Analysis of locomotor disorders in women with excessive body weight in relation to selected lifestyle elements

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ABSTRACT

Objective: The aim of this study was to evaluate the prevalence of locomotor disorders in overweight and obese women attending physiotherapy treatments compared to normal-weight subjects, taking into account selected elements of their lifestyle, i.e. leisure activities and diet.
Materials and methods: The study was conducted in a group of 222 women aged 35-45 years who attended outpatient physiotherapy treatments at the Health and Rehabilitation Centre in Biala Podlaska for chronic diseases of the locomotor system between September and November 2021. Based on the value of the BMI index, the subjects were divided into three groups: normal BMI values, overweight, and obese. The prevalence of locomotor disorders was evaluated in these groups. A diagnostic survey method using the author's questionnaire was used to determine leisure-time activities and diet.
Results: It was proved that the nature of degenerative changes in the locomotor system is related to the value of the body mass index (BMI) and the lifestyle of the subjects. In women with a normal BMI, lumbosacral and cervical spine pain as well as painful shoulder syndrome and tennis elbow were the most common. In contrast, in overweight and obese subjects, in addition to lumbosacral spine pain, knee and hip pathological states were the main reasons for physiotherapy treatments.
Conclusions: Overweight and obese women make more dietary mistakes than those with a normal BMI and prefer passive leisure activities.
Keywords: osteoarthritis, obesity, overweight, lifestyle, women

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INTRODUCTION

Excess body weight is the cause of some disorders of the locomotor system, the main ones being osteoarthritis of the knee and hip, which is now one of the most common causes of disability worldwide. Degenerative changes increase slowly, gradually, as cartilage destruction progresses. Osteoarthritis most commonly affects women and the main triggers are: being overweight, doing standing work and suffering from foot abnormalities [1].

Obesity can have both direct and indirect effects on the development of osteoarthritis. The direct impact is associated with an increase in the load placed on the hip and knee joints, which can lead to mechanical damage. The indirect impact of obesity on osteoarthritis is related to the adverse effects of metabolic changes on the condition of the cartilage structures that make up the joint.

Over the past few decades, there has been an increase in the number of overweight and obese people, which is a major social problem of our times. According to the WHO, in 2014, the problem of excessive body mass affected 1.9 billion and obesity 600 million adults worldwide. The country with a particularly high percentage is the United States. By contrast, in Europe, more than 50% of the population is overweight and 25% is obese. Data from the WHO report shows that the highest prevalence of excessive weight and obesity is in countries such as Andorra, Malta, the Czech Republic, the UK and Spain [2].

Genetic (30-40%) and environmental factors (60-70%) predispose to obesity, the most common of which are poor nutrition (excess calorie intake) and limited physical activity [3-5]. Obesity further exacerbates health complaints occurring mainly in adults and the elderly, significantly affecting health status and quality of life. Obesity-related mortality is most often due to the co-occurrence with obesity of cardiovascular diseases such as hypertension, ischaemic heart disease and stroke [6-7]. Obesity is also accompanied by diabetes and cancer [8-9]. Other health consequences of obesity include a number of diseases of the locomotor system, the most common of which are osteoarthritis of the hip and knee, which, according to many authors, is more frequently observed in people with obesity (more than 70% of people with this condition are obese) and females [10]. Excessive body mass and obesity contribute to the prevailance of pain in the cervical and lumbosacral spine, which are one of the most frequently diagnosed ailments of the locomotor system. It is a disease closely related to the modern, usually sedentary, lifestyle. Excessive body weight overloads the spine and joints, and this leads to mechanical damage to the bones, joints or in the structure of the intervertebral discs. A clear symptom of these changes is inflammation, perceived as pain, causing tingling, most often around the cervical and lumbar vertebrae, and nerve irritation, causing numbness, paresis or general weakness [11-13]. Every kilogram is an additional burden on all joints especially the hip and knee joints. Obesity leads to degeneration of the spine and deformation of most joints and related ailments: swelling, pains restriction of mobility in the joints. The spine curves, the vertebrae wear down, and discopathy occurs. Overweight people are more likely to suffer from leg pain and flat feet, there is persistent pain, especially when moving. In addition, overweight people often face the problem of a curved spine or contractures of the muscles that support it.

The aim of this study was to evaluate the prevalence of locomotor disorders in overweight and obese women attending physiotherapy treatments against normal-weight subjects, taking into account selected elements of their lifestyle, i.e. leisure time activities and diet.

