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Including: Social Work, Humanitary Health Intervention, Nursing, Missionary Work

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## *Nutrition as Health Intervention in Central Europe* Original Articles

- ✓NUTRITION AS HEALTH INTERVENTION IN CENTRAL EUROPE
- ✓HEALTH AWARENESS IN THE FIELD OF PHYSICAL ACTIVITY IN SLOVAKIA
- ✓METABOLIC SYNDROME AND MENTAL HEALTH IN THE TIME OF COVID-19 PANDEMIC
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- ✓ANALYSIS OF THE ASSOCIATION OF SELECTED LEISURE TIME ACTIVITIES AND OVERWEIGHT IN UNIVERSITY STUDENTS
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### Submit manuscript:

cswjournal@gmail.com

### Photo:

Michal Olah

### Contact

**International Gesellschaft für angewandte  
Präventionsmedizin i-gap e.V.**  
(International Society of Applied Preventive  
Medicine i-gap)

Währinger Str. 63 A-1090

Vienna, Austria

Tel. : +49 - 176 - 24215020

Fax : +43 / 1 4083 13 129

Mail : office@i-gap.org

Web : www.i-gap.org

### Visiting Editors

Maria Belovicova,

Ivan S. Mironyuk

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## Editorial

# Nutrition as Health Intervention in Central Europe

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This issue of the *Clinical and Social Intervention Journal* is devoted to the topic of nutrition and physical activity while tackling the problem of metabolic syndrome.

Nutrition is a factor of the external environment that significantly affects a person's quality of life and their health. It is intended to: prevent nutritional deficiencies; achieve high functional performance; prevent diseases of civilization (cardiovascular diseases, obesity, diabetes mellitus, osteoporosis, cancer, metabolic syndrome). Nutrition effects the development of chronic diseases by up to 50%.

This issue of the journal has been created thanks to the contribution of teachers of various higher education institutions, namely: St. Elizabeth University of Health and Social Sciences, Bratislava; the Catholic University in Ruzomberok - Faculty of Health; the Trnava University in Trnava - Faculty of Health Care and Social Work - Department of Public Health; P.J. Safarik University in Kosice - Faculty of Medicine - Department of Nursing Care and Department of Social and Behavioral Medicine; Tomas Bata University in Zlin - Faculty of Humanities and Faculty of Management and Economics. This underlines the fact that this topic is very important and remains highly relevant.

The articles focus on various aspects of the metabolic syndrome: its connection with obesity; cardiovascular diseases; musculoskeletal system; non-alcoholic fatty liver disease; hypovitaminosis D; state of mental health. In their work, the authors did not avoid the COVID-19 pandemic which has affected all areas of our lives.

Individual studies analyze eating and exercise habits and health literacy of children, students, adults and seniors.

The authors map and evaluate the current state of the matter in question; seek and propose solutions that would contribute to improving the health literacy of the population in the field of nutrition; increase their physical activity.

We do have a common goal - whether from the point of view of medicine, nursing, social work or public health - which is to prevent and protect the health of our citizens.

**Maria Belovicová**

St. Elizabeth University of Health and Social Sciences, Bratislava, SK

**Ivan S. Mironyuk**

Uzhorod National University, UA

# Health Awareness in the Field of Physical Activity in Slovakia

S. Paulik (Samuel Paulik)<sup>1</sup>, A. Plskova (Adriana Plskova)<sup>1</sup>, M. Kacmarikova (Margareta Kacmarikova)<sup>1</sup>, R. Ochaba (Robert Ochaba)<sup>1,2</sup>

Original Article

<sup>1</sup> Trnava University, Faculty of Health Sciences and Social Work, Department of Public Health, SK.

<sup>2</sup> Public Health Authority of the Slovak Republic, Department of Health Promotion and Health Education, Bratislava, SK.

## E-mail address:

samuel.paulik@tvu.sk

## Reprint address:

Department of Public Health  
Faculty of Health Sciences and Social Work  
Trnava University in Trnava  
Univerzitne nam. 1  
918 43 Trnava  
Slovakia

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## Reviewers:

Steve Szydowski  
University of Scranton school of education, USA  
Pawel S. Czarnecki  
Rector of the Warsaw Management University, PL

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## Abstract:

**Objectives:** The aim of this study was to provide up-to-date information on the prevalence of insufficient physical activity in Slovaks according to gender and age in 2019.

**Design:** Pilot study

**Participants:** A cross-sectional survey conducted in 2019 (men n = 1,298; women n = 1,316) monitored 2,614 participants in the age category 15 - 64 years from all over Slovakia.

**Methods:** We statistically analyzed the questionnaire survey on Health Awareness in Slovakia using the Chi-square test and Fisher's test, in which the level of significance was determined p-value ≤ 0.05.

**Results:** Young men preferred active sports compared to young women who preferred to spend time on social networks. Older men preferred light physical activity compared to older women, who preferred reading books and magazines.

**Conclusion:** With increasing age, the performance of physical activity in Slovaks decreased.

## Introduction

Factors that negatively affect one's vitality are a lack of physical activity and a high level of sedentary behavior during the day (Damen *et al.*, 2020). Physical inactivity is defined as an activity that does not consume sufficient muscle energy (González - Fuentes – Márquez, 2017). Physical inactivity is one of the main risk factors for non-communicable diseases, ranking 14th in the world and 11th in high-income countries (Leski-

nen *et al.*, 2020). A sedentary lifestyle is defined by activities that are performed while sitting or lying down, with energy expenditure equal to or less than 1.5 metabolic equivalents (MET) (Bakker *et al.*, 2020). These activities include the use of electronic devices, reading, writing, drawing, painting, doing homework, sitting at school, on the bus, car, or train (Silva *et al.*, 2020). Sedentary behavior is currently considered a public health problem with high care costs associated

**Table 1** Differences in types of physical activity according to gender and age categories (ÚVZ SR 2019)

| Type of physical activity                         | Age category | Men | Women | p-value |
|---|--------------|-----|-------|---------|
| Active sport                                      | 15-18 years  | 38% | 26%   | 0,044   |
|   | 19-25 years  | 27% | 27%   |         |
|   | 26-40 years  | 20% | 28%   |         |
|   | 41-64 years  | 15% | 19%   |         |
| Recreational physical activity (cycling, dancing) | 15-18 years  | 38% | 39%   | 0,048   |
|   | 19-25 years  | 21% | 27%   |         |
|   | 26-40 years  | 15% | 6%    |         |
|   | 41-64 years  | 26% | 28%   |         |
| Easy physical activity (walking)                  | 15-18 years  | 30% | 27%   | 0,068   |
|   | 19-25 years  | 21% | 24%   |         |
|   | 26-40 years  | 31% | 27%   |         |
|   | 41-64 years  | 18% | 22%   |         |
| No interest in physical activity                  | 15-18 years  | 41% | 36%   | 0,054   |
|   | 19-25 years  | 27% | 29%   |         |
|   | 26-40 years  | 28% | 24%   |         |
|   | 41-64 years  | 5%  | 11%   |         |

with technological progress and industrialization (Cuesta-Vargas *et al.*, 2020).

## Methodology

A cross-sectional survey conducted in 2019 (men  $n = 1,298$ ; women  $n = 1,316$ ) monitored 2,614 participants from all over Slovakia. The questionnaire was compiled by the Public Health Authority of the Slovak Republic (ÚVZ SR) focusing on the health awareness of Slovak citizens aged 15 to 64 years. Employees from 36 regional public health offices disseminated the questionnaire in printed form in May and June. The questions focused on basic social and demographic data with regards to the type and frequency of physical activity.

The R-project (version 3.2.2.) was used in the

statistical analysis in the form of Chi-square test (frequency  $> 5$ ) or Fisher's exact test (frequency  $< 5$ ), which were used to determine differences between social, demographic data and frequency of types of physical activity, with  $p\text{-value} \leq 0.05$  chosen as the level of significance.

## Results

We confirmed statistically significant differences in the type of physical activity. Specifically, we found that boys aged 15 to 18 years (38%) preferred active sports compared to girls in the same age category (26%) ( $p = 0.044$ ). Men in the age category from 26 to 40 years (15%) preferred recreational physical activity compared to women in the same age category (6%) ( $p = 0.048$ ) (Table 1).

**Table 2** Differences in daily duration of physical activity according to gender and age categories (ÚVZ SR, 2019)

| Daily duration of physical activity | Age category | Men | Women | p-value |
|-------------------------------------|--------------|-----|-------|---------|
| More than 3.5 hours                 | 15-18 years  | 31% | 34%   | 0,058   |
|                                     | 19-25 years  | 27% | 32%   |         |
|                                     | 26-40 years  | 30% | 28%   |         |
|                                     | 41-64 years  | 12% | 6%    |         |
| Approximately 3.5 hours             | 15-18 years  | 35% | 24%   | 0,039   |
|                                     | 19-25 years  | 24% | 35%   |         |
|                                     | 26-40 years  | 29% | 19%   |         |
|                                     | 41-64 years  | 12% | 22%   |         |
| Less than 3.5 hours                 | 15-18 years  | 31% | 21%   | 0,028   |
|                                     | 19-25 years  | 27% | 37%   |         |
|                                     | 26-40 years  | 25% | 29%   |         |
|                                     | 41-64 years  | 17% | 13%   |         |
| Never                               | 15-18 years  | 40% | 38%   | 0,064   |
|                                     | 19-25 years  | 27% | 29%   |         |
|                                     | 26-40 years  | 28% | 27%   |         |
|                                     | 41-64 years  | 5%  | 6%    |         |

**Table 3** Differences in the frequency of performance of individual types of physical activity according to gender and age categories (ÚVZ SR 2019)

| Frequency of physical activity performance                   | Age category | Men                | Women              | p-value      |
|--|--------------|--------------------|--------------------|--------------|
| <b>Gardening</b><br>1/ 2/ 3/ 4                               | 15-18 years  | 87%/ 6%/ 3%/ 4%    | 81%/ 10%/ 5%/ 4%   | 0,061        |
|  | 19-25 years  | 2%/ 16%/ 50%/ 32%  | 3%/ 16%/ 57%/ 24%  | 0,051        |
|  | 26-40 years  | 13%/ 30%/ 24%/ 33% | 14%/ 30%/ 20%/ 36% | 0,068        |
|  | 41-64 years  | 56%/ 22%/ 10%/ 12% | 55%/ 23%/ 11%/ 11% | 0,213        |
| <b>Watching TV, listening to radio</b><br>1/ 2/ 3/ 4         | 15-18 years  | 27%/ 28%/ 24%/ 21% | 37%/ 32%/ 18%/ 13% | <b>0,036</b> |
|  | 19-25 years  | 28%/ 20%/ 16%/ 38% | 13%/ 15%/ 16%/ 56% | <b>0,047</b> |
|  | 26-40 years  | 57%/ 13%/ 7%/ 23%  | 63%/ 12%/ 7%/ 18%  | 0,054        |
|  | 41-64 years  | 2%/ 12%/ 52%/ 34%  | 1%/ 13%/ 55%/ 31%  | 0,065        |
| <b>Reading newspapers, magazines, books</b><br>1/ 2/ 3/ 4    | 15-18 years  | 5%/ 24%/ 26%/ 45%  | 6%/ 23%/ 27%/ 44%  | 0,081        |
|  | 19-25 years  | 44%/ 25%/ 14%/ 18% | 45%/ 27%/ 15%/ 13% | 0,342        |
|  | 26-40 years  | 16%/ 23%/ 28%/ 33% | 31%/ 29%/ 23%/ 17% | <b>0,045</b> |
|  | 41-64 years  | 35%/ 22%/ 16%/ 27% | 27%/ 20%/ 18%/ 35% | <b>0,047</b> |
| <b>Playing Games on PC, tablets</b><br>1/ 2/ 3/ 4            | 15-18 years  | 13%/ 30%/ 24%/ 33% | 14%/ 30%/ 20%/ 36% | 0,055        |
|  | 19-25 years  | 55%/ 22%/ 11%/ 12% | 55%/ 23%/ 11%/ 11% | 0,061        |
|  | 26-40 years  | 27%/ 28%/ 24%/ 21% | 36%/ 33%/ 18%/ 13% | 0,052        |
|  | 41-64 years  | 27%/ 19%/ 16%/ 38% | 13%/ 15%/ 16%/ 56% | 0,063        |
| <b>Social networks (Facebook, Twitter,...)</b><br>1/ 2/ 3/ 4 | 15-18 years  | 27%/ 28%/ 24%/ 21% | 36%/ 33%/ 18%/ 13% | <b>0,044</b> |
|  | 19-25 years  | 57%/ 14%/ 7%/ 22%  | 63%/ 12%/ 7%/ 18%  | 0,071        |
|  | 26-40 years  | 2%/ 12%/ 52%/ 34%  | 1%/ 13%/ 55%/ 31%  | 0,135        |
|  | 41-64 years  | 5%/ 24%/ 26%/ 45%  | 6%/ 23%/ 27%/ 44%  | 0,068        |
| <b>Visiting Cultural events</b><br>1/ 2/ 3/ 4                | 15-18 years  | 11%/ 30%/ 23%/ 36% | 26%/ 38%/ 15%/ 21% | <b>0,043</b> |
|  | 19-25 years  | 59%/ 25%/ 7%/ 9%   | 26%/ 38%/ 14%/ 22% | <b>0,012</b> |
|  | 26-40 years  | 35%/ 38%/ 19%/ 9%  | 44%/ 33%/ 15%/ 8%  | 0,051        |
|  | 41-64 years  | 13%/ 16%/ 19%/ 52% | 9%/ 12%/ 12%/ 67%  | 0,056        |

\*1/ 2/ 3/ 4 = every or every other day/ 1-2-times per week/ 1-2 times per month/ rarely or never

We found statistically significant differences in daily duration of physical activity. More men in the age group 26-40 years (29%) performed physical activity daily for approximately 3.5 hours/day compared to women in the same age group (19%). In contrast, more women in the age group of 41 to 64 years (22%) preferred to perform physical activity daily for approximately 3.5 hours/day compared to men in the same age category (12%) ( $p = 0.039$ ). More boys in the 15-18 age group (31%) performed less than 3.5 hours/day of physical activity compared to girls in the same age group (21%) ( $p = 0.028$ ) (Table 2).

We confirmed the differences between the sexes in the frequency of performing individual types of physical activity. Specifically, watching television and listening to radio, where this activity was performed daily by more girls in the 15-18 age group (37%) compared to boys in the same age group (27%) ( $p = 0.036$ ). On the contrary, more men in the age category 19 to 25 years (28%) daily watched TV and listened to radio compared to women in the same age category (13%) ( $p = 0.047$ ). More women in the 26-40 age group (31%) preferred reading books and magazines 1-2 times a week compared to men in the same age group (16%) ( $p = 0.045$ ). In contrast, more men in the 41-64 age group (35%) preferred reading books and magazines 1-2 times a week compared to women in the same age group (27%) ( $p = 0.047$ ). More girls in the 15-18 age group preferred spending time on social networks (36%) compared to boys in the same age group (27%) ( $p = 0.044$ ). More girls in the 15-18 age group (26%) visited cultural events every day compared to boys in the same age group (11%) ( $p = 0.043$ ). In contrast, more men aged 19 to 25 years (59%) visited cultural events compared to women in the same age category (26%) ( $p = 0.012$ ). We did not find statistically significant differences in other types of physical activity (Table 3).

## Discussion

In this study, we confirmed an increasing trend in physical activity with men being more active. The Baltimore Longitudinal Study also found a declining trend in both men and women who spend their time in sedentary behavior; where men also preferred more active sports (Talbot *et al.*, 2003). In a Polish study, they found

that approximately 35% of Polish adults are not physically active in their free time (Drygas *et al.*, 2009). However, the prevalence of a sedentary lifestyle (defined on the basis of low energy expenditure) is high in Europe in adults aged 25-64 years; it ranges from 59% to 64% of this age group (Varo *et al.*, 2003). A long-term study in Amsterdam found differences in physical activity between men and women due to different amounts of time spent on mild and intense activities (Karaca *et al.*, 2009).

With a decrease in sedentary behavior, there has been a steady increase in overall physical activity (Sigmund *et al.*, 2009). This increase in intense physical activity has been found in the US population in men only (Talbot *et al.*, 2003). In a Finnish study they also found that physical activity tended to increase with age (Borodulin *et al.*, 2007). Due to biological mechanisms a decrease in physical activity is expected with age (Sallis, 2000). This has also been confirmed by adults in the United Kingdom (Miles, 2007). Considering the intensity of the performed physical activity in this study, men are more physically active than women. Similar results were found in the Czech Republic (Suchomel *et al.*, 2008) or in Poland (Drygas *et al.*, 2009).

According to the World Health Organization, physical activity in adults aged 18-64 years includes physical activity in leisure time (walking, dancing, gardening, hiking, swimming), transport (cycling), occupation, housework, games, sports or planned exercise in the context of daily, family and community activities. Physical activity increases muscle fitness, bone health and reduces the risk of non-communicable diseases. Adults aged 18-64 years should perform at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or at least 75 minutes of high-intensity aerobic physical activity throughout the week, or an equivalent combination of medium and high intensity. *Aerobic activity* should be performed in sessions of at least 10 minutes' duration. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week or engage in 150-minute of high-intensity aerobic physical activity per week, or an equivalent combination of medium- and high-intensity aerobic activity. Muscle strengthening activities should be performed with the participation of large mus-

cle groups two or more days a week (WHO, 2011).

These recommendations are relevant for all healthy adults aged 18–64 years, unless specific medical conditions indicate otherwise. They apply to all adults, regardless of gender, race, ethnicity or income level. They also apply to individuals with chronic non-infectious conditions, such as hypertension or diabetes and for adults with disabilities. However, certain adjustments may need to be made for each individual based on their physical capacity and specific health risks or limitations (WHO, 2011).

The limitations of the study may be the dishonesty of the participants in the questionnaire survey, for whom it is not possible to prove causal associations between the monitored variables. The positives represent an even distribution of the file according to gender and the undemanding data collection.

Differences in physical activity were demonstrated in the participants, which confirmed the improving movement habits. This study confirmed the strengthening of health awareness in the field of movement habits, but there is still a need to spread information that supports awareness of the benefits of physical activity providing prevention against non-communicable diseases and increasing the overall quality of life.

## Conclusion

With increasing age, the performance of physical activity in Slovaks decreased. Women preferred undemanding physical activity, while men preferred more demanding physical activity. The benefits of physical activity need to be emphasized in national programs to prevent the burden of non-communicable diseases.

## Declaration

The questionnaire in the submitted work was anonymous. At the beginning of the questionnaire respondents received information about the purpose of the questionnaire and its evaluation. The authors have no conflict of interest.

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# Metabolic Syndrome and Mental Health in the Time of Covid-19 Pandemic

G. Stefkova (Gabriela Stefkova), M. Zamborivova (Maria Zamborivova)

Pavol Jozef Safarik University, Faculty of Medicine, Department of Nursing Care, Kosice, SK.

Original Article

## E-mail address:

gabriela.stefkova@upjs.sk

## Reprint address:

Gabriela Stefkova  
Pavol Jozef Safarik University in Kosice  
Faculty of Medicine  
Department of Nursing Care  
Kosice  
Slovakia

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Gabriela Lezcano  
University of California, San Francisco, USA  
Vitalis Okoth Odero  
Catholic university of Eastern Africa, Nairobi, KE

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## Abstract:

**Introduction.** At the end of 2019, China was hit by a disease with pandemic potential. It was a new coronavirus, also called COVID-19 (coronavirus disease). In March 2020, the World Health Organization (WHO) declared the situation a pandemic. Those most at risk were people with metabolic syndrome, mentally ill and the elderly. Metabolic syndrome (MetS) and its components have become a monitored issue in the context of mental illnesses. The COVID-19 pandemic, metabolic syndrome, and mental health have become interrelated. The number of mental illnesses has grown exponentially around the world, having affected several age groups.

**Methodology.** A search and selection of articles from the online scientific database WOS through bibliometric analysis, using the keywords "COVID-19", "metabolic syndrome",

"mental illnesses" in the period from 2020 to 2021 to present the relationships between metabolic syndrome and mental illnesses during the COVID - 19 pandemic.

**Conclusion.** In the area of publications, the issue of depression during the COVID - 19 pandemic was the most watched topic. A higher incidence of metabolic syndrome or its components has been reported in patients suffering from mental illnesses.

## Introduction

Within a few months, the COVID-19 pandemic has caused a global public health crisis with psychological and health consequences. The issue of the prevalence of metabolic syndrome and its components, along with mental illnesses, has grown in every age group and gender. Metabolic syndrome (MetS), also known as syndrome X, chronic cardiovascular disease syndrome, and Reaven syndrome is a multisystem disorder (1). It is based on the pathophysiological knowledge of the cardiovascular consequences of insulin resistance and abdominal fat storage. The knowledge of the metabolic syndrome issue in the context of a pandemic currently applies not only to metabolically oriented internists, but to all physicians, from preventive cardiologists to psychiatrists. A correctly diagnosed metabolic syndrome in a high-risk patient with mental disorder will always be a warning to healthcare professionals. Treatment options for the metabolic syndrome in general, from regimen measures to surgery, are set. There is a very complex relationship between metabolic syndrome and mental health conditions (2). Mental health refers to cognitive, behavioural and emotional well-being. Before the coronavirus disease (COVID-19) pandemic, almost 1 billion people worldwide suffered from some mental disorder. About 50 million people suffered from dementia and about 250 million people from alcohol or drug use disorders. Approximately half of all mental disorders started at the age of early adulthood (3). Coronavirus disease has been shown to have direct and indirect effects on human mental health and is a risk factor for the development, exacerbation and relapse of the metabolic syndrome.

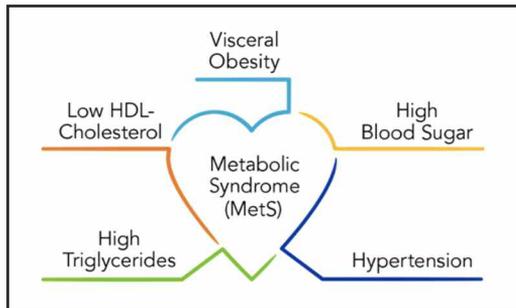
## Metabolic syndrome

The genesis of the metabolic syndrome concept is complex due to the comorbidity of the disease. The first co-occurrence of high blood pres-

sure, hyperglycaemia, and hyperuricemia was sufficient to diagnose MetS (4). Later, doctors correlated the waist / hip ratio with intra-abdominal fat. By that, they pointed to the metabolic complications of obesity, accompanied by a high ratio of waist circumference to hip circumference, which was specifically related to the amount of intra-abdominal fat (5). In the late 1980s, the definition of the metabolic syndrome was followed by the term 'deadly quartet', which consisted of the presence of obesity with a predominance of adipose tissue in the upper half of the body, hypertension, diabetes, and hypertriglyceridemia (6). A fundamental pathophysiological importance to the determination of MetS - already with the name "syndrome X" - was given by an American internist and endocrinologist Reaven (7). He placed emphasis on high cardiovascular risk and body fat distribution to determine the type of obesity (8). Visceral obesity has become an essential determinant of insulin resistance, leading to pathophysiological changes that lead to metabolic syndrome (9, 10, 11). Naming MetS an "Insulin Resistance Syndrome" formerly "Syndrome X" has harmonized many years of research of risk factors for cardiovascular diseases, insulin resistance, and abdominal adipose tissue deposition. The predictor of the development of the metabolic syndrome was an increase in the level of insulin resistance, where visceral adiposity played an important role in the diagnosis of MetS (12). The first clinical definition of the metabolic syndrome was proposed in the late 1990s by the World Health Organization (13). The diagnosis of MetS determined a condition meeting the criteria for the metabolic syndrome or biochemical clinical criteria by the existence of a combination of three of the five or more factors present (16 in total), waist circumference, triglyceridemia, HDL-cholesterol, high blood pressure, and fasting blood glucose (Figure 1). This definition quickly became popular for its

simplicity and is still the most widely used definition of the metabolic syndrome. The determination of the presence of metabolic syndrome as defined above does not require any special examination. An examination of glycemia, triacylglycerolemia, HDL-cholesterol and blood pressure are currently common practice in routine preventive examinations.

**Figure 1** metabolic syndrome causes



Source: <https://www.metabolicsyndrome-canada.ca/about-metabolic-syndrome>

## Mental health

Mental health care involves striking a balance between life activities and psychological flexibility. Mental illnesses have a number of health consequences, which often lead to a significant deterioration in the state of health and in the quality of patient's life (14). The World Health Organization (WHO, 2001) defines mental health as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community". Mental health can be affected by personal (e.g. gender), social (e.g. social relations and economic status) and family (e.g. family connections) factors (15). Worldwide, depression is a common mental health problem and is a major cause of the overall global burden of diseases (15, 16). The impact of depression is dangerous, it affects the quality of life of an individual by reducing their social functions and ability to cope with common situations. The WHO's vision for mental health in the program (GPW13) for 2019-2023 is to achieve the highest levels of mental health and well-being for all people (17).

## Covid – 19

At the end of 2019, a new disease with pandemic potential appeared in China. It was a new coronavirus called coronavirus disease 2019 (COVID-19) (18). Later, in the first quarter of 2020, the World Health Organization declared the outbreak of the disease a pandemic, after the virus infected more than 381,000 people in 195 countries. COVID-19 is an infectious disease that is the third identified SARS-CoV-2 coronavirus causing serious disease in humans. The first was SARS-CoV, also from China, which caused a pandemic between 2002 and 2003. In 2012, there was MERS-CoV (middle east respiratory syndrome), the second coronavirus, causing severe acute respiratory syndrome (19, 20). As coronaviruses have bats as their natural hosts, COVID-19 is considered a zoonosis (21). More vulnerable to COVID – 19 have been people with comorbidities, the elderly, and the helping professions (22). Transmission of SARS-CoV-2 occurred by excretion of airway droplets or saliva into the nasal, oral, or conjunctival mucosa during speech, cough, or sneezing directly between the infected and susceptible individuals. It was also transmitted indirectly, through contaminated objects or surfaces. The incubation time in symptomatic cases ranged from 2 to 14 days, with an average of 5 days (22). The course of the disease varied depending on the individual immunological factors, age and existing comorbidities. In a mild form of the disease, the upper respiratory tract was affected, with the occurrence of fever, fatigue, myalgia, cough, odynophagia, runny nose and sneezing. Gastrointestinal symptoms were manifested by abdominal pain; vomiting, and diarrhoea have also been reported (23). More frequently the occurrence of severe acute respiratory syndrome has been observed in elderly patients with COVID-19 pneumonia and chronic diseases, e.g. type 2 diabetes, chronic obstructive pulmonary disease, systemic arterial hypertension, cardiovascular diseases (24). In moderate COVID - 19 disease, the lower respiratory tract was affected, accompanied by pneumonia, fever, and cough. The determining criterion for the severity of the disorder was the presence or absence of hypoxia (25). COVID-19 affected all age groups; however, people over the age of 60 had the worst prognosis leading to death (26). At the time of the pandemic, measures were taken which led to social isolation, loss or risk of

loss of income and livelihood, economic unrest, increased alcohol and drug use, intimate partners and family violence, reduced physical activity and intellectual stimulation and others (27). Many people feared a new infection, death or a possible loss of family members. Analyses of Covid-19 pandemic studies have shown that forced quarantine has led to feelings of confusion, anger, and post-traumatic stress disorder (28). The age group of 21-40 years (as opposed to people over the age of 65) has been more exposed to depressive experience due to future fear and economic problems associated with job loss (29).

## Methodology

We have used WOS (Web of Science) as one of the online databases in the MyRa application to collect bibliometric data. In the online database, we selected the "search" option and entered keywords to obtain available publications related to COVID-19 in interaction with metabolic syndrome and mental health. We have limited the continuous updating of the database to search in the range of 2020 - 2021 with the following parameters: open access, area category: medicine, document type: full text / abstract, country of selection and language of documents: without restriction. We performed the method of bibliometric analysis according to the following procedure: to interact with COVID-19, we entered the terms "metabolic syndrome" and "mental health" into the search engine. At the time of data collection, we captured 143,682 articles on COVID-19 in the WOS database, on metabolic syndrome and mental health in the interaction with COVID-19, there were 1,537 publications in all areas of research. The database was created mostly by authors from the USA.

