel készítéséhez használnak.

A placeboul szolgáló *maltodextrin* keményítőből előállított szénhidrátok keveréke. Egy élelmiszer, amit számos termék (pl. bébiételek, bioételek, édességek) tartalmaz.

Az alábbi ábra mutatja be a vizsgálat menetét.

A vizsgálat 6 hónapja során 5 alkalommal (6 hetente) fog Önnel kutatócsoportunk valamely tagja személyesen kapcsolatba lépni. Természetesen **kérdés** vagy probléma esetén, a vizsgálat folyamán bármikor keresheti munkatársainkat.

Az *1. vizsgálati napon* megmérjük a gyermek testtömegét és testmagasságát, adatokat gyűjtünk a gyermek egészségi állapotára vonatkozóan, valamint székletmintát kérünk. Ezzel egyidejűleg megkapják az első 6 hétre elegendő étrendi kiegészítőt és egy vizsgálati naplót.

A vizsgálati napló a gyermek egészségére, az étkezésére, az étrendi kiegészítő elfogyasztására és a széklet minőségére vonatkozó kérdéseket tartalmaz. Kérjük, **a naplót minden nap töltse ki**, hogy minél pontosabb adatokat kaphassunk!

6 hetente szervezünk egy vizsgálati napot az óvodában, ennek keretében megkapják a következő 6 hétre elegendő étrendi kiegészítőt, ill. a következő naplót. Kérjük, ezekre az alkalmakra a kitöltött Vizsgálati Naplót hozza magával!

Szeretnénk a gyermekénél lezajló fertőző megbetegedésekről minél részletesebben tájékozódni. Ha felkeresi orvosát, kérjük, minden esetben vigye magával és töltesse ki vele a **„Kérdőív a házi gyermekorvos részére"** című adatlapot. Kérjük, ezeket a házi gyermekorvos által kitöltött adatlapokat aztán őrizze meg és a Vizsgálati Naplóval együtt hozza el nekünk az óvodába.

Az 5. (utolsó) vizsgálati napon ismét megmérjük gyermeke testtömegét és testmagasságát és újabb székletmintát gyűjtünk.

A vizsgálatban való részvétel feltétele

A kutatás csak akkor lehet eredményes, ha a résztvevők betartják a protokoll előírásait. Ezért a következő esetekben a kutatócsoport tagjai dönthetnek a gyermek vizsgálatból való kizárása mellett:

- Ha a gyermek tartósan nem szedi az étrendi kiegészítőt
- Ha a gyermek az előírásoktól eltérő módon szedi az étrendi kiegészítőt
- A kérdőívek hiányos (> 30%) kitöltése
- Váratlanul fellépő események, melyek potenciálisan befolyással lehetnek a vizsgálati eredményekre

Az étrendi kiegészítő szedésére vonatkozó útmutatások

Kérjük, ne változtasson gyermeke megszokott étrendjén! Válasszon egy Önöknek kedvező időpontot a nap folyamán (pl. reggeli, vagy mielőtt a gyermeke óvodába indul, vagy vacsora ideje) és lehetőség szerint mindig ugyanabban az időpontban adja gyermekének az étrendi kiegészítőt. Az étrendi kiegészítő por formátumú, ezért akár egy kevés italba (pl. víz, tea, tej, gyümölcslé) vagy a gyermek ételébe is belekeverhető.
Fontos, hogy gyermeke a teljes mennyiséget elfogyassza, közvetlenül az elkészítést követően.

Szeretnénk kérni, hogy más, prebiotikumot vagy probiotikumot tartalmazó étrendi kiegészítőt NE adjon gyermekének a vizsgálati időszakban!

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A Vizsgálati Napló kitöltésére vonatkozó útmutatások

A vizsgálati Napló két részből áll: az egyik füzetben **a gyermek egészségére vonatkozó kérdéseket** talál. Kérjük, minden nap töltse ki ezt a kérdőívet (javasoljuk az étrendi kiegészítő adásával azonos időpontban történő kitöltést). Ha gyermeke egészséges, mindössze egy kérdést kell megválaszolnia. Ha gyermeke beteg, kérjük, részletesen adja meg a gyermek tüneteit és panaszait és értékelje ezek súlyosságát. Kérjük, a betegség minden napján legalább egy alkalommal mérje meg a gyermeke testhőmérsékletét is!

A másik füzetben találja az **étrendre, az étrendi kiegészítő elfogyasztására és a széklet minőségére** vonatkozó kérdéseket. A vizsgálat bizonyos heteiben több, más heteken kevesebb információra van szükségünk. Kérjük, mindig válaszolja meg az adott héthez tartozó összes kérdést.

A vizsgálatban való részvétel várható haszna és esetleges kockázata

A vizsgálati készítmény inulint és oligofroktózt tartalmaz, melyek a táplálékok és táplálék alkotóelemek közé tartoznak.

Csecsemőknél igazoltan az alábbi kedvező hatásokat eredményezik:

- Ritkábban fordulnak elő hasmenéssel, hányással és lázzal járó megbetegedéses epizódok, továbbá ritkábban válik szükségessé antibiotikum adása (légúti) fertőzések kapcsán azon 4-24 hónapos csecsemőknél és kisdedeknél, akik rendszeresen fogyasztanak prebiotikus szénhidrátokat
- Egy korábbi, 3-6 éves gyermekekben lefolytatott vizsgálatunk során szignifikánsan kevesebb lázas megbetegedést észleltünk a prebiotikumot szedő gyermekekben. Jelen vizsgálat célja ezen ígéretes eredmények igazolása.

Azonban nem tudjuk garantálni a fent leírt kedvező hatások bekövetkezését gyermekénél.

Ugyanúgy, mint más ballasztanyagban gazdag élelmiszer (pl. hüvelyesek vagy káposzta) fogyasztása, az inulin/oligofruktóz fogyasztása is okozhat enyhe puffadást. Más mellékhatás NEM ismert.

Adatok kezelése, adatvédelem

A vizsgálat a Magyarországon hatályos, az információs önrendelkezési jogról és az információszabadságról szóló 2011. évi CXII. törvény, és az egészségügyi és a hozzájuk kapcsolódó személyes adatok kezeléséről és védelméről szóló 1997. évi XLVII. törvény (továbbiakban adatvédelmi törvények) betartásával történik.

A vizsgálat során gyermeke kódszámot kap, személyes adatait és vizsgálati eredményeit titkosan kezeljük és más célra nem használjuk fel. A vizsgálatok elemzésekor gyermeke neve helyett csak kódszám szerepel, így személye nem azonosítható. A vizsgálat során kapott adatokat részben külföldön elemzik, de gyermeke személyét nem azonosíthatják, adatai csak kódszám szerint szerepelnek majd.

A személyes adatok kezeléséért dr. Lohner Szimonetta és prof. dr. Decsi Tamás a felelős.

Azt, hogy Ön az adatainak az ismertetett módon történő kezeléséhez hozzájárul, a Beleegyező Nyilatkozat aláírásával igazolja.

Kilépés a vizsgálatból
A vizsgálatban való részvétel önkéntes és bármikor megszakítható. Az alkalmazott egészségügyi szolgáltatás minőségét semmilyen formában nem érinti, sem a részvételbe való beleegyezés, sem ennek visszautasítása. A beleegyezés önkéntes és befolyástól mentes, bármikor vissza lehet vonni akár szóban, akár írásban, minden indoklás nélkül, anélkül, hogy ebből a résztvevőnek bármilyen hátránya származna.

Költségtérítés
A vizsgálati készítményt (étrendi kiegészítőt) térítésmentesen biztosítjuk gyermeke számára. Magáért a vizsgálatban való részvételért nem jár honorárium. A vizsgálatban részt vevő gyermekek azonos értékben (10.000 Ft) ajándékot kapnak a vizsgálat végén. Ezen kívül a vizsgálatban részt vevő óvodáknak játékokkal, könyvekkel vagy más az óvodában felhasználásra kerülő ajándékkal köszönjük meg a részvételt.

Biztosítás
Bár a vizsgálattal kapcsolatosan semmilyen komplikációra nem számítunk, a vizsgálatban részt vevő összes gyermek biztosítva van (A biztosítás neve: HDI Versicherung AG Magyarországi Fióktelepe, címe: 1074 Budapest, Dohány u. 12.-14., kapcsolattartója: Bleicher Ildikó; ildiko.bleicher@hdi.hu; telefonszáma:+36(1)2482820). Kérjük, amennyiben úgy gondolja, hogy a gyermek panaszai a vizsgálatban való részvétellel összefüggésbe hozhatóak, haladéktalanul értesítse a vizsgálat vezetőjét!

Etikai engedély
A vizsgálatot az Egészségügyi Tudományos Tanács Tudományos és Kutatásetikai Bizottsága (ETT TUKEB) szakhatósági állásfoglalása alapján az Országos Tisztifőorvosi Hivatal engedélyezte.

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PÉCSI TUDOMÁNYEGYETEM
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Néhány gyakori kérdés a **Prebiotikumokról**:

Mik a prebiotikumok?

- A prebiotikumok szénhidrátok (cukrok)

Mik a prebiotikumok természetes forrásai?

- Zöldségek és gyümölcsök tartalmazzák (pl. cikória (Maci kávé alapanyaga), vörös hagyma, fokhagyma, csicsóka, borsó)
- Nagy mennyiségben megtalálhatók az anyatejben, ezek a szénhidrátok védik a szoptatott csecsemőket a fertőzésekkel szemben. Emiatt a forgalomban levő csecsemőtápszerek is tartalmaznak hozzáadott prebiotikumot

Mely kedvező hatása ismert?

- Élelmi rost: elősegíti az egészséges bélműködést; megelőzi a székrekedést és a hasmenést
- Természetes eredetű tápanyaga a bennünk élő hasznos bélbaktériumoknak. Elősegíti a hasznos bélbaktériumok elszaporodását, így erősíti az immunrendszert és fokozza a szervezet ellenálló képességét a fertőzésekkel szemben
- Segít megelőzni a káros baktériumok elszaporodását az emésztő rendszerben
- Serkentik a kálcium felszívódását és beépülését, ezáltal hozzájárulnak a csontok egészségéhez
- Nem emésztődnek sem a szájban, sem a gyomorban, így nem károsítják a fogakat és nem hizlalnak
- Fogyasztásuk során nem emelik a vércukor szintet

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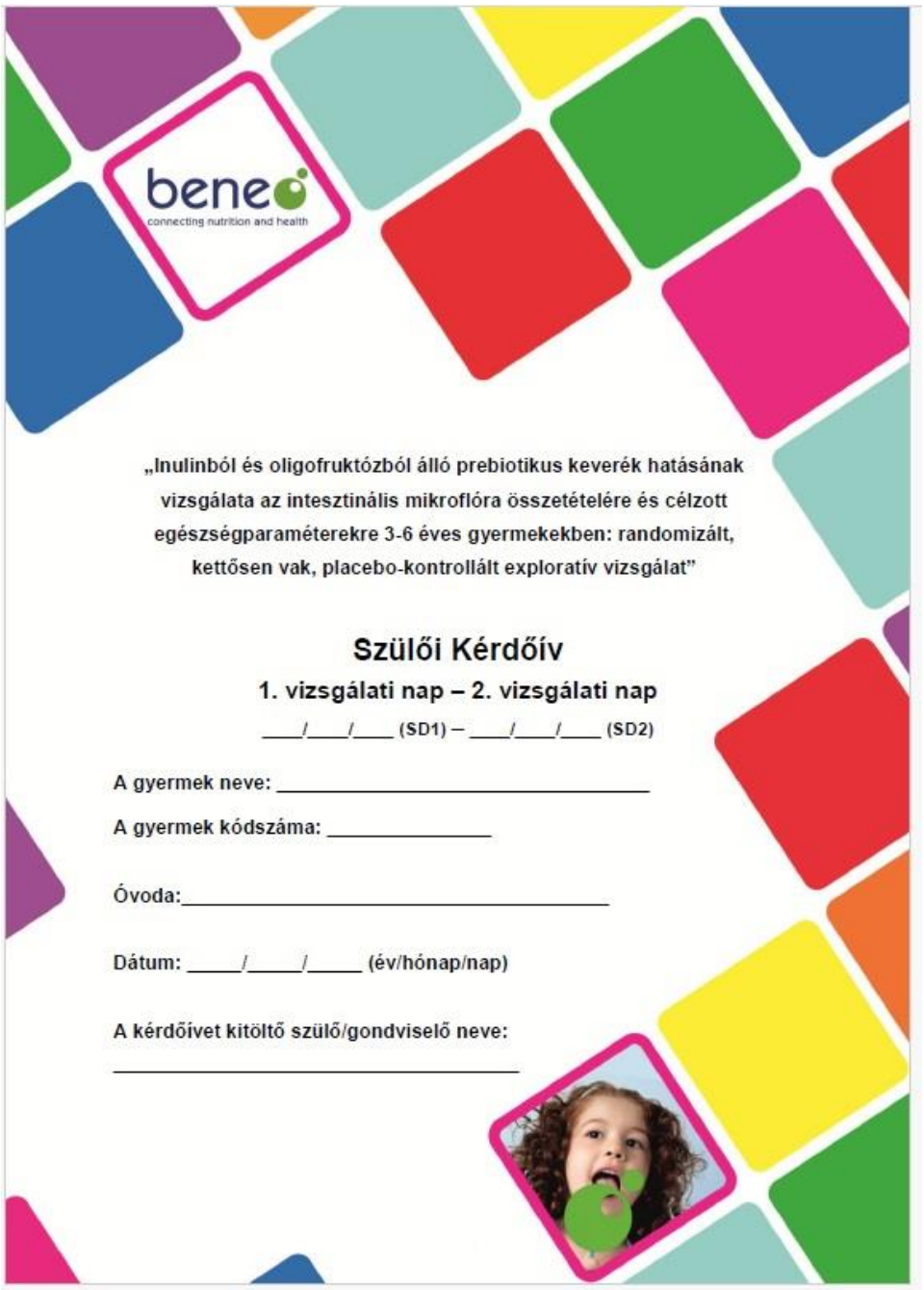
Appendix A3: Three- day food- record diary



SD1.1. AZ ÉTRENDI KIEGÉSZÍTŐ SZEDÉSÉRE VONATKOZÓ KÉRDÉSEK

1.1.1. Gyermeke minden nap ugyanabban az időpontban vette be az étrendi kiegészítőt?	Igen	Nem
1.1.2. Melyik napszakban vette be gyermeke az étrendi kiegészítőt?	Reggel ☐ Délelőtt ☐ Délben ☐	Délután ☐ Este ☐
1.1.3. Hány adag étrendi kiegészítőt felejtettek el bevenni? (Kérjük, adja meg a megmaradt tasakok konkrét számát.)	____ adag	

1.1.4. Megjegyzések:

SD1.2. ÉTRENDI BEVITELRE VONATKOZÓ ADATOK

1.2.1. Megváltoztak bármilyen módon gyermeke étkezési szokásai az elmúlt 6 hétben?	Igen	Nem
1.2.2. Ha igen, kérjük, részletezze:	_____	
1.2.3. Kizár rendszeresen valamilyen ételfajtát gyermeke étrendjéből (pl. húst, halat, tejterméket, tojást)?	Igen	Nem
1.2.4. Ha igen, milyen ételeket?	_____	

Milyen gyakran fogyasztott gyermeke az elmúlt 6 hétben a vizsgálati készítményen kívül **pre- vagy probiotikus termékeket**?
Kérjük, karikázza be a megfelelő választ!