STUDY MATERIALS AND METHODS

The study was conducted in a group of 222 women aged 35-45 years who attended outpatient physiotherapy treatments at the Health and Rehabilitation Centre in Biala Podlaska for chronic diseases of the locomotor system between September and November 2021. Older people were not considered in order to eliminate the influence of age on changes in the osteoarticular system. Referrals for physiotherapy treatments were made by primary care physicians and specialists, taking into account the patient's disease unit, place of residence, the patient's age and the type of physical treatment.

According to the doctor's referral, the following conditions were the most common in the group of women surveyed: knee (17%) and hip (8%) due to degenerative changes, lumbosacral (48%) and cervical spine pain (10%), painful shoulder syndrome (9%), tennis elbow (5%) and heel spur (3%).

After obtaining consent to participate in the study, the women had basic anthropometric measurements taken. Body height was measured to the nearest 0.1 cm using an anthropometer from Sieber Hegner & Co. AG. In addition, body weight was measured to the nearest 0.1 kg using an electronic medical scale (CAS). The women entered the study in the morning, dressed in gym clothes, without shoes. A standing position was enforced, freely upright with an even load on the lower limbs. On the basis of the results obtained, body mass index (BMI) was calculated, which made it possible to separate three groups of women: normal BMI (18.5-24.9 kg/m^2), overweight (25-29.9 kg/m^2) and obese (30 kg/m^2 or

more). Underweight women (BMI less than 18.5 kg/m2) were excluded from the study due to their small numbers (2 subjects).

A diagnostic survey method using the author's questionnaire was used to evaluate the leisure activities and diet of the women surveyed. The questionnaire also included questions about the respondents' education and type of work. The data analysis was performed in groups of overweight and obese women against subjects with normal BMI values, and the statistical significance of the obtained differences was evaluated with the $\chi 2$ test using the STATISTICA 12 statistical programme.

RESEARCH FINDINGS

Based on the analysis of the data obtained, it was found that almost half of the subjects had normal body mass index (BMI) values. Excessive body mass occurred in 15% and obesity in 39.55% of the women (Figure 1).

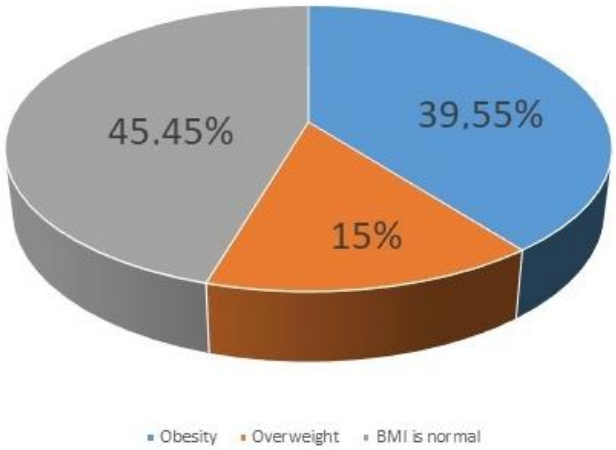

Figure 1. Percentage of female respondents according to BMI value

Obesity 39.55% overweight 15% BMI is normal 45.45%

The social characteristics of the subjects are shown in Table 1. As the data obtained shows, the vast majority of women live in rural areas. When analysing education, it was observed that most of the women with normal BMI were characterised by higher education, while among the overweight and obese respondents, most finished their education at high school level (a statistically significant difference). Researched females most frequently do office jobs.

Table 1. Social characteristics of female respondents according to BMI

Variables	Normal BMI		Overweight		Obesity	
	n	%	n	%	n	%
Place of residence						
town	32	32.00	13	39.39	25	28.74
village	68	68.00	20	60.61	62	71.26
Education						
primary or vocational	18	18.00	7	21.22	8	9.20
secondary	30	30.00	14	42.42	48	55.17
higher	52	52.00	12	36.36	31	35.63
Type of work performed						
physical	36	36.00	11	33.33	29	33.33
intellectual	64	64.00	22	66.67	58	66.67

The primary aim of the study was to evaluate the prevalence of locomotor disorders in relation to BMI.

Researched females with a normal BMI were most frequently referred to physiotherapy treatments related to the experienced lumbosacral spine pain (48%), followed by cervical spine pain (21%) and painful shoulder syndrome (20%).

A disorder called tennis elbow was found in 11% of the subjects in this group. In the overweight and obese groups, the majority of subjects were also characterised by lumbosacral back pain, while none of the patients in these groups reported cervical back pain. One in three overweight women received physiotherapy treatment for hip conditions and one in five for chronic knee conditions. Obese women, apart from lumbosacral back pain, complained most frequently of knee joint disorders. Hip joint disorders and heel spurs were much less common (Table 2).

