Overweight and obesity vs. Metabolic complications In a group of persons with intellectual disabilities. Preliminary study

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Abstract

Introduction: Obesity is a major health problem within the population of those with intellectual disabilities. It carries with it a number of negative health consequences that lead to, inter alia, overpressure of the blood, carbohydrate-lipid metabolism disturbances, diabetes type II, cardiovascular disease and stroke. Many forms of obesity in people with mental disabilities are of a genetic background, however, of great importance in its formation is life-style choices and health care system practices.

Material and methods: This study included 24 people at 24 to 52 years of age, in whom a diagnosis had been made prior to their attaining 16 years of age, of mild and moderate mental impairment. From these persons, we took venous blood samples (after fasting) in order to obtain data on total cholesterol (TC), HDL cholesterol (HDL), LDL cholesterol (LDL), triglycerides (TG), and glucose (GLUC) levels.

Results: Overweight and obesity were diagnosed in 25% of all women and in 25% of all men, whereas obesity was seen in 16% of all women and 23% all men, respectively. A particular problem appeared to be abdominal obesity. This was evident in 41,7% of all surveyed (58,3% of all women and 50% of all men). In addition, hypercholesterolemia was common, and was diagnosed in 75% of all women and 16.7% of all men. This represented 46% of the total surveyed.

Conclusions**:** Our study revealed that environmental factors conducive to mental stimulation, above all, the possibility of employment, foster motor activity. This positively affects the correct metabolic transformation in people with intellectual disabilities.

Keywords: intellectual disabilities, disturbances of carbohydrate metabolism and lipid, metabolic syndrome

Introduction

Epidemiological studies show that, within medium-developed and highly developed countries, the state of being overweight and obese is a common problem. This situation is primarily the result of changes in behaviour and lifestyle [1, 2].

The expansion of the processed food industry has led to the prevalence of consumption based on a high energy diet rich in fats and carbohydrates [2]. Obesity is a problem because of its epidemiological prevalence and extent within the population. Despite considerable progress in the diagnosis, treatment and prevention, cardiovascular diseases associated with obesity are a major cause of death in the United States and in other industrialised countries [3, 1].

The World Health Organization (WHO) defines obesity as the excessive accumulation of adipose tissue - this being a significant contributor to health deterioration [4]. The best and most useful indicator of the state of being underweight, overweight or obese, according to the WHO, is body mass index (BMI). This is measured by dividing the body weight in kilograms, by the square of the height specified in meters, (body weight (kg) /height (m2). In the case of obesity, this index is equal to or greater than 30 kg/m2. The state of being overweight is diagnosed when the value of the index is equal to or greater than 25.0 kg/m2, and an individual is considered underweight when the value of the index is less than 18.5 kg/m2 [5].

Another indication of excess body weight is waist girth - as proposed by the *International Diabetes Federation IDF).* This index is useful, particularly in the diagnosis of abdominal or celiac obesity, which particularly correlates with the disturbances of carbohydrate and lipid metabolism which lead to the development of *Metabolic syndrome* (MS) and type 2 diabetes. This indicator is different, depending on the race. In Europe, in the population of caucasians, abdominal obesity is diagnosed when the waist girth is >= 94 cm in men, while in women, this figure is >= 80 cm [6] .

The most common adverse obesity effects include: disturbances of carbohydrate metabolism, including insulin resistance, lipids metabolism disturbances or increase in blood pressure. As a result, these dysfunctions contribute, among others, to the formation of cardiovascular diseases, respiratory diseases, type 2 diabetes and depression [7].

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Table I. The new International Diabetes Federation (IDF) definition of the metabolic syndrome [6].