1.2.5. Probiotikus ital (100 ml) (pl. Actimel®) A termék(ek) neve: _____	Soha 0	Havonta 1 2 3 4 >4	Hetente 1 2 3 4 >4
1.2.6. Probiotikus joghurt (150 g) (pl. Danone Activia®, Bakony Joghurt Plusz®) A termék(ek) neve: _____	Soha 0	Havonta 1 2 3 4 >4	Hetente 1 2 3 4 >4
1.2.7. Probiotikus gyógyszer vagy táplálék-kiegészítő (pl. Normaflore®, Progastro KID®, Lactive®, Protexin®) A termék(ek) neve: _____	Soha 0	Havonta 1 2 3 4 >4	Hetente 1 2 3 4 >4
1.2.8. Prebiotikus táplálék-kiegészítő (pl. Inulin Prebiotikus Por, Prebiotikus Rost Koktél) A termék(ek) neve: _____	Soha 0	Havonta 1 2 3 4 >4	Hetente 1 2 3 4 >4
1.2.9. Más pre- vagy probiotikus termék A termék(ek) neve: _____	Soha 0	Havonta 1 2 3 4 >4	Hetente 1 2 3 4 >4

SD1.3. A gyermek EGÉSZSÉGI ÁLLAPOTA az elmúlt 6 hétben

1.3.1. Gyermeke az elmúlt 6 hétben végig egészséges volt? (Ha válasza IGEN, folytassa a kérdőívet a **2.5.** ponttól)	Igen Nem

LÁZ

1.3.2. Az elmúlt 6 hétben volt a gyermek lázas?	Igen Nem
1.3.3. Ha igen, kérjük, adja meg, hogy hány alkalommal volt a gyermek lázas az elmúlt 6 hétben (hőmérséklete hónaljban mérve >38 °C, végbélben >38,5 °C)	1 2 3 4 >4
1.3.4. Ha igen, kérjük, adja meg a lázas időszakok kezdetének és végének dátumát (év/hónap/nap)	__/__/__ – __/__/__ __/__/__ – __/__/__ __/__/__ – __/__/__ __/__/__ – __/__/__
1.3.5. Ha igen, kérjük, adja meg a csúcshőmérsékletet (a legmagasabb mért értéket)	____ °C
1.3.6. Kérjük, adja meg, hogy hol mérte a gyermek testhőmérsékletét!	végbélben ☐ hónaljban ☐ máshol ☐
1.3.7. Kérjük, adja meg azon napok számát, amikor gyermeke az elmúlt 6 hétben lázas volt (hőmérséklete hónaljban mérve >38 °C, végbélben >38,5 °C)	____ nap

LÉGÚTI FERTŐZÉS

1.3.8. Észlelt orrfolyást gyermekénél az elmúlt 6 hétben?	Igen Nem
1.3.9. Ha igen, kérjük, adja meg az elmúlt 6 hétben észlelt orrfolyásos epizódok számát	1 2 3 4 >4
1.3.10. Ha igen, kérjük, adja meg az orrfolyásos epizódok kezdetének és végének dátumát (év/hónap/nap)	__/__/__ – __/__/__ __/__/__ – __/__/__ __/__/__ – __/__/__ __/__/__ – __/__/__
1.3.11. Milyen jellegű váladék ürült a gyermek orrából?	vizes ☐ sűrű, sárgás-gennyes ☐
1.3.12. Köhögött-e gyermeke az elmúlt 6 hétben?	Igen Nem
1.3.13. Ha igen, kérjük, adja meg az elmúlt 6 hétben észlelt köhögéses epizódok számát	1 2 3 4 >4
1.3.14. Ha igen, kérjük, adja meg a köhögős időszakok kezdetének és végének dátumát (év/hónap/nap)	__/__/__ – __/__/__ __/__/__ – __/__/__ __/__/__ – __/__/__ __/__/__ – __/__/__

1.3.15. Kérjük, hogy értékelje a köhögés súlyosságát!	enyhe ☐ mérsékelten súlyos ☐ súlyos ☐
1.3.16. Jelzett-e a gyermeke az elmúlt 6 hétben **fülfájdalmat?**	Igen Nem
1.3.17. Ha igen, kérjük, adja meg az elmúlt 6 hétben észlelt fülfájós epizódok számát	1 2 3 4 >4
1.3.18. Ha igen, kérjük, adja meg a fülfájós időszakok kezdetének és végének dátumát (év/hónap/nap)	___/___/___ - ___/___/___ ___/___/___ - ___/___/___ ___/___/___ - ___/___/___ ___/___/___ - ___/___/___
1.3.19. Kérjük, értékelje a fülfájás súlyosságát!	enyhe ☐ mérsékelten súlyos ☐ súlyos ☐

GYOMOR-BÉLRENDSZERI FERTŐZÉSEK

1.3.20. Volt a gyermeknek az elmúlt 6 hétben gyomor-bélrendszeri **(hasmenéssel-hányással járó)** megbetegedése?	Igen Nem
1.3.21. Volt a gyermeknek az elmúlt 6 hétben **hasmenéses** fertőző megbetegedése?	Igen Nem
1.3.22. Ha igen, kérjük, adja meg az elmúlt 6 hétben észlelt hasmenéses megbetegedések számát	1 2 3 4 >4
1.3.23. Ha igen, kérjük, adja meg a hasmenéses epizódok kezdetének és végének dátumát (év/hónap/nap)	___/___/___ - ___/___/___ ___/___/___ - ___/___/___ ___/___/___ - ___/___/___ ___/___/___ - ___/___/___
1.3.24. Kérjük, értékelje a hasmenés súlyosságát!	enyhe ☐ mérsékelten súlyos ☐ súlyos ☐
1.3.25. Kérjük, értékelje a széklet minőségét a mellékelt **Bristol skála** szerint!	5-ös típus ☐ 6-os típus ☐ 7-es típus ☐
1.3.26. Volt a gyermeknek az elmúlt 6 hétben **hányással** járó fertőző megbetegedése?	Igen Nem
1.3.27. Ha igen, kérjük, adja meg az elmúlt 6 hétben észlelt hányással járó megbetegedések számát	1 2 3 4 >4

1.3.28. Ha igen, kérjük, adja meg a hányásos epizódok kezdetének és végének dátumát (év/hónap/nap)	__/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__
1.3.29. Kérjük, értékelje a hányás súlyosságát!	enyhe ☐ mérsékelten súlyos ☐ súlyos ☐

HÚGYÚTI FERTŐZÉSEK

1.3.30. Volt a gyermeknek az elmúlt 6 hétben **húgyúti** fertőzése?	Igen Nem
1.3.31. Ha igen, kérjük, adja meg az elmúlt 6 hétben zajló húgyúti fertőzések számát	1 2 3 4 >4
1.3.32. Ha igen, kérjük, adja meg a húgyúti fertőzések kezdetének és végének dátumát (év/hónap/nap)	__/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__

ORVOSI VIZITEK

1.3.33. Felkereste gyermekével az elmúlt 6 hétben a házi gyermekorvost fertőzés/betegség miatt?	Igen Nem
1.3.34. Ha igen, kérjük, adja meg a házi gyermek-orvosnál tett látogatások számát	1 2 3 4 5 6 >6
1.3.35. Ha igen, kérjük, adja meg a vizitek dátumát (év/hónap/nap)	__/__/__ __/__/__ __/__/__ __/__/__ __/__/__
1.3.36. Kérjük, adja meg, hogy hány alkalommal kereste fel a házi gyermekorvost hasmenés/lazább széklet ürítés miatt	1 2 3 4 >4
1.3.37. **Hiányzott** a gyermek az elmúlt 6 hétben az óvodából fertőzés/betegség miatt?	Igen Nem
1.3.38. Ha igen, kérjük, adja meg, hogy az elmúlt 6 hétben hány napot hiányzott összesen a gyermek az óvodából:	____ nap

1.3.39. Kérjük, adja meg az egyes hiányzások első és utolsó napját (év/hónap/nap)	__/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__
1.3.40. Kérjük, adja meg az egyes hiányzások okát (diagnózis):	_____ _____ _____
1.3.41. Feküdt a gyermek **kórházban** az elmúlt 6 hétben valamilyen fertőző megbetegedés miatt?	Igen Nem
1.3.42. Ha igen, kérjük, adja meg, hogy az elmúlt 6 hétben kórházban töltött napok számát	1 2 3 4 5 6 >6
1.3.43. Kérjük, adja meg a kórházi kezelések első és utolsó napját	__/__/__ - __/__/__
1.3.44. Kérjük, adja meg a kórházi kezelés(ek) okát (diagnózis):	_____ _____ _____

SD1.4. AZ ELMÚLT 6 HÉT GYÓGYSZERELÉSÉRE VONATKOZÓ KÉRDÉSEK

1.4.1. Az elmúlt 6 hét folyamán szedett a gyermek antibiotikumot?	Igen Nem
1.4.2. Ha igen, kérjük, adja meg, hány antibiotikum kúrát kapott a gyermek az elmúlt 6 hétben	1 2 3 4 >4
1.4.3. Ha igen, kérjük, adja meg az antibiotikum kúrák első és utolsó napját (év/hónap/nap)	__/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__
1.4.4. Kérjük, itt adja meg az antibiotikum nevét	_____
1.4.5. Kérjük, itt adja meg az antibiotikum dózisát	_____
1.4.6. Jelentkezett hasmenés vagy észlelt lazább székleteket az antibiotikum kezelés során?	Igen Nem
1.4.7. Ha igen, adja meg azon napok számát, amikor hasmenést/higabb székletürítést észlelt az elmúlt 6 hétben	____ nap
1.4.8. Ha igen, kérjük, adja meg az antibiotikum kezeléssel összefüggésbe hozott hasmenéssel/híg székletürítéssel járó epizódok első és utolsó napját (év/hónap/nap)	__/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__ __/__/__ - __/__/__

1.4.9. Ha igen, kérjük, értékelje az egyes hasmenéssel/ híg székletürítéssel járó epizódok átlagos széklet jellemzőit a mellékelt **Bristol skála** alapján, és adja meg az adott típusba tartozó székletürítések számát	5-ös típus (lágy) _____	6-os típus (lágy) _____	7-es típus (folyékony) _____
1.4.10. Kapott a gyermek hashajtót az elmúlt 6 hétben?	Igen	Nem	
1.4.11. Ha igen, kérjük, adja meg, hány napig szedett a gyermek hashajtót	1 2 3 4 5 6 >6		
1.4.12. Ha igen, kérjük, adja meg a hashajtószedés alkalmainak első és utolsó napját (év/hónap/nap)	___/___/___ – ___/___/___ ___/___/___ – ___/___/___ ___/___/___ – ___/___/___ ___/___/___ – ___/___/___		
1.4.13. Kapott a gyermek bármilyen más gyógyszert az elmúlt 6 hétben?	Igen	Nem	
1.4.14. Ha igen, kérjük, adja meg a gyógyszer nevét	_____		
1.4.15. Ha igen, kérjük, adja meg, hány napig szedte a gyermek a fenti gyógyszert az elmúlt 6 hétben	1 2 3 4 5 6 >6		
1.4.16. Ha igen, kérjük, adja meg a gyógyszerszedés alkalmainak első és utolsó napját (év/hónap/nap)	___/___/___ – ___/___/___ ___/___/___ – ___/___/___ ___/___/___ – ___/___/___ ___/___/___ – ___/___/___		

SD1.5. A POTENCIÁLIS MELLÉKHATÁSOKRA VONATKOZÓ KÉRDÉSEK

1.5.1. A gyermek alapvetően jól tolerálta az étrendi kiegészítőt?	Igen	Nem
1.5.2. Észlelt bármilyen negatív tünetet, melyet összefüggésbe hoz az étrendi kiegészítő szedésével?	Igen	Nem
1.5.3. Ha igen, kérjük, itt részletezze:	_____	
1.5.4. Jelzett a gyermek hasi diszkomfortot (panaszkodott hasfájásra)?	Igen	Nem

BRISTOL SZÉKLET SKÁLA

1-es típus		*Különálló, kisméretű bogyók (nehéz üríteni)*
2-es típus		*Alakja hurkaszerű, felszíne göröngyös*
3-as típus		*Formált, alakja hurkaszerű, felszíne strukturált*
4-es típus		*Formált, alakja virsliszerű, képlékeny, felszíne sima*
5-ös típus		*Lágy, amorf darabos, széle jól körülhatárolt (könnyű üríteni)*
6-os típus		*Részben híg, részben darabos, pépszerű széklet*
7-es típus		*Vizes, nincs szilárd része* *TELJESEN FOLYÉKONY*

Étrendi Napló

Kérjük, töltse ki az étrendi naplót, úgy, hogy az gyermeke étrendjének 3 napját fedje le, tartalmazza 2 munkanap és 1 hétvégei nap étrendjét (csütörtök/péntek/szombat).

Kérjük, adja meg az étrendi napló kitöltésének dátumát (év/hónap/nap):

1. nap: _____/_____/_____
2. nap: _____/_____/_____
3. nap: _____/_____/_____

Kérjük, a kitöltött étrendi naplót hozza el a következő vizsgálati nap alkalmával: _____/_____/_____.

Az étrendi napló kitöltésére vonatkozó útmutatások:

- Kérjük, ne változtasson gyermeke étkezési szokásain!
- Kérjük, hogy a 3 megadott nap során elfogyasztott minden ételt/italt tüntessen fel az étrendi naplóban!
- Kérjük, az étrendi naplót mindig az adott nap végén töltse ki!
- Kérjük, adja meg, hogy az adott ételfajtából hány adagot fogyasztott a gyermek az adott napon!
- A megadott mennyiségek mindig az adott étel ehető részére vonatkoznak
- A megadott mennyiségek egy felnőtt adagnak megfelelőek. Ha az Ön gyermeke többet vagy kevesebbet eszik, kérjük, adjon meg többszörös vagy töredék (1/2, ¼) porciót. Kérjük, az adagokat számokkal adja meg!
- Az Ön által megadott adatok segítségével fogjuk meghatározni gyermeke átlagos tápanyagbevitelét
- Ha van olyan élelmiszer/ital, melyet gyermeke rendszeresen fogyaszt, de nem találja meg a listában, kérjük, adja meg ezen élelmiszereket az üres mezőkben a lista végén!