When analysing how the subjects spend their leisure time, it was noted that 44% of women with a normal BMI spend their leisure time actively doing physical exercise. One in three of the respondents spends their leisure time browsing the Internet, one in ten watching TV or reading books, and 6% meeting their friends. The majority of overweight or obese respondents spend their leisure time in a passive way. Only 12.12% of overweight women and 10.34% of obese women devote this time to physical activity. The main way these women spend their leisure time in is watching TV. The differences in results between the study groups were found to be statistically significant (Table 3).

The surveys show that, irrespective of the BMI value, the most common means of transport among the respondents is their own car, and to a lesser extent public transport. Respondents rarely cycle and least often walk. The highest number of people cycling occurred in the group of obese women, while in the overweight group only one person walks (Table 3).

The results were obtained from the performed statistical test.There were no significant differences in the time spent on physical activity between the groups of women separated by BMI. In each group, the subjects most frequently devoted between 3 and 4 hours per week to physical activity (Table 3).

Table 2. Prevalence of locomotor disorders in female subjects according to BMI

Type of disorder	Normal BMI		Overweight		Obesity
	n	%	n	%	n
Knee joint disorders	0	0.00	7	21.21	30
Hip joint disorders	0	0.00	10	30.30	8
Back pain in the lumbosacral region	48	48.00	14	42.42	44
Back pain in the cervical region	21	21.00	0	0.00	0
Heel spurs	0	0.00	2	6.07	5
Painful shoulder syndrome	20	20.00	0	0.00	0
Tennis elbow	11	11.00	0	0.00	0

Table 3. Leisure activities and time spent on physical activity of female respondents according to BMI

Variables	Normal BMI		Overweight		Obesity	
	n	%	n	%	n	%
Leisure activities						
physical exercise	44	44.00	4	12.12	9	10.34
watching TV	10	10.00	16	48.49	40	45.98
meeting up with friends	6	6.00	7	21.21	12	13.79
Using the Internet	30	30.00	4	12.12	21	24.14
reading books	10	10.00	2	6.06	5	5.75

Means of transport used						
public transport	34	34.00	5	15.15	18	20.69
own car	43	43.00	23	69.70	40	45.98
bicycle	12	12.00	4	12.12	19	21.84
on foot	11	11.00	1	3.03	10	11.49
Time spent on physical activity per week						
15-30 min	12	12.00	5	15.15	15	17.24
1-2 hrs	35	35.00	11	33.33	25	28.74
3-4 hrs	53	53.00	17	51.51	47	54.02
More than 4 hrs	0	0.00	0	0.00	0	0.00

Diet plays a vital role in maintaining a healthy body weight. Therefore, the survey included several questions concerning eating habits. The majority of the respondents in the three separated groups consume the appropriate number of meals per day (4-5 meals). It was further observed that 37.93% of the obese subjects and 18.18% of the overweight women consumed 6 or more meals, while among the subjects with a normal BMI, one in three consumed only 2 or 3 meals per day. The majority of subjects snacked between meals, with a higher proportion of such subjects found in the overweight or obese groups than in the normal BMI group (Table 4).

Analysing the amount of fluids consumed per day, it was found that the subjects with a normal BMI consumed the most fluids and those with obesity the least. Women with a normal BMI mostly consumed water, while obese researched females consumed fizzy drinks and overweight subjects participating in the research consumed fizzy drinks or coffee (Table 4).

The most frequently consumed type of food among the respondents from all separated groups was meat dishes. However, some differences can be observed between the groups in the consumption of other foods. For example, soup is most frequently consumed by subjects with a normal BMI, flour dishes by overweight subjects and dairy dishes by overweight women. Respondents with a normal BMI and those who are overweight most often prefer dishes cooked in water, while women with obesity prefer fried dishes.

Analyzing the frequency of sweets consumption, it was observed that more than 70% of overweight or obese women consume them daily. On the other hand, the most frequently chosen answer option among respondents with normal BMI was "several times a week." The respondents were also asked about the frequency of alcohol consumption. None of the women surveyed admitted to consuming alcohol daily, and a small percentage also chose the answer "several times a week." 70% of respondents with normal BMIs consume alcohol occasionally, and about 60% of those in the other two groups do not drink alcohol at all.

The $\chi 2$ test showed that intergroup differences in all variables evaluating diet were statistically significant (Table 4).