According to the new IDF definition, for a person to be defined as having the metabolic syndrome, they must have, firstly, Central obesity (defined as waist circumference* with ethnicity specific values - USA : male ≥ 102 cm, female ≥ 88 cm, Europe: male ≥ 94, female cm ≥ 80 cm). If BMI is >30kg/m^2 (central obesity can be assumed and waist circumference does not need to be measured). Secondly, besides central obesity, they must show any two of the following four factors:	
Raised triglycerides	≥ 150 mg/dL (1.7 mmol/Lor specific treatment for this lipid abnormality
Reduced HDL cholesterol	< 40 mg/dL (1.03 mmol/L) in males < 50 mg/dL (1.29 mmol/L) in females or specific treatment for this lipid abnormality
Raised blood pressure	systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg or treatment of previously diagnosed hypertension
Raised fasting plasma glucose	(FPG) ≥ 100 mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes If above 5.6 mmol/L or 100 mg/dL, OGTT is strongly recommended, but is not necessary to define the presence of the syndrome.

Abdominal obesity, impaired glucose intolerance, hypertriglyceridemia and arterial hypertension are included in what is called the metabolic syndrome or MS. There are several diagnostic definitions of MS, but the latest clinical practice uses two. The first was proposed by *The National cholesterol Education Program's Adult Treatment Panel III, NCEP-ATP III* (8). According to the NCEP-ATP III, metabolic syndrome is observed in persons in whom there are at least three out of the five components of the definition: abdominal obesity (men: >102 cm; women: >88 cm), triglycerides concentration above 150 mg/dl (≥1.7 mmol/L), decreased HDL-cholesterol concentration (men: <40 mg/dl (<1.04 mmol/L); women: <50 mg/dl (<1.3 mmol/L), arterial blood pressure above 130/85 mmHg, glucose concentration on empty stomach >= 110 mg/dl (>=6.1mmol/l), or recognized diabetes. The criteria of the latest definition of the metabolic syndrome as proposed by the International Diabetes Federation (IDF), from 2006, are shown in Table I.

Obesity in adults with mental disabilities also appears to be a serious problem, but its dissemination is different, depending on the country of origin [9]. This is indicated by the research carried out in the United States, where interest in understanding the combination of obesity with mental disabilities is growing steadily. Through this interest, it was noticed that the number of individuals showing both traits has risen from 19.4% in 1985, to 34.6% in 2000 [7] . As of the latest available data, the obesity indicator in persons with mental disabilities in the UK is approximately 27 %, [10,11], in Ireland - 32 %, while in Australia, these figures broken down are 16,3% of all males and 26.5% of all females [7]. It is concluded, therefore, that an increase in body weight is more common in women than in men. Poland has not yet been carried out research concerning the problem of obesity in people with intellectual disabilities. Of further note, the tests carried out indicate that obesity prevalence is dependent on degree of mental disability. Excessive adipose tissue is more frequent in individuals with mild and moderate mental disabilities, than in those with severe and deep degrees of the affliction. This is due mainly to certain environmental determinants of obesity, such as life-style. Research has shown that persons living alone or with their families are more susceptible to obesity than are those who reside in institutions providing all day supervision [12, 7].

Mental impairment is often accompanied by comorbidic diseases, which are inter alia, usually epilepsy or mental disorders requiring medical treatment with neuroleptics. The prescribed psychotropic drugs for such disorders contribute to the increases of body weight, especially those from certain groups of second-generation medicines [13], the 'atypicals', which after a few months of use, induce body weight gain which is on average, 2 to 9 kg. This increase in bodyweight does not depend on diurnal dose, only on the type of drug [14]. Most second-generation medicines cause weight gain, with the exception of molindone, ziprazidone and aripiprazole. With regard to the first-generation medicines, otherwise known as the 'typicals', disturbing of carbohydrate metabolism is noticeable only after secondary administration of chlorpromazine [15, 16].

In view of the fact that, as so far, in Poland, research has not been carried out on ascertaining and understanding the precise relationship between body weight and metabolic disorders in adult groups of persons with mental disabilities, we decided to determine the degree of prevalence of overweight and obesity in these people. In addition, in order to better understand the reasons for this overweight situation being what it is, we attempted to determine to what extent sex, lifestyle and environmental factors affect body weight gains. Among the factors looked at, we included lifestyle, financial situation, physical and professional activity.