Hozzávetőleges mennyiségek:

1 teáskanál = kb. 5 g
1 kanál = kb. 15 g
1 pohár = kb. 200 ml
1 csésze = kb. 125 ml

	CSÜTÖRTÖK	PÉNTEK	SZOMBAT
ITALOK			
Ásványvíz (200 ml)			
Csapvíz (200 ml)			
Tea (125 ml)			
Gyümölcslé 100% gyümölcstartalommal (pl. narancs, alma) (200 ml)			
Zöldséglé (pl. paradicsom, sárgarépa) (200 ml)			
Szénsavas cukortartalmú italok (pl. Fanta, Cola, tonik, gyömbér) (200 ml)			
Szénsavas cukormentes italok (pl. Cola light) (200 ml)			
Szénsavmentes cukortartalmú italok (pl. jeges tea, szörpök, gyümölcslevek <100% gyümölcstartalommal) (200 ml)			
TEJ			
Teljes tej (házi tej) (150 ml)			
Tej 2,8% zsírtartalommal (150 ml)			
Tej 1,5% (vagy alacsonyabb) zsírtartalommal (150 ml)			
Édesített tej (pl. cukor/méz hozzáadásával vagy kakaó, karamell, tejeskávé, vaníliás tej) (150 ml)			
Szójatej (150 ml)			
TEJTERMÉKEK			
Natúr, cukormentes joghurt vagy kefír (150 g = 1 pohár)			
Édes, ízesített (gyümölcsös) joghurt (150 g = 1 pohár)			
Tejföl (150 g = 1 pohár)			
Puding (150 g = 1 pohár)			
Vaj (10 g = vékonyan kent kenyér)			
Túró (125 g = kis tálka)			
Szeletelt sajt (pl. Trappista, Pannónia, Edami, Lapka, Gouda) (30 g = 1 szelet)			
Lágy sajt (pl. Mozzarella, Brie, Babybel, Camembert) (30 g = 1 szelet)			
Kenhető sajt (Medvesajt, Camping, Boci) (30 g = 2 kocka)			
Reszelt sajt (30 g = 1 kenyérre való)			
GABONATERMÉKEK			
Fehér kenyér (50 g = vékony fél szelet)			
Toast (30 g = 1 szelet)			
Tejes kifli (45 g = 1 db)			
Vizes zsemle (54 g = 1 db)			
Fehér pelyhes kenyér (pl. kukoricás kenyér) (45 g)			
Teljes kiőrlésű lisztből készült kenyér (45 g)			

	CSÜTÖRTÖK	PÉNTEK	SZOMBAT
Teljes kiőrlésű kifli, zsemle (1 db)			
Teljes kiőrlésű extrudált kenyér (45 g)			
Finomított gabonából készült termékek (Abonett, macesz, Hamlett) (50 g = 1 szelet)			
Tészta (tojásos) (125 g = 1 tányér)			
Tészta (durum) (125 g = 1 tányér)			
Rizs (180 g = 1 adag)			
Töltött/rétegezett tészták pl. Lasagna, canelloni (200 g)			
Pizza (420g = 20 cm átmérőjű)			
REGGELIZŐ PELYHEK			
Müzli – édesítés nélkül (50 g = kis tálka)			
Müzli – édesített (50 g = kis tálka)			
Kukoricapehely (Cornflakes) (30 g = kis tálka)			
Reggelizõ pehely /gabonapehely (pl. Cerbona, Nestlé, Chocapic) (30 g = kis tálka)			
Zabpehely, zabkása (60 g = kis tálka)			
TOJÁS			
Tojás (60 g = 1 db közepes nagyságú tyúktojás)			
Csak tojásfehérje (30 g)			
Csak tojássárgája (30 g)			
HÚSOK, BELSŐSÉGEK			
Szárnyas (csirke/pulyka/kacsa) (150 g = 1 szelet/comb)			
Marhahús (150 g = 1 szelet)			
Disznóhús (150 g = 1 szelet)			
Nyúlhús (150 g = 1 szelet)			
Borjúhús (150 g = 1 szelet)			
Hamburger hús (150 g = 1 db)			
Vese, agy (100 g)			
Máj (100 g)			
Májkrém, húspástétom (30 g = 1 kenyérre való)			
Főtt sonka (30 g = 1 szelet)			
Füstölt sonka (30 g = 1 szelet)			
Bolognai vagy egyéb darált húsos szósz (30 g = 1 adag)			
Kolbász (30 g = 2 karika)			
Bacon szalonna (30 g = 1 szelet)			
Szalámi, felvágott (30 g = 1 szelet)			
Húshelyettesítő termékek (pl. Tofu)			

	CSÜTÖRTÖK	PÉNTEK	SZOMBAT
HALAK, TENGER GYÜMÖLCSEI			
Főtt/nyers/grillezett/sütőben sült (nem olajban sült) hal (150 g = 1 szelet)			
Halkonzerv (pl. olajos/paradicsomos tonhal, makréla) (90 g = fél konzerv)			
Olajban sült és/vagy panírozott hal (halrudacskák, rántott hal) (100 g = 3db)			
Tenger gyümölcsei (150 g = 1 adag)			
HÜVELYESEK			
Lencse, borsó, sárgaborsó (150 g = 1 adag)			
Bab (150 g = 1 adag)			
ZÖLDSÉGEK			
Uborka (150 g = 1 közepes)			
Paradicsom (150 g = 1 közepes)			
Káposzta (150g = 1 saláta adag)			
Sárgarépa (150 g = 1 nagy)			
Paprika (150 g = 1 db)			
Cukkini, tök, sütőtök (150 g = 1 fél)			
Csemegekukorica (150 g = fél konzerv / 1 cső)			
Padlizsán (150 g = 1 fél)			
Hagyma (30 g = 1 db)			
Spenót (150 g = 1 adag)			
Kelbimbó (150 g = 1 adag)			
Karfiol, brokkoli (150 g = 1 adag)			
Fehérrépa, zeller (50 g)			
Articsóka			
Póréhagyma, retek (150 g = 5 db)			
Fejes saláta (65 g = 1 negyed)			
Édesköménv (65 g)			
Endívia (65 g)			
Olajbogyó (30 g)			
Burgonya – főtt (200 g = 2db)			
Burgonyapüré (200 g = 4 evőkanál)			
Burgonya – sült (kevés zsiradékban) (200 g = 1 adag)			
Burgonya – sült (sok zsiradékban) (200 g = 1 adag)			

	CSÜTÖRTÖK	PÉNTEK	SZOMBAT
GYÜMÖLCSÖK			
Alma, körte (125 g = 1 db)			
Banán (100 g = 1 db)			
Sárgabarack, őszibarack, eper (120 g = 1 db / 1db / marék)			
Szilva, cseresznye (1 db/ marék)			
Szőlő (125 g = 1 kis fürt)			
Kivi (45 g = 1 db)			
Mangó (125 g = 1 db)			
Narancs, mandarin, grapefruit (150 g = 1 db)			
Ananász (125 g = 2 karika)			
Avokádó (50 g)			
Sárgadinnye, görögdinnye (125 g = 1 közepes szelet)			
Szárított gyümölcs (50 g = 1 marék)			
Befőtt (50 g = 5 meggy / fél barack)			
Gesztenye (25 g)			
Kókuszdió (45 g)			
Fenyőmag (25 g)			
ÉDESSÉGEK, NASSOLNIVALÓK			
Lekvár, dzsem (25 g = 1 kenyérre való)			
Méz (20 g = 1 kenyérre való)			
Piskóta, muffin (1 szelet / db)			
Cukrászsütemény, krémes sütemény, profiterol (120 g = 1 db)			
Keksz, teasütemény, édes száraz sütemény (50 g = 5 db)			
Csokoládészelet (pl. Kit Kat, Sport szelet) (20 g = 1 db)			
Csokoládékrém (pl. Nutella) (20 g = 1 kenyérre való)			
Fagylalt (75 g = 2 gombóc)			
Jégkrém (pl. Magnum, Cornetto) (1 db)			
Burgonyaszirom, chips (25 g = 1 marék)			
Popcorn (25 g = 1 marék)			
Földimogyoró (25 g = 1 marék)			
Pisztácia (25 g = 1 marék)			
Mogyoró (25 g = 1 marék)			
Mandula, kesudió (25 g = 1 marék)			
Olajos magvak: napraforgó, tökmag (25 g = 1 marék)			
Extrudált kukoricapehely (25 g = 1 marék)			

	CSÜTÖRTÖK	PÉNTEK	SZOMBAT
Cukorka (50 g = 1 db)			
Rágógumi (10 g = 1 db)			
Édes ostya, nápolyi (120 g = 5 db)			
ZSIRADÉKOK			
Olíva olaj (12 g = 1 evőkanál)			
Napraforgó-, repce olaj (12 g = 1 evőkanál)			
Zsír (20 g = 1 evőkanál)			
SZÓSZOK			
Majonéz (20 g)			
Ketchup (20 g)			
Besamel, Paradicsommártás, bolognai (50 g)			
Mustár (5 g)			
Mártás (50 g)			
Zöldség leves (50 g)			
Húsleves (50 g)			
Carbonara szósz, sajtmártás (50 g)			
TOVÁBBI ÉTELEK			

Ha a vizsgálathoz bármilyen megjegyzést kíván tenni, kérjük, itt tegye meg:

Az SD1.6. és az SD1.7. táblázatokat a vizsgálatot végző személyek töltik ki.

SD1.6. A SZÜKSÉGES SZÉKLETMINTÁK ÖSSZEGYŰJTÉSÉNEK MEGERŐSÍTÉSE

1.6.1 Amennyiben a gyermek az elmúlt 6 hétben szedett antibiotikumot: megtörtént a székletminták összegyűjtése az antibiotikus terápia során?	1. nap 7. nap 14. nap	☐ ☐ ☐
1.6.2 Megkapták a további (antibiotikum terápia esetén szükséges) székletgyűjtéshez a széklettartályokat?	Igen	☐

SD1.7. ELŐKÉSZÜLETEK A KÖVETKEZŐ 6 HÉTRE

1.7.1. Megkapták az Etrendi naplót, amit a következő vizsgálati nap előtti csütörtök/péntek/szombaton kell kitölteni?	Igen	☐
1.7.2. Megkapták a következő 6 hétre vonatkozó Szülői kérdőívet?	Igen	☐
1.7.3. Megkapták az étrendi kiegészítőt a következő 6 hétre?	Igen	☐

A kérdőívet kezelő/ellenőrző személy neve: _____

A kitöltés dátuma: _____/_____/_____ (év/hónap/nap)

Az következő vizsgálati nap (SD 2): _____/_____/_____ (év/hónap/nap)

Kérjük, hogy a kitöltött kérdőívet a következő vizsgálati napra (SD2) hozza magával!

NAGYON KÖSZÖNJÜK A VIZSGÁLATBAN VALÓ KÖZREMŰKÖDÉSÉT ÉS ÉRTÉKES SEGÍTSÉGÉT!

Appendix B

Appendix B1: Leaflets for the universities

Appendix B2: Questionnaire for students of medicine

A bizonyítékokon alapuló orvoslás gondolatkörének a megjelenése az orvosi- és egészségtudományi képzésben

KÉRDŐÍV ORVOSTANHALLGATÓK SZÁMÁRA

KEDVES ORVOSTANHALLGATÓ KOLLÉGA/KOLLEGINA!

Csertő Mónika vagyok a Pécsi Tudományegyetem Általános Orvostudományi Kar Interdiszciplináris Orvostudományok Doktori Iskola PhD hallgatója.

A PTE Klinikai Központ, Magyar Cochrane Tagozat kutatócsoportjával együttműködésben országos felmérést készítek, melynek célja annak megismerése, hogy a bizonyítékokon alapuló orvoslás eszméi milyen szerepet játszanak az orvosi- és egészségtudományi képzésben.

A kitöltők között nyereményjátékot hirdetünk (pendrive és más ajándéktárgyak kerülnek kisorsolásra), ehhez a kérdőív végén szükséges egy jeligét megadni. A nyertes jeligéket közzétesszük a Magyar Cochrane Tagozat honlapján (https://hungary.cochrane.org/hu)

Adatkezelési tájékoztató

A kérdőív kitöltése önkéntes és anonim. A kérdőívben megadott adatok nem kerülnek összekapcsolásra más adatbázisok adataival. A kérdőíves felmérés eredményei tudományos munka részeként kerülnek elemzésre és publikálásra. A tudományos publikációk nyilvánosan hozzáférhetőek lesznek az MTMT adatbázisban.

Köszönjük, hogy a kérdőív kitöltésével hozzájárul kutatásunk sikerességéhez!

JELIGE:

1. **Hallgató neme**
   - férfi
   - nő

2. **Melyik egyetem hallgatója vagy?**
   - Pécsi Tudományegyetem
   - Debreceni Egyetem
   - Semmelweis Egyetem
   - Szegedi Tudományegyetem

3. **Hányadik évfolyam hallgatója vagy?**
   - első
   - második
   - harmadik
   - negyedik
   - ötödik
   - hatodik
4. **Dolgoztál már korábban az egészségügyben (legalább 1 évet)?**
   - igen
   - nem

5. **Tanulmányaid mellett részt veszel kutatócsoport munkájában (pl. TDK munka keretében)?**
   - igen
   - nem

6. **A közeli hozzátartozóid között (szülők, testvérek, házastárs) van olyan, aki az egészségügyben dolgozik?**
   - igen
   - nem

7. **Ha igen, hatással volt ez a pályaválasztásodra?**
   - igen
   - nem

8. **Milyen gyakran olvasol szakmai folyóiratokat?**
   - naponta
   - hetente
   - havonta vagy ritkábban
   - soha

9. **Rendelkezel saját számítógéppel?**
   - igen
   - nem

10. **Van internet hozzáférésed?**
    - igen
    - nem

11. **Van ingyenes internet hozzáférésed?**
    - igen
    - nem

12. **A következő kereső felületek közül melyiket használtad már orvosi/ egészségügyi információ szerzésére (több válasz is jelölhető)?**
    - Google
    - Google scholar
    - Wikipedia
    - Pubmed/Medline
    - Medscape
    - Cochrane Library
13. **Mit tekintesz az egészségügyi információszerzés fő forrásának (Kérjük 1 választ jelöljön)?**
    - Nyomtatott szakkönyvek
    - Nyomtatott folyóiratok
    - Elektronikus szakkönyvek
    - Elektronikus folyóiratok
    - Elektonikus média
    - Szakmai irányelvek
    - Szórólapok
    - Oktatási jegyzetek
    - Egészségügyi szakemberek véleményének megismerése

14. **Vettél már részt szakmai képzésen (kurzus, tanfolyam), ahol a bizonyítékokon alapuló orvoslással (BAO, EBM) kapcsolatos ismereteket szereztél?**
    - igen
    - nem

15. **Ha igen, hasznosnak tartottad a képzést a további tanulmányaid illetve a későbbi munkád szempontjából?**
    - igen
    - nem

16. **Ha nem, hasznosnak tartanál egy ilyen képzést a további tanulmányaid illetve a későbbi munkád szempontjából?**
    - igen
    - nem

17. **Ha igen, melyik évfolyamon lenne szerinted hasznos az EBM oktatása?**
    - az 1.-2. évfolyamon
    - a 3.-4. évfolyamon
    - az 5.-6. évfolyamon

18. **Szerepet játszik-e az adott egészségügyi információ nyelve abban, hogy elolvasod-e?**
    - Igen, csak magyarul szeretek olvasni
    - Igen, csak angolul szeretek olvasni
    - Nem, az angol és magyar nyelvű forrásokat egyaránt elolvasom
    - Nem, sőt, olvastam már olyan forrást is, ami egyéb (nem angol vagy magyar) nyelven íródott

EBM tudás felmérés: Milyennek ítéled a készségeidet a következő területeken?

	Gyenge (1)	**Valamennyire értek hozzá (2)**	**Átlagos (3)**	**Átlagosnál jobb (4)**	**Haladó szintű (5)**
Szakmai irodalom keresése					
Keresés online adatbázisokban					
Klinikai kutatásokat leíró közlemények kritikus értékelésé					
Olyan fontos klinikai területek azonosítása, ahol még nem áll rendelkezésre elég szakirodalom					
A rendelkezésre álló szakirodalom kritikus megítélése					
Betegek szempontjából fontos kérdések azonosítása					

Önbevalláson alapuló fogalomismeret

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Bizonyítékokon alapuló orvoslás (evidence-based medicine)					
Eredeti kezelési szándék szerinti elemzés (intention-to-treat analysis)					
Esetszám (sample size)					
Esettanulmány (case study)					

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Kohorsz vizsgálat (cohort study)					
Konfidencia intervallum					
Kontrollált klinikai vizsgálat					

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Lemorzsolódás (lost to follow-up)					
Meta-analízis					
NNT (number needed to treat)					

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Randomizálás (randomization)					
Szakmai irányelv (guideline)					
Szisztematikus irodalmi áttekintés (systematic review)					

Attitűd felmérés: Mennyire értesz egyet a következő állításokkal?