## Results

### Metabolic syndrome, mental health and Covid - 19

A review of selected publications showed that the COVID-19 pandemic has caused a global public health crisis with psychological and health consequences within a few months. Metabolic syndrome currently affects more than a billion people worldwide (3). In all patients diagnosed with metabolic syndrome, including hypertension, diabetes, cardiovascular disease, there has been a poor prognosis for coronavirus disease

(30). In most countries, epidemiological data have confirmed a dramatic increase in the prevalence of obesity at the time of the pandemic, especially in the young population. The reason was physical inactivity, poor eating habits, sedentary lifestyle (31, 32). Physical inactivity and obesity have also become increasingly important factors in mental illness (32). Discussions on whether mental illnesses are associated with stress, an inflammatory response, or a genetic predisposition are also being considered in the context of the metabolic syndrome in the field of psychiatry. The life expectancy for people suffering from psychotic illnesses before the pandemic was 13-30 years shorter and the risk of death was 2-3 times higher due to somatic illnesses compared to the general population (33). Scientific articles on the most common somatic disorders and diseases in people with mental illnesses have confirmed an increased prevalence of obesity, metabolic syndrome (MetS), type 2 diabetes and cardiovascular diseases during the COVID - 19 pandemic. The incidence of overweight or obesity was more common in individuals with mental illness than in individuals without the disease (34). Figure 2 presents the most common terms used in many publications in relation to the impact of the COVID - 19 pandemic on mental health (35).

Mental health disorders are encountered by people with various time constraints and mental disabilities throughout their lives (14). We can already prove today that in the initial phase of the outbreak of COVID - 19 there was a deterioration in mental state, in particular higher levels of stress, anxiety, depression and post - traumatic symptoms in females, students, people with other pre - existing conditions, people with greater perception of the risk of the disease, people with higher rate of rumination, social tension and less social support (36). Higher rates of violence, self-harm, and suicidal ideation were also reported during the first month of the pandemic (29, 37, 38). Studies have reported higher rates of depressive experience in people aged 21-40 (as opposed to people over 65) due to future concerns and economic problems, especially job loss. A higher level of anxiety was caused by the "proximity of the pandemic", a condition in which a person personally knew someone infected with a coronavirus, whether it was a family member, friend or acquaintance (32, 39). Researches recorded



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# Comparison of Health Literacy of the Population Regarding Healthy Diet and Chronic Liver Diseases – West vs. East of Slovakia

I. Klobusovska (Ivana Klobusovska)<sup>1</sup>, M. Belovicova (Maria Belovicova)<sup>2,3,4</sup>,  
V. Ivankova (Viera Ivankova)<sup>5,6</sup>, M. Popovicova (Maria Popovicova)<sup>2</sup>,  
T. Hudakova (Tatiana Hudakova)<sup>5,7</sup>

Original Article

<sup>1</sup> Regional Public Health Authority with the seat in Bardejov, SK.

<sup>2</sup> St. Elizabeth University of Health and Social Sciences,  
Bratislava – Teacher, SK.

<sup>3</sup> Internal Clinic for Liver Disease Diagnosis and Treatment, Remedium s.r.o., SK.

<sup>4</sup> Slovak Society of Practical Obesity (SSPO), Bardejov, SK.

<sup>5</sup> St. Elizabeth University of Health and Social Sciences, Bratislava – student of external  
doctoral study, SK.

<sup>6</sup> Hospital and Health Care Centre of S. Kukura (NsP S. Kukuru), Michalovce, SK.

<sup>7</sup> Hospital and Health Care Centre Trebisov (NsP Trebisov), World of Health, SK.

## E-mail address:

bj.klobusovska@uvzsr.sk

## Reprint address:

Regional Public Health Authority with the seat in Bardejov  
Kuzmanyho 18  
085 67 Bardejov  
Slovakia

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## Reviewers:

Gabriela Lezcano  
University of California, San Francisco, USA  
Steve Szydowski  
University of Scranton school of education, USA

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## Abstract:

**Introduction:** The health status of the population is a result of the complex action of several components of society. Chronic non-communicable diseases are the leading cause of death. They are often a result of smoking, alcohol consumption, poor diet and lack of exercise.

**Objectives:** To obtain and compare information on health literacy of the population (Western versus Eastern Slovakia) regarding the most common liver diseases, risk factors for chronic liver diseases and healthy diet.

**Research sample group and methodology:** A self-designed questionnaire was composed of 30 questions. 400 respondents helped us to carry out the research: 145 men and 255 women. 200 respondents came from Western Slovakia and 200 respondents from Eastern Slovakia.

**Results:** We established several hypotheses, based on which we determined health literacy of the population in Eastern and Western Slovakia. Health literacy is statistically significantly higher in a selected sample of respondents from the western part of Slovakia.

**Conclusions:** In order to improve the health of the population, it is necessary to pay great attention to the education of the population about chronic diseases and healthy diet by all, the public health authorities, medicine and nursing. Close cooperation with general practitioners is a basic prerequisite for the successful solving of this problem.

## Introduction

Many different internal and external factors contribute to our health - genetic predispositions, psychological factors, stress, nutrition, degree of physical fitness, but also the availability and organization of healthcare. The state of our health is also affected by other factors such as education, economy, culture, safety, housing, technologies, habits, but also individual behavior in relation to one's health. The health status of the population is a result of the complex action of several components of society (1).

In Europe, up to 29 million people suffer from some kind of liver diseases, which most often affect people of working age. Chronic diseases are the leading cause of death and of poor quality of life in Europe. More than 4 million people in the EU die from chronic diseases every year. Worldwide, each year, 39.5 million people die from chronic diseases. If the current status is maintained, the number of deaths caused by chronic diseases will increase to 55 million by 2030 (2, 3).

Chronic non-communicable diseases are the leading cause of death. Here we include: cardiovascular diseases; cancer (digestive tract, esophagus, stomach, liver, colon, rectum, breast, prostate, lungs, bladder, uterus, nervous system

and blood cancer); chronic respiratory diseases; metabolic diseases (e.g. diabetes mellitus, metabolic syndrome and others), mental disorders and psychiatric diseases, injuries and others (1). Chronic diseases also represent an economic burden for the state as people in the bloom of life lose the ability to work. Many chronic diseases are preventable. They are often a result of smoking, alcohol consumption, poor diet and lack of exercise (4).

The Mediterranean diet is considered a model of a healthy diet. According to a study in the *British Medical Journal* from 2009, some components of the Mediterranean Diet, such as high consumption of vegetables and low consumption of meat and meat products, correlate with a lower risk of mortality more than other components, such as consumption of fish and cereals. Moderate alcohol consumption, high consumption of fruit, nuts and legumes also accompany a lower risk of mortality (5).

Education has long been one of the most important determinants of health. Investing in education is investing in health. The more pupils continue their education at a secondary school and finish it with a school leaving examination, the better the chances of a healthier population (6).

## Research objective

To obtain information on health literacy of the population regarding the most common liver diseases; risk factors for chronic liver diseases; healthy diet. We compare the health awareness of chronic liver diseases in the western and the eastern part of Slovakia.

## Research sample group and methodology

A self-designed questionnaire was composed of 30 questions concerning demographic and identification data and data relating to knowledge of liver diseases. 400 respondents helped us to carry out the research: 145 men and 255 women. 200 respondents came from Western Slovakia and 200 respondents from Eastern Slovakia. Our goal was to obtain information about health literacy of the population. All respondents were informed about anonymity. A total of 400 questionnaires were distributed, all of which were returned to us, which meant 100% return rate. The target group of respondents were patients from outpatient clinics from Eastern and Western Slovakia (Poliklinic SZU - Kramare, Poliklinika Remedium Bardejov Spa). The first 6 items of the questionnaire dealt with data such as: age, gender, height, weight, completed education and residence. Regarding the age structure, the largest group of respondents was the age category up to 50 years. The least represented was the age category 81 years and over. Another item concerned gender. Of the 400 respondents, 145 were men and 255 were women. We also examined the highest level of education attained. Most respondents (43.3%) had completed secondary school with a school leaving examination and the least (5.3%) had completed elementary school.

**Results:** We set several hypotheses based on which we determined health literacy of the population in Eastern and Western Slovakia. For the needs of this publication, we have selected only some of the hypotheses.

**Hypothesis 1:** We assume that in Eastern Slovakia health literacy of the population about chronic liver diseases is significantly lower than in the Western part of the Slovak Republic.

**Hypothesis 2:** We assume that respondents with higher education go to preventive check-ups more regularly than people with lower education.

**Hypothesis 3:** We assume that in Eastern

Slovakia there is a lower health awareness of the population regarding healthy diet than in the western part of the Slovak Republic.

We tested **Hypothesis 1** using Mann Whitney's test. Questions 7-15 concerned the knowledge about non-alcoholic fatty liver disease; its risk factors; the possibility of transmitting chronic viral hepatitis, the meaning of elevated liver function tests.

**Conclusion:** Health awareness is statistically significantly higher in a selected sample of respondents from Western Slovakia.

The questions in the questionnaire related to **Hypothesis 2** were numbered 16-21. We show the results of **Hypothesis 2** in graph 1.

In Graph 1 we can see that the preventive check-ups are attended regularly by 19 respondents with elementary education; 47 respondents with secondary school without a school leaving examination; 125 respondents with secondary school with a school leaving examination; 96 respondents with a university degree. We also see that preventive check-ups do not attend: 2 respondents with elementary education; 27 with secondary school without a school leaving examination; 48 with secondary school with a school leaving examination; 36 respondents with a university degree.

**Conclusion: Hypothesis 2 was confirmed only in question 21**, which concerned participation in preventive examinations, participation was significantly higher in respondents with higher education ( $p = 0.013$ ). The hypothesis was not confirmed in the questions of monitoring the health status (measuring and knowing the values of one's own blood pressure, knowing the values of cholesterol and glycaemia). Differences in the care of one's health do not depend on education.

In **Hypothesis 3**, we assumed that in Eastern Slovakia there is a lower health awareness of the population regarding healthy diet than in Western Slovak Republic. Questions 22-27 concerned the frequency of eating; the consumption of vegetables; most frequently consumed healthy foods; the frequency of consumption of meat products and fish.

**Conclusion: Hypothesis 3 was confirmed only in 3 Questions (22 - frequency of eating; 26 - frequency of consumption of meat and meat products; 27 - frequency of consumption of fish).** Nevertheless, we state that the health awareness

of a healthy diet is higher in Western regions of the Slovak Republic.

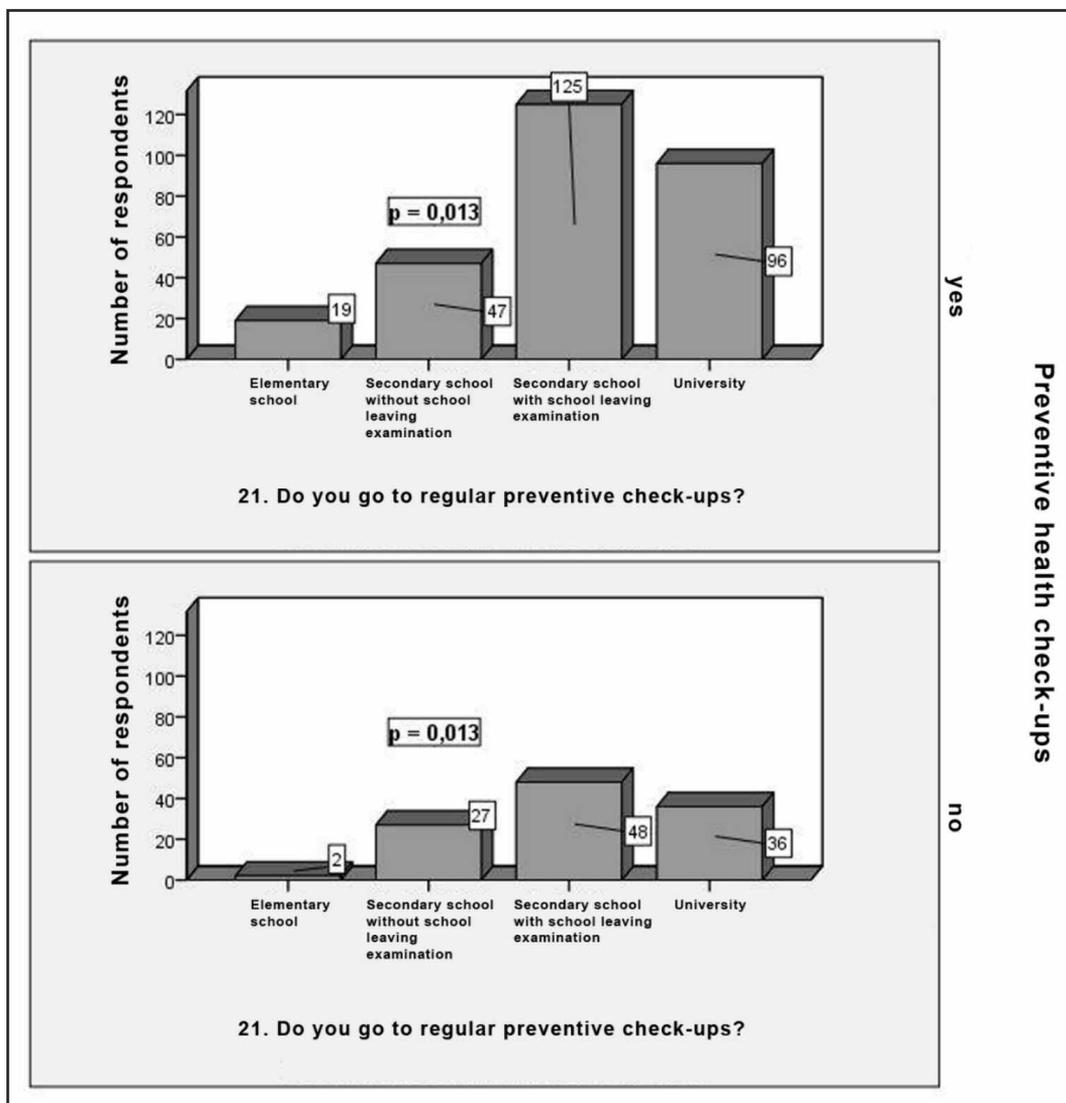
### Discussion

In Slovakia, chronic liver diseases are the 5<sup>th</sup> most common cause of death and in the case of productive age they take 3<sup>rd</sup> place right after cardiovascular and oncological diseases. In 2014, chronic liver diseases caused 4% of deaths in men and 2% in women. The European Association for the Study of the Liver rates Slovakia as the country with the 4<sup>th</sup> highest mortality from liver diseases (4). We tried to compare the situa-

tion of health literacy about chronic liver diseases in Western and Eastern Slovakia. Factors such as gender, age, residence and completed education were evaluated and assigned to the level of knowledge and opinion about liver diseases.

**In the first hypothesis**, we assumed that in Eastern Slovakia there is a significantly lower health awareness of the population about chronic liver diseases than in Western Slovakia. We verified the hypothesis with Questions 7–15, using the Mann Whitney test. In Question 14 we asked respondents if they know how a person could get infected with Hepatitis B or C: The possibility of

**Graph 1** Do you go to regular preventive check-ups?



sexual intercourse was reported by 10.8% of the respondents; by intravenous drug use by 10.5% of the respondents; 8.3% think that with blood; 4.0% answered with tattoos and piercings; 66.5% of respondents could not give an answer and answered “do not know”.

**Conclusion:** Health awareness of chronic liver diseases between the regions of Eastern and Western Slovakia was confirmed in 7 questions 8 - 10 & 12 - 15 (it was not confirmed only in 2 theoretical Questions 7 & 11). Health awareness is statistically significantly higher in a selected sample of respondents from Western Slovakia.

In their study, Sultan *et al.* (7) attempted to use a psychometric tool to assess the level of knowledge and awareness of Hepatitis C infection in HCV (Hepatitis C) positive patients. This study revealed that proper knowledge of HCV transmission patterns in HCV-infected patients was unsatisfactory in most participants. The proportion of correct answers to knowledge questions among HCV-infected patients varied considerably, ranging from 19.5% to 87.5%, with various gaps in knowledge and misunderstandings about such transmission methods as; vertical transmission and hand-shaking transmission; kissing; working with someone who has HCV.

**In verifying the 2nd hypothesis,** we assumed that respondents with higher education go to preventive check-ups more regularly than people with lower education. We verified this hypothesis with Question 21 from the questionnaire. We also added testing Questions 17, 18, 19 to see if respondents were monitoring their health status. From the total number of 400 respondents (100%) we see that 71.8% go to preventive check-ups regularly; 28.3% do not go to regular check-ups. Preventive check-ups are regularly attended by: 19 respondents with elementary education; 47 respondents with secondary school without a school leaving examination, 125 with secondary school with a school leaving examination; 96 respondents with a university degree. Furthermore, we can see that preventive check-ups are not attended by: 2 respondents with elementary education; 27 respondents with secondary school without a school leaving examination; 48 with secondary school with a school leaving examination; 36 with a university degree. Differences depending on education are statistically significant ( $p = 0.013$ ).

**Conclusion: Hypothesis 2 was confirmed only in Question 21** which concerned participation in preventive examinations; participation was significantly higher in respondents with higher education ( $p = 0.013$ ). However, the hypothesis has not been confirmed in health status monitoring issues (16, 17, 18). Differences in care for one's health do not depend on education ( $p > 0.05$ ).

**In verifying Hypothesis 3,** we assumed that in Eastern Slovakia there is a lower health awareness of the population regarding healthy diet than in Western Slovak Republic. Current eating habits can be defined as regular intake of foods with a high energy value and at the same time with a low nutritional value, while the intake of highly nutritious foods (fruits, vegetables, legumes) is suppressed (8). We verified this hypothesis with Questions 22, 23, 25, 26, 27.

**Conclusion: Hypothesis 3** was confirmed in only 3 questions 22, 26, 27. Nevertheless, we state that the health awareness of a healthy diet is higher in the regions of Western Slovakia.

Most European member states do not focus on food security and sustainability, e.g. local fruits and vegetables are rarely recommended. The closer the food is grown, the shorter its storage, transport and ultimately the loss of nutrients. This is especially true for vegetables and fruits. The average fruit and vegetable intake in Europe is too low. This can only be improved if the availability and access to vegetables and fruit is improved. Recommendations to consume a varied diet especially of plant origin are contained in most national dietary recommendations. It is important to eat the widest possible range of foods in order to increase the variety of nutrients consumed. Plant-based foods contain many biologically active ingredients or metabolites with a strong protective role against diseases, in particular non-communicable diseases (8).

Scientific studies focused on various populations, among them especially the so-called *Seven Countries Study*, have shown that the Mediterranean Diet has a positive effect on health and reduces mortality from a variety of causes, in particular mortality from cardiovascular diseases and cancer (9). It also reduces the incidence of neurodegenerative diseases, including Parkinson's and Alzheimer's. The Mediterranean Diet

plays a very important role in the prevention of metabolic syndrome - a disease with high cardiovascular risk, which is characterized by a set of risk factors and symptoms occurring in the patient at the same time (obesity, high cholesterol, high blood pressure, impaired glucose tolerance) (5). In order to improve the health of the population, it is necessary to pay great attention to the education of the population about healthy nutrition by all, public health authorities, medicine and nursing.

## Conclusion

A varied diet containing healthy and tasty foods from around the world is generally considered to be a natural and sensible solution in the nutrition of every healthy individual (10). A Mediterranean Diet with a frequent and rich proportion of sea fish, seafood, whole grains, olive oil, fruits and vegetables could be an ideal solution for us. There are no foods that can "regenerate" or "rejuvenate" a human body. However, proper nutrition and a healthy lifestyle will help to maintain vitality even in old age and reduce the risk of serious diseases such as cancer, heart and vascular diseases, diabetes, obesity or osteoporosis. Even if someone suffers from one of these diseases, it is usually possible to reduce its negative impact on health by making the right nutritional decision (11).

It is important to intensify the cooperation between public health professionals and GPs, internists, hepatologists, gastroenterologists and others involved, which would help to address a major societal problem and improve citizens' health (12). At the same time, it is necessary to increase the education of clients about chronic liver diseases; diseases of civilization as well as about healthy eating not only through specialist clinics; but especially through the Health advisory which are located at the Public Health Authorities. It is essential to support the development and funding of well-managed national information campaigns to raise awareness of chronic diseases. It is important to promote the principles of quality and effective primary and secondary prevention, especially in order to protect and restore the health of patients with liver diseases. Close cooperation with GPs is a basic precondition for the successful solving of this issue (13).

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# Analysis of the Association of Selected Leisure Time Activities and Overweight in University Students

K. Grendova (Kristina Grendova), M. Machajova (Michaela Machajova), K. Bartkova (Kludia Bartkova)

Trnava University, Faculty of Health Sciences and Social Work, Department of Public Health SK.

Original Article

## E-mail address:

kristina.grendova@truni.sk

## Reprint address:

Kristina Grendova  
Department of Public Health  
Faculty of Health Sciences and Social Work  
Trnava University in Trnava  
Univerzitne nam. 1  
918 43 Trnava  
Slovakia

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## Abstract:

**Objective:** The aim was to analyze preferred free time activities of adolescents / university students

**Design:** Cross-sectional study

**Participants:** The inclusion criteria for participants were full-time university students with a maximum age of 25 years. The study involved a total of 173 students.

**Methodology:** Data were collected by an online questionnaire and also by observing the behavior of university students. The obtained data were processed in the statistical program R-project. Statistically significant values are at the level of  $p \leq 0.05$ . Statistical tests - chi square test and correlation - were used for the analysis.

**Results:** The results show that university students prefer sedentary activities in their free time, the prevalence of overweight and obesity is increasing. University students spend several hours a day in front of their computer screen.

**Conclusion:** The results proved that smoking had no effect on BMI values. The results showed that there was no statistically significant difference in BMI values in terms of the amount of time university students spend in front of their computer screen in their free time.

## Introduction

Adolescence brings new opportunities and at the same time new risks to young people. The habits of young adults can have both, positive and negative effects on health. The influence of society and the media such as the internet, television, radio, the press and others affect the lives of young people and can influence them. The most popular form of spending free time for adolescents is on the media. Adolescents' leisure time is one of the public health problems. In the 21st century, the importance of leisure time was defined by documents and activities adopted in the previous century. Leisure time is one of the most important sources of personal, social and economic development that contributes significantly to the quality of life. Leisure time promotes overall health and well-being. Society is a complex and interconnected system and leisure time cannot be separated from other life goals. Nowadays, growing dissatisfaction; stress; boredom; lack of exercise; loss of creativity; alienation are characteristic for many societies. All these problems can be reduced through leisure activities. One should spend at least 150 minutes a week on moderate-intensity physical activity or 75 minutes on high-intensity physical activity (the intensity of activity can also be adequately combined). Aerobic exercise should always last at least 10 minutes and at least 2 days a week should be devoted to strengthening the main muscle groups ("Global Recommendations", 2010). Leisure time is above all a time "for yourself" and your loved ones. This time is stated to be devoted mainly to hobbies, friends and family, or simply to "doing nothing".

## Theoretical Background

A study by authors Matejovicova *et al.* showed that drug use is increasing at university,

especially among girls. The results showed the use of illegal drugs if their parents were university-educated (2015).

Tobacco and alcohol are legal, easily available and socially tolerated substances that are also part of this issue. The increase began in 2008, especially among young women. If we compare the results in drug use among young women and young men, women reach the same level of drug use as men (Nociar, 2014).

Physical activity that young people do in their free time is necessary for further development, especially for university students for whom this activity is important not only for mental, but also for physical development. At the same time, leisure time is a risk factor if it becomes unstructured and unorganized by the student (Ilieva, Ignatov, 2017).

A high prevalence of risk factors for cardiovascular diseases has been found in the population of young people, especially in university students. These factors included overweight, in 27.5% of male students; 7.1% of female students. Visceral obesity was found in 15.2% of female students; 10.1% of male students. The results also indicate low physical activity, which is one of the other factors in the development of cardiovascular diseases, in 41.9% of female students; 31.9% of male students. Of the respondents, 22.1% of male students; 10% of female students were current smokers (Illow, Rozanska, Illow, 2016).

The majority of European full-time students (75%) who were involved in the research devote their free time to work in addition to university studies as confirmed by a comparative analysis of the social and economic living conditions of university students in Europe with an emphasis on results for the Slovak Republic. The largest share of working students (more than 60%) is in Ireland, the Netherlands, the Czech Republic, Es-

tonia, Switzerland, Malta, Poland and Austria. Norway, Germany, Denmark, Finland, Sweden, Montenegro, Hungary, Latvia, Croatia and France are countries with a medium share of working students (40% to 60%). Less than 40% of students work in countries including Romania, Russia, Italy, Georgia, Ukraine, Serbia, Lithuania, Bosnia and Herzegovina and Armenia (EU-ROSTUDENT, 2015).

## Objectives

The aim of the study was an analysis of leisure activities and overweight in university students.

To achieve it, we chose sub-aims: to find out the eating habits of university students; to find out the prevalence of smoking among university students; to find out the amount of time they spent in front of their screen; to analyze the frequency of physical activity in their free time.

We set hypotheses:

1. We assume that there is no statistically significant difference in the value of BMI depending on the performance of physical activity in leisure time.
2. We assume that there is a statistically significant difference in the performance of physical activity in leisure time depending on gender.
3. We assume that there is a statistically significant difference in BMI values depending on the time that university students spend in front of the screen in their free time.
4. We assume that there is no statistically significant difference in cigarette smoking depending on gender.

## Monitor Research Sample Group and Methodology

A cross-sectional study was conducted among university students between September 2020 and January 2021. The questionnaire survey was conducted using an online platform, as the epidemiological situation did not allow other methods of data collection. The condition for inclusion was that the respondents were full-time university students and at the same time did not exceed the age of 25. We used an online questionnaire which was filled in by 173 students. The questionnaire consisted of 12 questions. The 1<sup>st</sup> part consisted of questions aimed at finding

general data about the respondents. The 2<sup>nd</sup> part consisted of questions to identify leisure activities that affect the development of overweight or obesity in the monitored population of university students. The questionnaires were sent to the respondents by e-mail, and there was also a link allowing filling in on a telephone or computer available. Students were informed that filling in was voluntary and anonymous. The return rate of the questionnaires was 87%. Obtained data were processed using a statistical program R-project and then interpreted in the paper. In statistical analyzes, we considered statistically significant values at the level of  $p \leq 0.05$ . Statistical tests - chi square test and correlation - were used for the analysis.

## Results

The majority of university students (92%) stated that they did not eat regularly, which could affect their body weight. In the work, we did not identify the factors that affect the regularity of eating. The causes can be: lack of time; lack of funds; lack of options; short lunch breaks. In the next question, we were interested in students' opinion on whether they considered their diet to be balanced. 8% of women; 2% of men considered their diet balanced. "Rather yes" was stated by 35% of women; 15% of men. The "rather no" answer was chosen by 7% of women; 26% of men. For 8% of men; 6% of women, their diet was definitely not balanced.

92% of the surveyed university students agreed with the statement that society influences our lifestyle which points to the formation and selection of leisure activities according to what is interesting; what the society appreciates; what the trends are. Especially for young people, such information is a warning sign as some of these trends may have negative impact on young people's health. The findings show that 45% of the university students who participated in the research had the BMI value higher than 25; 43% of the university students involved in the research had the standard value of 18.5-25; 12% of the students had BMI values below 18.5.

Prevalence of smoking in the monitored group represented 14% of the university students smoking regularly. 20% of the university students smoke occasionally; 66% of the university students do not smoke. Using the chi square test, we

confirmed the hypothesis that there is no statistically significant difference in BMI according to the frequency of smoking ( $p>0.05$ ). In the sample group, according to gender, 19% of women; 12% of men smoke. 81% of women; 88% of men chose the answer “do not smoke”. Using the chi square test, we confirmed the hypothesis that there is no statistically significant difference in cigarette smoking according to gender ( $p>0.05$ ). Using a chi square test, we refuted the hypothesis that there was a statistically significant difference in BMI values according to the time that university students spend in front of the screen in their free time ( $p>0.05$ ).

57% of the university students perform physical activity in their free time at least once a week; 30% of the university students perform physical activity at least once a month; 23% of the university students stated that they did not do sports in their free time. Using the chi-square test, we confirmed the hypothesis that there was a statistically significant difference in the performance of free time physical activity according to gender ( $p>0.05$ ).

On average, university students spend 5.5 hours a day in front of a screen, including a telephone or computer. It is only the time that is used in this way in their free time. 14% of the university students spend less than 2 hours a day in front of the screen; 59% of the students spend in front of the screen 2-3 hours of their free time per day; 27% 3 hours a day. Using the chi square test, we verified the hypothesis that there was no statistically significant difference in BMI value and performing physical activity in leisure time ( $p>0.05$ ).