Our aim was to assess the impact of being overweight or obese within those with intellectual disabilities, including the prevalence of metabolic syndrome, doing so on the basis of IDF criteria. Hence, we set out to determine whether there is an effect played by environmental factors and lifestyle on the parameters defining the metabolic syndrome: waist circumference, arterial blood pressure, waist circumference, LDL cholesterol, HDL triglycerides, total cholesterol and glucose.

Materials and methods

Initially, the research group consisted of 30 adults who were diagnosed as having some degree of mental impairment prior to 16 years of age. These were residents of the Assisted Living Facility in Leczna, and the Occupational Therapy Workshops in Lublin, as well as individuals of the District Vocational Rehabilitation Facility in Leczna. The main selection criterion was the above-mentioned mild or moderate mental disability diagnosis, consistent with the guidelines set out by ICD-10 [17], as well as voluntary participation in all test steps. Each person had to sign a voluntary consent form to participate in the research, in accordance with resolution of Bioethics Committee of Medical University of Lublin (No KE-0254/101/ 2013). In the case of incapacitated persons (two persons), we asked as well, for the written consent of their legal guardians.

The study was divided into several stages:

- A physical examination. This included the determination of height, body weight, waist circumference and hip circumference, and the intent was to determine the body mass index *(BMI (body weight (kg) /height (m2))* and WHR Ratio (*waist circumference/hips circumference)* [18]. Moreover, we twice assessed blood pressure - in the morning, within two consecutive days. What is more, we undertook a clinical interview with the examined person and their legal guardian (to find out about co-existing diseases, medications prescribed, and diseases occurring in their family).
- The taking of blood samples for biochemical tests for the determination of concentrations of total cholesterol (TC), HDL-cholesterol (HDL), LDL cholesterol (LDL), triglycerides (TG), and glucose concentration. These were obtained from venous blood, on an empty stomach (GLUC), using standardized methods for the determination.
- A personal questionnaire which was used to collect information about demographics, behaviour (both pro- and anti-health), psychosocial functioning and other variables useful in the study (age, sex, level of education).
- The return and explanation of the laboratory test results and related feedback information.

The above-mentioned steps involved 27 people, as three persons were re-assessed as being severely mentally impaired, hence, they were excluded from the study.

Description of the study group

Of the 27 individuals, our research used the data drawn from 24 persons (n = 24) between the ages of 24 to 52 years. This study group included 12 women (n = 12) and 12 men (n = 12), who were diagnosed as being mildly mentally impaired (about 20 people), or moderately mentally impaired (four persons) before they had reached 16 years of age. The average age of the people was 36 years, the standard deviation was equal to + /-8,7 year. Of note, the age of the women and men differed significantly (Mann–Whitney U test, rank sum for women 187,5; the rank sum for men 112, 5, $p < 0.03$). Among the study group, five people (20%) currently had employment in the Assisted Living Facility: their source of livelihood was both the Disability Living Allowance, as well as remuneration for work. Of these individuals, four persons assessed their situation as good, one person thought it to be difficult. The status of being currently unemployed in the open labour market or in supported employment enterprises was held by 19 persons (79 %). In addition, four persons (16.7%) among all responders, were supported financially by way of permanent allowance, while the source of livelihood for 13 persons (54%) was the Disability Living Allowance. What is more, two persons (8%) drew both a disability Living Allowance and a family allowance. Regarding their degree of satisfaction with life-style, 11 people among all responders (46%) considered their financial situation as difficult, while 11 persons (46%) thought it good and only two people (8%) considered it as very good. Furthermore, 14 people had professional training (58%), six persons (25%) had only primary education, one person (4 %) had completed secondary education and one person (4%) had had a post-secondary education. In addition, fifteen people came from the countryside (62%), nine from the city (38%).