	Egyáltalán nem értek vele egyet	Nem értek egyet	Semleges	Egyet értek	Kifejezetten egyet értek
A bizonyítékokon alapuló orvoslás (BAO) fontos a gyakorló orvos munkája szempontjából					
Szeretném, hogy a tanulmányaim során azon képességeim fejlődjenek, mely a BAO gyakorlati orvosi munka során történő alkalmazásához szükséges					
A BAO fontos a betegek optimális ellátásához					
A BAO elősegíti a betegek ellátásával kapcsolatos döntéshozatalt					
A BAO figyelembe veszi a gyakorló orvosok egyéni tapasztalatait					
A BAO figyelembe veszi a betegek kezeléssel kapcsolatos véleményét, preferenciáit					
Fontos, hogy a kutatási eredmények beépüljenek az orvosi gyakorlatba					
Minden klinikai vizsgálat azonos értékű					
A BAO gyakorlati alkalmazása megvalósíthatatlan terhet ró az egészségügyben dolgozókra					
A betegek ellátásával kapcsolatban felmerülő kérdéseimre a legmegfelelőbb választ szakkönyvekből kaphatom					
Leendő egészségügyi dolgozóként fontosnak tartom az egész életen át tartó tanulást					

Appendix B3: Questionnaire for students of health sciences

A bizonyítékokon alapuló orvoslás gondolatkörének a megjelenése az orvosi- és egészségtudományi képzésben

KEDVES KOLLÉGA/KOLLEGINA!

Csertő Mónika vagyok a Pécsi Tudományegyetem Általános Orvostudományi Kar Interdiszciplináris Orvostudományok Doktori Iskola PhD hallgatója.

A PTE Klinikai Központ, Magyar Cochrane Tagozat kutatócsoportjával együttműködésben országos felmérést készítek, melynek célja annak megismerése, hogy a bizonyítékokon alapuló orvoslás eszméi milyen szerepet játszanak az orvosi- és egészségtudományi képzésben.

A kitöltők között nyereményjátékot hirdetünk (pendrive és más ajándéktárgyak kerülnek kisorsolásra), ehhez a kérdőív végén szükséges egy jeligét megadni. A nyertes jeligéket közzétesszük a Magyar Cochrane Tagozat honlapján (https://hungary.cochrane.org/hu)

Adatkezelési tájékoztató

A kérdőív kitöltése önkéntes és anonim. A kérdőívben megadott adatok nem kerülnek összekapcsolásra más adatbázisok adataival. A kérdőíves felmérés eredményei tudományos munka részeként kerülnek elemzésre és publikálásra. A tudományos publikációk nyilvánosan hozzáférhetőek lesznek az MTMT adatbázisban.

Köszönjük, hogy a kérdőív kitöltésével hozzájárul kutatásunk sikerességéhez!

1. **Hallgató neme**
   - férfi
   - nő
2. **Melyik egyetem hallgatója vagy?**
   - Pécsi Tudományegyetem
   - Debreceni Egyetem
   - Semmelweis Egyetem
   - Szegedi Tudományegyetem
   - Miskolci Egyetem
   - Gál Ferenc Főiskola
   - Széchenyi István Egyetem
   - Egyéb:

3. **Milyen szakon tanulsz?**
   - Alapképzési (Bsc)
   - Mesterképzési (Msc)

4. **Milyen szakon tanulsz?**
   - Ápoló (Bsc)
   - Dietetikus (Bsc)
   - Gyógytornász (Bsc)
   - Mentőtiszt (Bsc)
   - Szülésznő (Bsc)
   - Népegészségügyi ellenőr (Bsc)
   - Egészségbiztosítási (Bsc)
   - Védőnő (Bsc)
   - Egészségturizmus szervező (Bsc)
   - Egészségügyi ügyvitel szervező (Bsc)
   - Orvosi Diagnosztikai Laboratóriumi Analitika (Bsc)
   - Radiográfia (Bsc)
   - Rekreációszervezés és egészségfejlesztés (Bsc)
   - Szociális munka (BA)
   - Csecsemő és kisgyermeknevelő (BA)
   - Ápolás (Msc)
   - Táplálkozástudományi (Msc)
   - Fizioterápia (Msc)
   - Egészségügyi tanár (Msc)
   - Klinikai Laboratóriumi Kutató (Msc)
   - Népegészségügyi (Msc)
   - Sportmenedzser (Msc)
   - Egészségügyi szociális munka (Msc)
   - Egyéb:

5. **Nappali, vagy levelezős munkarend hallgatója vagy?**
   - Nappali
   - Levelezős

6. **Hányadik évfolyam hallgatója vagy?**
   - első
   - második
   - harmadik
   - negyedik

7. **Dolgoztál már korábban az egészségügyben (legalább 1 évet)?**
   - igen
   - nem

8. **Tanulmányaid mellett részt veszel kutatócsoport munkájában (pl. TDK munka keretében)?**
   - igen
   - nem

9. **A közeli hozzátartozóid között (szülők, testvérek, házastárs) van olyan, aki az egészségügyben dolgozik?**
   - igen
   - nem

10. **Ha igen, hatással volt ez a pályaválasztásodra?**
    - igen
    - nem

11. **Milyen gyakran olvasol szakmai folyóiratokat?**
    - naponta
    - hetente
    - havonta vagy ritkábban
    - soha

12. **Rendelkezel saját számítógéppel?**
    - igen
    - nem

13. **Van internet hozzáférésed?**
    - igen
    - nem

14. **Van ingyenes internet hozzáférésed?**
    - igen
    - nem

15. A következő kereső felületek közül melyiket használtad már orvosi/ egészségügyi információ szerzésére (több válasz lehetséges)?

- Google
- Google scholar
- Wikipedia
- Pubmed/Medline
- Medscape
- Cochrane Library

16. Mit tekintesz az egészségügyi információszerzés fő forrásának (Kérjük 1 választ jelölj meg)?

- Nyomtatott szakkönyvek
- Nyomtatott folyóiratok
- Elektronikus szakkönyvek
- Elektronikus folyóiratok
- Elektonikus média
- Szakmai irányelvek
- Szórólapok
- Oktatási jegyzetek
- Egészségügyi szakemberek véleményének megismerése

17. Vettél már részt szakmai képzésen (kurzus, tanfolyam), ahol a bizonyítékokon alapuló orvoslással (BAO, EBM) kapcsolatos ismereteket szereztél?

- Igen
- Nem

18. Ha igen, hasznosnak tartottad a képzést a további tanulmányaid illetve a későbbi munkád szempontjából?

- Igen
- Nem

19. Ha nem, hasznosnak tartanál egy ilyen képzést a további tanulmányaid illetve a későbbi munkád szempontjából?

- Igen
- Nem

20. Ha igen, melyik évfolyamon lenne szerinted hasznos az EBM oktatása?

- Az 1.-2. évfolyamon
- A 3.-4. évfolyamon

21. Szerepet játszik-e az adott egészségügyi információ nyelve abban, hogy elolvasod-e?

- Igen, csak magyarul szeretek olvasni
- Igen, csak angolul szeretek olvasni
- Nem, az angol és magyar nyelvű forrásokat egyaránt elolvasom
- Nem, sőt, olvastam már olyan forrást is, ami egyéb (nem angol vagy magyar) nyelven íródott

EBM tudás felmérés: Milyennek ítéled a készségeidet a következő területeken?

	Gyenge (1)	**Valamennyire értek hozzá (2)**	**Átlagos (3)**	**Átlagosnál jobb (4)**	**Haladó szintű (5)**
Szakmai irodalom keresése					
Keresés online adatbázisokban					
Klinikai kutatásokat leíró közlemények kritikus értékelésé					
Olyan fontos klinikai területek azonosítása, ahol még nem áll rendelkezésre elég szakirodalom					
A rendelkezésre álló szakirodalom kritikus megítélése					
Betegek szempontjából fontos kérdések azonosítása					

Önbevalláson alapuló fogalomismeret

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Bizonyítékokon alapuló orvoslás (evidence-based medicine)					
Eredeti kezelési szándék szerinti elemzés (intention-to-treat analysis)					
Esetszám (sample size)					
Esettanulmány (case study)					

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Kohorsz vizsgálat (cohort study)					
Konfidencia intervallum					
Kontrollált klinikai vizsgálat					

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Lemorzsolódás (lost to follow-up)					
Meta-analízis					
NNT (number needed to treat)					

	Értem a jelentését, és másoknak is el tudnám magyarázni	Többé-kevésbé értem a jelentését	Nem ismerem a jelentését, de szeretném megismerni	Nem ismerem a jelentését, de szerintem nem is hasznos számomra	Nincs véleményem ezzel kapcsolatosan
Randomizálás (randomization)					
Szakmai irányelv (guideline)					
Szisztematikus irodalmi áttekintés (systematic review)					

Attitűd felmérés: Mennyire értesz egyet a következő állításokkal?

	Egyáltalán nem értek vele egyet	**Nem értek egyet**	**Semleges**	**Egyet értek**	**Kifejezetten egyet értek**
A bizonyítékokon alapuló orvoslás (BAO) fontos a gyakorló egészségügyi dolgozó munkája szempontjából					
Szeretném, hogy a tanulmányaim során azon képességeim fejlődjenek, mely a BAO gyakorlati munka során történő alkalmazásához szükséges					
A BAO fontos a betegek optimális ellátásához					
A BAO elősegíti a betegek ellátásával kapcsolatos döntéshozatalt					
A BAO figyelembe veszi a gyakorló egészségügyi szakemberek egyéni tapasztalatait					
A BAO figyelembe veszi a betegek kezeléssel kapcsolatos véleményét, preferenciáit					
Fontos, hogy a kutatási eredmények beépüljenek a klinikai gyakorlatba					
Minden klinikai vizsgálat azonos értékű					
A BAO gyakorlati alkalmazása megvalósíthatatlan terhet ró az egészségügyben dolgozókra					
A betegek ellátásával kapcsolatban felmerülő kérdéseimre a legmegfelelőbb választ szakkönyvekből kaphatom					
Leendő egészségügyi dolgozóként fontosnak tartom az egész életen át tartó tanulást					

nutrients

MDPI

Article

Dietary Energy and Nutrient Intake of Healthy Pre-School Children in Hungary

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Abstract: Diet in the early years of life may influence the development of chronic diseases later on. The aim of the present study was to investigate the dietary intake of 2- to 6-year-old Hungarian children. In 2013 and subsequently in 2016, cross-sectional surveys were conducted among parents of healthy children attending kindergarten in Hungary. We used a three-day food diary to record quantitative data of all the nutrients consumed by the children on two working days and one weekend day. The dietary intakes were compared to both the Hungarian recommended dietary allowances and the European Food Safety Authority recommendations. The nutritional data of altogether 186 children in 2013 and 556 children in 2016 were analyzed. The total energy and carbohydrate intake was appropriate. We observed high sugar intake in every fifth child. Protein, fat and cholesterol intake, as well as the intake of sodium, potassium and phosphorus, were high. The consumption of calcium and vitamin D was low. Water consumption was not satisfying. The present results underline the need for interventions starting early in life in order to ameliorate nutrient intake during childhood, possibly impacting long-term health outcomes.

Keywords: child nutrition; dietary assessment; macronutrients; micronutrients; nutrient intakes

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1. Introduction

Adequate nutrition is essential for children's growth and development. The inadequate intake of energy and nutrients may predispose children to a wide range of childhood and adulthood health problems, such as obesity, dental caries or even poor academic achievement [1]. Non-communicable diseases (such as type-2 diabetes, hypertension or cardiovascular disease) have become worldwide leading health problems during the past few decades; it has been convincingly demonstrated that these chronic diseases might be linked to childhood diet [2–6]. The dietary habits acquired in childhood often persist later in life [7]; therefore, improving children's food choices at the preschool age might be crucial to influence food choices later in life [8]. In Hungary, the dietary habits of schoolchildren aged 11 to 14 years were reported in 2007 [9]. Although the total energy intakes were appropriate, intakes of sodium were almost two- to three-fold higher than the recommended daily allowances (RDA) for these children. The ratio of *n*-6 to *n*-3 long-chain polyunsaturated fatty acids (LCPUFAs) was high, while the consumption of vitamin D was low in both genders. Another study reported the nutrition assessment of 0 to 3-year-old Hungarian infants and toddlers in four cities [10]. Hungarian children aged 0 to 3 years had high intakes of protein, sodium and phosphorus, while intakes of calcium and vitamin D were inadequately low. Moreover, the number of children with inadequately low calcium intakes increased significantly with increasing age. Intakes of iron, essential for the development of psychomotor and cognitive functions, were low in approximately 25 percent of 1- to

3-year-old children. Overweight and obesity affected 6.5 percent of the 2- to 3-year-old children, while 23.9 percent of the 24–36-month-old children were underweight.

As a response to the increasing trend in the prevalence of childhood obesity worldwide, governments initiated intervention programs to change this trend. The urgent need for new dietary, physical activity, behavioral, environmental and pharmacological approaches for the prevention and treatment of obesity, as well as for effective family-based and school-based programs, was emphasized [11–13]. Hungary implemented an extra tax on unhealthy food—called the "junk food tax" [14]—in 2011, mandatory physical education five times in a week for schoolchildren [15] in 2012, and the inclusion of less salt and more healthy food into the menus provided in schools in 2014 [16]. Taking into account the health and economic effects of salt reduction, the European Union developed a salt reduction framework program [17], which Hungary also joined some years ago. In our country, this program is known as Stop-Só National Salt Reduction Program [18]. The main elements of the Stop-Só National Salt Reduction Program were developed in 2009; our country undertook a 16 percent reduction in salt content in the widely consumed food groups in less than four years in order for the population to reduce salt intake. In Hungary, a kindergarten is defined as a full-time educational center for children between the ages of three and six years; however, children are allowed to be admitted from the age of 2.5 years. Most of the children receive three meals for five days a week in these daycare settings [19].

The aim of the present study was to investigate food consumption, including intakes of energy and macro- and micronutrients, in children attending a kindergarten in Hungary and compare the values observed with the current recommendations.

2. Materials and Methods

The data were collected in 2013 and 2016 in the baseline phase of two randomized controlled trials (2013–2014: NCT03241355 [20] and 2016–2017: NCT03457688). This way, the data correspond to a repeated cross-sectional study.

The parents of healthy children, who were attending a kindergarten in one of five Hungarian cities (Pécs, Győr, Mohács, Szeged and Szekszárd) and volunteering for one out of two consecutive prebiotic supplementation studies coordinated by our research group, were approached. The exclusion criteria were: congenital disease or malformation influencing the gastrointestinal system, immunodeficiency, food intolerance, food allergy or metabolic disorder requiring a special diet; regular (>three times per week) consumption of products or food supplements containing prebiotics or probiotics, antibiotic or laxative treatment; and/or any infectious disease within 14 days at the time of pre-examination. They were asked to fill in a three-day food-record diary and to record the quantitative data for all foods and beverages consumed by their children on two non-consecutive working days and on one weekend day (e.g., Sunday or Saturday). The three-day diary was filled in three times during the supplementation study; however, for the purpose of the cross-sectional dietary survey, we only used data from the diaries filled in at the very start of the studies. The information was collected in November to December in 2013 and in September to November in 2016.