We focused on the preferred leisure activities which we assigned to individual categories according to the BMI value. Respondents could choose several answers on how they spend their free time. Respondents whose BMI value was below 18 were mainly engaged in PC activities in their free time 95% of them chose this answer; 53% do sports; 47% devote their free time to reading; 42% of the respondents chose going to cinema and theater. 37% of the respondents with BMI value lower than 18 spend their free time watching TV; 26% of the respondents with BMI value below 18 go out to socialize. The largest percentage of the students with BMI value between 18 and 25: 87% prefer various activities

that they perform on PC in their free time; 59% of the respondents with BMI value between 18 and 25 prefer watching TV in their free time, 55% said that in their free time they go out with friends; 54% read various literature; the same percentage, 54% devote their free time to sports activities. At least 38% of the students go to a cinema or theater in their free time. Students with BMI value higher than 25 prefer activities on a computer in their free time; 84% chose this answer. 53% of the students with BMI value higher than 25 likes to read books and the same amount; 53%, go out to socialize; 51% enjoy sports activities; the same amount, 51%, watch TV in their free time. 41% of this category go to a cinema or theater (Table 1).

**Table 1** Selected activities according to BMI value

| Answer options          | BMI under 18 | %  | BMI of 18-25 | %  | BMI above 25 | %  |
|-------------------------|--------------|----|--------------|----|--------------|----|
| Reading                 | 9            | 47 | 41           | 54 | 41           | 53 |
| Watching TV             | 7            | 37 | 45           | 59 | 39           | 51 |
| Activities on computer  | 18           | 95 | 66           | 87 | 65           | 84 |
| Going out - socializing | 5            | 26 | 42           | 55 | 41           | 53 |
| Cinema and theatre      | 8            | 42 | 29           | 38 | 29           | 41 |
| Sports                  | 10           | 53 | 41           | 54 | 39           | 51 |

Out of the students with BMI value under 18: 21% do not do sports regularly; 53% do sports at least once a week; 26% do occasional sports which means that they engage in physical activity at least once a month. Students included in the category of BMI values ranging from 18 to 25 chose the option “I do not do sports” in 13%; the majority, i.e. 61% do sports regularly; 26% of the respondents do sports occasionally. The 3rd category was students whose BMI value exceeds 25: 10% of those respondents do not do sports at all; 53% do sports regularly; 37% occasionally.

**Table 2** Frequency of physical activity in leisure time according to BMI value

| Answer options                       | BMI under 18 |    | BMI of 18-25 |    | BMI above 25 |    |
|--------------------------------------|--------------|----|--------------|----|--------------|----|
|                                      |              | %  |              | %  |              | %  |
| I do not do sports                   | 4            | 21 | 10           | 13 | 8            | 10 |
| Regularly (at least once a week)     | 10           | 53 | 47           | 61 | 41           | 53 |
| Occasionally (at least once a month) | 5            | 26 | 19           | 26 | 28           | 37 |

## Discussion

University students are a part of the population that needs to be given sufficient attention. It is important to address the factors that affect their leisure time, whether as risk factors or, conversely, protective factors during this age period. Most of the respondents reported irregularities in their eating habits. Slow metabolism is one of the consequences of irregular eating; the body slows down; the brain does not work at the level it should; the lungs, heart or other organs do not perform their function on 100%. The body saves energy. If physical inactivity accompanies irregular eating, the body immediately begins to store the excess fat. Another common consequence of skipping meals is a lack of energy, which is accompanied by: fatigue; impaired concentration; irritability; or headaches. These symptoms are most often associated with irregular eating and blood glucose fluctuations. If one skips meals, their blood sugar level will fall sharply. Irregular eating or skipping meals usually leads to a lack of nutrients in the body. A body can function properly only if it has: the optimal amount of quality proteins; healthy fats; complex carbohydrates; vitamins; minerals; trace elements; other substances. These can only be provided by a regular and balanced diet. For example, calcium deficiency causes osteoporosis; low iron levels lead to anemia; avitaminosis C causes fatigue and immune disorders. 92% of the students agree with the statement that society influences their lifestyle. The media influences the choice of ac-

tivities according to what is fashionable, often it being not entirely suitable for health; whether it goes in the direction of overweight or underweight; imitating an idol; gaining a perfect figure can escalate into anorexia or other eating disorders – binge eating. According to the findings, fast food is a popular form of eating. It's cheap and convenient. For many companies this strategy has paid off: more than 1 in 3 American adults consume fast food on a given day (CDC, 2020).

Many studies have focused on spending free time online, with a focus on university students. The most common reasons for using the internet and smartphones were: sending e-mails; sending messages; spending time on social networks; listening to music (Carbonell *et al.*, 2018). A negative impact on university students' health was noted in students of medicine, pharmacy, and dental medicine in whom a significant relationship between potential internet addiction and anxiety, depression, and stress was found (Younes *et al.*, 2016). A Planet Health study used secondary school classes: to support watching television; increasing activity; improving diet. Compared to the control group, students who were assigned a time limit on television had a lower incidence of obesity in girls (CDC, 2020). The frequency of overweight and physical inactivity increases with increasing screen time. A relationship between too much time spent in front of the screen and poor eating habits has been reported in adolescent girls (Christofaro, G.D.*et al.*). Insufficient physical activity is a significant risk factor for diseases of civilization (NCD) such as: stroke; diabetes; cancer; as well as for other cardiovascular diseases. The level of physical activity is on a declining trend in many countries. Overall, 23% of adults and 81% of school-age adolescents are not sufficiently active. Adequate activity should be part of everyday life. The *WHO Global Action Plan for the Prevention and Control of the NCDs 2013-2020* expresses the motivation of the population for increased interest in physical activity. The goal is greater population activity to reduce the burden of NCDs, as expressed, the plan calls for a 10% reduction in physical inactivity by 2025, which contributes to achieving the *Sustainable Development Goals* (SDGs).

The WHO has provided general recommendations for a minimum number of activities for

all age groups to improve health; but it is important to know that doing some physical activity is better than doing none. Inactive people should start with a small amount of physical activity as part of their daily routine and gradually increase the duration, frequency and intensity. Start with a walk, light pace and increase the load accordingly. Countries and communities should also take targeted steps to provide individuals with opportunities to be physically active. Physical activity brings a number of health benefits; reduces the risk of coronary heart disease; stroke; diabetes; hypertension; depression; various types of cancer including colon cancer and breast cancer. It is the basis of energy balance and weight control. In general, women and girls are less active than men and boys; older adults are less active than younger adults. Adults aged 18 to 64 should achieve at least 150 minutes of moderate physical activity each week or at least 75 minutes of intense activity throughout the week, or an equivalent combination of mild and intense activity. To be beneficial for health and prevention of cardiovascular and respiratory diseases, each activity should be performed at intervals of at least 10 minutes (WHO, 2018).

According to a study from 2016, more boys than girls engage in physical activity in their free time (Telford *et al.*, 2016). However, both sexes exercise the same amount of physical activity in their free time, 50%. A study focused on the frequency of free time physical activity was conducted with 24-year-old adolescents. It found that 2.5% of the respondents perform physical activity in their free time several times a day; 11.6% perform physical activity every day. Physical activity was performed 4 times a week by 16.5% of the 24 years old respondent; twice a week by 33%; once a week by 19%; 1-2 times a month by 9.3%; less than once a month by 6.2%; not at all by 2.1% (Aaltonen *et al.*, 2016). Smoking does affect BMI value, so we focused on this issue as well. 14% of the university students smoke regularly; 20% of university students smoke occasionally; 66% of university students do not smoke. Using a statistical chi-square test, we refuted the hypothesis that there is a statistically significant difference in BMI values according to the time that university students spend in front of the screen in their free time,  $p > 0.05$ . As a result, increasing time spent in front of the

screen does not increase BMI value, yet other factors are not considered. On average, university students spend 5.5 hours a day in front of a screen, including a telephone or computer. It is only the time that is used in this way in their free time. 14% of the university students spend less than 2 hours a day in front of the screen; 59% of the students spend in front of the screen 2-3 hours/day out of their free time; 27% of the students spend 3 hours a day.

## Conclusion

Confirming or refuting hypotheses about the effect of smoking on BMI value was one of the goals of our work. By evaluating the questionnaire data from university surveys, the given hypothesis was refuted. The results clearly indicate that smoking does not affect BMI value. We focused on the hypothesis of whether there was a statistically significant difference in BMI values according to the time spent by university students in front of the screen in their free time. This hypothesis was refuted. The existence of various intervention programs helps to promote a balanced diet that university students lack. Low regular participation in physical activity in leisure time can lead to the definition of the basic objectives of the intervention. Society should pay more attention and create space for physical activity, either in the form of active involvement with children in these activities or by creating appropriate conditions and sufficient time for physical activity. It is necessary to focus on this issue on not only regionally but also on the state level. It is necessary to expand sports venues and provide as many opportunities for movement as possible. Current steps are affecting the future, and primary prevention is a key to reducing the risk of cardiovascular diseases.

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## Declaration

The questionnaire in the submitted work was anonymous. At the beginning of the questionnaire respondents received information about the purpose of the questionnaire and its evaluation.

The authors have no conflict of interest.

# Eating Habits of People Aged 15-18 Years

R. Ochaba (Robert Ochaba)<sup>1</sup>, B. Orlicka (Beata Orlicka)<sup>2</sup>, M. Kacmarikova (Margareta Kacmarikova)<sup>1</sup>

<sup>1</sup>Trnava University, Faculty of Health Sciences and Social Work, Department of Public Health, SK.

Original Article

<sup>2</sup>Public Health Authority of the Slovak Republic, Department of Health Promotion and Health Education, Bratislava, SK.

## E-mail address:

robert.ochaba@truni.sk

## Reprint address:

Robert Ochaba  
Department of Public Health, Faculty of Health Sciences and Social Work  
University in Trnava  
Univerzitne nam. 1  
918 43 Trnava  
Slovakia

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Andrea Shahum  
University of North Carolina at Chapel Hill School of Medicine, USA  
Vitalis Okoth Odero  
Catholic university of Eastern Africa, Nairobi, KE

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## Abstract:

**Introduction:** Determination of the status of eating habits is a necessary step for evaluating future changes in terms of their comparison. Children and young people are an important target group in this regard.

**Objective:** To determine and compare the status of eating habits in the youth and adult population in terms of the most significant risks.

**Methodology and characteristics of the sample group:** In 2019, the research sample consisted of 745 respondents aged 15-18 years. Of this number, 51% were girls (n = 379) and 49% were boys (n = 366). The software program Epi Data 3.1 was used for statistical processing of questionnaires from the re-

spondents. A database for inserting data from the respondents was created in the program. The data were further processed in Microsoft Excel 2007.

**Results:** Increasing levels of energy drinks consumption and declining milk consumption pose significant nutritional risks. On the other hand, we can see an increase in the number of consumers of raw vegetables and a decrease in the number of daily consumers of sweets.

**Conclusion:** Further measures need to be taken to support positive changes in the content and frequency of eating.

## Introduction

Proper eating habits, or a healthy diet, is a factor that positively affects our health and helps prevent the development of various chronic non-communicable diseases. By a healthy diet we mean a diet in which macronutrients are consumed in appropriate proportions which depends on the energy and physiological needs of the body. They also differ in varying age categories. A healthy diet also provides enough micronutrients that are needed to meet the physiological needs of the individual (Cena, 2019).

The basic principles of proper diet include:

- adequate energy intake,
- elimination of risk factors (consumption of salt, saturated fats, trans fats or sugars),
- increasing the intake of factors that positively affect health (fiber, vitamins, polyunsaturated fatty acids, minerals, or trace elements),
- consumption of 4-5 servings per day,
- ensuring sufficient water intake,
- give preference to stewed or cooked foods when preparing meals,
- at least 30 minutes of physical activity in addition to proper diet (Bederova, 2018).

## Sample Group Characteristics and Methods

In 2019, the Public Health Authority of the Slovak Republic carried out a survey entitled *Health Awareness and Behavior of the Residents of the Slovak Republic*. In the survey, we used a questionnaire to find out various attributes of health awareness and behavior of the population of Slovakia in the age category 15 years and over. Data collection was carried out through all 36 regional public health offices in Slovakia. In the survey, we dealt with several topics, one part being the issue of eating. Respondents aged 15 and over were included in the survey, while we

focused on the population aged 15-18 years.

The software program Epi Data 3.1 was used for statistical processing of questionnaires from the respondents. A database for inserting data from the respondents was created in the program. The data were further processed in Microsoft Excel 2007. In 2019, the research sample consisted of 745 respondents aged 15-18 years. Of this number, 51% were girls (n = 379) ; 49% boys (n = 366). Almost half of the respondents lived in a countryside (49%, n = 364) and the remaining 51% lived in cities (n = 381).

## Results

In the survey *Health Awareness and Behavior of the Population of the Slovak Republic*, part of the questions focused on the issue of eating habits. Specific issues were used to determine the frequency of consumption of specific foods and beverages.

### Cooked food

In our group, up to 82% of adolescents consumed cooked food at a frequency of 1-2 times a day; some days without cooked food 16% of respondents and only 2% of the respondents had cooked food only rarely.

### Fish

Fish, as a source of vitamin D, were most consumed at a frequency of 1-2 times a month. Only 2% of the respondents consume canned fish and fish salads daily or every other day. 22% consume canned fish and salads 1-2 times a week and rarely or never up to 36% of the respondents. Even lower is the consumption of fresh and frozen fish. Only 1% of the respondents consume them every day or every other day. Consumption at a frequency of 1-2 times a week is at the level of 16% and of 1-2 times a month at the level of

43%. 40% of the respondents do not consume fresh nor frozen fish at all or do only very rarely.

### **Meat**

The respondents in our sample group consume meat more often than fish. Poultry is consumed most often. 17% of respondents consume it every day, more than half (58%) 1-2 times a week; 17% 1-2 times a month; only 8% do not consume poultry meat at all. Consumption of pork is the highest at a frequency of 1-2 times a week, with more than half of the respondents (52%) choosing this option. 5% consume pork every day / every other day; 30% 1-2 times a month; 13% of respondents rarely or never. Only 4% consume beef every day or every other day. 36% of respondents consume beef 1-2 times a week; 39% 1-2 times a month. 21% of respondents avoid beef. It is similar with consumption of smoked meat products. 22% of respondents rarely or never consume smoked meat products. On the contrary, 6% of respondents consume them every day, 34% 1-2 times a week and 38% 1-2 times a month.

### **Lard, butter, and margarine**

More than half of the respondents (58%) do not consume lard. On the contrary, 3% of respondents consume it every day. At a frequency of 1-2 times a week, 10% of respondents use lard and at a frequency of 1-2 times a month, 29% do. Butter (51%) is consumed more often than margarines (8%) - every day / every other day. Consumption of butter at a frequency of 1-2 times a week is at the level of 31% and 1-2 times a month at the level of 12%. 6% of respondents consume butter very rarely or not at all. Regarding the consumption of margarines, 18% of respondents consume them 1-2 times a week, 27% of respondents 1-2 times a month and 47% of the respondents do not consume them at all or do only very rarely.

### **Milk, dairy products, and eggs**

According to our survey, up to 47% of young people aged 15-18 consume milk every day or every other day. Up to 37% of respondents consume milk 1-2 times a week. At lower frequencies, 1-2 times a month only 9% of respondents consume milk and rarely or never only 7%. Consumption of other dairy products such as cheese

and yoghurt is at the frequency every day / every other day as high as the milk consumption.

Up to 49% of respondents consume cheese and yoghurt every day or every other day. At a frequency of 1-2 times a week, they are consumed by 39% of respondents, at a frequency of 1-2 times a month by 10% of respondents. Only 2% of the respondents rarely or never eat cheese and yoghurt.

In the following question, we focused on the consumption of eggs. Every day or every other day, 26% of respondents consume eggs. At a frequency of 1-2 times a week, eggs are consumed by 52% of respondents and 1-2 times a month by 17%. Rarely or not at all eggs are consumed by 5% of respondents.

### **Vegetables**

Other foods we asked respondents about include raw, cooked, stewed, or canned vegetables. Up to 42% of respondents consume raw vegetables every day / every other day. Another 36% of respondents consume vegetables 1-2 times a week. 15% of respondents consume raw vegetables 1-2 times a month and only 7% of the respondents never or rarely. Consumption of cooked, stewed, or canned vegetables at a frequency of every day / every other day is lower (18%) than that of raw vegetables (42%). The highest share of consumption is at the frequency of 1-2 times a week (44% of respondents). 1-2 times a month; 27% of respondents consume vegetables in this form and the remaining 11% do not consume such vegetables at all or only rarely.

### **Legumes**

Another necessary food that we asked about in the questionnaire are legumes. Only 9% of respondents consume legumes daily. Higher consumption of legumes is at the frequency: 1-2 times a week (40%) and 1-2 times a month (41%). 10% never or very rarely consume legumes.

### **White and brown breads**

We were asking respondents how often they consumed breads, especially the white and brown varieties. Every day or every other day, white breads are consumed more often (57%) than dark ones (51%). Similar results are true for the consumption of 1-2 times a week. 26% of respondents consume white breads 1-2 times a week

and 25% of respondents consume brown breads. White breads are consumed 1-2 times a month by 9% of respondents and brown breads by 16%. Never or only rarely consumes white breads 8% of respondents and 8% does not even consume brown breads.

### **Potatoes, rice, and pasta**

Potatoes, rice, and pasta are not consumed at all or rarely consumed by 1-2% of the respondents. Every day or every other day, 23% of respondents consume potatoes, 19% of respondents eat rice and 14% of respondents consume pasta. The highest consumption of these foods is at a frequency of 1-2 times a week. 1-2 times a week, 66% of respondents consume potatoes; 65% rice; 63% pasta. 1-2 times a month, 21% of respondents consume pasta; 14% rice; 10% potatoes.

### **Sweets and confectionery products**

Sweets as a risk factor are consumed every day / every other day by up to 36% of respondents. Another 39% of respondents consume them 1-2 times a week; 20% of the respondents 1-2 times a month; the remaining 5% do not consume them at all or only very rarely.

### **Unsweetened mineral water, soft drinks, juices**

As for drinks, we were detecting the frequency of consumption of unsweetened mineral water, soft drinks, or fruit juices. Unsweetened mineral water is consumed every day / every other day the most (41% of respondents). Soft drinks are consumed daily by 26% of respondents and fruit juices by 20% of respondents. 28% of respondents drink unsweetened mineral water 1-2 times a week and 21% of young people aged 15-18, 1-2 times a month. Rarely or never drink unsweetened mineral water 10%. Soft drinks are most often consumed at a frequency of 1-2 times a week (34% of respondents). The remaining respondents drink soft drinks 1-2 times a month (24%) or rarely/never (16%). Like soft drinks, fruit juices are most often consumed at a frequency of 1-2 times a week (41% of respondents). 29% of respondent drink fruit juices 1-2 times a month and 10% rarely or never.

### **Caffeine and energy drinks**

At this young age (15-18 years), up to 29% of the respondents consume caffeinated beverages

daily or every other day, and 9% also consume energy drinks. Caffeine drinks are consumed 1-2 times a week by 29% of respondents, 1-2 times a month by 21% of respondents and only the remaining 21% of respondents do not drink caffeine drinks at all. As for the consumption of energy drinks, more than half of respondents (54%) do not consume them at all or just rarely. 15% of respondents have energy drinks 1-2 times a week and 22% of respondents have them 1-2 times a month.

## **Discussion**

Changes in eating habits in terms of composition of the diet are also confirmed by the international HBSC survey in the age category of 15 years. The incidence of fruit and vegetable consumption among Slovak schoolchildren has been growing since 2014. However, it should be noted that despite the positive trend, there is still great potential in this area, as the percentage of children consuming vegetables every day is still at the level of 28% - 44%, in the case of fruit of 31% - 52% (Ochaba, 2020). Compared to our sample group, the percentage of consumers of raw vegetables is 42%. Compared to the Slovak adult population, children are worse off, as according to data from 2019, up to 49% of the adult population consumes raw vegetables every day and every other day (Ochaba, 2021). We can also see an increase in vegetable consumption since 2013. From the point of view of the food components, milk is an important nutrient. In general, we see a decrease in an everyday milk consumption in both the child population and in the adult population. In our group, 47% of the youth population aged 15-18 years consumed milk. Compared to adults, the difference represents 10% with the adult population having worse results (Daníhelova, 2020). In terms of the frequency of sweets consumption, 36% of daily consumption is a high number. Unfortunately, the data itself is also confirmed by the HBSC survey, where the daily consumption of sweets in 15-year-olds is approximately at the same level, but with a declining trend compared to 2010 (Geckova, 2019). In the adult population, it was at the level of 23.5% in 2019 with a trend of a slight decrease compared to 2013 (Daníhelova, 2020). Another significant risk is the daily consumption of energy drinks, being it reported by 9% of young

people and 15% consumption during the week from our group of young people aged 15-18. According to the HBSC survey, among 15-year-olds, the consumption of energy drinks is at a level of 25% during the week, with boys dominating (Ochaba, 2019). In the adult population, daily consumption of energy drinks is 3.6% and weekly consumption is 6.9% (Danihelova, 2020).

## Conclusions

Based on the assessment of the nutritional status of the population of the Slovak Republic, milk consumption has decreased from 67.8 kg / person / year to 67.1 kg / person / year since 1992. Cheeses and curds recorded rather significant increase in consumption by 8.4% and fermented milk products by 14.9%. Compared to the recommended food rations, the consumption of butter is 7.1% higher; consumption of lard is 6.7% higher; the consumption of vegetable fats and oils 16.7% higher. Consumption of vegetables and vegetable products decreased by 3.2 kg / person / year compared to 2001. Consumption of fresh vegetables decreased by 0.4 kg / person / year (0.7%). Consumption of fruit and fruit products decreased by 1.6 kg / person / year (3.1%). (4) However, since 2017, consumption of fruit and fruit products has also increased by 2.3 kg, which represents an increase of 3.7%. The increase reached the value of 64.7 kg per person in 2018. The consumption of alcoholic and non-alcoholic beverages increased. Consumption of alcoholic beverages has increased by 2.4% and consumption of non-alcoholic beverages has increased by 4.7% since 2017 (Sitarova, 2018).

Eating habits are closely related to the health of the population; support the immune system; reduce the risk of non-communicable diseases; increase life expectancy. A healthy diet is an essential part of a healthy lifestyle. The basic condition for the implementation of a healthy diet is moderation in eating, which means a recommendation to control the food consumed in terms of its amount. The survey on the health awareness and behavior of the population shows a positive trend, especially around: increasing consumption of raw vegetables; declining daily consumption of meat other than poultry. On the contrary, the negative trend is a decrease in milk consumption and increased consumption of energy drinks in young people as well as in the adult population (Ochaba, 2021).

## Declaration

The questionnaire in the submitted work was anonymous. At the beginning of the questionnaire respondents received information about the purpose of the questionnaire and its evaluation. The authors have no conflict of interest.

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# Health Awareness in the Field of Eating Habits in Slovakia

A. Plskova (Adriana Plskova)<sup>1</sup>, S. Paulik (Samuel Paulik)<sup>1</sup>, M. Kacmarikova (Margareta Kacmarikova)<sup>1</sup>, R. Ochaba (Robert Ochaba)<sup>1,2</sup>

Original Article

<sup>1</sup>Trnava University, Faculty of Health Sciences and Social Work, Department of Public Health, SK.

<sup>2</sup>Public Health Authority of the Slovak Republic, Department of Health Promotion and Health Education, Bratislava, SK.

## E-mail address:

adriana.plskova@tvu.sk

## Reprint address:

Adriana Plskova  
Department of Public Health  
Faculty of Health Sciences and Social Work  
University in Trnava  
Univerzitne nam. 1  
918 43 Trnava  
Slovakia

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Selvaraj Subramaniam  
Kuala Lumpur  
Zofia Szarota  
Pedagogical University of Cracow, PL

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## Abstract:

**Objectives:** The aim of our research was to monitor the differences in the intake of food commodities according to gender and age in the Slovak Republic in 2019.

**Design:** Pilot study

**Participants:** The total number of respondents was 2,614 from all over the Slovak Republic, aged 15 to 65 years.

**Methods:** A questionnaire-based cross-sectional survey conducted in 2019 under the auspices of the Public Health Authority of the Slovak Republic (ÚVZ SR). For statistical analysis, we used the Chi-square test and Fisher's test, with a determined

level of significance  $p\text{-value} \leq 0.05$ .

**Results:** With increasing age, women took more caloric food commodities compared to men who preferred foods of plant origin.

**Conclusion:** With increasing age, the intake of high-calorie foods increased in both sexes.

## Introduction

In general, current eating habits can be defined as regular intake of foods with high energy and at the same time low nutritional value, while the intake of highly nutritious foods (fruits, vegetables, legumes) is suppressed. It is alarming that a majority of young people do not meet dietary recommendations. Their daily energy intake comes mainly from highly processed foods that contain excessive amounts of carbohydrates, fats, and synthetic ingredients and from sweetened beverages without nutritional value for the human body (Czoli *et al.*, 2020). It is important to prefer high-fibre foods, fruits, vegetables, whole grain products, low-fat dairy products, white meat or nuts. Adherence to good dietary principles can reduce the risk of not only obesity but also of other cardiovascular diseases (Arghavan *et al.*, 2019). Considering the changes in diet in recent decades, the aim of this article was to monitor the differences in the intake of individual food commodities according to gender and age in the Slovak Republic in 2019.

## Methodology

A total number of respondents involved in the questionnaire survey which was conducted during the year was 2,614 respondents (men  $n = 1298$ ; women  $n = 1316$ ) from all over the Slovak Republic. The questionnaire was compiled by the Public Health Authority of the Slovak Republic (ÚVZ SR) and was used to monitor the health awareness and behavior of the inhabitants of the Slovak Republic. This questionnaire was designed for respondents aged 15- 64 years. Data were collected in May and June by staff from health counselling departments of 36 regional public health offices. The questionnaire was provided in printed form. The collected data included socio-demographic data, the frequency of consumption of individual food commodities and the reduction in body mass index. The R project (version 3.2.2) was used for statistical analysis. Differences between the frequency of certain

food commodity consumption and socio-demographic variables (gender, age, regions of the Slovak Republic) were analyzed using the Chi-square test (frequency  $> 5$ ) or Fisher's exact test (frequency  $< 5$ ). A  $p\text{-value}$  of  $\leq 0.05$  was determined as the level of significance.

## Results

We found statistically significant differences in individual food commodities. More women in the 19-25 age group (52%) preferred daily consumption of pork compared to men in the same age category (37%) ( $p = 0.036$ ). More young men in the 15-18 age group (47%) preferred poultry consumption over girls in the same age group (35%) ( $p = 0.049$ ). More women in the 26-40 age group (79%) rarely chose to eat smoked meat products compared to men in the same age group (62%) ( $p = 0.039$ ). In fish and beef intake, we did not find statistically significant differences according to gender and age group (Table 1).

More women in the 19-25 age group (56%) preferred to consume eggs every day compared to men in the same age category (47%) ( $p = 0.049$ ). More women in the 41-64 age group (56%) preferred to eat pasta every day compared to men in the same age group (47%) ( $p = 0.046$ ). We did not find statistically significant differences in milk intake (Table 2).

More women in the 19-25 age group (54%) rarely preferred to consume vegetables compared to men in the same age category (36%) ( $p = 0.013$ ). More women in the 41-64 age group (54%) rarely preferred to consume legumes compared to men in the same age group (36%) ( $p = 0.021$ ). We did not find statistically significant differences in fruit intake between men and women according to age group (Table 3).

## Discussion

Eating habits in society have changed over the years, reducing the consumption of nutritious foods. This negative issue is the biggest problem, especially for the adolescent population, which

has the worst diet in terms of nutritional quality compared to other age groups, and this gap will further widen. This phenomenon coincides with our study, where adolescents had the highest rate of consumption of fatty products and the lowest consumption of vegetables of all age categories while also representing the largest consumers of sweetened beverages. Consumption of alcoholic beverages was similar in all age categories, but the trend of alcohol consumption was stagnant.