In the subjective assessment of pro-heath behaviour, 79% of all participants evaluated themselves as physically active (walking, cycling, etc.), among them, one person (4%), regularly practised a sport. In addition, 21 persons (87%) described themselves as being fit, and three people (12 %) thought themselves unfit.

An addiction to smoking was strongly prevalent among the responders, as ten persons (42 %) were smokers. More than half, 58% of all respondents (14 people) also had a co-existing mental disorder, of these, 11 persons (46 %) were currently taken a prescribed psychotropic drug (Table II). However, 54% or 13 people of the study group, were not prescribed any medications.

Table II. Summary of the psychotropic drugs taken by the study group

Type of drug	N	%
Anti-depressants	2	8
Anti-epileptic	4	16
Antipsychotic drugs typical	3	12
Antipsychotic drugs atypical	2	8

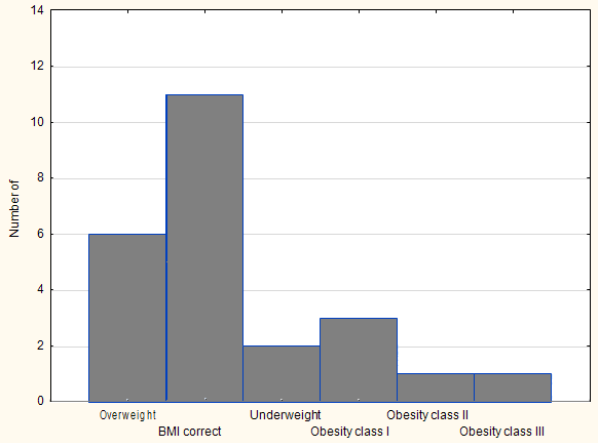
Statistical analysis

The obtained results were statistically analyzed using STATISTICA software, version 10. Testing hypotheses was performed by using Mann-Whitney U test. In the case of the variables measured on a nominal scale, we used the non-parametric chi-squared test with the Yates's correction in situations where all the expected numbers in the table were >5, and the exact Fischer test, where any expected table number was less than 5. The correlation between variables was carried out using Spearman's rank correlation coefficient. The results were found to be significant at the level of $p<0.05$.

Results

Figure 1 shows the distribution of the overweight and the obese as measured according to BMI, in the examined group of people.

Figure 1. Number of tested people according to body mass index BMI

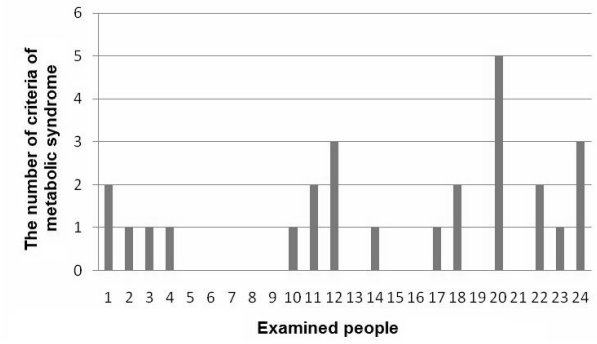


The group of women and men did not differ significantly in terms of body mass index (BMI) (Mann-Whitney U test), the rank sum for women being 128, while the rank sum for men was 172, $p< 0.21$). Breaking this figure down, two women were assessed as being underweight (17%), five women (42%) had correct body mass index, three women (25%) were overweight, one woman (8%) was obese class I, and one woman (8%) was obese class II. In the men's group, the distribution of body mass index BMI was as follows: six men (50%) had normal body mass index, three (25%) were assessed as overweight, two (17%) were obese class I, one man (8%) was obese class III. Taking into account the entire study group, obese patients comprised 20% of the total, while, an overweight assessment, according to the BMI, was diagnosed in 25% of the total surveyed.

Abdominal obesity measured by the WHR ratio, was found in ten people (42% of all tested): six women (50% of all women) and four men (33% of all men). An interpretation of waist circumference according to the guidelines proposed by the IDF generated different figures. Of all women, seven (58%) was diagnosed as having abdominal obesity, of all men, six people (50%) had a waist circumference greater than 94 cm (indicating abdominal obesity).