The parents were asked not to change the eating habits of the child during the study and to record all foods and drinks consumed by the child with the precise amount of the consumed portions. In the three-day food-record diary, each day, information had to be provided on the type of foods and beverages (including water) consumed by the child on the given day (starting from the time of waking up and proceeding chronologically until the time of going to sleep). The foods were to be described in detail, including preparation methods and brands when relevant, as well as the amounts consumed.

If necessary, a qualified, skilled dietician discussed the food item data with the parents. The nursery staff was also involved into the study in order to receive proper information about food items and portion sizes consumed during the day in the kindergarten.

The energy and nutrient intake calculations were performed with NutriComp Étrend Sport 4.0 software (NutriComp Health and Nutrition Co., Budapest, Hungary) This soft-

ware includes a wide range of foods available on the market and consumed in Hungary; however, also, other food items can further be added to the database. The software was validated and effectively used already in other dietary surveys in Hungary [21,22].

The average intakes over the three days were calculated to represent the observed intake distributions. The dietary data included nutrient intake estimates from foods (both naturally present and fortified) and drinks only and excluded nutrient intake estimates contributed by any dietary supplements.

The children's height and weight were recorded with children standing barefoot in light clothing. The ratio of calculated energy intake (EI) and estimated basal metabolic rate (BMR) was used to check the subjects for misreporting. BMR was calculated according to the Hungarian recommendation [23]. The record was excluded if the EI/BMR ratio was lower than 1.1 or higher than 2.7, according to the method of Goldberg et al. [24]. The statistical analysis was performed by SPSS 20.0 (IBM). Each child's average daily intake was compared to the Hungarian national recommendations [25] and to the recommendations of the European Food Safety Authority [26,27]. Although both recommendations are displayed, the comparisons—since they are from the data of Hungarian children—were basically compared to the Hungarian recommendation. The EFSA recommendation only provides additional information.

Seventy percent of the Hungarian RDA was defined as the lower border (potentially inadequate), whereas 130 percent of the RDA was defined as the higher border (excessive intake) to determine the extreme level of daily nutrient intake of subjects according to the method of the Institute of Medicine in the United States of America [28].

The descriptive statistics were generated and presented in order to show the mean intakes of nutrients and the proportion with adequate intakes. The results in the tables were expressed as mean, standard deviation (SD) and percentage values of the appropriate variables [29].

Two age groups were formed according to the categories of the Hungarian national nutrient recommendations: 2.5- to 4-year old children (including all children prior to four years of age at the time of the examination) and children aged 4 to 6 years (i.e., over four years but prior to seven years of age).

The prebiotic supplementation trials where these cross-sectional data were obtained were approved by the Scientific and Research Ethics Committee of the Medical Research Council, Budapest, Hungary (STUDY I: 40564-3/2013/EKU and STUDY II: 34458-1/2016/EKU). Children were included in the study after their parents have provided written informed consent.

3. Results

In 2013, from a total of 219 applicants, 209 children started the study and filled in the three-day food-record diary. Then, 16 children (eight percent) were excluded as possible under-reporters and 7 children (three percent) as possible over-reporters. Finally, 186 (85 percent) children had valid, reliable data suitable for statistical analysis. The final sample (n = 186) consisted of 51 children aged 2.5 to 4 years and 135 children aged 4 to 6 years. The gender distribution was 91 girls to 95 boys.

In 2016, out of 942 applicants, 782 children started the study. Then, 19 children (two percent) were excluded as possible under-reporters and 17 (two percent) children as over-reporters. Finally, 556 participants (300 boys and 256 girls) had valid, reliable results suitable for statistical analysis. Of these children, 148 children were 2.5 to 4 years old, and 408 children were 4 to 6 years old at the beginning of the study. All the children attended kindergarten five days per week in both studies.

3.1. Energy and Macronutrient Intakes

The mean daily energy and nutrient intake of children is shown in detail in Tables 1 and 2. The percentages of children with excessive, adequate or insufficient nutrient intakes are shown in detail in Tables 3 and 4.

Table 1. Dietary energy and nutrient intake of healthy, 2.5- to 4-year-old pre-school children in Hungary.

Daily Energy/Nutrient Intake	Survey in 2013 2.5–4 Years (*n* = 51) Mean Age: 3.3 Years Min Age: 2.6 Years Max Age: 3.9 Years		Survey in 2016 2.5–4 Years (*n* = 148) Mean Age: 3.4 Years Min Age: 2.9 Years Max Age: 3.9 Years		Hungarian Recommendation 1–3 Years	EFSA Recommendation * 1–3 Years
	Mean	SD	Mean	SD		
Energy (kcal)	**1435**	237	1579	263	1350	4.75 MJ/day, at PAL = 1.4
Protein (g)	52	10	58	12	43	0.9 g/kg bw/d
Protein (E%)	15	3	15	3	13	-
Fat (g)	49	12	58	13	44	-
Fat (E%)	32	8	34	8	30	35–40
Carbohydrate (g)	194	35	202	40	188	121–161
Carbohydrate (E%)	55	10	52	10	57	45–60
Cholesterol (mg)	177	70	212	64	135	no data
Dietary fiber (g)	19	28	16	5	15	10
Water (mL)	1088	287	1034	719	1300	1300
Sugar (E%)	11	5	11	4	10	10
Sodium (mg)	2355	703	3162	767	500	400
Potassium (mg)	1979	469	1946	436	1000	800
Calcium (mg)	627	256	603	219	800	**450**
Phosphorus (mg)	781	183	808	172	620	250
Iron (mg)	11	33	7	2	8	**7**
Copper (mg)	0.79	0.91	0.66	0.22	0.4	1
Zinc (mg)	5	2	6	2	5	**4.3**
Magnesium (mg)	253	74	244	53	150	230
Chromium (µg)	43	17	50	23	60	no data
Manganase (mg)	1.1	0.4	1.7	2.1	1.2	0.5
Retinol equivalent. (mg)	0.65	0.83	0.46	0.29	0.4	0.25
D vitamin (µg)	1.4	0.5	1.6	1.3	10	15
α-Tocopherol (mg)	11	4	9	3	6	9
Thiamine (µg)	777	222	749	212	500	**100 µg/MJ**
Riboflavin (µg)	1071	348	1052	316	800	**600**
Vitamin B_6-Pyridoxine (µg)	1284	829	1239	386	500	**600**
Cobalamin (µg)	2.4	1.6	2.5	1.6	0.7	1.5
Vitamin C (mg)	104	66	53	32	50	**20**
Niacin equivalent (mg)	18	5	9	3	9	**1.6 (mg NE/MJ)**
Folate (µg DFE)	122	49	102	44	100	**120**
Pantothenic acid (mg)	3	1	3	1	2	4

* PRIs are presented **in bold type** and AIs in ordinary type.

Table 2. Dietary energy and nutrient intakes of healthy, 4- to 6-year-old pre-school children in Hungary.

Daily Energy/Nutrient Intake	Survey in 2013 4–6 Years (*n* = 135) Mean Age: 5.27 Years Min Age: 4 Years Max Age: 6.62 Years		Survey in 2016 4–6 Years (*n* = 408) Mean Age: 5.3 Years Min Age: 4 Years Max Age: 6.9 Years		Hungarian Recommendation 4–6 Years	EFSA Recommandation * 4–6 Years
	Mean	SD	Mean	SD		
Energy (kcal)	**1503**	270	1689	305	1700	5.4 MJ/day day at PAL = 1.4
Protein (g)	55	11	63	12	54	0.85 g/kg bw/d
Protein (E%)	16	7	16	3	13	-
Fat (g)	49	10	63	15	55	-
Fat (E%)	30	5	35	8	30	20–35
Carbohydrate (g)	207	49	215	43	236	154–206
Carbohydrate (E%)	55	6	52	11	57	45–60
Cholesterol (mg)	192	79	232	75	170	no data
Dietary fiber (g)	14	5	18	10	19	14
Water (mL)	1092	298	1037	508	1600	1600
Sugar (E%)	12	5	10	4	10	10
Sodium (mg)	2497	730	3469	852	700	500
Potassium (mg)	1997	567	2096	505	1400	1100
Calcium (mg)	620	215	635	225	800	**800**
Phosphorus (mg)	783	177	855	179	620	440
Iron (mg)	14	39	8	2	8	**7**
Copper (mg)	0.7	0.5	0.7	0.3	0.6	1
Zinc (mg)	6	1	6	2	6	**5.5**
Magnesium (mg)	253	61	262	59	200	230
Chromium (µg)	46	22	53	22	80	no data
Manganase (mg)	1.1	0.4	1.7	1.2	1.7	1
Retinol equivalent (mg)	0.5	0.4	0.5	0.4	0.5	0.3
D vitamin (µg)	1.4	0.9	1.5	0.7	10	15
α-Tocopherol (mg)	17	46	9	3	7	9
Thiamine (µg)	816	259	781	220	700	**100 µg/MJ**
Riboflavin (µg)	1077	350	1104	339	1000	**700**
Vitamin B_6-Pyridoxine (µg)	1210	376	1349	441	600	**700**
Cobalamin (µg)	3.2	6.2	2.6	1.9	1	1.5
Vitamin C (mg)	87	67	56	34	50	**30**
Niacin equivalent (mg)	19	6	22	5	11	**1.6 (mg NE/MJ)**
Folate (µg DFE)	114	54	105	40	130	**140**
Pantothenic acid (mg)	3	2	3	1	3	4

* PRIs are presented **in bold type** and AIs in ordinary type.

Table 3. Percentage of children with excess, adequate or insufficient nutrient intake I.

Daily Energy/Nutrient Intake	Survey in 2013 2.5–4 Years (*n* = 51) Mean Age: 3.3 Years Min Age: 2.6 Years Max Age: 3.9 Years			Survey in 2016 2.5–4 Years (*n* = 148) Mean Age: 3.4 Years Min Age: 2.9 Years Max Age: 3.9 Years		
	Low	**Normal**	**High**	**Low**	**Normal**	**High**
Energy	0	100	0	1	72	27
Protein	0	61	39	0	46	54
Fat	6	63	31	1	45	54
Carbohydrate	0	94	6	1	88	11
Cholesterol	8	47	45	1	30	69
Dietary fiber	25	62	14	9	75	16
Daily fluid intake	22	75	4	44	54	2
Sugar	20	53	27	9	53	39
Sodium	0	0	100	0	0	100
Potassium	0	8	92	0	7	93
Calcium	39	57	4	46	49	5
Phosphorus	0	59	41	1	53	46
Iron	25	73	2	16	78	6
Copper	0	18	82	1	22	76
Zinc	12	73	16	5	67	28
Magnesium	2	18	80	0	18	82
Chromium	55	43	2	49	35	16
Manganase	24	65	12	14	51	35
Retinol equivalent	22	33	45	21	56	23
Vitamin D	100	0	0	99	1	1
Tocopherol	4	18	78	1	41	58
Thiamine	2	27	71	1	36	64
Riboflavin	2	53	45	5	48	47
Pyridoxine	0	0	100	0	5	95
Cobalamin	0	6	94	0	4	96
Vitamin C	8	24	69	32	39	28
Niacin equivalent	0	8	92	0	3	97
Folate	12	55	33	20	38	43
Pantothenic acid	2	45	53	5	50	45

Low < 70% reference value; Adequate: 70–130% reference value; High: >130% reference value.

In 2013, the total mean daily energy intakes in 2.5- to 4-year-old children were fully appropriate when compared to the Hungarian recommended values adjusted for age. Three years later, in 2016, more than one fourth of the 2.5- to 4-year-old children had excessive daily energy intakes. Among the 4- to 6-year-old children, in 2016, approximately three times more children had high daily energy intakes than in 2013, according to the Hungarian recommendations.

Table 4. Percentage of children with excess, adequate or insufficient nutrient intake II.

Daily Energy/Nutrient Intake	Survey in 2013 4–6 Years (*n* = 135) Mean Age: 5.27 Years Min Age: 4 Years Max Age: 6.62 Years			Survey in 2016 4–6 Years (*n* = 408) Mean Age: 5.3 Years Min Age: 4 Years Max Age: 6.9 Years		
	Low	**Normal**	**High**	**Low**	**Normal**	**High**
Energy	10	88	2	3	90	7
Protein	4	89	7	0	74	26
Fat	14	84	2	3	73	25
Carbohydrate	20	75	5	12	86	2
Cholesterol	16	58	27	3	50	47
Dietary fiber	50	48	2	22	73	5
Daily fluid intake	59	39	1	68	31	1
Sugar	11	49	40	18	59	23
Sodium	0	0	100	0	0	100
Potassium	1	40	59	0	31	69
Calcium	43	54	3	39	55	6
Phosphorus	1	59	41	0	42	58
Iron	21	71	8	8	81	11
Copper	4	71	25	3	68	29
Zinc	16	75	9	10	76	14
Magnesium	1	59	41	0	51	48
Chromium	70	27	2	60	36	4
Manganase	65	34	1	29	58	13
Retinol equivalent	36	42	22	32	53	16
Vitamin D	100	0	0	100	0	0
Tocopherol	3	41	56	4	46	50
Thiamine	11	55	34	7	68	25
Riboflavin	7	75	19	9	65	26
Pyridoxine	1	7	92	0	6	94
Cobalamin	1	12	87	1	10	89
Vitamin C	23	30	47	28	41	31
Niacin equivalent	2	16	82	0	4	96
Folate	42	41	17	40	55	5
Pantothenic acid	25	66	9	19	69	12

Low < 70% reference value; Adequate: 70–130% reference value; High: >130% reference value.

In both the age groups and in both the years investigated (2013 and 2016), the mean protein intakes were higher than the Hungarian recommended values. However, the high consumption of protein decreased with increasing age: in 2016, among the 2.5- to 4-year-old children, every second child and one quarter of the 4- to 6-year-old children had a high protein intake, respectively.

The fat consumption as a percentage of energy (E%) was between approximately 30–35 for both the age groups in both studies.

The cholesterol intakes were far above the Hungarian recommended values: 45 percent of the 2.5- to 4-year-old children had a high cholesterol intake in 2013 and 69 percent in

2016. In 2013, a total of 27 percent, and in 2016, a total of 47 percent of the 4- to 6-year-old children had a high cholesterol intake, respectively.

Among the 2.5- to 4-year-old children, the mean daily fluid intakes were 22 percent lower than the recommendations; moreover, 44 percent of the 2.5- to 4-year-old children (2016) had insufficient daily fluid intakes (according to both Hungarian and EFSA recommendations.) While the Hungarian and EFSA recommendations on daily fluid intakes for 4- to 6-year-old children are obviously higher (1600 mL/day) than those for 2.5- to 4-year-old children (1300 mL/day), the mean intakes were almost exactly the same low in this age group (in 2013: 59 percent, in 2016: 68 percent).

In 2013, the sugar consumption was high by 27 percent, and in 2016, by 39 percent of the 2.5- to 4-year-old children. The result was not much better at the age of 4 to 6 years. In 2013, a total of 40 percent, and 23 percent of the children in 2016, had a high sugar intake (the Hungarian and EFSA recommendations for sugar intake are the same).