Alcohol consumption is also increasing with age - studies have shown stronger trends in alcohol consumption in older age groups (Gigliotti – Bessa, 2004; Galduroz *et al.*, 2004). In addition to the harmful effects of alcohol on health, NHANES data from 2003-2008 found poorer food quality among men and women on the days they consumed alcohol, emphasizing higher total fat consumption and lower intake of fruit, milk, and dairy products (Breslow *et al.*, 2013). In this

**Table 1** Differences in the intake of meat food commodities according to gender and age category (ÚVZ SR, 2019)

| Food commodities                      | Age category  | Men                | Women              | p-value      |
|---------------------------------------|---------------|--------------------|--------------------|--------------|
| Fresh fish<br>a/ b/ c/ d              | 15 - 18 years | 43%/ 38%/ 12%/ 7%  | 44%/ 36%/ 13%/ 7%  | 0,078        |
|                                       | 19 - 25 years | 7%/ 19%/ 25%/ 49%  | 6%/ 15%/ 24%/ 55%  | 0,085        |
|                                       | 26 - 40 years | 37%/ 39%/ 13%/ 11% | 38%/ 36%/ 13%/ 13% | 0,074        |
|                                       | 41 – 64 years | 46%/ 42%/ 9%/ 3%   | 48%/ 42%/ 8%/ 2%   | 0,068        |
| Pork<br>a/ b/ c/ d                    | 15 - 18 years | 22%/ 60%/ 16%/ 2%  | 16%/ 64%/ 18%/ 2%  | 0,058        |
|                                       | 19 - 25 years | 37%/ 40%/ 18% 5%   | 52%/ 35%/ 9%/ 4%   | <b>0,036</b> |
|                                       | 26 - 40 years | 14%/ 49%/ 29%/ 8%  | 19%/ 53%/ 22%/ 6%  | 0,051        |
|                                       | 41 – 64 years | 5%/ 43%/ 45%/ 7%   | 6%/ 42%/ 44%/ 8%   | 0,094        |
| Beef<br>a/ b/ c/ d                    | 15 - 18 years | 18%/ 72%/ 8%/ 2%   | 14%/ 71%/ 13%/ 2%  | 0,081        |
|                                       | 19 - 25 years | 17%/ 70%/ 12%/ 1%  | 11%/ 71%/ 16%/ 2%  | 0,077        |
|                                       | 26 - 40 years | 9%/ 64%/ 23%/ 4%   | 8%/ 66%/ 24%/ 2%   | 0,063        |
|                                       | 41 – 64 years | 50%/ 28%/ 14%/ 8%  | 53%/ 29%/ 12%/ 6%  | 0,072        |
| Poultry<br>a/ b/ c/ d                 | 15 - 18 years | 47%/ 28%/ 14%/ 11% | 35%/ 31%/ 15%/ 19% | <b>0,049</b> |
|                                       | 19 - 25 years | 26%/ 43%/ 24%/ 7%  | 26%/ 41%/ 25%/ 8%  | 0,084        |
|                                       | 26 - 40 years | 45%/ 28%/ 18%/ 9%  | 47%/ 23%/ 17%/ 13% | 0,073        |
|                                       | 41 – 64 years | 17%/ 38%/ 19%/ 26% | 10%/ 22%/ 25%/ 43% | 0,053        |
| Smoked meat<br>products<br>a/ b/ c/ d | 15 - 18 years | 11%/ 31%/ 36%/ 22% | 8%/ 27%/ 35%/ 30%  | 0,052        |
|                                       | 19 - 25 years | 9%/ 40%/ 41%/ 12%  | 4%/ 42%/ 46%/ 7%   | 0,053        |
|                                       | 26 - 40 years | 6%/ 13%/ 19%/ 62%  | 3%/ 5%/ 13%/ 79%   | <b>0,039</b> |
|                                       | 41 – 64 years | 5%/ 51%/ 31%/ 13%  | 5%/ 56%/ 29%/ 10%  | 0,074        |

\* a/ b/ c/ d = every day/ 1-2 times per week/ 1-2 times per month/ rarely

study, men preferred alcohol (beer) consumption over women.

Consumption of fruits and vegetables has a protective effect on the risk of obesity, type 2 diabetes mellitus, cardiovascular diseases and some types of cancer. The World Health Organization has stated that an estimated 2.7 million deaths registered worldwide in 2000 could have been prevented with adequate fruit and vegetable consumption (Lock *et al.*, 2005).

In a Brazilian study, total fruit consumption increased in adults and older adults, but not in adolescents. In the Brazilian study, fruit consumption showed a declining trend with higher consumption recorded in the elderly population. Spanish researchers have reported adverse trends in vegetable consumption (Valdés *et al.*, 2009), but vegetable consumption has increased in the Portuguese population, as in this study. These findings are consistent with another study conducted in Sweden (Eiben *et al.*, 2004) and in New Zealand (Laugesen – Swinburn, 2000). An examination of vitamin and mineral deficiencies was a pri-

ority in 2006 which is why the Brazilian Nutrition Guidelines recommend growing fruit and vegetables – for the supply of fiber and vitamins such as carotenoids, with an emphasis on the consumption of dark green and orange vegetables (IBGE, 2011). The score of dark green vegetables and legumes in the group of adolescents also decreased.

According to 2008 data from the IBGE (2011), food groups, whose presence in the diet steadily increased along with the level of household income, were meat, milk and dairy products, fruits and vegetables. On the other hand, among the negative indicators of food quality was higher intake of sweet foods, soft drinks, pizza and bakery products. The presence of soft drinks in the diet was 5 times higher with a higher financial income than in the group with a lower financial income. In this study, an increased dietary quality score was observed among adults and older adults, mainly due to increased fruit intake and decreased saturated fat intake. However, the overall consumption for all food groups has been inadequate and remains a cause for concern. The

**Table 2** Differences in milk, egg and pasta intake according to gender and age category (ÚVZ SR, 2019)

| Food commodities    | Age category  | Men                | Women              | p-value      |
|---------------------|---------------|--------------------|--------------------|--------------|
| Milk<br>a/ b/ c/ d  | 15 - 18 years | 34%/ 38%/ 16%/ 12% | 30%/ 37%/ 15%/ 18% | 0,094        |
|                     | 19 - 25 years | 47%/ 42%/ 9%/ 2%   | 47%/ 43%/ 8%/ 2%   | 0,159        |
|                     | 26 - 40 years | 20%/ 65%/ 13%/ 2%  | 12%/ 66%/ 20%/ 2%  | 0,058        |
|                     | 41 – 64 years | 46%/ 39%/ 12%/ 3%  | 48%/ 37%/ 12%/ 5%  | 0,066        |
| Eggs<br>a/ b/ c/ d  | 15 - 18 years | 6%/ 69%/ 23%/ 2%   | 5%/ 67%/ 24%/ 4%   | 0,079        |
|                     | 19 - 25 years | 47%/ 31%/ 14%/ 8%  | 56%/ 29%/ 9%/ 6%   | <b>0,049</b> |
|                     | 26 - 40 years | 36%/ 31%/ 18%/ 15% | 33%/ 29%/ 17%/ 21% | 0,072        |
|                     | 41 – 64 years | 21%/ 43%/ 27%/ 9%  | 19%/ 42%/ 29%/ 10% | 0,061        |
| Pasta<br>a/ b/ c/ d | 15 - 18 years | 26%/ 52%/ 17%/ 5%  | 23%/ 59%/ 16%/ 1%  | 0,094        |
|                     | 19 - 25 years | 42%/ 36%/ 15%/ 7%  | 43%/ 41%/ 13%/ 3%  | 0,054        |
|                     | 26 - 40 years | 18%/ 44%/ 27%/ 11% | 18%/ 47%/ 26%/ 9%  | 0,052        |
|                     | 41 – 64 years | 47%/ 22%/ 15%/ 16% | 56%/ 15%/ 12%/ 17% | <b>0,046</b> |

\* a/ b/ c/ d = every day/ 1-2 times per week/ 1-2 times per month/ rarely

biggest worries were caused by the data found in the group of adolescents who had the worst quality of diet which tended to decline further. Compared to other age groups, adolescents make worse choices of consumed foods. Studies show that adolescents prefer highly processed foods rich in sugar and fat, which affect health during developmental stages (USDA, 2009; Andrade *et al.*, 2010). The IBGE survey (2011) confirms a significant increase in the proportion of overweight Brazilian adolescents. In this study, significant differences were observed only in adolescent women.

The study has several limitations, the first being a short follow-up period. Positives include the adequate distribution of respondents according to gender and the time-saving nature of data collection.

Despite the limitations, differences in eating habits were demonstrated among respondents, which provide evidence of the urgent need for measures to improve the quality of diet in society as a whole, with respect to adolescents. This in-

formation may support the development of measures to encourage the consumption of specific groups of foods, such as fruit and vegetables, milk and dairy products and wholegrain products, while supporting the reduction of added sugar and sodium by food producers. It is essential to realize that eating habits are modifiable lifestyle factors. The role of national nutrition guidelines with regard to public health needs to be emphasized. Appropriate implementation for target groups can significantly reduce the incidence of not only overweight and obesity, but also of other diseases of civilization, which significantly affect the quality of life.

## Conclusion

With increasing age, the intake of high-calorie foods increased in both sexes. Obesity and overweight have been increasing especially in adults and adolescent girls. Given that diet is a modifiable lifestyle factor, the role of national nutrition recommendations needs to be emphasized.

**Table 3** Differences in fruit, vegetable and legumes intake according to gender and age category (ÚVZ SR, 2019)

| Food commodities        | Age category  | Men                | Women              | p-value      |
|-------------------------|---------------|--------------------|--------------------|--------------|
| Vegetable<br>a/ b/ c/ d | 15 - 18 years | 46%/ 23%/ 19%/ 12% | 49%/ 23%/ 14%/ 14% | 0,088        |
|                         | 19 - 25 years | 8%/ 27%/ 29%/ 36%  | 5%/ 17%/ 24%/ 54%  | <b>0,013</b> |
|                         | 26 - 40 years | 5%/ 27%/ 39%/ 29%  | 4%/ 18%/ 37%/ 41%  | 0,051        |
|                         | 41 - 64 years | 62%/ 13%/ 11%/ 14% | 71%/ 11%/ 7%/ 11%  | 0,064        |
| Fruit<br>a/ b/ c/ d     | 15 - 18 years | 2%/ 7%/ 16%/ 75%   | 1%/ 3%/ 8%/ 88%    | 0,058        |
|                         | 19 - 25 years | 6%/ 28%/ 29%/ 37%  | 9%/ 25%/ 29%/ 37%  | 0,077        |
|                         | 26 - 40 years | 1%/ 18%/ 41%/ 40%  | 3%/ 16%/ 40%/ 41%  | 0,069        |
|                         | 41 - 64 years | 1%/ 9%/ 37%/ 53%   | 1%/ 11%/ 33%/ 55%  | 0,087        |
| Legumes<br>a/ b/ c/ d   | 15 - 18 years | 1%/ 3%/ 21%/ 75%   | 0%/ 1%/ 10%/ 89%   | 0,059        |
|                         | 19 - 25 years | 2%/ 22%/ 40%/ 36%  | 2%/ 28%/ 44%/ 26%  | 0,061        |
|                         | 26 - 40 years | 1%/ 16%/ 43%/ 40%  | 2%/ 17%/ 51%/ 30%  | 0,055        |
|                         | 41 - 64 years | 12%/ 34%/ 26%/ 28% | 2%/ 13%/ 29%/ 56%  | <b>0,021</b> |

\* a/ b/ c/ d = every day/ 1-2 times per week/ 1-2 times per month/ rarely

## Declaration

The questionnaire in the submitted work was anonymous. At the beginning of the questionnaire respondents received information about the purpose of the questionnaire and its evaluation. The authors have no conflict of interest.

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# Preferred Methods of Treating Obesity in Late Adulthood and Senior Age

J. Babecka (Jozef Babecka)<sup>1</sup>, M. Popovicova (Maria Popovicova)<sup>2</sup>, M. Belovicova (Maria Belovicova)<sup>2,3,4</sup>, P. Snopek (Petr Snopek)<sup>5,6</sup>

<sup>1</sup> Catholic University in Ruzomberok, Faculty of Health, Ruzomberok, SK.

<sup>2,3</sup> St. Elizabeth University of Health and Social Sciences, Bratislava, SK.

<sup>3</sup> Internal Clinic for Liver Disease Diagnosis and Treatment, Remedium s. r. o., SK.

<sup>4</sup> Slovak Society of Practical Obesitology (SSPO), Bardejov, SK.

<sup>5</sup> Tomas Bata University in Zlin, Faculty of Humanities, Department of Health Care Sciences, Zlin, CZ.

<sup>6</sup> Hospital in Zlin, Zlin, CR.

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## E-mail address:

jozef.babecka@ku.sk

## Reprint address:

Jozef Babecka  
Catholic University in Ruzomberok  
Faculty of Health  
Ruzomberok  
Slovakia

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## Abstract:

**Objective:** To identify preferred solutions – therapy - for overweight and obesity in older adults and seniors

**Participants:** A total of 110 respondents were contacted, out of which 14 refused to cooperate or filled in the questionnaire incorrectly. The return of questionnaires was 96, i.e. 100%. The group of respondents consisted of individuals of both sexes, aged 50 and over, living in a natural social environment or in one of the selected institutions. Due to the fact that - in our opinion - a relatively large amount of attention is paid to the senior age group

while the group of people in the age range of 50-64 is forgotten, we have not chosen the senior age respondents exclusively.

**Methods:** The data obtained by the processing of the questionnaires were analytically evaluated. For statistical processing a program StatisticaCz version 9 was chosen, a descriptive analysis of the data was performed, followed by analysis by comparing averages and particular tests of statistical significance (Chi-square test, Kruskal Wallis, KendalovoTau).

**Results:** An adjustment of the diet as a part of the solution of the overweight and obesity therapy would be chosen by the most respondents, 75 (46.5%) of them. 44 (27.0%) respondents would choose sport or other physical activity. 11 (6.7%) respondents would deal with overweight and obesity pharmacologically - with the help of medications, and only 25 (15.3%) respondents would choose surgery as a way of dealing with overweight and obesity. On the contrary, only 8 (4.9%) respondents were not interested in dealing with the weight gain. 24 (25.0%) respondents would choose the surgical way of solving obesity. An answer "possibly yes" was chosen by 13 (13.5%) respondents. 21 (21.9%) individuals inclined to the "rather not" variant. 33 (34.4%) respondents chose the "certainly not" answer. An answer "I don't know" was chosen by 5 (5.2%) respondents.

**Conclusion:** Obesity is a global social problem which is not to be solved just in healthcare and it is certainly not an issue of an individual.

## Introduction

BMI of 30 kg/m<sup>2</sup> and more is considered obesity. However, this criterion has certain shortcomings, especially in old age. There may be problems with weighing and measuring height in immobile patients. Other problems can arise as a result of old-age changes in one's body. The biggest disadvantage of BMI is that it does not reflect changes in body composition. When assessing using BMI, the altered muscle-to-fat ratio underestimates obesity, while on the other hand the decrease in height during aging overestimates it (1). Alternative measurements (arm-span, knee height) were developed to determine the height of bedridden patients, but their contribution was not adequately validated. BMI increases as we age. Its increase is more significant when evaluated using longitudinal studies. BMI is not considered a very accurate tool for assessing nutritional status, as it only has 50-60% sensitivity in detecting obesity and malnutrition.

## Waist circumference

Large waist circumference (more than 102 cm in men and more than 88 cm in women)

is more common in men over the age of 65 than in younger age groups (2). The incidence of obesity assessed by waist circumference is greater than that assessed by BMI. The waist circumference is an indicator of the amount of intra-abdominal fat which produces the substances causing the metabolic syndrome. Waist circumference is a better indicator of ischemic heart disease than BMI. Larger waist circumference is associated with worse prognosis even in people with lower BMI (2).

## Aging changes in the body

Aging changes in the body significantly modify the assessment of nutritional status in older age. Between the age of 20 and 30, the progressive loss of lean body mass begins. Between the age of 20 and 70, muscle mass is reduced by 40% and the amount of fat increases. The amount of fat is greatest between the age of 60 and 70. After the age of 70, the reduction in fat-free mass continues and the amount of fat also begins to decrease. During aging, fat is redistributed. The amount of intra-abdominal fat increases relatively more as a result of greater loss of limb

muscle and infiltration of fat into the liver. Fatty liver and muscle impair the effectiveness of insulin (3). An increase in abdominal fat slows down with age. Muscle atrophy contributes to weight loss in an older age, and thus the proportion of fat in the composition of the body increases even with weight loss (1).

### **Practical problems in assessing the state of nutrition in old-age patients**

Many older people are not able to stand up, so their height and weight cannot be measured. A presence of edema restrains the determination of BMI. Measuring the waist circumference is impossible in bedridden patients. When measuring the waist circumference, it is necessary to maintain all the requirements for correct assessment. The examined person should stand upright with the weight evenly distributed between both legs, which are 10 - 15 cm apart. The measurement should be taken in the morning on an empty stomach, at the end of normal expiration. The patient must not draw in the abdomen and should not be meteoric. The measuring tape must not be elastic and must be applied loosely, parallel to the floor, at half the distance between the edge of the lowest palpable rib and the spinallia superior. The hips circumference is measured at the widest part. Evaluation of obesity using the ratio of hip and waist circumference in old age patients is affected by atrophy of the gluteal muscles. An open question is the determination of the ideal weight. There are several ideal weight calculators on the Internet, but none of them is validated for patients of older age. Between the age of 70 and 75, overweight people (BMI 25.6 kg / m<sup>2</sup>) have the best prognosis (4). Due to this fact, it is not recommended to use the same BMI categories as in younger age groups in people over 70 years of age. The same is true of waist circumference, as there has been lower mortality in men with larger waist circumferences (5). The usual weight (i.e. the weight a person has had for a long time) is used to assess weight loss or gain.

### **Treatment of obesity**

The "Primum est non nocere" also applies to the treatment of obesity, especially in old age. Before starting, it is necessary to consider whether this treatment is feasible and to assess its benefits and risks (whether the patient will live long enough

to see its effect). Obesity in the elderly is usually a long-term issue, so the changes caused by obesity are advanced and less reversible. In addition, changing eating habits is very difficult. Older people have a reduced ability to adapt food intake to current needs (6). Reducing the amount of food and eliminating some ingredients has a negative impact on quality of life and can cause a deficiency of vitamins and minerals. The choice of diet is influenced by diseases (for example, a high-protein diet is contraindicated in kidney disease). An adverse effect of weight reduction is muscle loss. In a meta-analysis of 52 studies looking at the impact of energy restriction, it was found that in half of the studies, the reduction in lean body mass contributed to weight loss in 25% or more. If exercise was also part of the program, the loss of lean body mass was only 11%. A cautious approach is particularly required when obesity is combined with sarcopenia (sarcopenic obesity), which increases the overall mortality by 24%. Weight reduction and exercise also alleviate the symptoms of fragility. Weight loss is associated with loss of femur bone density, but not of the spine nor of other bones. A 10% weight reduction is associated with a significant increase in the risk of hip fracture. When reducing weight, it is most important that the daily energy intake of food is at least 500 kcal (2,092 kJ) less than the expenditure. At this value, a weight reduction of 0.5 - 0.7 kg / week can be expected. The required amount of energy is calculated by multiplying basal metabolism by a coefficient depending on physical activity. There are several calculators for calculating basal metabolism available on the Internet (7). In general, the daily energy expenditure in older age is 30 - 35 kcal / kg, depending on the activity. The tolerance of reduced food intake will be improved by drinking water before meals, slow eating and a diet with stronger satiating effect. The composition of the diet is important. There is a large number of reduction diets. Some of them can also be harmful (for example, a high-fat diet). In old age, the use of very low energy diets is not recommended. They should contain a sufficient amount of quality proteins, vitamins and minerals. Many of these requirements are met in a high-protein diet. A high protein diet is considered a diet with a protein content of more than 0.8 g / kg / day, or if the protein accounts for more than 15-16% of energy (8). A high-protein diet in-

creases the secretion of neuropeptides, cholecystokinin and peptide YY, which induce satiety and reduce orexigenic ghrelin production. High protein content is associated with a high satiating effect, which improves compliance. Another advantage is that proteins have the greatest thermic effect. Their processing consumes 15-30% of the energy they contain. The authors (8) state that in polysaccharides it is 5-10%. Fats have the lowest thermic effect (0 - 3%). A diet with a higher protein content is also advantageous in older age as the use of proteins in old age is worsened. A recommended daily dose of protein in the elderly is higher (1 g / kg body weight). In patients with weak muscles, this dose is 1 - 1.6 g / kg / day. Higher protein intake has a protective effect on muscles. Another advantage of a high-protein diet is a 50% reduction in weight gain after the reduction diet (8). Depending on the source of the protein, a high-protein diet may increase the risk of kidney stones. Animal products high in protein often contain large amounts of cholesterol and triglycerides, which can have negative effects. Other sources of protein are more suitable, such as fish, soy and other legumes. High protein intake can increase phosphate and sulphate production. Therefore, a sufficient intake of vegetables and fruits that have an alkalizing effect is recommended. Monitoring of renal function is also recommended. Excess amino acids can be transformed into glucose and fats, causing weight gain. A high protein diet is not suitable for patients with advanced kidney disease. Pharmacological treatment of obesity is not currently recommended in elderly patients, with the exception of antidepressants in the treatment of night eating (Waldan's syndrome), in which the patient has early anorexia and consumes at least 1/4 of food at night (9).

### **Surgical treatment**

For some patients, due to a failure of the conservative treatment, a surgical treatment may be considered. Criteria for bariatric surgery include a BMI of 40 or 35-40 kg / m<sup>2</sup>, with other complications that can be ameliorated by surgery (e.g., nocturnal apnea, diabetes mellitus, and resistant hypertension, impaired mobility) (1). Number of patients with surgically treated obesity is also increasing in senior age. In the United States, people aged 60 years make up 10% of pa-

tients operated on for obesity. A meta-analysis of 26 studies with 8,149 patients aged 55 years and older found improved level of diabetes compensation in 54.3% and better control of hypertension in 42.5%. Dyslipidemia improved in 42.5% of patients. 53.7% of patients lost the extra weight. Complications occurred in 14.7% of patients. Mortality within 30 days after surgery was 0.01% (10).

### **Conclusion**

Several negative effects of obesity persist into old age, but many are milder. Negative consequences correlate more with waist circumference than with BMI. Overweight people have the best prognosis (BMI 25 - 30 kg / m<sup>2</sup>). The treatment of obesity in old age should be carefully considered, as its effect is less significant in old age and higher body weight may have a protective effect in some diseases. Measures for muscle maintenance (adequate protein intake and exercise) are also part of the obesity treatment.

### **Research sample group and methodology**

A total of 110 respondents were contacted, out of which 14 refused to cooperate or filled in the questionnaire incorrectly. The return of questionnaires was 96, i.e. 100%. The group of respondents consisted of individuals of both sexes aged 50 and over, living in a natural social environment or in one of the selected institutions. Due to the fact that - in our opinion - a relatively large amount of attention is paid to the senior age group while the group of people in the age range of 50-64 is forgotten, we have not chosen the senior age respondents exclusively. According to the WHO, those people do not yet belong to the category of seniors, but they are part of the population that is already preparing for the senior age. The data obtained by the processing of the questionnaires were analytically evaluated. For statistical processing a program StatisticaCz version 9 was chosen, a descriptive analysis of the data was performed, followed by analysis by comparing averages and particular tests of statistical significance (Chi-square test, Kruskal Wallis, KendallovoTau).

**Objective:** To identify preferred solutions - therapy - for overweight and obesity in older adults and seniors

## Hypotheses

H0 We assume that there will be no significant difference between the preferred ways of dealing with overweight and obesity between men and women.

Ha We assume that there will be a significant difference between the preferred ways of dealing with overweight and obesity between men and women.

## Analysis of results

Out of the total number of 96 respondents, 27 (28.1%) respondents were in the category under 59 years of age, 69 (71.9%) respondents were over 60 years of age. The average age of the respondents was 64.25 years. The youngest respondent was 50 years old at the time of the research, the oldest respondent was 85 years old. The most numerous group consisted of respondents in the age category of 63 to 65 years, i.e. the senior sphere. The second most numerous group were older people aged 58 years and another large group was again the senior category aged 70 to 72 years. Of this, according to gender, 61 (63.5%) were women and 35 (36.5%) were men. Below is a table based on age, weight, height and BMI.

Table 2 shows that the significance level of 0.05 is less than the significance of  $p$  in all tests

performed. Thus, it can be claimed that no statistically significant difference was found in the choice of options for treating overweight and obesity between men and women. Based on statistical testing, no significant difference was found between the selected options for dealing with overweight and obesity depending on the age of the respondents. In this case, thanks to the Chi-square reciprocity statistical test, the null hypothesis cannot be rejected. It can be argued that in the sample of respondents, there is no significant difference between the way of dealing with overweight and obesity depending on gender, so we do not reject H0.

## Discussion

Our goal was to identify preferred ways of dealing with overweight and obesity in the old-age patients and the elderly. The established hypothesis assumed that there would be no significant difference between the ways of dealing with overweight and obesity between men and women. For testing we used items from the questionnaire, in which the respondents had to state, in addition to gender, also the possibilities of dealing with overweight and obesity. The option of physical activity as a way of solving obesity was surprisingly chosen by a relatively large

**Table 1**

| Age, weight, height, BMI |    | Age   | Weight | Height | BMI   |
|--------------------------|----|-------|--------|--------|-------|
| Mean                     |    | 64,25 | 87,93  | 169,39 | 30,49 |
| Median                   |    | 63,00 | 87,00  | 170,00 | 29,59 |
| Mode                     |    | 63    | 80     | 170    | 29    |
| Standard deviation       |    | 7,807 | 15,509 | 7,870  | 3,935 |
| Minimum                  |    | 50    | 62     | 150    | 24    |
| Maximum                  |    | 85    | 132    | 189    | 41    |
| Percentile               | 25 | 58,25 | 76,75  | 163,00 | 28,35 |
|                          | 50 | 63,00 | 87,00  | 170,00 | 29,59 |
|                          | 75 | 69,75 | 96,00  | 175,00 | 31,87 |

Source: own source, 2020

number of respondents, 54% of men and 41% of women. In her work on similar topics, Kunesova (2005) states that while many seniors consider physical activity to be an important factor in tackling obesity, most of them do not exercise nor go for walks and spend their free time on non-physical activities, predominantly watching television and reading. Only a minimal percentage spend their free time playing sports or performing other

physical activities (11). Kunesova (2016) states that physical activity is one of the most important components of obesity therapy, even in the elderly, where the goal is, among other things, to prevent or delay the onset of addiction or non-self-sufficiency of the elderly. Nevertheless, in practice, many older people are not inclined towards this option. 71% of men and 82% of women then prefer to make adjustments to their

**Table 2**

|  |  | Gender                   |       | Total responses |
|--|--|--------------------------|-------|-----------------|
|  |  | Man                      | Woman |                 |
| Sport or other physical activity                   | Number   | 19                       | 25    | 44              |
|  | % according to q02                                 | 54,3%                    | 41,0% |                 |
| Dietadjustment                                     | Number   | 25                       | 50    | 75              |
|  | % according to q02                                 | 71,4%                    | 82,0% |                 |
| Pharmacological way, using weight loss medications | Number   | 2                        | 9     | 11              |
|  | % according to q02                                 | 5,7%                     | 14,8% |                 |
| Surgical treatment                                 | Number   | 9                        | 16    | 25              |
|  | % according to q02                                 | 25,7%                    | 26,2% |                 |
| Not interested in dealing with the weight gain     | Number   | 2                        | 6     | 8               |
|  | % according to q02                                 | 5,7%                     | 9,8%  |                 |
| Total number of respondents                        |  | 35                       | 61    | 96              |
| <b>Statistical significance test - Chi square</b>  |  |                          |       |                 |
|  | The value of the test statistic (Ch <sup>2</sup> ) | Significance of the test |       |                 |
| Sport or other physical activity                   | 1,585 <sup>a</sup>                                 | <b>0,287</b>             |       |                 |
| Dietadjustment                                     | 1,445 <sup>a</sup>                                 | <b>0,305</b>             |       |                 |
| Pharmacological way, using weight loss medications | 1,791 <sup>a</sup>                                 | <b>0,318</b>             |       |                 |
| Surgical treatment                                 | 0,003 <sup>a</sup>                                 | <b>1,000</b>             |       |                 |
| Not interested in dealing with the weight gain     | 0,495 <sup>a</sup>                                 | <b>0,706</b>             |       |                 |

Source: own source, 2020

diet. The high percentage of answers for this variant was again surprising, given that older people are reluctant to change established eating habits. This can also be justified by the fact that the respondents are aware that the composition of the diet and eating habits are among the basic pillars of influencing overweight and obesity treatment. Still, awareness can only be a prerequisite here, not a guarantee of change (12). Belovicova et al (2021) states that only a small part of the respondents chooses foods with reduced fat and sugar content (13). Hlubik (2007) agrees that in seniors there is still preference for foods rich in fats and simple sugars. Pharmacological treatment would only choose 5.7% of men, but up to 14.8% of women. This may be due to the fact that medications have become a phenomenon of the last century. They have saved many millions of lives, especially the most vulnerable, namely children and the elderly. Many times, however, it is more convenient to disperse the difficulty by swallowing chemicals. Unfortunately, very often, pharmacological companies support us in this approach. Most weight loss products are not very suitable for people over 65 years of age. With the possibility of surgery as a way of dealing with obesity, the percentage in both sexes was the same, 26% (14). According to Sherman (2016), surgery can not only change patients' weight, but it can also achieve the alleviation of associated diseases. Few realize that people are more afraid of surgery than of the diseases they encounter on a daily basis. Few also realize that the risks of surgery are many times lower than the obese condition without intervention itself. Only 6% of men and, surprisingly, 10% of women in this age group do not deal with weight gain at all (15). In the monitored group of respondents, no significant difference was found between the way of dealing with overweight and obesity depending on gender, therefore we do not reject H0.