Regarding the metabolic syndrome, three persons (12.5% of the total surveyed) were diagnosed as having this (by meeting three criteria), more specifically, one women (8%) and two men (17%). A statistical analysis did not reveal any differences between men and women in the number of identified criteria of the metabolic syndrome (Mann-Whitney U test, rank sum for women - 145, the rank sum for men - 155, $p< 0.79$). Ten persons, however, (42% of the total surveyed) showed none of the criteria of the metabolic syndrome. An accurate summary is shown in Figure 2.

Figure 2. The co-existence of diagnostic criteria of the metabolic syndrome among the study group. From number 1 to 11: women; from 12 to 24: men. A number of criteria ≥3 means recognized metabolic syndrome.



The differences between individuals with abdominal obesity and without abdominal obesity in the tested group of persons, reached statistical significance in terms of age, body weight, BMI, systolic blood pressure and diastolic pressure. This means that people with abdominal obesity had a significantly higher BMI (body mass index) (The Mann-Whitney U test, rank sum for persons with abdominal obesity was 229. The rank sum for persons without abdominal obesity was 71, $p< 0.00$).

Of those characterised by a higher arterial pressure, regarding systolic pressure - Mann-Whitney U test, rank sum for persons with abdominal obesity was 207, the rank sum for persons without abdominal obesity was 92, $p<0,00$;

and diastolic blood pressure - Mann- Whitney U test, rank sum for persons with abdominal obesity was 202, the rank sum for persons without abdominal obesity was 97, p< 0.02. These dependencies increase with age (Mann-Whitney U test, rank sum for people with abdominal obesity - 203, rank sum for persons without abdominal obesity - 95, p< 0.01).

No significant differences were observed between LDL cholesterol, HDL, total cholesterol, triglycerides and glucose in people with abdominal obesity and those without.

To determine higher lipid and lipoprotein concentrations in the plasma, we utilised the classification seen in the WOBASZ program: hypercholesterolemia - LDL >= 3.0 mmol/l (115 mg/dl) or TC >= 5.0 mmol/l (190 mg/dl) and hypertriglyceridemia - TG >= 1.7 mmol/l (150 mg/dl) [19]. The figures employed in assessing aterogenic dyslipidemia (which is associated with increased concentration of triglycerides) were - TG >= 1.7 mmol/l (150 mg/dl) and low HDL concentration - women <1.2 mmol/l (45 mg/dl), - men < 1.0 mmol/l (40 mg/dl) [20].

The hypercholesterolaemia prevalence in the study group was 46%, and was also assessed in the individuals who were considered underweight. What is interesting, nine out of the twelve women were (75%) were hypercholesterolaemia, while most men (i.e., eight out of the twelve surveyed or 66%) had standard LDL and total cholesterol concentration. Furthermore, an aterogenic dyslipidemia optimal was found in one man (8% of the total examined) who had also been diagnosed with metabolic syndrome. Regarding hypertriglyceridemia, an increased level of triglycerides was observed in one women (8%) and in two men (17%), and reduced HDL-cholesterol level was observed in two women (17%) and in three men (25%). Increased LDL cholesterol concentration, total cholesterol, triglycerides and reduced HDL was also evident in the group of persons without abdominal obesity, and even in persons who were underweight. In establishing whether or not psychotropic drugs affect the body weight, blood pressure levels, glucose and cholesterol levels, in the examined group, 14 persons (58% of the total examined) were afflicted with an associated mental disorder, of which 11 persons (46%) regularly took prescribed psychotropic drugs, the majority were women.