3.2. Macroelements

All preschool children, without exception, had higher daily sodium intakes than the Hungarian and the EFSA recommendations. The sodium intakes in 2.5- to 4-year-old children in 2013 were almost five times higher than the corresponding Hungarian recommended daily sodium intakes (Table 1); in 2016, the corresponding values were more than six times higher than the recommendation (500 mg/day). In 4- to 6-year-old children in 2013, the mean daily sodium intakes were 3.5 times higher than the recommended daily intakes (700 mg/day), whereas in 2016, the corresponding values were approximately five times higher than the Hungarian recommendations.

Over nine out of ten of the 2.5- to 4-year-old children achieved the recommended daily potassium intakes in both studies according to both recommendations (Hungarian and EFSA). In the 4- to 6-year-old age group, the mean daily potassium intakes in 2013 were higher than the recommendations in more than half of the children, whereas in 2016, the corresponding value was higher. In contrast, the daily calcium intakes were far below the Hungarian recommendation of 800 mg/day (for both the age groups) in both of the studies (Table 1). In 2016, in the 2.5- to 4-year-old children, the mean daily calcium intakes were low for 46 percent of them, whereas in the 4- to 6-year-old children, the corresponding value was 39 percent. The intakes of phosphorus were above the recommended value (EFSA and HRDA), and with increasing age, a slight increase in those exceeding the recommended daily intake was observed. In 2016, the mean daily intakes of magnesium were higher than the recommendation by 82 percent in the 2.5- to 4-year-old children and 48 percent in the 4- to 6-year-old children.

3.3. Microelements

In 2016, the intakes of iron in over three quarters of the children in both age groups achieved the national recommendations. In 2016, the mean daily copper intakes of 76 percent of the 2.5- to 4-year-old children were higher than the Hungarian recommended intakes (0.4 mg/day). In over 29 percent of 4- to 6-year-old children, the intakes of copper were higher than the HRDA (0.6 mg/day). The results for 2013 were very similar to those seen in 2016. The mean daily zinc intake values were satisfactory at above 67 percent in each group in both studies compared to the Hungarian recommendations.

3.4. Fat Soluble Vitamins

The recommendation for vitamin A (retinol) is formulated as the retinol equivalent (recently, the retinol activity unit): 1 RAU is equal to 1 μg retinol or 12 μg β-carotene. In 2016, the mean daily intakes for both 2.5- to 4-year-old and 4- to 6-year-old children met the recommendations; however, the individual daily intakes were low in 2016 for approximately 21 percent and were high for approximately 23 percent of the 2.5- to 4-year-old children (Table 3) compared to the Hungarian recommendations. The corresponding values were 32 percent (low) and 16 percent (high) in the 4- to 6-year-old children (Table 4).

In 2013, we observed similar results. The mean daily intakes of calciferols were low for nearly the entity of the 2.5- to 4-year-old children and 100% of the 4–6-year-old children according to the Hungarian recommendations (Tables 3 and 4).

In 2016, higher than the Hungarian recommended intakes of vitamin E (α-tocopherol) were observed in 58 percent of the 2.5- to 4-year-old children. In 2013, approximately 78 percent of the 2.5- to 4-year-old children and 56 percent of the 4- to 6-year-old children had high intakes of vitamin E (Tables 3 and 4).

3.5. Water Soluble Vitamins

While the mean intakes of the water soluble vitamins thiamine, riboflavin, pyridoxine, and cobalamin considerably exceeded the recommendation, the ascorbic acid intakes were around the recommended levels in each age group in both studies according to both recommendations (Tables 1 and 2).

4. Discussion

Our study showed that in Hungarian preschool children, sugar, protein, fat, cholesterol, sodium, potassium and phosphorus intakes were, in general, high, whereas intakes of calcium, vitamin D, pantothenic acid and folic acid were low. Water consumption was not satisfying in either of the age groups. Moreover, among the 2.5- to 4-year-old children, every third child had an excessive intake of energy according to the recommendations of either HRDA or EFSA.

The importance of dietary intervention programs for preschool children to influence theirs food choice at an early age in order to prevent several childhood and adulthood health problems is evident. In Hungary, kindergartens provide pre-school education and full day care for children aged 2.5 to 6 years as part of the public education system. Kindergarten education and care is free in all public institutions; moreover, at the time of this survey, approximately one third of the Hungarian 3- to 6-year-old children received meals in kindergarten for free (parents only have to pay for the meals if their income is above a certain level). Children consumed not only one hot meal (lunch) in the childcare institution but also two other cold meals (one in the morning hours and one in the afternoon). This means that the foods and beverages consumed in the kindergarten are core parts of the children's diets.

All the kindergartens included into the present study were maintained within the Hungarian public education system, i.e., privately-owned kindergartens offering various special services for an extra fee were not included. Since in public kindergartens, both the admission criteria of the children and the fees to be covered by the families are regulated on a nation-wide basis, it can be assumed with good reason that the socio-economical backgrounds of the families in the present study were evenly distributed and representative for the 2.5- to 6-year-old urban pediatric population in Hungary.

The energy intake data seen in our dietary survey indicate that a positive energy balance is already present in a considerable percentage of kindergarten-aged children in Hungary. Worldwide, over 200 million children (one in three children under five) are either undernourished or overweight. The proportion of overweight children (5 to 19 years old) rose from one in ten to almost one in five in roughly one generation's time between 2000 and 2016 [30]. This also underlines the importance of the early start of dietary intervention programs to prevent obesity. In Hungary, the public kindergarten system may offer an excellent place for carrying out obesity prevention programs.

Adequate protein and essential amino acid intakes are important for normal child growth and development; however, a high protein intake has no known benefit but carries an additional possible risk of obesity development. The background of this phenomenon might be explained by the "Early Protein Hypothesis": excessive intakes of protein stimulates the secretion of insulin and insulin-like growth factor I (IGF-1) and increases the plasma concentration of insulin-releasing amino acids [31]. The high protein intakes observed in the present study may contribute to susceptibility for overweight and obesity.

Long periods of adequate Ca intake in childhood increase bone mineral density (BMD) and reduce osteopenia risk [32]. Both in the present Hungarian dietary questionnaire study and in a similar study among 6-year-old Polish children, intakes of calcium did not reach the recommended level, and inadequate intakes of vitamin D and potassium with excessive intakes of sodium were observed [33]. The observation that a dietary pattern characterized by a relatively high consumption of dairy products and whole grains with cheese and eggs is positively associated with childhood higher bone mineral density [34] might offer the possibility of dietary intervention.

Studies indicated that the early introduction to starchy table foods resulted in an increased affinity for the taste of salt at the preschool age [35]. Sugar-sweetened beverage consumption was described to be positively associated with salt intake; each additional 1 g/day salt intake was associated with 17 g/day sugar-sweetened beverage consumption in a study [36]. Consequently, reducing the salt intake might have a preventive role in both later hypertension and childhood obesity.

Although in our investigation, the energy percentage derived from protein, fat and carbohydrates were in their normal ranges, the energy percentage of added sugar was one to two percent higher than recommended. A high intake of sugar-added beverages is associated with an increased risk of overweight and obesity [37–39]. Furthermore, it might result in higher diastolic blood pressure and elevated triglycerides levels and elevated cardiovascular risks later in life [40].

Excessive salt intake causes extracellular volume increase, resulting in an elevation of blood pressure [41].

The uppermost recommended daily intake of sodium is 0.5 g for 1- to 3-year-old children and 0.7 g for 4- to 6-year-old children (according to HRDA). The current intakes of sodium in the present study were three to five times higher than the Hungarian recommended daily sodium intake for preschool children. The Public Catering Act-EMMI (Ministry of Human Capacities) Decree 37/2014. (IV.30) [16] maximized the quantity of added salt and decreased it to 2.5 times lower than before. This regulation ("Canteen reform") has been mandatory for kindergartens, primary and secondary schools, in-patient care and any other public catering in Hungary since September 2015. During implementation, it is important to keep in mind that most of the sodium originates from processed foodstuffs, not mainly from table salting.

Excessive refined sugar and sodium intake and suboptimal calcium were described not only in other Hungarian cross-sectional surveys involving children from other age groups [9,10] but also in other countries [32,33] involving children from the age groups investigated in our study. This also underlines the extent of the problem and strengthens the importance of the early healthy-eating interventions among the kindergarten and preschool children.

Our present study has some limitations. Some of the data originated from the kindergarten teachers, who completed the filling out of the questionnaires in addition to their other work duties, which could have resulted in inaccuracies in data intake and later during the evaluation. The dietary data included nutrient intake estimates from foods (both naturally present and fortified) and drinks only and excluded nutrient intake estimates contributed by eventual dietary supplements. The differences in the results of the two studies may be due to the larger sample size in 2016.

Children acquire dietary habits during early life. It should be, therefore, a high priority to provide evidence-based and parent-focused practical support for parents and emphasize the importance of healthy eating among the staff members of kindergarten kitchens [42]. Inappropriate diets and eating habits in childhood lead to an increasing number of overweight and obese children and adolescents, although there is an increasing awareness of the adverse effects of non-communicable diseases. In Hungary, the obesity rate is high; among children, it is 40 percent, and among adolescents, it is 32 percent [43]. Family and public catering systems (e.g., preschool, school) have a predominant place in the formation of nutritional behavior. There are several risk behaviors, e.g., elevated

energy and fat intake, the overconsumption of simple carbohydrates, excess salt intake, low vegetable and fruit consumption, low calcium intake and the consumption of sugar-sweetened beverages among kindergarten and school children. The objective is reducing the prevalence of obesity and non-communicable diseases, making the healthier option the easier option.

5. Conclusions

Sodium and refined sugar intake, which are known risk factors of obesity and high-blood-pressure disease, should be controlled already in kindergarten children. An increased consumption of dairy products should be advised to increase the calcium intake. The average daily intake of vitamin D was insufficient for every child. Pantothenic acid and folic acid intake were low. Water and dietary fiber consumption was not satisfying.

While the total energy and carbohydrate intake was appropriate among the younger observed group, every third child had an excessive intake of energy. Protein, fat and cholesterol intake was, in general, high.

Sodium intake was enormously high, while potassium intake also exceeded the recommended value in both studies. It results in a rather unfavorable sodium/potassium ratio. Interventions should be focused on the promotion of fruit, vegetable and water consumption. Furthermore, a decrease in saturated fat and added sugar intake is needed.

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PLOS ONE

RESEARCH ARTICLE

Self-reported attitudes, knowledge and skills of using evidence-based medicine in daily health care practice: A national survey among students of medicine and health sciences in Hungary

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Abstract

In order to map attitudes, knowledge and skills related to evidence-based medicine (EBM) in students of medical and health sciences faculties, we performed an online survey during the spring semester 2019 in all medical and health sciences faculties in Hungary. In total, 1080 students of medicine and 911 students of health sciences completed the online questionnaire. The attitude towards EBM was generally positive; however, only a small minority of students rated their EBM-related skills as advanced. There were large differences in the understanding of different EBM-related terms, with 'sample size' as the term with the highest (65%) and 'intention-to-treat analysis' with the lowest (7%) proportion of medical students being able to properly explain the meaning of the expression. Medical students who already participated in some EBM training rated their skills in searching and evaluating medical literature and their knowledge of EBM-related terms significantly better and had a more positive attitude towards using EBM in the practice than students without previous EBM training. EBM trained medical students were more likely to choose online journals (17.5% compared to 23.9%, $p<0.05$) and professional guidelines (15.4% compared to 6.1%, $p<0.001$) instead of printed books (33.6% compared to 52.6, $p<0.001$) as the main source of healthcare information retrieval and used Pubmed/Medline, Medscape and the Cochrane Library to a significant higher rate than students without any previous EBM training. Healthcare work experience (OR = 1.59; 95% CI = 1.01–2.52), conducting student research (OR = 2.02; 95% CI = 1.45–2.82) and upper year university students (OR = 1.65; 95% CI = 1.37–1.98) were other factors significantly influencing EBM-related knowledge. We conclude that the majority of students of medical and health sciences faculties are keen to acquire EBM-related knowledge and skills during their university studies. Significantly higher EBM-related knowledge and skills among EBM trained students underline the importance of targeted EBM education, while parallel increase of knowledge and skills with increasing number of education years highlight the importance of integrating EBM terminology and concepts also into the thematic of other courses.

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Introduction

Using evidence-based medicine (EBM) in daily medical and health care practice represents an essential element of developed health care systems. Ideally, in countries with evidence-based practice (EBP), the knowledge generated in clinical trials is timely incorporated into clinical guidelines and serves as a pillar of professional bedside decision making [1]. For successful implementation of EBP, ideas of EBM should become an integral part of the thinking of health care providers at all levels; moreover, besides their adequate knowledge of EBM it is also important that health care professionals possess the willingness and ability to use the acquired knowledge in the daily practice, when making actual decisions about the therapy of patients.

Although EBM is now an accepted part of clinical practice, there are still opposing standpoints: while supporters emphasize facilitated and improved healthcare decisions, which result in a smaller variability in quality of health care provided by different practitioners, the critics take the position that EBM is "cookbook medicine", that it is unable to account for individual patient factors and neglects personal professional experiences [2]. Another potential problem is that health care providers are often not properly trained to implement the evidence [3, 4].

A decade ago the Hungarian EBM working group (developed into Cochrane Hungary), was one of the ten partners who participated in the EU EBM TTT project funded by the European Union. Their goal was to harmonise EBM learning and teaching across the European healthcare sector and to encourage trainers to learn effective teaching methods for tutoring application of EBM in various clinical settings [5]. Cochrane Hungary was founded in 2014 with the aim to provide postgraduate training to healthcare practitioners and to support the understanding of the aims of Cochrane and relevance of EBM among various professionals working at all levels of healthcare.

Currently in Hungary, EBM is taught to students of medicine and health sciences only within the framework of facultative courses. However, during the basic, preclinical and clinical modules of healthcare education there are also several courses which do not have EBM training in their main focus. Nevertheless, these courses incorporate the principles of EBM and teach many EBM-related terms.

However, the attitudes, knowledge and skills of future health care provides, i.e. students of medical and health sciences faculties towards EBM have not been investigated so far, although proper theoretical and practical knowledge about EBM is essential for the realisation of EBP in the near future in Hungary.

The current survey was aimed primarily to evaluate the attitudes, knowledge and skills of students of medicine and health sciences shortly before they finish their studies and start to work as a health care professional. In addition, it aimed to compare data to those obtained in similar students right at the beginning of their university studies. The second aim of this survey was to answer the question to what extent participation in an EBM course during the studies of medicine or health sciences can improve using EBM-related knowledge and skills in the daily health care practice and can change attitudes of students of medicine and health sciences towards evidence based medicine.

Methods

Study design and setting

This cross-sectional survey was conducted online between February and May 2019 at every Hungarian medical and health sciences faculties.

Participants

All medical students studying in one of the four medical faculties in Hungary–namely, 1) University of Pécs, Medical School, Pécs; 2) Semmelweis University, Faculty of Medicine,

Budapest; 3) University of Debrecen, Faculty of Medicine, Debrecen and 4) University of Szeged, Faculty of Medicine, Szeged–were eligible to participate in this survey. All students studying health sciences in seven institutions–namely, 1) University of Pécs, Faculty of Health Sciences, Pécs; 2) Semmelweis University, Faculty of Health Sciences, Budapest; 3) University of Debrecen, Faculty of Health, Nyíregyháza; 4) University of Szeged, Faculty of Health Sciences and Social Studies, Szeged; 5) University of Miskolc, Faculty of Health Care, Miskolc; 6) Gál Ferenc College, Faculty of Health and Social Sciences, Gyula; 7) Széchenyi István University, Petz Lajos Institute of Health and Social Studies, Győr–were also eligible to participate in this survey. Although there are medical and health sciences programs available in English and German at these Hungarian universities, in the frame of the present survey we wanted to obtain information about attitudes, knowledge and skills of Hungarian students studying in the Hungarian programs. Therefore, questionnaires were mailed only to these students, in the Hungarian language. (It is to be noted that due to administrative and financial reasons there are no Hungarian students that participate in the English or German programs of the Hungarian universities). No further exclusions were made.