## Conclusion

Obesity is a global social problem which is not to be solved just in healthcare and it is certainly not an issue of an individual. Characteristic is the etiopathogenetic complexity of obesity, its inconspicuous and gradual course with devastating health consequences, which is secondarily difficult and expensive to treat as a separate disease. The state of knowledge on the current treat-

ment options can be compared to an information vacuum, not only in lay people, but also in the medical environment of first contact. It is not just a question of overweight and obesity, it's not just the diets, but it is especially a question of our thinking and our approach to a healthy lifestyle. Although many prognoses of the future development of overweight and the complications associated with it sound very bleak, it is time for us to take an active interest in the health of ourselves and of the people around us. Addressing obesity thus requires a systematic and long-term care of many professionals. An active cooperation of the patient is also crucial. After all, no society is rich enough to afford not to treat obesity and not to solve the problem. It is therefore necessary to pay particular attention to prevention, even in the older age group, because their path to any reduction attempts is much more difficult.

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# Nutrition of Children in Roma Community

A. Beresova (Anna Beresova)<sup>1</sup>

Original Article

<sup>1</sup> Pavol Jozef Safarik University in Kosice, Faculty of Medicine, Department of Social and Behavioral Medicine – teacher, SK.

## E-mail address:

anna.beresova@upjs.sk

## Reprint address:

Anna Beresova  
Institute of Social and Behavioral Medicine  
Faculty of Medicine of the UPJS  
Tr. SNP 1  
040 01 Kosice  
Slovakia

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Johnson Nzau Mavole  
Catholic university of Eastern Africa, Nairobi, KE  
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Institute of Infectious Diseases, Catholic University of the Sacred Heart, Rome, IT

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## Abstract:

**Objective:** The aim of the research is to determine eating habits of Roma children in a selected Roma community and to identify behavioural factors that affect them.

**Design:** Descriptive study.

**Participants:** Sample consisted of 86 children from a selected Roma community.

**Methods:** A questionnaire aimed at detecting eating habits and practice of children from a Roma community. Data processing through descriptive statistics.

**Results:** The results show that 80% of the children involved in the research think that they eat healthily because they consume fruits, vegetables, meat and potatoes. In the families, fruits, vegetables and legumes are represented in the diet in lower percentages. In dietary behavior, we identified an influence of TV advertising on children's food choice in 70% of the respondents.

**Conclusion:** The results of our research suggest that there is a need to expand the work of health education assistants in Roma communities as well as in schools.

## Introduction

Nutrition is an important factor for a child's development and growth. A recent trend in nutrition has been a reduction in energy intake, a reduction in fats, sugars and table salt. In practice, this means increased consumption of fruits, vegetables, legumes, cereal and whole grain products (6). Unfavorable indicators of the health and lifestyle of Roma children have their origin and cause in the families. Such as in the majority population, in the Roma minority also applies that the family has the primary formative and identification impact on shaping child's personality. In Roma families, socio-economic opportunities and stereotypes are manifested mainly in the consumption of unhealthy foods. A consumption of cheap fat meat, animal and vegetable fats, sweets and sweetened beverages with a high content of simple carbohydrates is high. A consumption of fruits, vegetables, milk and dairy products is low. From the point of view of healthy nutrition, especially in children, a low consumption of fish, eggs, legumes and vegetables is a significantly unfavorable indicator, when these important food components are replaced by bread and sweets (8).

In order to address overweight and obesity in children and young people in general, it is necessary to address the issue of marketing of foods high in fat, sugar and salt, specifically for these age groups (WHO). While adults may recognize when they are being a target of advertisements, children and young people do not necessarily distinguish between advertisements and cartoons. Children are particularly receptive and represent an easily influenceable target group in terms of negative advertising supporting development of unhealthy dietary preferences (1). The aim of our research is to determine eating habits of Roma children in a selected Roma community and to identify behavioral factors that affect them. We focused on the description of the consumption of fruits, vegetables, dairy and meat products. We were also interested in whether parents buy food promoted in advertisements to their children.

## Methodology

The research sample group consisted of 86 Roma pupils, grades 5 to 9, from 2 elementary schools located in the part of the city of Kosice with an increased concentration of Roma inhabitants. The group was a purposive convenience sample. As a method of data collection, we chose a questionnaire of our own design, in which we focused on the identification of nutritional habits of the addressed children and socio-demographic variables. To evaluate the data, descriptive statistics methods in SPSS 25.0 program were used.

## Results

The research sample consisted of 86 Roma pupils. Of the total number of respondents, there were 51 (59%) boys and 35 (41%) girls. The age variable was not determined. Due to the size of the sample, analyses of gender differences in the eating habits of the respondents were not performed. Table 1 presents the findings in the area of subjective evaluation of healthy eating by the respondents.

To compare the findings presented in Table 1, in Table 2 we present the findings from the question on the composition of their school midmorning snacks.

**Table 1** Respondents' evaluation of their own diet (n= 86)

| Do you think that you eat healthy?                       | n  | %  |
|--|----|----|
| Yes, because I eat fruits, vegetables and dairy products | 25 | 29 |
| Yes, because I eat healthy foods                         | 12 | 14 |
| Yes, because I eat potatoes, meat, soup                  | 32 | 37 |
| No, I don't eat healthy                                  | 17 | 20 |

**Table 2** A composition of respondents' school midmorning snacks (n= 86)

| For a school midmorning snack you have:      | n  | %  |
|--|----|----|
| Fruits                                       | 12 | 14 |
| Crisps                                       | 11 | 13 |
| Bread with butter and smoked meat products   | 53 | 62 |
| Biscuits                                     | 8  | 9  |
| I do not have any midmorning snack at school | 2  | 2  |

### Behavioral factors of nutritional habits of Roma children

Table 3 presents the findings related to the respondents' nutrition. Respondents generally consume fruits and vegetables, as well as milk and dairy products, which we can evaluate positively. From the analysis of the item finding which fruits the interviewed children prefer, we found that they prefer bananas (30%) and oranges (17%). Of the fruit typical of our climate zone, a total of 41% of children chose apples, pears and plums. Interviewed children should limit the consumption of sweets, meat and smoked meat products. In the question on what their family prefers in their diet, we found that it was meat in 30 (35%); potatoes in 20 (26%); pasta in 12 (14%). In the families, fruits, vegetables and legumes are represented in the diet in lower percentages. The analysis shows that unhealthy composition of a diet is preferred in the families of the respondents. The results correspond with the scientific knowledge about the primary formative and identification impact of the family in shaping the child's eating habits.

**Table 3** Frequency of respondents' consumption of recommended nutritional components (n = 86)

| Consumption      | Fruits | Vegetables | Dairy products and milk | Meat and smoked meat products | Sweets |
|------------------|--------|------------|-------------------------|-------------------------------|--------|
| daily            | 45     | 32         | 46                      | 24                            | 46     |
| 2-3 times / week | 41     | 27         | 34                      | 33                            | 15     |
| Once a week      | 0      | 14         | 0                       | 26                            | 25     |
| never            | 0      | 13         | 6                       | 3                             | 0      |

Among the priority areas and measures of the National Action Plan in the prevention of obesity for the years 2015–2025 (7) is included: Restriction of marketing and advertising for children and youth. One of the priorities is to limit children's exposure to advertisements of food/ drinks high in fat, sugar and salt. In Table 4, we present the findings resulting from the question focused on the effect of the advertising on parents' shopping behavior in the area of their children's nutrition.

**Table 4** Respondents' consumption of food based on advertising

| Consumption of food based on advertising     | n  | %  |
|--|----|----|
| Yes, they will definitely buy them for me    | 27 | 31 |
| Yes, but they only buy them for me sometimes | 24 | 28 |
| Yes, but they won't buy them for me          | 9  | 11 |
| I don't like the advertised products         | 7  | 8  |
| I do not watch advertisements                | 19 | 22 |

### Discussion and Conclusion

The choice of lifestyle remains a responsibility of an individual. It can be supported by: family background; work environment; economic accessibility; health promotion campaigns (2). Family's financial income, which affects the quality and nutritional composition of food, can also be considered a risk factor for children's nutrition in the Roma community. People on low incomes, with low level of education, with insuf-

ficient level of health literacy and the unemployed have greater problem to adhere to a healthy diet. These groups of the population show an occurrence of excessive consumption of foods rich in fats and sugars (5).

Similar to the group we studied, Rimarova *et al.* (9) found in their sample that most children think that they ate healthy. However, according to the authors' findings in the intake of fruit and vegetables, up to 18% of children answered that they did not consume fruit and vegetables. More than 50% of the respondents consumed fruit and vegetables only twice a week, which is insufficient, both in terms of fiber and pectin intake and in terms of vitamin intake. In our research sample, we found that 31% of the children consume vegetables only once a week or never. In the consumption of fruit, our findings were positive, children consume fruit daily or 2-3 times a week.

Analysis of the data generated in the ENERGY research project has shown that factors leading to undesirable behavior can be a result of a number of important factors at the level of the individual, home and school environment. The influence of parents (in the form of a role model, supporter, in setting rules and boundaries with the help of parental stimuli) seems to be crucial (3).

The results of our research point to the fact that it is necessary to primarily strengthen social work with families in Roma communities. In the work of health promotion assistants, we see limitations in the edification and education of Roma mothers, especially in the field of healthy child nutrition. In multidisciplinary cooperation, we need to make use of and more effectively apply the educational competence of nurses in practice (4).

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# Metabolic Syndrome and NAFLD in a Social Reintegration Facility Environment - Project Results

M. Belovicova (Maria Belovicova)<sup>1,2,3</sup>, M. Popovicova (Maria Popovicova)<sup>1</sup>, J. Babecka (Jozef Babecka)<sup>4</sup>, P. Snopek (Petr Snopek)<sup>5,6</sup>

Original Article

<sup>1</sup> St. Elizabeth University of Health and Social Sciences, Bratislava – Teacher, SK.

<sup>2</sup> Internal Clinic for Liver Disease Diagnosis and Treatment, Remedium s. r. o., SK.

<sup>3</sup> Slovak Society of Practical Obesity (SSPO), Bardejov, SK.

<sup>4</sup> Catholic University in Ruzomberok, Faculty of Health, Ruzomberok – teacher, SK.

<sup>5</sup> Tomas Bata University in Zlin, Faculty of Humanities, Department of Health Care Sciences - Professional Assistant, CR.

<sup>6</sup> Hospital in Zlin, Zlin, CR.

## E-mail address:

mriab9@gmail.com

## Reprint address:

Maria Belovicova  
St. Elizabeth University of Health and Social Sciences, Bratislava  
Nam. 1. maja 1  
811 06 Bratislava

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Michael Costello  
University of Scranton school of education, USA  
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University of California, San Francisco, USA

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## Abstract:

**Introduction:** Metabolic syndrome (MS) is a metabolic disease characterized by a simultaneous occurrence of several risk factors (RF) for the development of cardiovascular diseases. NAFLD - Non-alcoholic fatty liver disease - is characterized by the presence of hepatic steatosis, i.e. excessive accumulation of fat in liver tissue that is associated with insulin resistance.

**Objectives:** To determine the presence of MS and liver diseases in clients of the Social Reintegration Facility in Zakovce.

The project "*Screening of liver diseases in Social Reintegration Facility*" ran from 1/2020 to 10/2020. It was carried out within the institutional project of the St. Elizabeth University of Health and Social Sciences (VSZaSP sv. Alzbety) and the Slovak Society of Practical Obesity (SSPO).

**Participants and methods:** A total of 229 clients and employees of the Social Reintegration Facility of the Institute of Christ the High Priest in Zakovce: 188 clients (82%); 41 employees (18%). Men made up 63% of the sample (145); women 37% (84). The mean age of the clients was 51.4 years, the mean length of their stay in the facility was 5.87 years. We clinically examined the clients and employees, and we collected venous and capillary blood. We examined the stiffness of liver tissue with transient elastography, and we used a special CAP software to quantify the presence of steatosis.

**Results:** In the group of examined clients and employees of the Social Reintegration Facility in Zakovce, we were in particular looking for the presence of liver diseases. However, we also found the presence of other diseases of civilization that have a statistically significant effect on the indicators of MS, FLI, NFS, APRI, FIB-4, FS and CAP. Other research results are described by the authors in more detail in the article.

**Conclusion:** NAFLD is considered to be a slowly progressing chronic liver disease in both, adults and children. Besides taking care of our outpatient clinic patients, we should not forget about clients of the social reintegration facilities, in whom - due to the presence of several risk factors - the incidence of liver diseases and other diseases of civilization is even higher compared to the general population.

## Introduction

Every year, 39.5 million people die from chronic diseases. If the current state is maintained, the number of deaths from chronic diseases will increase to 55 million by 2030 (1). In terms of causes of death, diseases of civilization occupy a dominant place in the Slovak population (2). Metabolic syndrome (MS) is a metabolic disease characterized by a co-occurrence of several risk factors (RFs) for the development of cardiovascular diseases. It is a disorder of glucose metabolism associated with hyperglycaemia; development of insulin resistance; development of type 2 diabetes mellitus (type 2 DM) associated with obesity. Atherogenic dyslipoproteinemia, arterial hypertension, generalized atherosclerosis belong here (3).

The same risk factors have been demonstrated for metabolic syndrome and NAFLD. This finding raises a question of whether NAFLD is a symptom or a consequence of the metabolic syndrome. Most studies have concluded that a cardiovascular

disease, similarly to NAFLD, is a consequence or a complication of the metabolic syndrome. NAFLD - Non-Alcoholic Fatty Liver Disease - is characterized by the presence of liver steatosis, i.e. excessive accumulation of fat in liver tissue (steatosis must be present in more than 5% of hepatocytes) which is associated with insulin resistance. NAFLD is considered a benign, non-progressive form of the disease, while NASH - Non-Alcoholic Steatohepatitis - is a progressive form with the development of fibrogenesis with a high risk of liver cirrhosis and hepatocellular carcinoma of the liver (4). Patients with NAFLD carry an independent risk factor for cardiovascular disease; the risk of mortality from cardiovascular diseases is higher in people with NASH compared with people with only simple steatosis (5).

## Research objective

The aim of the research was: **a)** to document the presence of fibrosis and CAP in clients of so-

cial reintegration facility through examination by transient elastography; **b**) to find a correlation between the degree of fibrosis and the degree of CAP; **c**) to determine whether there is a correlation between BMI, FLI, CAP and FS; **d**) to determine whether associated diseases affect parameters such as MS (metabolic syndrome), FLI, NFS, APRI, FIB-4, FS and CAP; **e**) to determine whether there is a correlation between MS and NFS and CAP indicators; **f**) to determine whether MS, Fibroscan and CAP values increase with increasing BMI; **g**) to determine the correlation between the level of NH<sub>3</sub> (ammonia) and fat spectrum indicators (CHOL, TAG, LDL, HDL); **h**) to determine the correlation between NH<sub>3</sub> level and the CAP level.

### The research sample group and methodology:

The project "*Screening of liver diseases in Social Reintegration Facility*" ran from 1/2020 to 10/2020. It was carried out within the institutional project of the St. Elizabeth University of Health and Social Sciences (VSZaSP sv. Alzbety) and the Slovak Society of Practical Obesity (SSPO). We examined a total of 229 clients and employees of the Social Reintegration Facility of the Institute of Christ the High Priest in Zakovce: 188 clients (82%) and 41 employees (18%). Men made up 63% of the sample (145); women 37% (84). The mean age of clients in Zakovce was 51.4 years, the mean length of their stay in the facility was 5.87 years. We determined the nutritional status of the clients by determining their BMI: 95 clients (including employees) had physiological weight (41.4%); 69 were overweight (30.1% of the sample); 34 were obese (14.8%); 7 clients suffered from malnutrition (3%). At the beginning, we clinically examined all the clients and employees interested in the examination. We took a medical history (what diseases clients are being treated for, what medications they take, whether they are allergic to any medications or food). In addition to anamnestic data, we asked the clients/employees about the length of their stay in the facility, we determined their height, weight, waist circumference. We also collected venous and capillary blood. Due to the larger number of clients and employees, we visited the facility in Zakovce a total of 20 times. From the venous blood samples, we examined the follow-

ing biochemical parameters of the clients and employees: fat spectrum (cholesterol; LDL-cholesterol; HDL-cholesterol, triacylglycerols); so-called liver function tests (AST, ALT, GGT, ALP); albumin; bilirubin; glycemia; creatinine; levels of vitamin D; folic acid. From the capillary blood samples, we examined the level of ammonia (NH<sub>3</sub>) using the ARKRAY device.

Ammonia induces pathological changes in human hepatic stellate cells (activates stellate cells in vitro); disrupts intrahepatic hemodynamics; increases portal hypertension; enhances the formation of liver fibrosis in vivo; is a "target" in the treatment of chronic liver diseases (6).

We entered individual data into a so-called **hepcalculators** (developed thanks to the initiative of WORWAG Pharma GmbH in cooperation with the Slovak Society of Hepatology). The calculator automatically evaluates the entered data and calculates the following values for each patient: BMI, presence/absence of metabolic syndrome; indexes of liver damage FLI (fatty liver index); APRI, NFS (naflD fibrosis score), FIB-4. This helps to save time when processing data.

To examine the stiffness of liver tissue we used **transient elastography (TE)**. It is a non-invasive painless method that measures liver stiffness. The principle of elastography is based on the finding that fibrotic liver is less deformable by the action of an external forces, i.e. it is less elastic compared to a normal liver (Koller, Rac, 2015). We used special software to quantify the presence of steatosis (a so-called **CAP module** - controlled attenuation parameter).

CAP measurement results are given in dB / m. The measuring range is from 150 dB / m to 400 dB / m. Based on statistical recalculations, cut-off values with a sensitivity of  $\geq 90\%$  were determined for all degrees of steatosis:  $S \geq 1,215$  dB / m,  $S \geq 2,252$  dB / m,  $S \geq 3,296$  dB / m (7). dB / m values of individual degrees of hepatic steatosis in NAFLD as follows: S0: 150-240, S1: 240-270, S2: 270 - 303, S3 303-400. There are accurate scales for assessing hepatic steatosis not only for NAFLD, but also for viral hepatitis and liver diseases of various etiologies (7, 8).

For the needs of this screening project it was possible to purchase a PocketChem™ BA PA-4140 - a Japanese instrument from the ARKRAY company for determination of the ammonia levels; the NH<sub>3</sub> tests themselves; to rent a Fibroscan

530 Compact instrument with M and XL probes and built-in CAP function from the Czech Republic for one month. We also thank the PRO.MED.CS company for supporting the project.

## Results

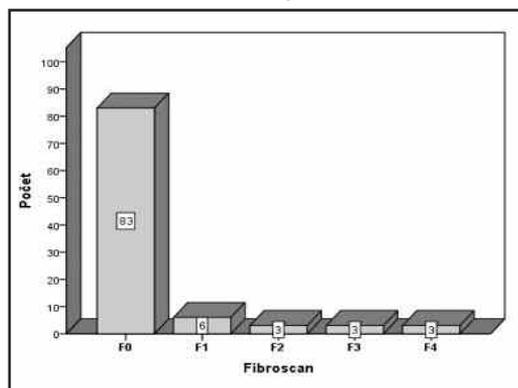
In the group of examined clients and employees of the Social Reintegration Facility in Závokce, we were in particular looking for the presence of liver diseases (with a focus on non-alcoholic fatty liver disease). However, in our research sample group, 63/229 respondents (27.5% of the sample) stated that they were being treated for cardiovascular diseases; 13/229 respondents (5.7%) were being treated for type 2 diabetes mellitus; 12/229 (5.2%) were being treated for lung diseases; 46/229 (20%) are taking psychiatric medications. 156/229 respondents (68.1%) are being treated for other diseases (e. g. diseases of the gastrointestinal tract, neurological diseases, diseases of the musculoskeletal system, etc.). 78/229 respondents (34%) are being treated for several diseases at the same time.

From the above, it is clear that diseases of civilization do not avoid Social Reintegration Facilities and that we must comprehensively assess the health status of the clients, although the project we carried out in this facility was primarily focused on liver diseases.

Based on the calculated fibrosis indexes, we selected a group of 98/229 clients in whom we performed examination by transient elastography. We hypothesized that they may have had liver damage in the sense of fibrosis: 83/98 examined had no liver fibrosis present (F0 / Metavir); we recorded grade F1 liver fibrosis in 6 clients; grade F2 in 3 clients; grade F3 in 3 clients; grade F4 (which is a synonym for liver cirrhosis) in 3 clients. The results are shown in graph no. 1.

We investigated *whether there was a correlation between the degree of fibrosis and the degree of CAP*. According to the Cohen scale (Pearson = 0.137), the correlation between CAP values and Fibroscan values was weak. The results are shown in table 1. On the CAP module, we distinguish the degrees of hepatic steatosis according to the percentage of liver impairment as follows: S0 (0 - 10% of hepatic steatosis); S1 (11 - 33%); S2 (34 - 66%); S3 (67 - 100%).

**Graph no. 1** Degrees of liver fibrosis determined by Fibroscan



\*pocet = number

In our research sample group: 42/99 patients had steatosis grade 0 (42.4%); 23/99 had steatosis grade 1 (23.2%); 11/99 had steatosis grade 2 (11.1%); 23/99 had steatosis grade 3 (23.2%).

**Table 1** Correlation between degree of fibrosis and degree of CAP Correlations

|     |                     | CAP | Fibroscan       |
|-----|---------------------|-----|-----------------|
| CAP | Pearson Correlation | 1   | .137            |
|     |                     |     | Sig. (2-tailed) |
|     |                     |     | .179            |
| N   |                     | 99  | .98             |

In the research, we investigated *whether there is a correlation between BMI, FLI, CAP and FS*. We found a statistically significant correlation between BMI and FLI, CAP and FS indicators.

At the same time, we wanted to determine *whether the associated diseases affect indicators such as MS, FLI, NFS, APRI, FIB-4, FS and CAP*. There is a statistically significant correlation between the incidence of associated diseases and indicators: MS, FLI, NFS, APRI, FIB-4, FS, CAP. The only exception is the Fibroscan (FS) indicator (Pearson = 0.188,  $p = 0.064$ ). We continued by *identifying correlations between MS and NFS and CAP indicators*. The correlation between MS and NFS and CAP indicators was confirmed. With the presence of MS, the value of both NFS and CAP increases. For NFS: Pearson = 0.266 \*\*,  $p = 0.0001$ , for CAP: Pearson = 0.359 \*\* and  $p = 0.001$ .

Another aim of the research was *to find whether the values of MS, Fibroscan and CAP increase with increasing BMI*. With statistical significance, a positive correlation was confirmed for all 3 markers. For MS and CAP, statistical significance was at alpha level = 0.01; for Fibroscan at alpha level = 0.05. With increasing weight (BMI), the incidence of MS and the degree of Fibroscan and CAP increase. On a device from the ARKRAY company, using the microdiffusion method, out of a drop of capillary blood we determined the ammonia level in 194/229 clients (85% of the group); out of which only 5% of the group (10/194) had a physiological value of NH<sub>3</sub> (55-60 μmol/l). The mean level of NH<sub>3</sub> in the clients but also in the employees of the facility was 181.8 μmol/l.

In our research, we set several goals associated with the level of NH<sub>3</sub>. One of them was: *to find out whether there was a correlation between ammonia level (NH<sub>3</sub>) and fat spectrum indicators (CHOL, TAG, LDL, HDL)*. We did not find a correlation in the monitored group.

At the same time, we analyzed individual parameters of the fat spectrum. We found an increased level of cholesterol in 106/221 clients (47.9%); 100/225 clients (46.4%) had an increased level of triacylglycerides (TAG); we found an increased level of LDL in 132/190 patients (69.4%); a decreased level of HDL was found in 72/191 clients (37.7%). On the whole, we can state that dyslipoproteinemia was very common in the clients, which is a risk factor not only for fatty liver disease but also for cardiovascular diseases. Another goal was *to determine possible correlations between the level of NH<sub>3</sub> and the degree of CAP*. According to the Cohen scale (Pearson = 0.083) the correlation between NH<sub>3</sub> and CAP was trivial / (negligible).

## Discussion

NAFLD is the most common liver disease in economically developed countries. The prevalence ranges from 17 to 46%, depending on diagnostic procedures, ethnicity, age, gender (9). In children, the prevalence of NAFLD is related to the age: 3-10%, but in obese children it reaches a value of 40-70% (10).

In Europe, in 2016, 73 million people suffered from NAFLD, out of which 2.5 million suffered from advanced fibrosis. By 2030, an in-

crease of NAFLD to 84 million can be expected. The alarming assumption is that by 2030, in Europe the number of people suffering from advanced fibrosis will double - from 2.5 million to 5 million (11). The prevalence of NAFLD increases with age, as older patients have more risk factors for metabolic syndrome (9). It is generally believed that the progression of NAFLD to steatohepatitis or to fibrosis results rather from associated diseases and their duration than from the age itself. Risk factors for the development of NAFLD are: obesity, type 2 diabetes mellitus (DM), hypertriglyceridemia (12, 13, 2).

**The key etiopathogenetic factors for NAFLD are:** high-calorie food intake, excessive intake of saturated fats; refined sugars; sweetened beverages; fructose; sedentary lifestyle; low physical activity; a so-called western type of diet (4). Excessive intake of fructose may increase the risk of developing NASH and advanced fibrosis. An unhealthy lifestyle plays an important role in the development and progression of NAFLD. Therefore, an evaluation of eating habits and physical activity is part of an extensive NAFLD screening.

NAFLD, especially when associated with type 2 DM and metabolic syndrome is supposed to be the most common chronic disease worldwide affecting 15-40% of the world's population (14). Cirrhosis in NAFLD was once referred to as cryptogenic. Today, it is the 3rd most common indication for liver transplantation (right after alcoholic cirrhosis and cirrhosis based on chronic hepatitis C). It is expected to dominate the indications for liver transplantation (15).

In the group of examined clients and employees of the Social Reintegration Facility in Zakovce, we were mainly looking for the presence of liver diseases (with a focus on NAFLD). During the examination of the clients we found not only frequent occurrence of dyslipoproteinemia, but also of other diseases of civilization. Within the research, we wanted to determine whether the associated diseases (cardiovascular and other diseases of civilization) affect indicators such as MS, FLI, NFS, APRI, FIB-4, FS and CAP. There is a statistically significant correlation between the incidence of associated diseases and indicators: MS, FLI, NFS, APRI, FIB-4, FS, CAP. The only exception is the Fibroscan (FS) indicator (Pearson = 0.188, p = 0.064).

Another aim of the research was to find whether the values of MS, Fibroscan and CAP increase with increasing BMI. With statistical significance, a positive correlation was confirmed for all 3 markers. For MS and CAP, statistical significance was at alpha level = 0.01; for Fibroscan at alpha level = 0.05. With increasing weight (BMI), the incidence of MS and the degree of Fibroscan and CAP increase (16).

The aim of the treatment of patients diagnosed with NAFLD / NASH is to slow down or to stop the progression of the disease; the development of liver fibrosis/cirrhosis; subsequent serious complications (4).

Epidemiological studies confirm a correlation between the occurrence of NAFLD and unhealthy lifestyle (17). The treatment strategy for NAFLD is mostly based on regimen measures and treatment of the individual components of the metabolic syndrome (18). For morbidly obese patients, bariatric surgery is a suitable alternative. Thorough treatment of the present risk factors is needed. Healthy eating takes on a new dimension in the context of the COVID-19 pandemic. It has become a global health and social problem with specific contexts in the field of gastroenterology and hepatology. There is a link between COVID-19 infection and NAFLD (19).

Physical activity is important not only in the treatment of NAFLD, but also in its primary prevention. Physical activity supports the production of active body mass; prevents undesired reduction of muscle mass during a reduction diet; reduces diet-induced decrease in resting energy expenditure; favourably affects the amount of postprandial energy expenditure; increases the mobilization of fats from fat stores. As important as the exercise itself is the limitation of sedentary way of spending free time outside of the exercise. Sedentary lifestyle and low cardiorespiratory fitness are among the most important independent predictors of premature mortality.