Table 4. Diet of female respondents in relation to BMI

Variables	Normal BMI		Overweight		Obesity	
	n	%	n	%	n	%
Number of meals per day						
2-3	32	32.00	5	15.15	12	13.79
4-5	60	60.00	22	66.67	42	48.28
6 or more	8	8.00	6	18.18	33	37.93
Snacking between meals						
yes	31	31.00	31	93.94	76	87.36
no	69	69.00	2	6.07	11	12.64

Amount of liquids consumed during the day						
0,5-1 l	5	5.00	8	24.24	45	51.72
1-1,5 l	20	20.00	18	54.55	26	29.89
2 l and more	75	75.00	7	21.21	16	18.39
Type of beverage consumed most frequently						
fizzy drinks	12	12.00	12	36.36	46	52.87
juices	28	2.,00	2	6.06	11	12.64
water	36	36.00	5	15.15	10	11.49
tea	4	4.00	2	6.06	5	5.75
coffee	20	20.00	12	36.36	15	17.25
Most commonly consumed foods						
flour dishes	10	10.00	6	18.18	12	13.79
soup	27	27.00	5	15.15	12	13.79
meat dishes	43	43.00	17	51,52	45	51,72
dairy dishes	8	8.00	5	15.15	14	16.10
vegetable or fruit salad	12	12.00	0	0.00	4	4.60
The most common method of food preparation						
boiling in water	43	43.00	21	63.64	32	36.79
frying	25	25,00	5	15.15	45	51.72
roasting	9	9.00	7	21.21	9	10.34
steaming	23	23.00	0	0.00	1	1.15
Frequency of sweets consumption						
daily	6	6,00	24	72.73	67	77.01
several times a week	57	57.00	5	15.15	10	11.49
seldom	23	23.00	2	6.06	5	5.75
I do not eat at all	14	14.00	2	6.06	5	5.75
Frequency of alcohol consumption						
daily	0	0.00	0	0.00	0	0.00
several times a week	9	9.00	4	12.12	14	16.09
occassionally	70	70.00	9	27.27	21	24.14
I do not drink at all	21	21.00	20	60.61	52	59.77

DISCUSSION

Obesity and related overloading of the feet is one of the causes of heel spurs. It is a degenerative lesion arising in the heel bone area. It is tumor-like in nature and causes inflammation, which causes the ossicle growth to expand and at the same time causes great pain and restricts free movement. The condition most often affects women, and is associated with declining estrogen levels, low physical activity and being overweight, as well as standing work. In cases of overweight or obesity, the occurrence of pain when walking and standing is much greater than in a slim person. As a condition, heel spurs are not dangerous to health, but they can effectively impede daily functioning [14-15].

Sharma et al [16] and Coggon et al [17] showed strong correlations between obesity and the

risk of developing and the rate of progression of knee arthrosis. According to Berenbaum and Sellam [18], a 1 kg/m2 increase in BMI above a value of 27 kg/m2 increases the risk of developing knee arthrosis by 15%. This relationship is greater in women than in men, and can affect the right and left limbs to the same degree. For hip osteoarthritis, obesity plays a lesser role, but is one of the risk factors [19-20].

The correlations between excessive body weight and the degenerative changes in the locomotor system outlined above are confirmed by our own research. According to the conducted research, lumbosacral spine pain and knee joint disorders were most frequently recognized pathological states in the locomotor system in obese subjects, while hip joint disorders and heel spurs were much less common. In women with a normal BMI values knee or hip pathological states were not observed, while in addition to lumbosacral back pain, the subjects complained of cervical back pain, painful shoulder syndrome and a disorder called tennis elbow. Our research also shows that the aforementioned pathological states (cervical spine pain, painful shoulder syndrome and tennis elbow) are not related to excessive body weight. Similar observations were noted by other authors [20-21].

Osteoarthritis is closely related to the lifestyle of modern man, especially in highly developed countries, where natural physical activity is steadily decreasing with the progress of civilization. This phenomenon was confirmed in our own research and particularly affected overweight and obese women. Researched females primarily spent their free time watching TV and browsing the Internet. In addition, it was shown that respondents with excessive body weight more frequently demonstrated dietary irregularities: they ate more meals than women with normal BMI values, snacked more often between meals, drank less fluids, and the most common type of beverage consumed were fizzy drinks or coffee. In addition, the researched subjects tended to consume fried foods with high amounts of carbohydrates and sweets. Similar observations were noted [22] and Ostrowska et al. [23].

CONCLUSIONS

1. It has been proved that the nature of degenerative changes in the locomotor system is related to the value of the body mass index (BMI) and the lifestyle of the researched females.
2. Respondents with normal BMI were most likely to suffer from lumbosacral and cervical spine pain, as well as painful shoulder syndrome and tennis elbow. In contrast, in overweight and obese subjects, in addition to lumbosacral spine pain, knee and hip pathological states were the main reasons for physiotherapy treatments.
3. Overweight and obese women make more dietary mistakes than those with a normal BMI and prefer passive leisure activities.

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Conflıcts of ınterest

The authors have declared no conflict of interest.

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