Questionnaire and outcomes

The questionnaire was developed by SL using ideas from similar questionnaires [6–11]. The content of these questionnaires was adapted to the target population of this survey and own teaching experience was also incorporated.

The questionnaire was divided into four main parts. The first part included questions regarding the background of the participating student filling in the questionnaire, including the name of the University, the class (year of studies), information on a background with practical work in health care, participation in research activity as member of the Scientific Students' Associations or having a close family member working in health care. The question regarding the participation in a course where EBM was taught was listed among the background questions, therefore students were not aware that this question was one of the main outcomes of the study. Students were also asked which source (printed and online resources, books, journals, professional guidelines etc.) do they consider as their main source of healthcare information retrieval and which search engines have they already used for the retrieval of health care information.

In the second part, students had to self-evaluate their EBM skills, i.e. how experienced they are in identifying patient-relevant questions, locating relevant scientific literature, using online databases for searching and in critical appraisal of already located scientific literature.

In the third part of the questionnaire, important terms of EBM were listed and students had to self-evaluate their knowledge on a 5-point categorical scale. The five ratings were: (1) I understand and I could explain to others; (2) Some understanding; (3) I do not understand, but would like to understand; (4) I do not understand, but I think, it wouldn't be helpful to me to understand; (5) No idea about this.

In the fourth part, attitudes towards using EBM in their future work as a health care professional were evaluated. Statements on the importance of EBM for the practical work and for patients to receive the optimal treatment were listed, and students had to evaluate on a 5-point scale ranging from strongly disagree to strongly agree about their judgements. Statements included also considerations whether evidence-based healthcare incorporates the personal expertise of physicians and the views and preferences of patients, and what extent of burden the application of EBM might mean to health care professionals in the daily routine patient care.

Pilot testing of the survey

A pre-test was done in a small group (n = 8) of medical students in order to make sure that the study population understood the questions. Study team members and students discussed questions in detail and questions were reformulated, if this was found to be necessary.

Recruitment, survey administration and data collection

Students were invited to participate in the survey via internal mailing systems of the universities. In the inviting e-mails they received the information that the survey was conducted by Cochrane Hungary with the main aim to receive information about the incorporation of EBM into the Hungarian medical and health sciences education. No further details were provided.

Moreover, small leaflets containing the title and the QR barcode of the questionnaire were distributed among students. In the cities of Pécs and Budapest an information day was held by the study team, where students received not only QR barcodes, but those students without smartphones were also offered the opportunity to fill in the questionnaire on paper instead of the electronic version.

Students were offered to follow a link to the questionnaire website. On the website they were asked to provide informed consent according to the EU General Data Protection Regulation. Only participants providing informed consent were allowed to fill out the questionnaire. Students of medical or health sciences faculties received different links; their questionnaire differed slightly, mainly in the introductory questions.

To encourage honest and transparent responses of the students, anonymity was ensured. Individual data were identified by assigning a unique identification number based on the time point of filling in the questionnaires.

Specific terms to be evaluated were provided in the questionnaire not only in Hungarian, but in parentheses also in English. Terms were listed in alphabetical order.

Data were captured via a Hungarian electronic surface developed for capturing online questionnaires, storing the data obtained from students and enabling a structured export of collected data to Excel and SPSS (http://online-kerdoiv.com/).

Data analysis

Data were first exported to Excel, in that one line represented answers of one person. Data were analysed using SPSS version 22 (SPSS INC., Chicago, IL, USA); descriptive statistics were calculated for each item. Outcomes for EBM-trained and non-trained students were compared with Mann-Whitney test after rejecting the null hypothesis of Shapiro-Wilk test of normal distribution, in case of quantitative variables. For variables expressed as percentages, Pearson Chi-square test was used. We explored possible associations between certain baseline variables and the attitudes, knowledge and skills by logistic regression models. All results with a significance level of $p < 0.05$ were considered statistically significant.

Ethical approval

The study was approved by the Scientific and Research Ethics Committee of the Medical Research Council, Budapest, Hungary (60826-1/2018/EKU). Written consent was obtained from the university leaders to conduct the survey.

Results

Participant characteristics

A total of 1080 Hungarian students of medicine and 911 Hungarian students of health sciences participated in the survey, which means approximately 17% of Hungarian medical students and 11% of health sciences students currently studying in Hungary. Their baseline characteristics are presented in Table 1.

Medical students. About one fourth of the medical students filling in the questionnaire have already participated in an EBM teaching course, most of them during the clinical half of medical training (12.7% of the first-year, 13.6% of the second year, 22.2% of the third year, 37.0% of the fourth year, 34.7% of the fifth year and 31.1% of the sixth year respondents).

Only 4.92% of medical students who received training in EBM found the training course inadequate, while all other students were satisfied with its content. Of the 821 medical students who did not participate in an EBM teaching course yet, 94.4% gave the answer that participation in such a course would be helpful for their later practical work as a medical doctor. AS to the place of the course in the curriculum, 10.38% of medical students thought that an EBM course would be effective in the first two years of medical education, 50.93% would like to

Table 1. Baseline characteristics of students who completed the online survey in the Hungarian faculties of medicine and health sciences.

Variable	Medical faculty students (n = 1080) %	Health sciences faculty students (n = 911) %
Location of the university		
• Budapest	38.24	29.09
• Pécs	31.57	39.63
• Szeged	18.89	9.77
• Debrecen	11.30	-
• Nyíregyháza	-	5.38
• Miskolc	-	9.98
• Gyula	-	5.38
• Győr	-	0.77
Class		
• 1st year	19.63	34.58
•2nd year	19.72	23.05
•3rd year	16.30	19.32
•4th year	13.52	15.04
•5th year/ MSc 1st year	16.02	5.16
•6th year/ MSc 2nd year	14.81	2.85
Gender (male %)	37.22	11.96
Practical experience (worked at least 1 year in health care)	10.1	25.14
Participating in student research as member of the Scientific Students' Associations	34.54	9.66
Near family member (parent, sibling, spouse) **working in health care**	36.57	39.96
Frequency of reading professional journals		
• Daily	2.87	5.60
• Weekly	21.57	25.25
• Monthly or less frequent	53.61	54.88
• Never	21.94	14.27
Private computer	98.80	98.24
Access to internet	99.72	99.74
Free internet access	65.56	57.52
Participated in a teaching course with EBM training	23.98	30.08

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have such a course during the third or fourth year of medical studies, while 38.69% of the respondents answered that they would find a training in EBM effective during the fifth or sixth year of education.

Out of the 1080 medical students, 695 declared that they are reading both Hungarian and English medical sources, while 120 students were reading medical resources not only in English and Hungarian, but also in other foreign languages. While 243 medical students answered that they prefer reading medical literature in Hungarian, only a small minority, i.e. 22 students declared their preference of reading medical literature in English.

Students of health sciences. Most of the students of health sciences filling in the survey questionnaire were participating in BSc education, with diverse specialisations. BSc specialisations representing at least 1 percent of participants were as follows: physiotherapists (27.97%), nurses (16.31%), dieticians (10.76%), paramedic officers (9.51%), health visitors (8.15%), medical diagnostic assistants (4.30%), midwifes (4.08%), health tourism managers (3.51%), public health supervisors (3.28%), radiographers (2.38%), recreation and health promotion managers (1.13%). Master specialisations representing at least 1% of participating students of health sciences were: nurses (1.59%), physiotherapists (1.25%), teacher of health sciences and health cares (1.13%) and nutritionists (1.02%).

Out of the 911 students of health sciences filling in the online questionnaire, 274 already participated in an EBM teaching course: 19.4% during the first-year, 26.7% during the second year, 34.7% during the third year and 38.7% during the fourth year among BSc students as well as 58.9% of the MSc students. The large majority of these students, i.e. 94.62% found the course useful for their later work as a health care professional. The vast majority of non-participants (95.06%) would find a training in EBM helpful for their later professional work (36.79% with preference during the 1st or 2nd year of education, while 63.24% with preference during the third or fourth year).

Among participating health sciences faculty students, 46.10% answered reading scientific literature both in the Hungarian and English language, while 45.44% answered reading scientific literature only in the Hungarian language. A small minority (7.35%) of students of health sciences reported reading medical resources also in other foreign languages, while only a very small minority (1.1%) preferred scientific literature in English.

Questionnaire characteristics

Of the 1991 questionnaires only 7.8% were filled out by the students on paper; the study team members converted these questionnaires into electronicversion.

The consistency testing demonstrated good internal consistency for both the skills questions (Cronbach's alpha = 0.85) and the knowledge-evaluating part (Cronbach's alpha = 0.89), and acceptable internal consistency for the attitude-evaluating part (Cronbach's alpha = 0.71).

Self-reported skills in EBM

The majority of medical students rated the following skills as average: finding medical literature, searching in online databases, critical appraisal of papers on clinical research and identifying patient-relevant clinical questions. Majority of medical students reported limited experience in critical appraisal of available scientific literature, while ability to identify knowledge gaps were reported to be poor (Table 2). Only a minority (under 10% of medical students for all the investigated categories) reported having advanced EBM-related skills (Table 2).

Medical students who participated in an EBM course rated all the six items of their skills in searching and evaluating medical literature significantly better than students who did not receive training in EBM (Table 2). However, this difference was not as marked in the subgroup

Table 2. Responses on a 5-point scale to the question: "How would you rate your skills in the following areas?".

	Poor	Limited experience	Average	Above average	Advanced	Students with EBM training	Students without EBM training	
	(1)	(2)	(3)	(4)	(5)	Mean score (SD)	Mean score (SD)	p
Medical students (n = 1080)						**n = 259**	**n = 821**	
Locating professional literature	5.37%	18.06%	44.26%	25.83%	6.48%	3.46 (0.89)	2.99 (0.94)	<0.001
Searching online databases	5.19%	16.94%	40.09%	28.89%	8.89%	3.42 (1.01)	3.12 (0.98)	<0.001
Critical appraisal of a scientific publication reporting findings from clinical research	22.96%	31.2%	30.09%	13.33%	2.41%	2.79 (1.02)	2.29 (1.03)	<0.001
Identifying knowledge gaps in practice (fields where not enough scientific literature is available to answer a specific clinical question)	38.89%	32.31%	20.46%	6.76%	1.57%	2.34 (1.08)	1.89 (0.95)	<0.001
Critical appraisal of available scientific literature	16.2%	30.37%	30.56%	19.35%	3.52%	2.94 (1.09)	2.54 (1.05)	<0.001
Identifying patient-relevant clinical questions	6.02%	16.11%	36.39%	32.5%	8.98%	3.45 (1.01)	3.15 (1.01)	<0.001
Health sciences faculty students (n = 911)						**n = 274**	**n = 637**	
Locating professional literature	4.28%	14.49%	50.05%	24.81%	6.37%	3.23 (0.83)	3.09 (0.92)	0.06
Searching online databases	3.40%	11.42%	42.15%	29.97%	13.06%	3.42 (0.89)	3.36 (1.00)	0.47
Critical appraisal of a scientific publication reporting findings from clinical research	20.97%	35.13%	33.48%	8.45%	1.98%	2.55 (0.97)	2.22 (0.94)	<0.001
Identifying knowledge gaps in practice (fields where not enough scientific literature is available to answer a specific clinical question)	36.33%	34.80%	22.83%	4.50%	1.54%	2.20 (0.95)	1.87 (0.93)	<0.001
Critical appraisal of available scientific literature	13.94%	30.63%	37.32%	15.48%	2.63%	2.84 (0.94)	2.50 (0.99)	<0.001
Identifying patient-relevant clinical questions	3.62%	14.82%	38.31%	33.59%	9.66%	3.58 (0.96)	3.17 (0.95)	<0.001

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of first and second year medical students, where such students participating in an EBM course rated only their skills in critical appraisal of the content of a scientific publications (p = 0.007) and in identifying knowledge gaps (p = 0.025) significantly better as compared to student who have not yet participated in such a course. Among third and fourth year medical students, all the six investigated skills (Table 2) were evaluated as significantly better in the subgroup of EBM course participants as compared to non-participants. The same was also true for the subgroup of fifth and sixth year medical students.

The distribution of answers to certain questions was similar among students of health sciences to that seen in the case of medical students, with the majority of students of health sciences rating their skills as average in locating professional literature, searching in online databases, in critical appraisal of papers on clinical research and in identifying patient-relevant clinical questions. Students had limited experience in critical appraisal of available scientific literature and rated their skills in identifying knowledge gaps as poor (Table 2). With the exception of searching in online databases, students of health sciences with EBM training had significantly higher ratings than had EBM non-trained students.

Sources and methods of healthcare information retrieval

The percentage distribution of answers to the question "Which source would you rate as the primary source of healthcare information retrieval?" among medical students who either participated or not in an EBM course are compared on Fig 1. Medical students not yet trained in EBM were significantly more likely to choose printed books as the main source of healthcare information retrieval, while medical students who already participated in an EBM course choose online journals and professional guidelines to a significantly higher extent compared tothose who did not participate in EBM course.

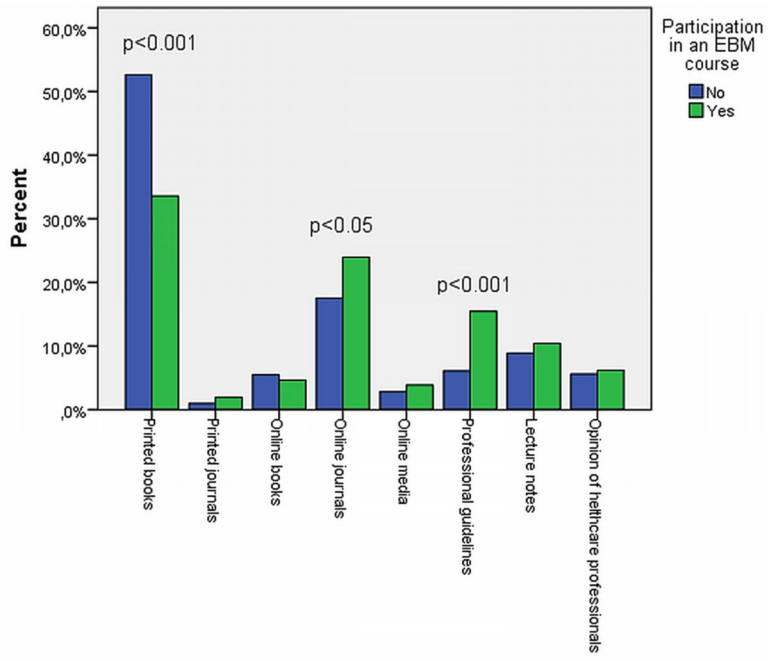

Fig 1. The opinion of Hungarian medical students regarding the most important source of healthcare information retrieval.

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Among students of the faculty of health sciences who were trained in EBM choose printed books to a significantly lower extent (28.8% vs 37.8%; p = 0.01) and professional guidelines to significantly higher extent (10.2% vs 3.6%; p<0.001) than those students who did not participate in EBM course. No other significant difference was seen between the two groups.