## Conclusion

NAFLD is considered to be a slowly progressing chronic liver disease in both, adults and children. Over the last 30 years, NASH has become a serious health problem due to the obesity epidemic and metabolic syndrome. NAFLD/NASH is considered to be an organ/liver manifestation of the metabolic syndrome and is likely to play

a key role in the pathogenesis of systemic atherosclerosis.

NAFLD should not be only perceived in terms of the risk of liver damage progression but also as an independent risk factor for cardiovascular diseases or diabetes. On the contrary, patients at high risk of developing cardiovascular diseases should be screened for NAFLD (12). Among other extrahepatic manifestations of NAFLD as an independent risk factor: colorectal cancer; kidney disease; some endocrinopathies; sleep apnoea syndrome; osteoporosis are intensively investigated (5).

Besides taking care of our outpatient clinics patients, we should not forget about clients of the Social Reintegration Facilities, in whom - due to the presence of several risk factors (including stress and difficult life circumstances that brought them to such facility) - the incidence of liver diseases and other diseases of civilization is even higher compared to the general population.

Our big thanks belong to Father Marian Kuffa, social workers and nurses who take exemplary and dedicated care of the clients of the Social Reintegration Facility in Zakovce and who were very helpful during the project implementation.

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# Steps to Development and Increase of Physical Movement and Health Literacy

M. Rafajdus (Michal Rafajdus), M. Machajova (Michaela Machajova)

Trnava University, Faculty of Health Sciences and Social Work, Department of Public Health, SK.

Original Article

## E-mail address:

michal.rafajdus@truni.sk

## Reprint address:

Michal Rafajdus  
Department of Public Health  
Faculty of Health Sciences and Social Work  
Trnava University in Trnava  
Univerzitne nam. 1  
918 43 Trnava  
Slovakia

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## Abstract:

According to the WHO, **health** is a state of complete physical, mental and social well-being while maintaining the **body's ability to adapt to changing environmental conditions**. The definition is concise, but it is important to be aware of the essential facts that affect people of the 21st century. Is it possible to adapt to rapidly changing environmental conditions? Musculoskeletal conditions are considered a global epidemic as their incidence and severity increase worldwide. Consideration should be given to the fact that musculoskeletal conditions, such as back pain (diagnosis of M54: dorsalgia), are beginning to be epidemiological in developed countries. According to the Institute for Health Metrics and Evaluation, the most common causes of years lived with disability (YLDs) in the Slovak Re-

public from 2005 to 2015 were non-communicable diseases. In 1st place were musculoskeletal deformities; 2nd place mental disorders and addictions; 3<sup>rd</sup> place other unspecified non-infectious diseases (Source: GBD, 2015). It is important to tackle this issue not only because of its permanent growth but especially for the frequent complications that cause higher morbidity. Various postural deformities caused by poor posture, which affect the relationships between internal organs and the musculoskeletal system/viscero-vertebral relationships but also vice versa. The prevalence of musculoskeletal diseases has an increasing trend in Slovakia, and therefore it is important to look for a way to raise awareness of the possibilities of these diseases' prevention. It is essential to revise outdated plans for physical development and adapt them to today's people. After all, the movement literacy of our children has a significantly declining tendency. Such intervention gives meaning to the public health; there should be a focus on the primary support of the health of the population where one of the possibilities may be the spiral mobilization method SM system. This method is intended for a person living in current times, who sits to a large extent and performs movements that are monotonously loading the muscles. The SM system is a simple and effective exercise that on the principle of spiral muscle chains pulls the spine upwards and stabilizes the balance of the spine. When performed in an optimal way, they relax overloaded parts of the spine; reduce muscle imbalance; contribute to overall health. The priority for proper physical movement should be a desire for a healthy body without pain and disease. The path to health leads through cognition and education because the most important result of any education is self-knowledge.

## Introduction

"Health, health, health" - we believe that this is the most important thing we have. The current questions are: Is that really so? Are we trying to do something for our own health? Or are they just common phrases?

According to the WHO, **health** is *a state of complete physical, mental and social well-being while maintaining the body's ability to adapt to changing environmental conditions*. The definition is concise, but it is important to be aware of the essential facts that affect people of the 21st century. Technology is advancing by leaps and bounds, but we humans and our genetics, which have evolved over millennia, cannot change as fast as we imagine and thus today's modern man is paying for their current lifestyle. From our own professional practice, we do notice that people are not aware of this change and do not admit it. We crave for knowledge, but we have forgotten

the legacy of the ancient Greeks that the development of mental abilities should be harmoniously connected with all-round physical development and vice versa. This means that physical movement and knowledge move hand in hand to health.

## Habits are Formed in Infancy

The instinctive physical key movement habits have their origins in the process of physical development initiated in the first days of baby's life. The newborns wiggle and twist on their stomachs which are movements that precede crawling and they push against the mat on which they are lying - whether it's their mother's body, a mattress in a crib, or a blanket on the floor. Such movements form the basis on which a naturally upright and healthy body will be built. Not only do these movements provide extensive stimulation of sensory and motor neurons that map the connections

between the body and the brain, but they also build a firm, strong center of the body that ensures and maintains body's structural integrity.

As the baby's inner muscles in the middle of the body strengthen, it also awakens its ability to complete a series of naturally evolving developmental milestones, such as rolling over and sitting, and then climbing and sitting on its side, building each task on the previous one, until the child reaches the peak of the primary human goal - uprightness. And once the baby manages to find balance while standing on both lower limbs, they will stand, walk and run forever. Once a well-developed child can stand and walk, their body center is strong enough to stabilize their spine and, at first attempts, control their body with their own energy. Much more important than whether this happens sooner or later is whether the child has been given the opportunity to actively participate in these neurodevelopmental movements in order to build a healthy nervous system and a firm and strong chain of body muscles which will provide natural support for the upright body in the upcoming years.

Babies who do not explore and do not undergo progressive developmental movements may never build a strong enough foundation to fix the natural position of the pelvis, which provides a comfortable support for the upright spine. Although such children are still moving and are achieving other developmental goals, which present the ability to learn to stand, walk and run, they have probably already adopted adaptive movement patterns that will function as new and unnatural basic setting. The weak center of the body, the oppressed spine and the general structural axis deviation will negatively affect their health and vitality in the following years.

### **Current Standard**

Many chronic health problems that are nowadays common not only among Americans can be avoided or solved by better diet; increased physical activity; reduced stress. What is missing from the list of recognized causes of various health problems is the incorrect position of the whole structure. Poor posture is an important factor that plays a crucial role in the large number of cases of chronic pain experienced by millions of people. Until we understand the details, natural biomechanical forms of the body and acknowl-

edge their importance, and until they become part of medical school education, the pain epidemic and other posture health problems will not stop afflicting millions of adults and children around the world.

Although poor posture has become an increasing problem since people began spending more time at their desks, in their cars and in front of the television, it cannot be compared to the drastic changes that have taken place since the intensive use of computers, mobile phones and other digital devices which claim more and more time from our daily lives. Today, poor posture can be seen even in babies and young children. The fear of placing babies on their stomachs, the often-repeated rule that a baby must lie on their backs, and the growing dependence on various positioning aids for infants have led to too many babies spending almost all of their time, whether awake or asleep, either lying on their backs or leaning in loungers. As a result, their weight is constantly transferred to the back of the pelvis, often in a collapsed position in baby car seats, rocking chairs, prams, carriers or swings. All of this distorts their inner abdominal muscles, which then weaken. The more we know the role of specific physical movements in healthy development, the clearer we will see how unhappy this trend is.

### **Increased Incidence of Disorders in Children**

At the same time, school teachers, occupational therapists, physiotherapists and other experts in what is described as a child's normal development observe: an increasing number of children who show chronically collapsed posture; reduced muscle tension; difficulty with balance and coordination; ankles valgus; flat feet or collapsed arch; acquired hip dysplasia; unintegrated primitive reflexes; vision problems; behavioral disorders; multiple food allergies and intolerances; chronic digestive problems; sleep disorders; apathy and fatigue, anxiety; depression ... - and the list goes on (Porter, 2017).

Why are we witnessing such a shocking increase in the incidence of disorders, diseases and health problems in our children? Changes made to diagnosis criteria and case reporting processes may play a role, but they are not in themselves sufficient to explain the overwhelming nature of this phenomenon. Many genetic and environ-

mental factors are also likely to contribute to the status quo. In conjunction with each other, some then create complex interactions, for example when an existing genetic risk "meets" certain environmental factors. Suppression of neurodevelopmental movement in children is one of the key factors that may worsen the innate predisposition to develop: autism; attention-deficit disorders; other health problems; and may also be the primary cause itself.

Although parents, teachers and health professionals may be aware that today's children often are prone to a hunched posture, there are no effective measures to tackle this issue. This is because our society does not understand what natural really is (a collapsed posture, reduced muscle tension and problems with coordination and balance), what then determines which characteristics prevail - whether natural or unnatural?

An upright figure aligned along the axis: what it looks like; how it works; how it manifests itself in the correct posture. When the naturally upright figure is characterized by a firm posture aligned with the body core, effortlessly engaged and noticeably relaxed in its balance and coordination - it is characterized by the "big three" - (body axis, muscle balance, muscle range). It is important to note that anyone, of any age, is able to return to a naturally upright posture. Many people, including myself, have been able to successfully overcome chronic tension and pain and improve and overcome a long list of other health problems that may have occurred later in life.

People can ignore the fact that they come from nature or forget about it, but we are still dependent on it. Our health and quality of life are largely determined by the degree of our compliance with the laws of nature. From the moment of conception and further in the mother's uterus, a new life cycle begins to be written - a continuous run from birth, through childhood, adulthood, old age and finally to death, accompanied by a pattern that nature has given us. It is tragic that the violation of the laws of nature is now causing problems to the youngest of our species - our babies and children. While some difficulties arise for reasons we are unable to understand or control, many developmental "disorders" appear to be caused by factors that are in our power to influence if we understand how the collective "we" involuntarily violates certain laws of nature.

## Physical Literacy as a Way to Health

We need to give consideration to the fact that musculoskeletal problems, such as back pain (diagnosis of M54: dorsalgia), are beginning to be epidemiological in developed countries. According to the Institute for Health Metrics and Evaluation, the most common causes of "years lived with disability" (YLDs) in the Slovak Republic from 2005 to 2015 were non-communicable diseases. In 1st place were musculoskeletal deformities; 2<sup>nd</sup>; mental disorders and addictions; 3<sup>rd</sup> other unspecified non-infectious diseases (GBD, 2015). According to information from the Social Insurance Agency of the Slovak Republic, disability due to diseases of the musculoskeletal system in Slovakia for the years 1997 - 2016 has highly increasing character (SP, 2016).

It is important to address this issue, not only because of its permanent growth, but especially for the frequent complications that cause higher morbidity. Various postural deformities arising from poor posture, which affects the relationships between internal organs and the musculoskeletal system/viscera-vertebral patterns/, but also vice versa. Also breathing which is the basis for the correct position of the body and the exchange of gases in the body. All of this is a physiological need for health, but the modern age brings us psychological strain, which is also reflected in posture and breathing habits. Due to the growing prevalence of musculoskeletal disorders in the Slovak Republic, it is important to look for an effective way of prevention. One option is to raise awareness of this issue.

Organization of mass sports events, such as marathons, has become a phenomenon of recent years. On the one hand, enthusiasm for physical movement is welcome, but on the other hand, physical movement can also be detrimental to health for those who do not perform it properly. Our lifestyle, consisting of: sitting; driving; stress; unbalanced diet; smoking, leads to degeneration of the musculoskeletal system especially of the spine. Once we decide to start a sports activity, we must realize that we are not healthy if we perform it a lot, but if we do it adequately, correctly and consciously. Three principles are essential for proper movement: proper functional body axis; muscle balance (all muscles have sufficient and even development); muscle and movement range of motion. Also, exercise with

one-sided sports load must include corrective and compensating elements. These must be monitored to re-create the correct axial position. Otherwise, unilateral exercise-sports load can cause the development of other muscle imbalances. All this is a need that brings longevity into sport. With one-sided, unconscious loading of the body, postural imbalances and health problems quickly arise. Our body is made up of about 600 muscles. Therefore, our emphasis must be on adequate comprehensive development, not just on esthetics, nor on superficial muscles. We have genetically determined proper movement habits, and therefore our proper movement development is influenced by a large number of factors since birth. Modern times have a very negative impact on proper physical movement habits. It is important to perceive the physical movement because with conscious and correct body movement, pathological movement habits can be eliminated.

### **SM System Method**

Physical literacy of our children, with markedly declining trend, serves as a reflection of the current times. Therefore, in addition to the curriculum, preventive and compensatory exercises should be included in the everyday life of students and their families. A child spends most time in domestic and work environment observing their family members, friends or teachers. At school, a teacher should be able to correct and admonish the child (pupil), at home this responsibility is left to the parents. The intention is to build the right habits when sitting, standing, walking or performing any physical activity. A recommended way of preventive exercises is the so-called SM-system, which is physically and financially undemanding. At the same time, in practice, it is a proven way to prevent various musculoskeletal problems.

The SM system method, i.e. the "Stabilization and Mobilization System", is based on 30 years of gradual development and 25 years of clinical experience with this exercise in patients with spinal, thoracic and cervical back pain; in patients with acute disc disease; scoliosis. This exercise eliminates both, local and general causes of back pain at the same time. It is of great importance in the prevention and treatment of joint disorders (hip, knee, shoulder, leg and arch joints) (Smisek, 2013).

The SM system provides functional stabilization and mobilization of the spine. This method works on the principle of spiral muscle chains that pull the spine upwards and at the same time stabilize the balance of the spine. When performed in an optimal way, they relax overloaded parts of the spine and strengthen weakened muscles which reduces muscle imbalance. It is performed with an elastic rope that is attached to a fixed point which allows extensive movement of the limbs against a small and gradually increasing resistance. This activates the muscle spirals with a stabilizing function. The elastic rope can be understood as an extension of the muscle fibers that activate these spirals. Exercise allows some muscles to stretch during a time of natural relaxation and at the same time strengthen others thanks to elastic resistance. Each rope has a loop at the end that is worn on a hand, similar to a running stick. It is only set aside in the hand. Incorrect way of holding it is a crampy grasp that overloads the wrist and elbow, and which can lead to carpal tunnel syndrome or lateral/medial epicondylitis (tennis elbow syndrome). Gentle grip also results in greater loosening of the neck tension. In the case of the lower limb, we put this loop on a foot (Smisek, 2013). Exercise SM system combines important components: movement and its optimal coordination; muscular apparatus and formation of descending muscle spirals; the response to the spine which is the centring (i.e. alignment to the midline and traction, i.e. upward stroke in the whole spine or only in certain segments) (Smisek, 2013).

There are several principles that need to be followed when exercising. 1st is the exercise position. It is practiced in standing position; the body must be aligned along the axis given by the earth's gravity. However, the axis may deviate slightly to compensate for the elastic force of the rope. The 2nd principle is the alternation of activation (spiral stabilization) and relaxation (vertical stabilization) along with inhaling and exhaling. 3<sup>rd</sup> the stand must be balanced and the body strengthened at a time when force is acting on it. At a time when no force is acting on the body, we are completely relaxed. 4th is a coordination of the movement, the strengthening of the body is performed from the bottom up which means from the pelvis (switching on the gluteal muscles) to the shoulder girdle and continue to a balanced

position of the head. We relax from the nape downwards. The strength with which one exercises is another part. It is a small force in the widest possible range of motion and it respects the weakest link in the chain of motion. 5th principle is the speed of exercise - the exercise is performed slowly. At the end of the movement, we slow down even more so that we can finish the final detail. The movement is slow and smooth, we do not perform it jerkily. It is also important to focus on the complexity of the movements. If the exercise is performed adequately, the muscles from the surface of the foot to the fingers of the hands are activated. The choice of exercises is also very important. First, the symmetrical exercises are preferred, which fix muscle imbalances, followed by asymmetrical exercises, moving from simpler exercises (on both lower limbs) to more complex ones (only on one, standing limb) (Smisek, 2013). This method is intended for a person living in current times, who sits to a large extent and performs movements monotonously loading the muscles.

The importance of public health lies in the orientation to support the health of the population where one of the possibilities is the exercise of the spiral-mobilization method SM system as well as properly designed educational lectures by an expert. This method is intended for a person living in current times who sits to a large extent and performs movements that are monotonously loading the muscles. The SM system is a simple and effective exercise that, on the principle of spiral muscle chains pulls the spine upwards and stabilizes the balance of the spine. When performed in an optimal way they: relax overloaded parts of the spine; reduce muscle imbalance; contribute to overall health. The priority for proper physical movement should be a desire for a healthy body without pain and disease.

### Movement Hygiene and Literacy

Movement hygiene and literacy can help people find and use information and strengthen the impact on their own health. It is important that health literacy becomes part of the upbringing of children. The sooner a child acquires the necessary knowledge, skills and habits and the sooner we manage to contribute to the formation of their attitudes, the greater the benefit of health literacy for their health. The development of health liter-

acy increases the overall level of the health of the population. The main benefit of health literacy is that it helps people improve their health. Health is the most important and crucial value of every person, as well as of society as a whole and that is why building and mastering health literacy should be an integral part of our lives. Through health literacy the citizen becomes an active factor in the healthcare system. Their decision can be based on proven knowledge about health problems and about the ways of solving them. With their attitudes, interests and needs, people can influence the further development of the healthcare system, and thus the favorable development of the population's health.

### Conclusion

The path to health leads through cognition and education because the most important result of any education is self-knowledge. From our experience, it is about the people's knowledge and awareness of a given posturological issue (posturology is the science of posture). After each lecture and consultation, people are surprised at the amount of new information they have learned and wonder why this is not being talked about in education, healthcare or sports. Probably because it wasn't necessary in earlier times. Lifestyle did not use to have such a serious impact on health, and therefore, nowadays, this new role is relevant for trainers, teachers, health professionals and therapists. It is essential to revise outdated plans for physical development and adapt them to today's people. Exercise is like medicine, but we need to know how to dose it properly to achieve its effect. Such intervention gives meaning to **the public health** - a focus on the primary support of the health of the population.

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# The Effect of Obesity on Musculoskeletal System

V. Knap (Viliam Knap)<sup>1,2</sup>, P. Ondova (Perla Ondova)<sup>1</sup>, M. Istonova (Miriam Istonova)<sup>1,2</sup>, K. Oravcova (Katarina Oravcova)<sup>1</sup>

Original Article

<sup>1</sup> Pavol Jozef Safarik University, Faculty of Medicine, Department of Physiatry, Balneology and Medical Rehabilitation, Rastislavova 43, Kosice, SK.

<sup>2</sup> St. Elizabeth University of Health and Social Sciences, Palackeho 1, Bratislava, SK.

## E-mail address:

viliam.knap@upjs.sk

## Reprint address:

Viliam Knap  
Department of Physiatry, Faculty of Medicine, Balneology and Medical Rehabilitation  
Pavol Jozef Safarik University in Kosice  
Tr. SNP 1  
040 01 Kosice  
Slovakia

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## Reviewers:

Roberto Cauda  
Institute of Infectious Diseases, Catholic University of the Sacred Heart, Rome, IT  
Vitalis Okoth Odero  
Catholic university of Eastern Africa, Nairobi, KE

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## Abstract:

Obesity arises and persists during an excessive long-term positive energy balance. Risk factors for the development of obesity are, in particular: a high-calorie diet, low physical activity; adaptation to a sedentary lifestyle; irregular diet. The most commonly used criterion for assessing obesity is the Body Mass Index – BMI. The incidence of obesity in Europe is between 10% to 25% in women, while more than 50% of the population in most European countries is overweight and obese. The effect of obesity on the musculoskeletal system is demonstrable in patients who suffer its consequences during their life. Long-term overweight is the cause of excessive strain on bones, joints and muscles, which over time, due to the chronic course of obesity, affects almost every obese individual. Obe-

sity prevention programs, the development of a healthy lifestyle, healthy eating and exercise-related activities are our common goals for preventing obesity.

|   |   |   |
|---|---|---|
| $\text{BMI} = \frac{\text{weight in kg}}{(\text{height in m})^2}$ | for example height of 171 cm,<br>weight of 100 kg | $\text{BMI} = \frac{100}{1,71 \text{ m}^2} = 34 \text{ (severe obesity)}$ |
|---|---|---|

## Introduction

Obesity is defined as a chronic disease characterized by an increase in body fat stores which is no longer just a cosmetic problem, but an overall health problem. People who are overweight have serious health risks: such as diabetes; cardiovascular and respiratory diseases; high blood pressure; joint diseases; cancer. Obese people have not only health problems, but also social and mental problems. They may suffer from: depression; inferiority complex; often have reduced self-esteem; difficulty being successful at work.

## Classification of obesity

We distinguish between primary obesity, the primary cause of which is an imbalance between energy intake and expenditure, caused by excessive food intake. Secondary obesity is usually caused by another disease. Obesity can be:

**1. An android type**, a so-called male-type or central-type obesity, with a distribution of fat in the torso and abdomen, which is considered more risky. In this type of obesity, visceral fat accumulates in the abdominal cavity. The visceral fat is highly metabolically active and, among other things, produces hormones and cytokines that mediate a further increase in obesity and development of metabolic complications.

**2. A gynoid type**, a so-called female-type, with fat accumulation in the hip area, which is less dangerous for the patient than the previous type. Abdominal obesity is associated with metabolic and cardiovascular diseases, often combined into a metabolic syndrome. Abdominal obesity is defined by a waist circumference greater than > 88 cm in non-pregnant women and > 102 cm in men.

The most commonly used criterion for assessing obesity is the Body Mass Index - BMI. Today, body mass index (BMI expressed in kg / m<sup>2</sup>) is the most common measure for the expression of underweight, overweight and obesity in adults. It

is calculated as the weight in kg divided by the square of the height in meters.

## Classification of overweight and obesity according to the World Health Organization

|                 |                    |                         |
|-----------------|--------------------|-------------------------|
| Normal weight   | BMI<br>18,5-24,9   | zero risk               |
| Overweight      | BMI<br>25,0 – 29,9 | (low-risk)              |
| Class 1 obesity | BMI<br>30,0 – 34,9 | (moderate-risk)         |
| Class 2 obesity | BMI<br>35,0-39,9   | (high-risk)             |
| Class 3 obesity | BMI<br>>=40,0      | (life-threatening risk) |

(WHO, 2021)

Reducing body weight by 5-10%, an obese patient achieves the greatest health benefit at the beginning of treatment. The results of several world studies confirm that reducing body weight by 5 to 10% and maintaining it for a long time reduces the risk of premature death as well as the development of several serious diseases.

## Pathogenesis of obesity

Obesity arises and persists during an excessive long-term positive energy balance. Risk factors for the development of obesity are, in particular; a high-calorie diet; low physical activity; adaptation to a sedentary lifestyle; irregular diet. In practice, energy intake is higher than energy expenditure, with excess kilocalories being stored as fat stores.

## Epidemiology of obesity in Slovakia and in the EU

The incidence of obesity in Europe is between 10% to 25% in women, while more than 50% of the population in most European countries is overweight and obese. Only in the recent 10 years, the number of obese people has increased by 10-40%. (Pauco, 2021). In 2019, the Public Health Authority of the Slovak Republic carried out a survey entitled “Health Awareness and Behavior of the Residents of the Slovak Republic”. It was conducted within Slovakia, the research sample consisted of 3,744 respondents aged 15 and over.

The BMI survey found the occurrence of:

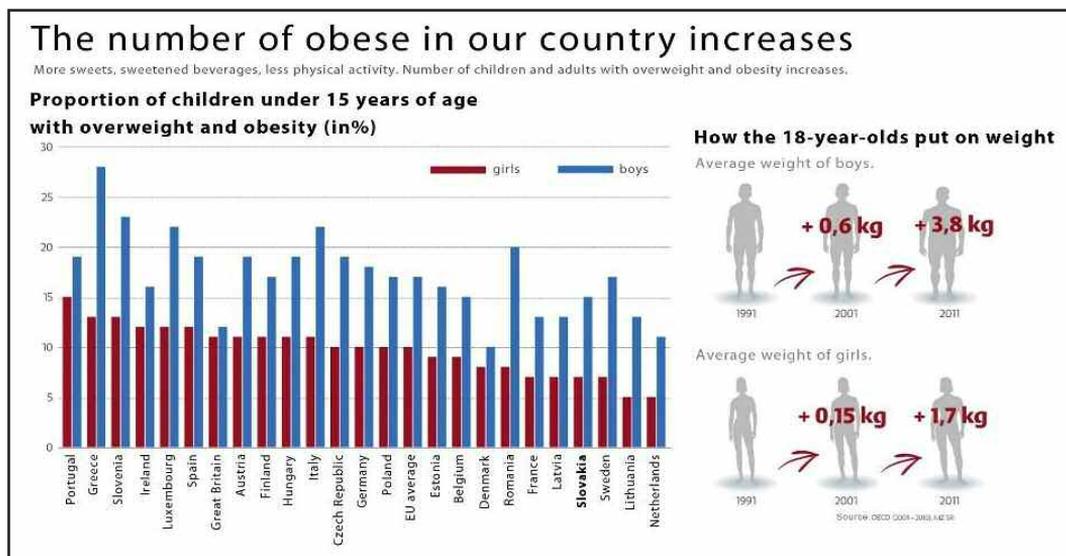
1. overweight (BMI: 25.0 – 29.9) in 35.6 % of the respondents,
2. class I obesity (BMI: 30.0 – 34.9) in 12.2 % of the respondents,
3. class II obesity (BMI: 35.0 – 39.9) in 2.3 % of the respondents,
4. class III obesity (BMI: 40 & over) in 0.4 % of respondents. (www.uvzsr.sk, 2021).

The onset of childhood obesity in the Slovak Republic began in 2000 with a delay of approximately 15–20 years compared to other industrially and economically developed European countries. According to the COSI Study (Childhood Obesity Surveillance Initiative) organized by the WHO in 2015, in line with national criteria, 9.9% of boys

aged 8 years were overweight; 8.8% were obese in Slovakia. The prevalence of overweight in girls of the same age was found in 7.5%; obesity in 9.5%. The share of obese children in Slovakia corresponds to the average of the European countries evaluated within the COSI project. The problem is that approximately 75-80% of obese children remain obese in adulthood which is of course associated with an increase in diseases accompanying overweight and obesity. Overweight and obesity in children and adolescents are also associated with an increase in type 2 diabetes mellitus. According to statistics from the countries of the Organization for Economic Co-operation and Development (OECD), 1 in 6 children was overweight or obese. Over the course of 5 years, obesity has spread more slowly than before. However, today, new OECD findings confirm an increase in obesity in all surveyed countries, up to tenfold. The world is going through a very rapid nutritional and epidemiological transition. Following a statistical survey of 23 European countries by the European Childhood Obesity Surveillance Initiative (COSI), 14% of boys; 10% of girls were obese at the age of 7-8 years. According to the WHO, in the European Union, 1 in 8 children aged 7 to 8 is obese. (see Table No. 1, 2) (Fabryova, 2020; Folentova, 2015; Rybanska, 2019;).

WHO has declared obesity a global epidemic due to its far-reaching health and social conse-

**Table 1**



(Folentova 2015)

quences, and just like the European Union, considers the fight against obesity to be one of its top priorities. Enormous financial resources are spent on the treatment of obesity and the associated health complications in many fields of medicine, but especially in: internal medicine; diabetology; cardiology; gynecology; orthopedics; neurology; and, last but not least, in surgery. Worldwide, statistical assessment of mortality ranks obesity and its complications among the 3 most common causes of death in the population between the age of 50 and 70. In the younger generation (age group 25-35 years), severe forms of obesity increase the risk of premature death by almost tenfold compared to the life prognosis of non-obese people of the same age.