Search engines used for healthcare information retrieval are shown in Table 3. (Here results were available for 1465 students only, as due to a technical problem not all students answered the question "Which search engines have you already used for healthcare information retrieval?" as a multiple choice, but as a single choice question. Only data from students answering the question as multiple choice were analysed.)

Table 3. Popularity of different search engines among Hungarian students of medicine and health sciences faculties.

Medical students (n = 697)	
Google	94.12%
Google scholar	27.12%
Wikipedia	72.45%
Pubmed/ Medline	63.99%
Medscape	22.38%
Cochrane Library	5.02%
Health sciences faculty students (n = 768)	
Google	90.63%
Google scholar	20.57%
Wikipedia	52.60%
Pubmed/ Medline	49.35%
Medscape	17.45%
Cochrane Library	4.69%

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Google was the most popular search engine, followed by Wikipedia and Pubmed/Medline. Medscape and especially the Cochrane Library were used by only a minority of students for the retrieval of scientific literature (Table 3).

When conducting a subgroup analysis comparing EBM trained and non-trained medical students, we found that Pubmed/Medline (84.0% vs. 57.9%, [EBM trained vs. EBM non-trained], $p<0.001$), Medscape (36.2.0% vs. 18.2%, $p<0.001$), and the Cochrane Library (12.3% vs. 2.8%, $p<0.001$) were used to a significantly higher extent for healthcare information retrieval by EBM trained than non-trained medical students. There were no significant differences in the use of Google (92.6% vs. 94.6%, $p = 0.35$), Google Scholar (30.7% vs. 26.0%, $p = 0.27$) and Wikipedia (73.8% vs. 68.1%, $p = 0.16$) between the EBM trained and non-trained medical students.

Although the use of Pubmed, Medscape and Cochrane Library were generally lower among students of health sciences than among medical faculty students, subgroup analysis comparing EBM trained and non-trained health sciences students had comparable results to those seen in the case of medical students: Pubmed/Medline (62.7% vs. 43.6%, [EBM trained vs. EBM non-trained], $p<0.001$), Medscape (25.3.0% vs. 14.0%, $p<0.001$), and Google scholar (26.6% vs. 17.9%, $p = 0.01$) were used to a significantly higher extent by EBM trained than non-trained health sciences faculty students, while there were no significant differences in the use of Google (90.6% vs. 90.7%, $p = 1.00$) and Wikipedia (51.9% vs. 52.9%, $p = 0.81$). Among students of the faculty of health sciences, the use of the Cochrane Library did not significantly differ between EBM trained and non-trained students (6.4% vs. 3.9%, $p = 0.14$).

Knowledge of EBM-related terms

There were large differences in the understanding of different EBM-related terms (Table 4). The most known term among medical students was 'sample size'; about two third of medical students answered that they could explain meaning of the term to others. In contrast, only 7% of medical students thought that they could explain the meaning of the term 'intention-to-treat analysis'. When evaluating answers as if they were scores on a 5-point-scale and comparing the range of scores between EBM-trained and non-trained medical students, we found that those participating in an EBM course rated their knowledge regarding EBM-related terms to be significantly better than students who did not receive a training in EBM yet (with $p<0.001$ for all investigated terms).

We also calculated a mean score based on the 13 scores (listed in Table 4) evaluating knowledge of individual students and conducted a multifactorial logistic regression analysis to reveal factors having an influence on better or worse scores (i.e. a mean score higher or lower than 2.0). Healthcare work experience (OR = 1.59; 95% CI = 1.01–2.52, $p = 0.048$), conducting student research as member of the Scientific Students' Associations (OR = 2.02; 95% CI = 1.45–2.82, $p<0.001$), upper year university students (OR = 1.65; 95% CI = 1.37–1.98, $p<0.001$) and participation in an EBM teaching course (OR = 3.32; 95% CI = 2.32–4.76, $p<0.001$) proved to have a significant positive influence on the knowledge of EBM related terms among medical students, while gender (OR = 1.22; 95% CI = 0.93–1.61, $p = 0.15$) and having a close family member working in healthcare (OR = 0.96; 95% CI = 0.73–1.26, $p = 0.75$) had no significant effect.

Among students of health sciences, the most known term was 'case study', while the least known was 'confidence interval' (Table 4). Also health sciences faculty students with EBM training rated their knowledge on most of the EBM-related terms significantly better than students without EBM training, although there was no significant difference in the knowledge of trained and non-trained students in case of the terms 'lost to follow-up' ($p = 0.15$) and 'number

Table 4. Self-reported understanding of evidence-based healthcare-related terms among Hungarian medical and health sciences faculty students.

	I understand and I could explain to others	Some understanding	Do not understand, but would like to understand	Do not understand, but I think, it wouldn't be helpful to me to understand	No idea about this
Medical students (n = 1080)					
Evidence-based medicine	43.33%	38.98%	15.83%	0.28%	1.57%
Intention-to-treat analysis	6.96%	25.65%	60.65%	3.43%	3.33%
Sample size	65.09%	25.19%	6.94%	0.83%	1.94%
Case study	59.07%	33.61%	4.91%	0.83%	1.57%
Cohort study	30.74%	30.74%	33.70%	2.04%	2.78%
Confidence interval	33.61%	37.22%	23.80%	3.80%	1.57%
Controlled clinical study	44.44%	37.04%	16.48%	0.74%	1.30%
Lost to follow-up	37.59%	31.67%	26.20%	2.04%	2.50%
Meta-analysis	25.46%	24.44%	43.70%	3.70%	2.69%
NNT (number needed to treat)	14.26%	27.13%	51.94%	3.43%	3.24%
Randomisation	53.61%	31.57%	12.50%	1.02%	1.30%
Practical guideline	58.15%	30.74%	9.35%	0.56%	1.20%
Systematic review	28.80%	38.70%	28.89%	1.48%	2.13%
Health sciences faculty students (n = 911)					
Evidence-based medicine	39.85%	39.96%	16.47%	1.43%	2.31%
Intention-to-treat analysis	10.10%	33.04%	48.85%	4.28%	3.73%
Sample size	53.35%	29.09%	11.96%	2.31%	3.29%
Case study	54.77%	31.17%	9.11%	1.65%	3.29%
Cohort study	16.90%	27.11%	47.31%	3.29%	5.38%
Confidence interval	8.89%	21.62%	57.08%	6.59%	5.82%
Controlled clinical study	31.94%	38.97%	23.82%	2.31%	2.96%
Lost to follow-up	44.24%	28.76%	22.50%	1.98%	2.52%
Meta-analysis	18.66%	24.70%	48.74%	3.62%	4.28%
NNT (number needed to treat)	9.44%	21.41%	58.84%	4.61%	5.71%
Randomisation	41.93%	32.27%	21.41%	1.76%	2.63%
Practical guideline	54.34%	33.26%	9.22%	1.32%	1.87%
Systematic review	33.59%	39.30%	21.30%	2.85%	2.96%

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needed to treat' ($p = 0.05$). Upper year university students (OR = 1.47; 95% CI = 1.05–2.05, $p<0.05$) and participation in an EBM teaching course (OR = 1.69; 95% CI = 1.47–1.93, $p<0.001$) were factors that significantly influenced EBM-related knowledge.

Attitudes towards using EBM in health care practice

All medical students agreed that EBM is important for the practical work of physicians and wished to improve their skills in applying EBM (Table 5). However, students trained in EBM were more likely to answer "strongly agree" instead of "agree", which resulted in significant difference between the EBM-trained and non-trained groups in the 8 out of 11 parameters compared (Table 5). The degrees of agreement with the statements that "EBM is important for patients to receive the optimal treatment" and that "EBM facilitates decisions about individual

Table 5. Response frequency and means of ratings to the question: "On a scale ranging from 'strongly disagree' to 'strongly agree' how would you rate your opinion about the following statements?" among Hungarian medical students (n = 1080).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Students with EBM training (n = 259)	Students without EBM training (n = 821)	
	(1)	(2)	(3)	(4)	(5)	mean range (SD)	mean range (SD)	p
Evidence based medicine (EBM) is important for the practical work of physicians	0.56%	0.83%	12.87%	45.00%	40.74%	4.50 (0.68)	4.17 (0.75)	<0.001
During my studies, I would like to improve my skills in applying EBM during my practical work as a medical professional	0.28%	0.83%	16.76%	49.35%	32.78%	4.31 (0.76)	4.08 (0.72)	<0.001
EBM is important for patients to receive the optimal treatment	0.28%	0.74%	14.54%	49.91%	34.54%	4.42 (0.67)	4.10 (0.71)	<0.001
EBM facilitates decisions about individual patient's care	0.37%	0.74%	14.35%	48.06	36.48%	4.46 (0.69)	4.11 (0.72)	<0.001
EBM considers the personal expertise of physicians	2.78%	18.43%	43.80%	26.39%	8.61%	3.18 (1.06)	3.20 (0.89)	0.83
EBM considers views and preferences of patients regarding their own therapy	4.07%	23.43%	44.07%	22.04%	6.39%	2.94 (1.08)	3.06 (0.88)	0.07
It is important to incorporate research results into healthcare practice	0.28%	0.19%	5.65%	42.87%	51.02%	4.53 (0.63)	4.42 (0.64)	0.01
All types of studies are of equal value	19.07%	53.61%	19.26%	7.13%	0.93%	2.00 (0.90)	2.23 (0.83)	<0.001
EBM means an unrealistic burden to health care professionals in the daily routine patient care	7.96%	42.13%	42.13%	6.94%	0.83%	2.41 (0.88)	2.53 (0.74)	0.01
Textbooks are the most optimal source of information, when a question regarding the care of patients should be answered	3.7%	29.26%	38.7%	25.74%	2.59%	2.84 (0.93)	2.98 (0.88)	0.06
As a future healthcare practitioner, I find life-long learning as vital	0.37%	0.93%	5%	30.93%	62.78%	4.66 (0.56)	4.51 (0.70)	0.01

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patient's care" were also significantly higher in the EBM-trained medical student group than in those without EBM training.

The majority of medical students were unable to decide whether EBM considers also the personal expertise of physicians as well as the views and preferences of patients regarding their own therapy; in this context there were no differences between EBM-trained and non-trained medical students. Medical students were also unsure whether textbooks are the most optimal source of information when questions regarding the care of individual patients should be answered (Table 5). Life-long learning was seen as very important in both groups, but scores representing the strength of agreement were significantly higher among EBM trained medical students (Table 5).

Among students of health sciences there were 6 out of 11 statements with significant difference between the opinion of EBM-trained and non-trained students (Table 5).

Discussion

Summary of findings

The present study attempted to provide an overall picture about the extent to which concepts of EBM are incorporated into medical and health sciences education in Hungary and to answer the question whether evidence-based education in the present form is effective enough to improve skills and knowledge and build a generally positive attitude towards EBM among students.

In the international scientific literature several studies are available that assess the attitudes, knowledge and skills of medical and healthcare professionals [7, 12–18] and describe generally

positive attitudes, however with skills of very different level in using EBM in practice. Moreover, in countries, where EBM courses are already incorporated into the curriculum, surveys have assessed the attitudes, knowledge and skills of both educators [6] and educated students [19–22]. These studies consistently reported positive attitudes toward EBM among undergraduate students participating in EBM education.

The uniqueness of our study is that it compares attitudes, knowledge and skills of students who participated in an EBM training course and those who are not EBM course attendees studying in the same institutions and faculties. Therefore we think, that our findings may also be adaptable and useful to countries where, as in Hungary, only a part of students receive focused EBM education or where EBM concepts are just in progress to be introduced into curriculum.

In the present study, the attitude towards EBM was generally positive among both medical and health sciences students; however, only a small minority of students rated their EBM-related skills as advanced, and there were large differences in the understanding of different EBM-related terms. General terms, like 'evidence-based medicine' or 'sample size' were better understood than more specific terms, like 'intention-to-treat analysis', 'confidence interval' or 'number needed to treat'. This difference might be related simply to the fact that general terms are more likely to appear also during the education of subjects other than EBM. These results suggests that a list of EBM-related terms which is constructed at faculty level, handed out and recommended for medical and health sciences faculty students during their studies might improve the transmission of EBM-related knowledge.

Importance of targeted EBM training is strongly underpinned in our study by the results on sources and methods used by students for scientific information retrieval. Of course, for a large majority of university students printed books represent the most important source of information. However, EBM training seems to be an important tool to educate students of the importance of using up-to-date scientific information (e.g. those published in online journals) for supporting healthcare decisions. The significant difference in the use of PubMed/Medline and the more than fourfold difference in the use of the Cochrane Library seen in this study in medical students who participated in EBM courses as compared to those who did not highlight the importance of teaching how to use these data retrieval systems for medical decision making.

Among both medical and health sciences faculty students, upper year students and participating in research activities were important factors contributing to EBM-related knowledge. Because the percent of EBM-trained student was also increasing in parallel with the number of years of studies, this observation might underpin further the important role of incorporating EBM education into other courses besides targeted EBM training.

Students of health sciences were generally characterised by more self-confidence, especially when self-evaluating their EBM-related skills. However, differences between EBM-trained and EBM non-trained students from the faculty of health sciences were less pronounced than in the case of medical students. These slight differences between students of medicine and health sciences might not necessarily reflect the lower effectiveness of EBM training among students of health scientific, but might rather indicate that the number of non-EBM-trained students overestimating their knowledge was higher in our sample among students of the faculties of health sciences.

It is interesting that the large majority of medical students were neutral regarding the statements 'EBM considers the personal expertise of physicians' and 'EBM considers views and preferences of patients' with no significant differences between EBM-trained and non-trained students. This observation indicates that medical students, at least in Hungary, are unsure about the way how EBM should be implemented in the daily practice. There is considerable

potential for improvements to move away from "cookbook medicine" towards a science-based, but individualised medicine that involve both professional expertise and individual patient factors.

Study limitations

Although attempts were made to maximize the rate of filling out the questionnaire by a representative number of students by sending out invitations and reminders to participate several times, the participation rate from different universities does not fit the proportion of the students studying there. Consequently, students with more active attitudes towards scientific or public life might be overrepresented in the sample. Moreover, first and second year students were more eager to participate in the survey, therefore their opinion might be overrepresented against the opinion of students from upper university years. We cannot fully exclude response bias and should be cautious with self-reported information [23].

In the present survey we have not asked detailed information about the characteristics (e.g. hours, content) of the EBM course attended by the students. Additionally, the possible differences in EBM education among faculties and specialisations were not studied and their impact were not analysed.

During the university studies there is a unique opportunity to form attitudes of future healthcare providers and to pass over EBM-related knowledge, however in our findings, i.e. attitudes, knowledge and skills of undergraduate medical and health sciences faculty students do not necessarily reflect the real use these students will make of EBM later as a health professional.

Conclusions

Substantial proportion of students of the medical and health sciences faculties would like to acquire EBM-related knowledge and skills during their university studies. Although the attitude towards EBM is generally positive, only a small minority of students rated their EBM-related skills as advanced in the present survey. Self-reported EBM-related knowledge and skills are higher among students who already received an EBM-training, an observation which underlines the role of targeted EBM education in both medical and health sciences education. Targeted EBM training seems to be more effective following the second education year, when medical students have already acquired basic knowledge in medicine. Increased EBM-related knowledge and skills among higher year medical students highlight the importance of integrating EBM concepts also into other courses of the basic, preclinical and clinical modules.

Supporting information

S1 Questionnaire.
(XLS)

S2 Questionnaire.
(XLS)

S3 Questionnaire.
(PDF)

S4 Questionnaire.
(PDF)

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