**Health risks of obesity and its socio-economic consequences**

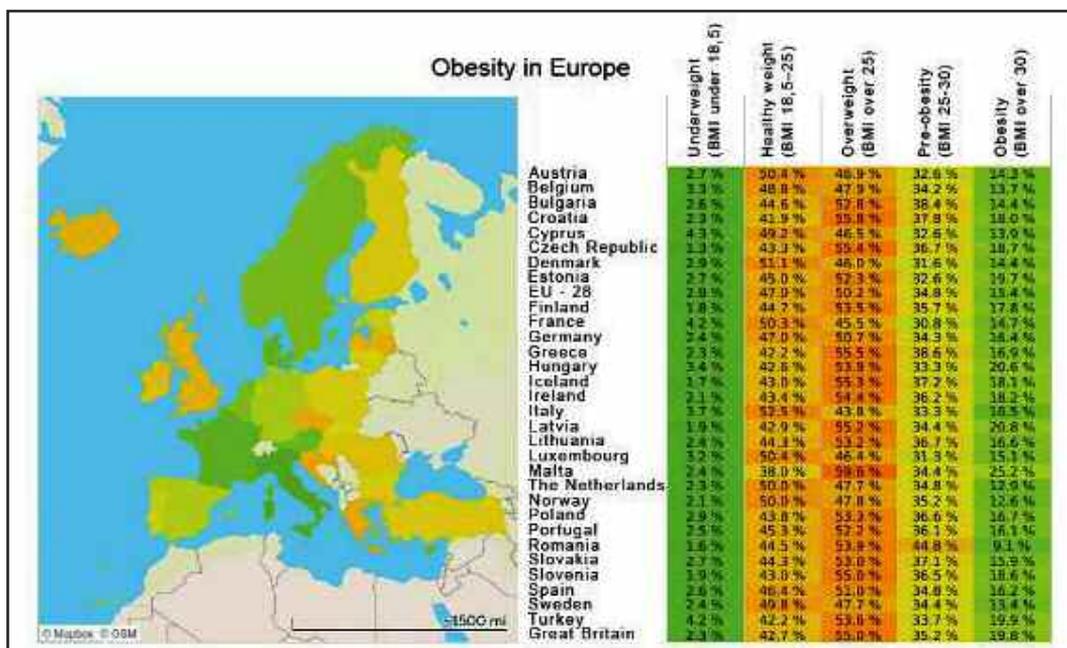
Obesity causes a significant increase in morbidity, disability and mortality, worsens the quality of life. The direct healthcare costs of obesity in Europe are estimated at 2-8% of total healthcare costs, which is comparable to diseases such as cancer.

Obesity is one of the biggest public health challenges of the 21st century. Over the last two

decades, the incidence of obesity has tripled in the EU region, which is a particularly alarming trend. The rising trend of obesity is especially alarming in children and adolescents. The annual rate of increase in the prevalence of childhood obesity is steadily rising. (Rybanska, 2019; Fabryova, 2020)

The current rate is ten times higher than in the 1970s. More than 60% of children who are overweight before puberty will be overweight even in early adulthood, which is particularly worrying as it can lead to a reduction in the average age at which non-communicable diseases develop. This greatly increases the cost of healthcare services, as such people need healthcare for much of their lives. Unhealthy eating and lack of physical activity contribute to overweight and obesity, which are among the main risk factors for non-communicable diseases. Overweight and obesity are responsible for approximately 80% of cases of type 2 diabetes in adulthood, 35% of ischemic heart disease cases and 55% of cases of hypertension in adulthood. Overweight is also a risk factor for cancer of the colon, breast, endometrium. Obesity also has negative effects on psychosocial health and personal quality of life. Systematic research shows that childhood obesity is closely linked to risk factors for: cardiovascular disease; diabetes;

**Table 2**



(Eurostat, 2014)

orthopedic problems; mental disorders. High BMI during adolescence is a prerequisite for high mortality and cardiovascular diseases in adulthood even when a person loses the excess weight. It is alarming that children are now more often victims of many health conditions associated with obesity which were once associated with the adult population. (Rybanska, 2019; Fabryova, 2020)

Effective regulation of obesity requires an integrated approach of several ministries, including comprehensive long-term conceptual measures. Nutritional interventions at school, in the workplace and in communities have shown moderate effectiveness in preventing obesity. Nutritional control can bring several positives, but care must be taken as negative consequences such as loss of non-fat tissue, growth retardation and worsening of eating disorders may also occur. Strategies for food services, health and physical education, games and sports need to be integrated and all professionals should be invited to develop the concepts. Weight control programs combined with increased physical activity, frequent walks, and activity program development can increase the effectiveness of obesity treatment. Even if we do not manage to reduce obesity itself, we can, at least reduce the morbidity. The participation of parents in the treatment program is important for the successful reduction of body weight in young children and partly also in adolescents. (Rybanska, 2019; Fabryova, 2020).

### **The effect of obesity on the musculoskeletal system**

The weight-bearing joints and especially the articular cartilage are constantly exposed to mechanical stress. This process occurs in both, asthenic and obese individuals. In a case of an obese group of patients with increased body weight, during walking, the mechanical load acting on the cartilage increases to 2 to 3 times the weight. Mechanoreceptors which are activated when the joint is overloaded react on the surface of chondrocytes. Overloading causes complex biochemical processes leading to its destructive processes. Activation of mechanoreceptors thus damages articular cartilage and causes osteoarthritis (Gerykova, 2013).

### **Low back pain**

As a result of obesity, the ratio between adipose and muscle tissue changes in favor of the

adipose tissue. As a result, the abdominal, sciatic and other muscles are weakened. A weakened abdominal wall causes a change in the position of the pelvis towards the front, which we call the anterior position of the pelvis. This process causes an increase in lumbar lordosis. The result of this process is an overload of the lower thoracic, lumbar and sacral spine. The load on the ligaments, plates, joints, back muscles increases, and they respond with painful signaling to the central nervous system. These pains, which occur in the lower back, are referred to as "low back pain" (Bener, *et al.*, 2003).

### **Lower cross syndrome**

In patients with low back pain, during a complex physiotherapeutic examination, we often find a lower cross syndrome, with a manifestation of shortening of the hip flexors. On the one hand we find weakened abdominal muscles, on the other hand, there are weakened hip extensors. There is also an overload of paravertebral muscles with the occurrence of painful myofascial trigger points. As a result of the muscle dysbalance, incorrect posture occurs (Kolar, 2009).

### **Muscle dysbalance**

The onset of muscle dysbalance is manifested by a weakened abdominal wall which causes development of lumbar hyperlordosis; there is an increased load on the intervertebral discs which can lead to degenerative and destructive changes. We call this process spondylosis as a manifestation of a degenerative condition of the intervertebral spaces. Due to the damage of the discs, the spinal ligaments elongate and lose their stabilizing function, and subsequently the instability of individual sections of the spine arises. The ligaments lose their function and therefore the back muscles start to replace their function, especially the paravertebral ones. After a certain time, these muscles and muscle groups are also overloaded and painful reflex changes occur. Body's response to this change is the formation of bone spurs, the so-called osteophytes which on one hand reduce the pain caused by reflex spasms, but on the other hand also limit the mobility of the spine. The process of spondylosis continues with the transition to spondylarthrosis (Gerykova, 2013).

## Spondylarthrosis

Spondylarthrosis is an osteoarthritis of the intervertebral joints with similar symptoms. Its formation is preceded by the narrowing of the intervertebral disc. Osteophytes growing on the edges of vertebrae can suppress the spinal cord or spinal roots as they grow. This process can also occur with intervertebral disc prolapse due to its uneven load in hyperlordosis. (Gallo *et al.*, 2011).

## Enthesopathy

The most common tendon disorders caused by obesity are enthesopathy of the short muscles of the sole of the foot. We are talking about: tendon pain of *musculus flexor digitorum brevis*;

*musculus quadratus plantae*; *musculus abductor pollicis longus*. This disease is manifested by: pain in the heel bone, initially it occurs after periods of inactivity; later pain also occurs during or after the physical activity. We can also bring the pain by palpation; we can observe swelling in the given locality and crepitus in the place of muscle insertion above the heel. The muscles are in hypertension and often palpably painful. The biomechanics of the foot are broken. During long-term difficulties, a heel spur (*calcar calcanei*) forms on the heel bone, which then suppresses the surrounding soft structures, such as the subcutaneous tissue and skin. When walking, when they are suppressed by the weight of the body, the patient feels pain with increasing intensity. Another disease of overloading is plantar fasciitis, which manifests itself with the same symptoms. Unlike enthesopathy, it affects the short muscles of the sole of the foot, the attachment of the plantar fascia, down to the projection of the heel bone (Dobea *et al.*, 2009; Gallo *et al.*, 2011; Gerykova, 2013).

## Prevention and treatment

Obesity prevention programs, the development of a healthy lifestyle, healthy eating and exercise-related activities are our common goals for preventing obesity. In today's modern times, there are several forms of pharmacological treatment that are selected on the basis of BMI values and potential comorbidities, such as hyperlipidemia, high blood pressure or worsened glucose tolerance. The main goal of the treatment is change in weight; another goal is to reduce the complications associated with obesity. We must

not forget preventive measures in the field of health policy where it is necessary to focus on high-risk young people and the child population in connection with families and schools. Properly set up processes for the prevention and treatment of obesity lead to a healthy diet and make an effort to improve the environment, by which they help to develop sports activities. (Rybanska 2019).

At the same time, regular exercise serves as an effective prevention of weight gain and of development of the mentioned cardiovascular and metabolic diseases associated with obesity or overweight. Regular healthy movement brings beneficial effects to: the human body; the cardiovascular; respiratory; metabolic and locomotor system. Physical activity in obese patients has a beneficial effect on blood sugar levels, which significantly reduces the risk of developing or worsening of the type 2 diabetes mellitus. By increasing metabolism, it also helps to regulate cholesterol levels; more specifically it regulates the ratio between HDL and LDL, thus preventing the development of atherosclerosis and possible clinical complications resulting from it. The loss of fat stores reduces peripheral resistance, which results in an adjustment of blood pressure in hypertensive patients and we achieve regularity of heart rate. In skeletal muscle, metabolic reconstruction of muscle fibers occurs on the basis of demands placed on the muscle and its activity. (Rybanska, 2019; Fabryova, 2020).

## Conclusion

The effect of obesity on the musculoskeletal system is demonstrable in patients who suffer its consequences during their life. Long-term overweight is the cause of excessive strain on bones, joints and muscles, which over time, due to the chronic course of obesity, affects almost every obese individual. Obesity is also a factor that causes various difficulties and complications in the treatment of the diseases of the musculoskeletal system. We can slow down overweight and obesity if our society focuses on the causes of their origin. Prevention, which should be linked to the school environment in relation to a combination of healthy diet and physical activity, is essential. In addition to the school environment, the home environment is also very important because with parents promoting a healthy lifestyle, enough ex-

ercise and a healthy diet, we can stop obesity. It is the habits that children acquire at home, associated with healthy eating, exercise and the right choice of food, that can transfer to other aspects of life and thus they will decide to be sufficiently physically active. Promoting various physical activities can help reduce the incidence of risk factors for non-communicable chronic diseases. Maintaining adequate physical activity throughout life of the population is a key task of the EU's national population health programs as this is the way we can prevent obesity in practice.

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# Key Predictors of Overweight and Obesity in Adult Population

M. Popovicova (Maria Popovicova)<sup>1</sup>, M. Belovicova (Maria Belovicova)<sup>1,2,3</sup>,  
Petr Snopek (Petr Snopek)<sup>4,5</sup>, J. Babecka (Jozef Babecka)<sup>6</sup>

Original Article

<sup>1</sup> St. Elizabeth University of Health and Social Sciences,  
Bratislava – teacher, SK.

<sup>2</sup> Internal Clinic for Liver Disease Diagnosis and Treatment, Remedium s.r.o., SK.

<sup>3</sup> Slovak Society of Practical Obesitology (SSPO), Bardejov, SK.

<sup>4</sup> Tomas Bata University in Zlin, Faculty of Humanities, Department of Health Care  
Sciences – Professional assistant, CR.

<sup>5</sup> Hospital in Zlin, Zlin, CR.

<sup>6</sup> Catholic University in Ruzomberok, Faculty of Health, Ruzomberok – teacher, SK.

## E-mail address:

maria.popovic911@gmail.com

## Reprint address:

Maria Popovicova  
Pupavova 4  
071 01 Michalovce  
Slovakia

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## Reviewers:

Gabriela Lezcano  
University of California, San Francisco, USA  
Daniel J. West  
University of Scranton school of education, USA

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## Abstract:

**Introduction:** According to experts, overweight and obesity, are the most dangerous civilization diseases of today. World-wide, over 312 million people are obese and another 1.3 billion suffer from obesity. Increased weight is a significant health risk and it means a decrease in quality of life and, especially in life expectancy. Because of this, in our research, we address the problem of current society which is overweight and obesity.

**Methods:** To verify hypotheses, we used chi-square test of independence. It is a universal statistical test with wide use. It is most

often used to verify the relation between nominal type variables. **Results:** By analyzing the results, we have found that overweight or obesity of the parents, respondents' satisfaction, eating habits and gender are related to overweight and obesity of the respondents. However, we have not found a relation between the physical activity of the respondents and their overweight or obesity. In case our respondents do not exercise and have bad eating habits, their body weight would be likely to increase. **Conclusion:** To prevent the development of overweight and obesity and its complications that have a negative impact on our health, it is necessary to make a targeted and effective intervention that is aimed at a healthy lifestyle.

## Introduction

A paradox of modern civilization is that while a 3rd of the population still suffers from food insecurity, the World Health Organization (WHO) has identified obesity as the biggest health problem of current times and warns of a global epidemic. In recent decades, obesity has become a global problem of human kind, which is now becoming pandemic. Obesity has become a national problem in countries around the world. Obesity has become an epidemic worldwide, with a high incidence not only in economically developed countries but also in many less developed countries (1). Current development of the obesity pandemic has its laws. The 1st phase of the epidemic began to spread in the late 1970s in the United States when there was an increase in overweight and obesity throughout the population system. In the 2nd phase, which dates from the new millennium, is characterized by the development of health complications accompanying obesity and overweight. The 3rd phase of the health consequences of the obesity epidemic is expected by the end of the decade of our century. Finally, according to experts, the last 4th phase should flow smoothly from the third phase and it will be characterized by the transmission of phylogenetic obesity to subsequent generations. Catastrophic visions expect that as a result, the average life expectancy of the entire population will be shortened (2). According to WHO global data from 2008, more than 1.4 billion people ( $\geq 20$  years old) were found to be overweight. Of these people, more than 200 million were men and almost 300 million were women. Because of this, experts rightly consider obesity to be the epidemic of the 3rd millennium. The trend of rising prevalence of obesity is particularly worrying in

children as they carry the epidemic into adulthood creating a growing health burden for the next generation. It is estimated that worldwide as many as 155 million children and adolescents are overweight or obese today. Now is the right time to stop further epidemic spread of this plight (3).

## Most common diseases accompanied by overweight and obesity

Many people consider obesity to be a cosmetic problem, which is very bad. Obesity is a serious metabolic disorder that significantly affects human life and health. Thus, obesity can be characterized as a metabolic disorder, due to the increase in body fat in the interaction of genetic predispositions with environmental factors. The insidiousness of obesity is that it does not cause any problems at first, it does not hurt and therefore it does not require medical care. Obesity is the third most common chronic disease in developed countries, but in Europe it ranks at the top. The main problem with obesity is that it increases morbidity and mortality (4). 1<sup>st</sup> degree obesity shortens life by 3 years and 3<sup>rd</sup> degree obesity even by 10 years. It is reported that with every 5kg weight gain, the overall mortality is increased by 30% (5). In 2002, the WHO even identified overweight and obesity as the 6<sup>th</sup> most important health risk (6). The risks of the disease and the complications that accompany obesity are diverse and can affect almost every organ, and it is the extent and duration of obesity that affects its accompanying complications and diseases.

Obesity is one of the major medical problems because it is closely linked to a number of other diseases. The most common diseases accompanied by overweight and obesity are:

- 80% of diabetes mellitus cases. It is currently considered a pandemic of mankind. It is one of the diseases that greatly affect life of the patient / client, especially its quality.
- 35% of ischemic heart disease
- 55 % of hypertension among adults in Europe.
- causes more than a million deaths.

### Causes of excess weight

There are many causes of obesity, so it has a multifactorial etiology. Table 1 points out the possible causes contributing to obesity.

### Genetic factors

Heredity (different ability to burn nutrients) also plays a role in the development of obesity, because according to the latest results of genetic research on human obesity, there is at least one gene on each chromosome related to its development. In the context of genetics, cases of mutations in genes causing monogenic or polygenic obesity have been described as early as in the period of growth.

### Prenatal factors

As demonstrated in population studies, children of parents with higher body mass index (BMI) values or obesity are more likely to be overweight or obese; genetic factors are more clearly applied here. It has been found that up to 50% of obesity occurrence is due to heredity. Therefore, if both parents are obese, there is up to 80% chance that their child will also be obese if she/he does not maintain a healthy lifestyle. Other comprehensive studies have demonstrated the combined effect of a number of factors such as: family situation; weight and BMI of parents; lifestyle; nutrition and smoking of the future mother. Later obesity can then be caused mainly by the accumulation of the influence of various factors in the early stages of ontogenesis.

### Environmental factors

In general, we can say that excess weight is mainly due to an unhealthy lifestyle. In the long run finding the causes of excess weight; it is free and unrestricted access to food. A characteristic feature of the modern diet is its high energy value; high glycaemic index; also high content of unsaturated fatty acids. Overeating resulting in a positive energy balance for which humans have no adaptive metabolic mechanism ready, has become a reality of today. Experts do not consider excess food intake as the main reason for obesity, but rather a lack of physical activity (2). A sedentary lifestyle is currently considered a growing threat to public health. If a person spends an average of 6 hours a day sitting in front of a TV, their life is shortened by an average of 5 years. For example, in the US and the UK, today less than half of all adults are physically active enough to meet at least the WHO minimum recommendation. On average, adults in these countries spend up to 90% of their free time sitting.

According to a study by researchers at the German University of Regensburg, people who spent most of their time sitting had a 66% higher risk of developing cancer than those who sat for a shorter time. The most common types of cancer were colon, lung or uterine cancer (8). Factors contributing to the development of obesity, its prevention and treatment, should be a priority not only of healthcare, but also of governments and self-governments.

### Research objectives

- To inspect overweight or obesity in respondents' parents.
- To detect respondents' satisfaction with their health.
- To inspect the physical activity of the respondents.

**Table 1** Factors contributing to the development of obesity (7)

|                       |  |
|-----------------------|--|
| Genetic factors       | body weight programming (regulatory mechanisms in the hypothalamus) - disorders or mutations in genes and genetic syndromes  |
| Prenatal factors      | obesity or starvation in the mother  |
| Environmental factors | insufficient physical activity, increase in sedentary activities - inappropriate diet, "dietary chaos", increased energy intake - psychosocial and family problems |

- To detect the gender-related differences in eating habits of respondents
- To find the level of awareness in the field of overweight and obesity.

### Data analysis methods

The sample of our research consisted of deliberately selected clients. In the descriptive part of the research we used the tools of descriptive statistics. We processed the obtained answers using the Microsoft Office 2013 spreadsheet. We verified the hypotheses with inductive statistics tools. To verify the hypotheses, we used the chi-square statistical test. The decision on the significance of the differences is made on the basis of the calculated p value and the significance level of 0.05.

### Demographic data

A total of 168 respondents took part in the survey. There were 112 women in the sample group, which accounted for 66.67% of the sample; 56 men, i.e. 33.33% of the sample.

**Table 2** Characteristics of the sample group

|       | n   | %     |
|-------|-----|-------|
| women | 112 | 66.67 |
| men   | 56  | 33.33 |
| Total | 168 | 100   |

Based on the body mass index (BMI), we divided the respondents into 2 groups, namely respondents with optimal body weight and overweight to obese respondents. The research sample consisted of 73 (43.45%) respondents with normal body weight; 95 (56.55%) overweight to obese respondents.

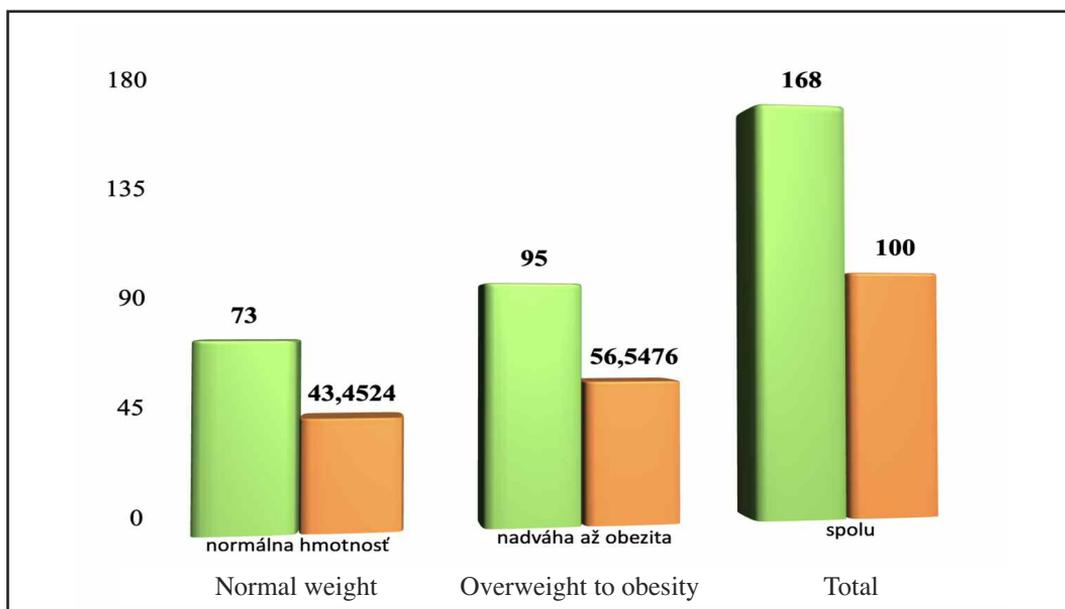
### Hypotheses

- H<sub>1</sub> Respondents' overweight is related to their parents being overweight or obese.  
 H<sub>2</sub> Respondents' satisfaction with their health is related to their overweight.  
 H<sub>3</sub> Respondents' physical activity is related to their overweight or obesity.  
 H<sub>4</sub> Respondents' bad eating habits are related to their overweight.  
 H<sub>5</sub> Respondents' gender is related to their poor eating habits.

Respondents' overweight is related to their parents being overweight or obese.

When analysing the relationships between overweight respondents and overweight or obese parents, a statistically significant difference was found ( $p = 6.56264E-05$ ,  $\chi^2 = 19.26307$ , s.v.2). Based on the results, we can say that there is a link between overweight respondents and overweight or obese parents. Based on the test results, we can accept the alternative hypothesis H<sub>1</sub> and reject the null hypothesis. Parental obesity has

**Graph 1** Weight of respondents divided by body mass index (BMI)



a statistically significant effect on respondents' overweight. We accept the hypothesis. As many as 36.91% of overweight and obese respondents in our research reported their parents being overweight or obese.

Respondents' satisfaction with their health is related to their overweight.

The 2nd hypothesis was tested on the basis of 2 items at the selected significance level of 0.05; degrees of freedom, where we determined the critical value of Pearson's Chi-square, which is, according to the table, equal to 5.99. We can state that this hypothesis was confirmed on the basis of chi-square 11.86, because based on the statistical processing of Pearson's Chi-square test of independence the value of tested items is higher than the critical table value. Therefore, we can say that there is a relationship between respondents' satisfaction with their health and overweight. The P value of 0.0027 also confirms a connection between the individual items. The value of 23.21% in Table 4 indicates a dissatisfaction with their own health in overweight or obese respondents.

### Hypothesis 3

Respondents' physical activity is related to their overweight or obesity.

Given the calculated value of the chi square of 1.583 and the p value of 0.208291, which is higher than the selected level of significance, in

hypothesis 3, we found that there is no relationship between the physical activity of the respondents and their overweight or obesity. Despite performing physical activities, participants in the research were overweight and obese. However, if they did not perform physical activities and still had poor eating habits they would most likely gain weight. Based on the test results, we can reject the alternative hypothesis and accept the null hypothesis, which means that the physical activity of the respondents is not related to their overweight or obesity.

### Hypothesis 4

Respondents' bad eating habits are related to their overweight.

To verify the hypothesis of the effect of respondents' bad eating habits on their overweight, we used a chi-square statistical test. We put the variable of eating habits of the respondents into a causal relationship with the questionnaire item with excessive weight. The chi-square value 6,743 is higher than the table value for 1 degree of freedom, which expresses the dependence between the variables. In hypothesis 4, we found a relationship between the individual items. Also, a p value of 0.009409, which is lower than the significance level of 0.05, suggests that there is a relationship between the individual items. Based on the test results, we can reject the null hypothesis and accept the alternative hypothesis,

**Table 3** Observed frequency of respondents' excess weight and parental overweight or obesity

| Observed frequency O  | parental overweight or obesity |       |             |       |    |       |       |
|-----------------------|--------------------------------|-------|-------------|-------|----|-------|-------|
|                       | yes                            | %     | Do not know | %     | #  | %     | total |
| Normal weight         | 23                             | 13.69 | 19          | 11.31 | 31 | 18.45 | 73    |
| Overweight to obesity | 62                             | 36.91 | 15          | 8.93  | 18 | 10.71 | 95    |
| Total                 | 85                             |       | 34          |       | 49 |       | 168   |

**Table 4** Observed frequency of respondents' excess weight and satisfaction with one's own health

| Observed frequency O  | satisfaction with one's own health |       |             |       |    |       |       |
|-----------------------|------------------------------------|-------|-------------|-------|----|-------|-------|
|                       | yes                                | %     | Do not know | %     | #  | %     | total |
| Normal weight         | 44                                 | 26.19 | 12          | 7.14  | 17 | 10.12 | 73    |
| Overweight to obesity | 32                                 | 19.05 | 24          | 14.29 | 39 | 23.21 | 95    |
| Total                 | 76                                 |       | 36          |       | 56 |       | 168   |

which means that the respondents' bad eating habits are related to their overweight.

### Hypothesis 5

Respondents' gender is related to their poor eating habits.

### Discussion

Overweight and obesity are key issues that greatly affect people's health. Together with other diseases, overweight and obesity account for 50% of the global burden. Due to this fact, we focused on overweight and obesity in our research. Based on the results of our research, we can conclude that: overweight or obesity of parents; satisfaction of respondents; bad eating habits; gen-

der are related to overweight to obesity. However, we did not find a connection between the physical activity of the respondents and their overweight or obesity in our research. Our research participants performed physical activities and were still overweight and obese. If they followed proper eating habits and continued to exercise, they would certainly get rid of overweight and obesity. Also, the conclusions of the Lifestyle Heart Trial study showed that an intensive lifestyle change (in the form of aerobic exercise, non-smoking, stress management) can, after just one year, lead to reduction in body weight, reduction in blood pressure, change in eating habits and choosing a more beneficial diet, and to developing the habit of regular sports activity (9).

**Table 5** Observed frequency of respondents' excess weight and physical activity

| Observed frequency O  | physical activity |       |             |       |     |
|-----------------------|-------------------|-------|-------------|-------|-----|
|                       | yes               | %     | Do not know | %     | #   |
| Normal weight         | 29                | 17.26 | 44          | 26.19 | 73  |
| Overweight or obesity | 47                | 27.98 | 48          | 28.57 | 95  |
| Total                 | 76                |       | 92          |       | 168 |

**Table 6** Observed frequency of respondents' excess weight and bad eating habits

| Observed frequency O  | bad eating habits |       |      |       |       |
|-----------------------|-------------------|-------|------|-------|-------|
|                       | bad               | %     | good | %     | total |
| Normal weight         | 26                | 15.48 | 47   | 27.98 | 73    |
| Overweight to obesity | 53                | 31.55 | 42   | 25    | 95    |
| Total                 | 79                |       | 89   |       | 168   |

**Table 7** Observed frequency of respondents' excess weight and gender

| Observed frequency O | bad eating habits |       |      |       |       |
|----------------------|-------------------|-------|------|-------|-------|
|                      | bad               | %     | good | %     | total |
| women                | 38                | 22.62 | 74   | 44.05 | 112   |
| men                  | 41                | 24.41 | 15   | 8.92  | 56    |
| total                | 79                |       | 89   |       | 168   |

$$df = 1$$

$$p = 1,51444E-06$$

$$\chi^2 = 23,1295$$

The final value obtained by testing with Pearson's chi-square test is

$p = 1.51444E-06$ , this value is significantly higher than our chosen significance level of 0.05%.

Hypothesis H5 was confirmed, gender of the respondents is related to their bad eating habits.

According to Dr. Ukropcova (2013), who - together with her team - researched physical activity and its impact on health, most of us take 3,000 steps, in better instances 5,000 steps a day. However, some are able to move even less, reducing daily walking to just 1,000 to 2,000 steps. Several clinical studies have shown that in 20-year-olds (students) 2 weeks of physical inactivity leads to insulin resistance, where insulin in tissues acts weaker in processing of sugars and metabolism no longer functions normally (10). Kvicala (2013) states that direct costs themselves make up 2-8% of the total costs of healthcare. No less negligible are also the indirect costs, the loss associated with sick leaves and with loss of performance and subsequently with possible early retirement. He further claims that treating an obese person costs 3 times as much as treating a person with normal weight. At the beginning of this millennium, in the United States, \$177 billion is the cost used to address the consequences of obesity. A 20 kg weight reduction leads to a reduction in pharmacotherapy costs of up to 50% (11). However, the financial consequences also affect the obese people, who spend large sums of money trying to lose weight, and there are many of these people, because according to a US study, 63% of Americans have tried to lose weight at some point of their lives and 29% are trying to lose weight in the current time (12). Because of that, in the fight against overweight and obesity, the most important thing is to focus on prevention. Prevention needs to be done especially in people who have a greater genetic predisposition to obesity. They should pay more attention to the correct composition of their diet and to sufficient regular activity than people who do not have such predispositions. Above all, it is most important to focus on prevention in children, because learning the right eating habits and lifestyle starts at birth.

## Conclusion

Even though obesity is a frequently discussed topic and its negative consequences are well known, its prevalence continues to rise. We are used to obesity, we even tolerate it and overlook it in our loved ones even though there is already a lot of evidence of it being one of the most serious health risks ever. Medical science, dealing with the topic of obesity, is constantly evolving

and advancing, but it is still failing to stop the rising incidence of obesity. It is therefore striking that, despite the pressure, the demographic curve of obesity continues to rise steeply; humans are growing in width; the graph is growing in height; obesity is taking on gigantic proportions. And so, today's world is no longer divided only into the poor and the rich, the smokers and the non-smokers, but also into the fat and the skinny ones.

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# Eating and Lifestyle of University Students During the Worldwide Covid-19 Pandemic

P. Snopek (Petr Snopek)<sup>1,3</sup>, J. Bejtkovsky (Jiri Bejtkovsky)<sup>2</sup>, M. Popovicova (Maria Popovicova)<sup>4</sup>, M. Belovicova (Maria Belovicova)<sup>4,5,6</sup>

Original Article

<sup>1</sup> Tomas Bata University in Zlin, Faculty of Humanities, Department of Health Care Sciences, Zlin, CZ.

<sup>2</sup> Tomas Bata University in Zlin, Faculty of Management and Economics, Department of Management and Marketing, Zlin, CZ.

<sup>3</sup> T. Bata Regional Hospital, Zlin, CZ.

<sup>4</sup> St. Elizabeth University of Health and Social Sciences, Bratislava–teacher, SK.

<sup>5</sup> Internal Clinic for Liver Disease Diagnosis and Treatment, Remedium s. r. o., SK.

<sup>6</sup> Slovak Society of Practical Obesity (SSPO), Bardejov, SK.

## E-mail address:

snopek@utb.cz

## Reprint address:

Petr Snopek  
Tomas Bata University in Zlin  
Faculty of Humanities, Department of Health Care Sciences  
Stefanikova 5670  
760 01 Zlin  
CZ

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Kuala Lumpur  
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## Abstract:

**Objective:** The aim of this article was to find whether the global COVID-19 pandemic could affect eating habits in the form of breakfast as the first meal of the day, and whether due to the global COVID-19 pandemic there was a change in body weight in selected university students studying in the Czech Republic.

**Design:** Structured anonymous online questionnaire survey

**Participants:** A total of 628 university students studying in the

Czech Republic (68.95% women; 31.05% men) mostly aged 20 to 29 (63.38%)

**Methods:** Mathematical-statistical methods were used to verify the established research questions, namely Pearson's chi-square test and to investigate the strength of the dependence - Cramer's V.

**Results and Conclusion:** There is a relationship between regular eating habits in the form of breakfast as the first morning meal of a day, before and during COVID-19 and gender and also the biological age of respondents. Furthermore, it was found that there is a statistically significant relationship between the change in body weight during COVID-19 and gender, as well as the biological age of the respondents.

## Introduction and Theoretical Background

The Coronavirus 2019 disease (SARS-CoV-2 virus, COVID-19) has caused global disruption in the lives of all pupils and students (Powell *et al.*, 2021). Right after the meeting of the State Security Council, on March 10, 2020, by the means of emergency measures, the Ministry of Health decided to ban the personal presence of pupils and students in education and study processes at Czech primary, secondary and higher vocational schools, universities and other school facilities with effect from March 11, 2020 until further notice in order to prevent the spread of COVID-19 disease (mzcr.cz, 2020). From April 20, 2020, gradually the measures began to be relaxed: first for universities; pupils in the 9th grade of primary schools; graduates; then for the rest of the pupils. Physical attendance in classes was voluntary (msmt.cz, 2020).

The government decided to ban the personal presence of pupils and students in higher, secondary and primary schools on October 12, 2020, effective from October 14, 2020. The schools were to open on November 2, 2020, but the epidemiological situation was still unfavorable, so the government decided the schools would remain closed (msmt.cz, 2020; mzcr.cz, 2020).

On May 24, 2021, all primary and secondary schools as well as universities in the Czech Republic returned to full operation without rotation (msmt.cz, 2020; mzcr.cz, 2020).

All these measures influenced and subsequently also forced to change or adjust the daily lifestyle and eating habits of all pupils and students (Powell *et al.*, 2021).

During the social and physical distancing and

subsequent lockdown and global pandemic of COVID-19, not only pupils and students, but the entire population has become accustomed to: less movement; less physical activity; sedentary lifestyle; non-adherence to daily routine habits in healthy lifestyle and eating when compared to what it used to be like before the worldwide COVID-19 pandemic. These factors may ultimately lead to adverse effects on human health, such as: eating disorders; increased body fat and obesity; loss of strength and endurance; to an overall weakening of physiological systems due to restriction of movement; online teaching and working from home (Andreato *et al.*, 2020; Jagim *et al.*, 2020; Pinto *et al.* 2020).

Nieman (2020) argues that after the end of the global COVID-19 pandemic, there will be a significant demographic shift toward obese, physically inactive, and older population in all countries of the world. As further stated by Boukrim *et al.* (2021), the worldwide COVID-19 pandemic and the associated strict restrictions and limitations have affected lifestyle, especially dietary behavior and physical activity of the population, and increased the risk of stress, especially in adolescents. This increases the consequent risk of degenerative diseases such as obesity, diabetes, cardiovascular diseases and so on, which can lead to a higher risk of death. Babecka (2020) further adds that, obesity significantly increases morbidity and mortality, it worsens the quality of life and brings serious socio-economic problems. In the European region, obesity is an under-estimated and under-diagnosed public challenge health with rapidly increasing prevalence.

Lana *et al.* (2020) mentions that a healthy and balanced diet and appropriate daily eating habits

can contribute to the prevention and treatment of diseases, because proper nutrition plays a dominant role in the development and maintenance of the immune system of not only adolescents and young people. Babecka (2020) states that proper nutrition and a healthy lifestyle will help maintain vitality even in old age and reduce the risk of serious diseases such as cancer, heart and vascular diseases, diabetes, obesity or osteoporosis. Even if someone suffers from one of these diseases, it is usually possible to reduce its negative impact on health by making the right nutrition decisions. However, in this context, Ruiz-Roso *et al.* (2020) states that during the global COVID-19 pandemic, it may have been relatively difficult to purchase quality and fresh food or ingredients, and some food shortages may have occurred.

Fulkerson *et al.* (2017) or Simmons *et al.* (2012) state that the global COVID-19 pandemic, lockdown and subsequent measures and restrictions could create: closer contact between family members; increase interest in home cooking which could have a positive but also a negative impact on lifestyle, especially on individual families' diets.

Therefore, as reported by Galli *et al.* (2020), due to the global COVID-19 pandemic, it is desirable and beneficial to conduct research in the field of lifestyle, especially eating, to prevent eating disorders and unhealthy lifestyle, obesity, cardiovascular diseases. Subsequently, this would internally motivate the population to follow daily eating habits.

Experts in healthy lifestyle, especially in eating, recommend that the diet should be nutritionally varied and rich, not exceeding the daily recommendations for calories, solid fats, sodium or added sugars. In addition, it should provide the recommended daily intake of fruits, vegetables, whole grains and low-fat dairy products (Hiza *et al.*, 2012; Reedy *et al.*, 2010; Sliwa *et al.*, 2016). Hiza *et al.* (2012) further adds that the lifestyle and especially the diet of the population and its quality is directly affected by: biological age; gender; nationality; ethnic origin; income; the highest level of education attained.

On the other hand, Leech *et al.* (2015) and Spence (2017) argue that a regular diet is a key aspect of eating habits, and breakfast is considered the most important meal of the day because, among other things, it supports the overall better

quality of the diet. Furthermore, when preparing breakfast, it is necessary to think about the combination of foods in meals, where, for example, cereals protect against weight gain (Priebe *et al.*, 2016; Williams, 2014).

In this context, Wesnes *et al.* (2003) state that skipping breakfast has a very negative impact on cognitive processes, functions and overall performance, especially in pupils and students.

The article focuses on finding whether the global COVID-19 pandemic, lockdown and subsequent measures and restrictions could affect changes in behavior and lifestyle preferences, especially in eating, among selected university students studying in the Czech Republic. This change in behavior and preferences could be related to: closure of university canteens; restaurants; restrictions on services; students' returns home; restrictions on physical activity; social distancing; complete lockdown. The aim of this article was to find out whether the global COVID-19 pandemic could affect eating habits in the form of breakfast as the first meal of a day, and whether, due to the global COVID-19 pandemic, there was a change in body weight in selected university students studying in the Czech Republic. The article presents a classical structure, i.e. after stating the theoretical basis, a part focused on defining research goals, methodology and data follows. Subsequently, obtained primary data are presented and a discussion is performed. The last part of the article is a conclusion that summarizes the key aspects of the issue.

## Research Objectives, Methodology and Data

The article focuses on the area of healthy lifestyle, especially on eating, of university students studying in the Czech Republic during the global COVID-19 pandemic, when various measures and restrictions were applied, which were directly related to their eating habits and eating in general. However, the question remains whether these measures have positively or negatively affected the lifestyle of the Czech population. Participation in the research was completely anonymous and voluntary. This article presents only some partial fragments of the ascertained primary information, which are part of the whole complex of discovered facts, data and information.

The main aim of the research was to determine whether there is a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and selected respondent characteristics. A partial goal of the research was to determine whether the global COVID-19 pandemic had an effect on the change in body weight of selected university students studying in the Czech Republic.

**Research Question 1:** Is there a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and the gender of respondents?

**Research Question 2:** Is there a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and the biological age of respondents?

**Research question 3:** Is there a statistically significant relationship between the change in body weight during the global COVID-19 pandemic and the gender of respondents?

**Research question 4:** Is there a statistically significant relationship between the change in body weight during the global COVID-19 pandemic and the biological age of respondents?

The research was conducted online through an anonymous structured questionnaire survey, which consisted of several consecutive parts. The research ran from November 2020 to February 2021. A total of 639 respondents, i.e. university students studying in the Czech Republic, took part in the research. However, due to incompleteness or ambiguity of some answers in the questionnaire survey, a total of 11 questionnaires were discarded. After this correction, a total of 628 questionnaires were used for the mathematical-statistical methods. Verification of the research hypotheses was performed using Pearson's chi-square test which determines whether there is a relationship between selected statistical features. Usually, the defined significance level is 5%, i.e. 0.05. If the value of P is lower than this defined level, the conclusion is to reject the null hypothesis. The obtained primary information and data were then processed using a Mi-

crosoft Excel 2013 spreadsheet and using the statistical software IBM SPSS Statistics 23. The research was further based on scientific methods such as induction, deduction, analysis and synthesis.

## Results and Discussions

Table (Table 1) presents the structure of the addressed respondents, i.e. university students studying in the Czech Republic participating in the research.

**Table 1** Basic characteristics of the addressed respondents (Own elaboration)

| Gender                    | Absolute frequency | Relative frequency |
|---------------------------|--------------------|--------------------|
| Women                     | 433                | 68.95 %            |
| Men                       | 195                | 31.05 %            |
| <b>Total</b>              | <b>628</b>         | <b>100.00 %</b>    |
| Biological age            | Absolute frequency | Relative frequency |
| 19                        | 67                 | 10.67 %            |
| 20–29                     | 398                | 63.38 %            |
| 30–39                     | 42                 | 6.69 %             |
| 40 and over               | 121                | 19.27 %            |
| <b>Total</b>              | <b>628</b>         | <b>100.00 %</b>    |
| Scientific field of study | Absolute frequency | Relative frequency |
| Economics                 | 313                | 49.84 %            |
| Humanities                | 255                | 40.61 %            |
| Technical study           | 39                 | 6.21 %             |
| Art                       | 21                 | 3.34 %             |
| <b>Total</b>              | <b>628</b>         | <b>100.00 %</b>    |
| Change in body weight     | Absolute frequency | Relative frequency |
| No change in body weight  | 168                | 26.75 %            |
| Weight loss               | 77                 | 12.26 %            |
| Weight gain               | 378                | 60.19 %            |
| None of the stated        | 5                  | 0.80 %             |
| <b>Total</b>              | <b>628</b>         | <b>100.00 %</b>    |

Based on Table 1, it can be said that 68.95% of women and 31.05 % of men participated in the research. These respondents were mostly aged 20 to 29 years (63.38%). The second most represented segment, based on the biological age of the respondents, was the age group 40+. The classification of respondents according to the field of their study represented a total of four fields, namely economics (49.84%), humanities (40.6%), technical studies (6.21%) and art (3.34%).

**Research Question 1:** Is there a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and the gender of the respondents?

Pearson's chi-square test was used to verify research Question 1. Mathematical-statistical testing of the defined dependence showed that the p-value is lower than the standard defined significance level (0.05). Thus, in this case, there is a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and the gender of the respondents ( $X^2 = 1.009$ ,  $df = 3$ ,  $p < 0.05$ ). The strength of the dependence was further investigated using Cramer's V, with its value being 0.399. It can therefore be said that in this case it is a weak relationship.

**Research Question 2:** Is there a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and the biological age of respondents?

In the case of research Question 2, the presumed dependence was verified by the Pearson chi-square test. The research has shown that the p-value is equal to 0.000. The null hypothesis is therefore rejected at the significance level of 5 %. Thus, it can be concluded that there is a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and the biological age of respondents ( $X^2 = 111.212$ ,  $df = 9$ ,  $p = 0.000$ ). The strength of the dependence was further investigated using

Cramer's V, with its value being 0.172. It can therefore be said that in this case it is a weak relationship.

**Research Question 3:** Is there a statistically significant relationship between the change in body weight during the global COVID-19 pandemic and the gender of the respondents?

Pearson's chi-square test was used for mathematical-statistical verification of the defined research Question 3. The research found that in this case the p-value is lower than the usually defined level of significance of 5 %, i.e. 0.05. The P-value for the research question is equal to 0.023. It can thus be argued that there is a statistically significant relationship between the change in body weight during the global COVID-19 pandemic and the gender of the respondents ( $X^2 = 9.531$ ,  $df = 3$ ,  $p = 0.023$ ). The strength of the dependence was further investigated using Cramer's V, with its value being 0.123. It can therefore be said that in this case it is a weak relationship.

**Research Question 4:** Is there a statistically significant relationship between the change in body weight during the global COVID-19 pandemic and the biological age of respondents?

To verify research Question 4, the Pearson chi-square test was used, where the p-value is lower than the typically determined significance level of 5 %. It can be concluded that there is a statistically significant relationship between the change in body weight during the global COVID-19 pandemic and the biological age of the respondents ( $X^2 = 66.888$ ,  $df = 9$ ,  $p < 0.05$ ). The strength of the dependence was further investigated using Cramer's V, with its value being 0.188. It can therefore be said that in this case it is a weak relationship.

It can be said that the lockdown and the subsequent global COVID-19 pandemic apparently caused a change in body weight in the respondents who participated in the research. The research also found that the respondents, i.e. selected university students studying in the Czech Republic, during the global COVID-19 pandemic ate breakfast, especially in the time period from 7.00 AM to 7.59 AM from Monday to Friday. During the weekend, i.e. from Saturday to Sunday, they preferred a time period of  $\geq 8.00$  AM. Thus, it can be concluded that during the global COVID-19 pandemic respondents did not skip

breakfast as frequently as before the global COVID-19 pandemic.

As the research of Deshmukh-Taskar *et al.* (2013) and Min *et al.* (2011) show, skipping breakfast was consistently associated with lower intake of micronutrients, failure to meet the recommended intake of calcium, vitamin A, vitamin C and magnesium compared to regular breakfast consumers. From their research, Cho *et al.* (2003) further add that skipping breakfast is not an effective way to manage or reduce one's weight. Based on their research in Morocco, Boukrim *et al.* (2021) found that more than a quarter of their respondents (26.4%) were overweight after the first wave of the global COVID-19 pandemic and 4.7% were obese. This finding corresponds with our research, where 378 of our respondents (60.19%) experienced weight gain during the worldwide COVID-19 pandemic. Boukrim *et al.* (2021) further argue that weight gain is related to: gender; personal expenditure; stress; low physical activity.

Based on their investigations Mestaghanmi *et al.* (2021), state that women were more likely to change weight, be overweight and obese. Other findings were made by Ruiz-Roso *et al.* (2020) who claim that during the global COVID-19 pandemic, respondents' intake of legumes, vegetables and fruits increased significantly whether it was breakfast or not. However, it further presents that a total of 14.0% of their respondents consumed sweet and fried foods during the global COVID-19 pandemic which may, among other things, ultimately lead to obesity.

## Conclusion

As a result of the global COVID-19 pandemic the whole world was forced to adopt measures and restrictions to prevent the spread of a pandemic that affected all areas. This article examines issues focused on a healthy lifestyle, especially on eating, of university students studying in the Czech Republic. The main aim of the research was to determine whether there is a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and selected respondent characteristics. A partial goal of the research was to determine whether the global COVID-19 pandemic

had an effect on the change in body weight of selected university students studying in the Czech Republic.

Through a literature search on the issue, 4 research questions were defined, which were subsequently verified using mathematical-statistical methods. It was found that there was a statistically significant relationship between regular eating habits in the form of breakfast as the first morning meal of a day before the global COVID-19 pandemic and during the global COVID-19 pandemic and the gender of respondents as well as the biological age of the respondents. Furthermore, it was found that there is a statistically significant relationship between the change in body weight during the global COVID-19 pandemic and the gender of respondents, as well as the biological age of the respondents. The research presented in this article has certain limitations, which may include a low number of respondents; respondents were only university students studying in the Czech Republic; the research was carried out only online. Despite these limitations, it can be said that this article brings new facts and information that can be used for further research or interpretation.

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# Occurrence of Obesity in Patients with Cardiovascular Diseases

M. Zamboriova (Maria Zamboriova)<sup>1</sup>, L. Dimunova (Lucia Dimunova)<sup>1</sup>, J. Michalkova (Jana Michalkova)<sup>1</sup>, J. Buckova (Jana Buckova)<sup>2</sup>, I. Nagyova (Iveta Nagyova)<sup>2</sup>

<sup>1</sup> Department of Nursing, Faculty of Medicine Pavol Jozef Safarik University in Kosice, SK.

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<sup>2</sup> Department of Social and Behavioral Medicine, Faculty of Medicine Pavol Jozef Safarik University in Kosice, SK.

## E-mail address:

maria.zamboriova@upjs.sk

## Reprint address:

Maria Zamboriova  
Faculty of Medicine Pavol Jozef Safarik University in Kosice  
Department of Nursing  
Tr. SNP 1  
040 01 Kosice  
Slovakia

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University of North Carolina at Chapel Hill School of Medicine, USA  
Vitalis Okoth Odero  
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## Abstract:

**Objective:** The aim of this research is to identify behavioral risk factors in patients with cardiovascular diseases with a focus on obesity.

**Design:** Descriptive study.

**Participants:** The sample group consisted of 878 patients with ischemic heart disease.

**Methods:** Clinical, laboratory parameters and a questionnaire focused on identifying behavioral risk factors of one's lifestyle. Data processing through descriptive and inductive statistics.

**Results:** The mean BMI is 29.39 ( $\pm$  SD 4.69). The results

show that 355 (40.2%) patients have obesity and we identified overweight as a precursor to obesity in 377 (42.93%) patients. We found deficiencies in behavioral risk factors (smoking, alcohol consumption, nutrition, physical activity) in all patients. A significant relationship was confirmed between smoking, alcohol consumption and obesity.

**Conclusion:** The results of our research suggest that there is a need to improve primary and secondary prevention in patients, healthcare professionals and government policy.

## Introduction

Cardiovascular diseases (CVD) belong among diseases with the highest morbidity and mortality rate in Slovakia. According to current medical knowledge, a great number of risk factors contribute to the origination and development of cardiovascular diseases, and it is true that the more risk factors one has, the sooner the disease develops and it develops faster. An increased weight is associated with: increased risk of overall morbidity and mortality from CVD; with increased blood pressure; increased likelihood of diabetes (1).

The summary of ESC recommendations also states that overweight and obesity are associated with a risk of death from CVD (2). In most cases, obesity is a multifactorial determined disease, in which the interaction of environmental factors and genetic predispositions leads to a positive energy balance that results in excessive accumulation of adipose tissue. It is usually defined by body mass index (BMI - weight in kg/height in m<sup>2</sup>) (3). Obesity is one of the behavioral risk factors for the origination and development of cardiovascular diseases. Other behavioral risk factors include: smoking; poor eating habits; alcohol consumption; insufficient physical activity, and excessive stress. The aim of our research was to identify behavioral risk factors in patients with cardiovascular diseases. We focused on obesity as one of the most important risk factors and we also monitored the relationship between obesity and selected risk factors.

## Methodology

The sample group consisted of 878 patients with ischemic heart disease (IHD), hospitalized in a specialized cardiovascular medical facility (VUSCH, a.s.) in Kosice. The sample was selected on the basis of the following criteria: confirmed ischemic heart disease; patients indicated

for selective coronary angiography; patients after coronary angiography or coronary angioplasty; patients with positive findings from coronary angiography. As a method of data collection, we used clinical, laboratory parameters and a questionnaire of our own design, in which we focused on the identification of behavioral risk factors of one's lifestyle (smoking, alcohol consumption, eating habits, physical activity). The research was carried out in a specialized medical facility the East Slovak Institute of Cardiovascular Diseases, a.s. Kosice (VUSCH, a.s.). The study protocol was approved by the Ethics Committee of the Faculty of Medicine, P. J. Safarik University in Kosice (approval no. 115/2011), and all patients gave written informed consent before participating in the study. To evaluate the data, methods of descriptive and inductive statistics (Pearson's Chi-square test) were used. Data were processed in SPSS 25.0.

## Results

The sample group consisted of 878 patients with IHD. The mean age of the patients was  $57.81 \pm SD 7.58$  years. The age range of the research group was from 24 to 75 years. Of the total number of respondents, 60% were men ( $n = 527$ ); 40% were women ( $n = 351$ ). In terms of clinical and laboratory parameters, we found the following values: mean systolic blood pressure:  $137.03 (\pm SD 18.80)$ ; mean diastolic blood pressure:  $83.39 (\pm SD 11.47)$ ; mean total cholesterol:  $4.92 (\pm SD 1.23)$ ; mean HDL cholesterol:  $1.24 (\pm SD 0.61)$ ; mean LDL cholesterol:  $2.92 (\pm SD 1.69)$ ; mean triglycerides:  $1.98 (\pm SD 1.51)$ ; mean blood glucose:  $6.76 (\pm SD 4.22)$ . The values of obesity represent the calculation of BMI index that is above 30. Mean BMI of the sample is  $29.39 (\pm SD 4.69)$ . The maximum BMI value of the respondents was 51.99; the minimum value was 16.90. BMI below 25 (normal weight)

had 16.62% (n = 146) of respondents (Table 1). The results show that 355 (40.2%) patients have obesity and we identified overweight as a precursor to obesity in 377 (42.93%) patients.

**Table 1** BMI index values (n = 878)

| Body Mass Index (BMI)         | n   | %     |
|-------------------------------|-----|-------|
| BMI underweight (<18.5)       | 11  | 1.25  |
| BMI normal weight (18.5-24.9) | 135 | 15.37 |
| BMI overweight (25-29.9)      | 377 | 42.93 |
| BMI obesity (30-34.9)         | 249 | 16.9  |
| BMI extreme obesity (>35)     | 106 | 12.07 |

### Lifestyle behavioral risk factors

Smoking is identified as one of the most serious risk factors for cardiovascular diseases. In the monitored group, 46.2% (n = 405) were ex-smokers; 40.9% (n = 359) were absolute non-smokers; 12.9% (n = 114) - the smallest number - were smokers.

As for the alcohol consumption, the most common response was: occasional alcohol consumption in 59.6% (n = 523); abstinent in 37.1% (n = 326); regular alcohol consumption in 3.3% (n = 23) of respondents. We were also interested in what kind of alcohol respondents consume. The answer "all types of alcohol" had the highest share of 47.5% (n = 253); it was followed by hard liquor with 20.7% (n = 113); wine 15.5% (n = 86); beer 14.0% (n = 78); whiskey and brandy 1.3% (n = 12); the lowest share had other alcohol with 1% (n = 10).

Table 2 lists the findings related to patients' nutrition. Respondents generally consume fruit

and vegetables, which we can evaluate positively. They should limit the consumption of smoked meat products. When asked what kind of bread they preferred, we found that a consumption of white bread dominated in 57.4% (n = 494) of respondents; 30.9% (n = 266) of asked patients preferred brown bread; consumption of both white and brown was reported by 11.7% (n = 118) of respondents.

Physical activity is an important part of adherence to the treatment of patients with cardiovascular diseases. In the monitored group: 74.5% (n = 650) of patients answered that they preferred walking; 22.1% (n = 195) of patients do not exercise; 3.4% (33) of respondents practice sport regularly.

Overall, we were interested if there was a relationship between obesity and significant risk factors such as smoking and alcohol consumption. A significant relationship was confirmed between obesity and smoking in the sense that ex-smokers and non-smokers are more obese than smokers ( $\chi^2 = 6.207$ ;  $p = 0.045$ ). Similarly, we found a statistically significant relationship between obesity and alcohol consumption. Patients who consume alcoholic beverages occasionally have a higher incidence of obesity than patients who are abstinent or consume alcohol regularly ( $\chi^2 = 9.901$ ;  $p = 0.007$ ).

### Discussion and Conclusion

Obesity or overweight are currently a global public health problem that is reaching epidemiological proportions in economically developed countries. According to OECD indicators (4), overweight and obesity occurrence in Slovakia is below the average of the EU countries. About 16% of the population over 15 years of age is obese in Slovakia. According to the analysis of

**Table 2** Nutrition of patients with IHD (n = 878)

| Consumption      | Fruit n (%) | Vegetables n (%) | Sweets n (%) | Smoked products n (%) |
|------------------|-------------|------------------|--------------|-----------------------|
| daily            | 436 (49.7)  | 359 (40.9)       | 226 (26.1)   | 75 (8.7)              |
| 2-3 times a week | 315 (35.9)  | 400 (45.6)       | 257 (29.7)   | 369 (42.9)            |
| once in a week   | 81 (9.2)    | 82 (9.3)         | 202 (23.4)   | 241 (28.0)            |
| seldom           | 42 (4.7)    | 35 (4.0)         | 177 (19.0)   | 169 (17.6)            |
| never            | 6 (0.5)     | 2 (0.2)          | 16 (1.8)     | 24 (2.8)              |

the latest available data of clients of Counseling Centers for Health Protection and Support (i.e. Health Counselling) of the Slovak Republic Public Health Authority, in the area of occurrence of one of the risk factors of cardiovascular diseases: 50.3% of clients had normal weight; overweight was found in 29.1% of clients; obesity in 18% of clients. Those were mainly age groups over 35 years in men: over 45 years in women (5). In the monitored group, we also recorded a high incidence of obesity (40.2%) and overweight (42.93%) in patients with CVD. The presence of other risk factors such as smoking, poor eating habits, alcohol consumption and insufficient physical activity indicate shortcomings.

The results of our research point to the fact that it is necessary to strengthen primary and secondary prevention in patients with cardiovascular diseases. The most important measure to prevent obesity is to control body weight and maintain a BMI of 20-25.0 kg / m<sup>2</sup>, waist circumference <102cm in men: <88cm in women, ideally <94cm in men; <80cm in women (2, 6, 7). As pointed out by several authors (8, 9, 10, 11, 12), it is possible to use several options, e.g. creation of educational centers or more effective administering of nurses' educational competences in practice. In treatment and nursing care, multidisciplinary cooperation (13) and effective application of communication skills of nurses and physicians in relation to the patient are necessary. Emphasis is placed on the attitude towards health and on responsible behavior, such as: regular weight control; adherence to dietary recommendations; regular physical activity; participation in preventive health check-ups (14). Overweight and obesity is an issue of interest at the national level as well as in the international context.

### Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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