Of note, the anthropometric measurements: body weight, body mass index BMI, obesity index WHR, were significantly higher in the group of persons not receiving prescribed psychotropic drugs (body weight: Mann-Whitney U test, rank sum of people not receiving medication - 206, rank sum of people taking medication - 94, p<0,01; BMI- Mann-Whitney U test, rank sum of people not receiving medication - 198, rank sum of people taking medication -102, p<0,04; WHR - Mann-Whitney U test, rank sum of people not receiving medication - 203, rank sum of people taking medication - 97, p< 0.02). In both sexes, there are no demonstrated significant differences in cholesterol concentration, glucose in serum and arterial blood pressure with respect to taking or not taking prescribed psychotropic drugs.

Table III and IV show correlations between the various factors of age, body weight, BMI, waist circumference, WHR, systolic pressure, diastolic BP, fasting glucose level, cholesterol HDL, LDL, triglycerides, total cholesterol, sex distribution.

Our study revealed that in the women's group, high correlations exist between systolic pressure and body weight (rs 0, 77, p< 0.05), BMI (rs 0, 76, p< 0.05), waist circumference (rs 0, 80, p< 0.05) and WHR ratio (rs 0, 71, p< 0.05), which increased with age. In men, however, it was found that, together with the increase in body weight and BMI index, decreased cholesterol HDL existed (body weight & HDL, rs= -, 060, p< 0.03; BMI & HDL, rs= -0, 61, p< 0.03). Such dependencies were not detected in the women's group.

Research revealed that the persons who considered themselves as being physically active have lower total cholesterol in the blood, in comparison to people who thought themselves physically inactive (Mann-WhitneyU test, rank sum for active 41, rank sum for physically inactive - 37, p< 0.01). In our research, we observed differences between residents of rural and urban areas. The rural inhabitants had higher blood glucose concentrations (Mann-Whitney U test, rank sum for rural residents - 153, rank sum for urban residents - 146, p< 0.04), higher total cholesterol (Mann-Whitney U test, rank sum for rural residents - 223, rank sum for urban residents - 77, p< 0.03) and higher LDL cholesterol (Mann-Whitney U test, rank sum for rural residents - 223, rank sum for urban residents - 76, p< 0.03). It was also found that people currently working have lower blood glucose concentration, in comparison to persons who were unemployed (Mann-Whitney U test, rank sum for persons working - 204, rank sum for the unemployed - 96, p< 0.01).

The study results reveal as well that persons employed have significantly lower total blood cholesterol, in comparison to those unemployed (Mann-Whitney U test, rank sum for those who ever were employed - 78, rank sum for long-term unemployed - 222, p< 0.04), and they were primarily from the urban population (67% of the total examined). Interestingly, these persons, to a lesser extent, had abdominal obesity - as measured using waist circumference according to IDF, as well as by the WHR ratio. This was of statistical significance, showing a moderate relationship (waist circumference, Fischer's exact test, p<0,05, Fi Yuel's indicator - 0.50; WHR ratio, Fischer's exact test, p<0,05, Fi Yuel's indicator - 0,48).

Table III. Correlations of Spearman's rank in the group of women, between the age, body weight, BMI, and WHR, and arterial blood pressure, glucose, HDL-cholesterol, LDL, as well as total and triglycerides. Marked coordinates of correlation are significant at p < ,05000

	N	R - Spearman	t(N-2)	p
Age & body weight *	**12**	**0,597548**	**2,35661**	**0,040185**
Age & BMI *	**12**	**0,636213**	**2,60771**	**0,026143**
Age & Waist circumference*	**12**	**0,656694**	**2,75360**	**0,020352**
Age & WHR*	**12**	**0,797902**	**4,18587**	**0,001870**
Age & Systolic pressure *	**12**	**0,666078**	**2,82393**	**0,018039**
Age & LDL cholesterol *	**12**	**0,697187**	**3,07537**	**0,011733**
Body weight & Systolic pressure *	**12**	**0,773297**	**3,85680**	**0,003177**
Body weight & Diastolic pressure *	**12**	**0,795794**	**4,15565**	**0,001962**
Body weight & HDL cholesterol	12	-0,573427	-2,21339	0,005126
Weight & Triglycerides	12	0,503497	1,84282	0,095157
BMI & Age *	**12**	**0,636213**	**2,60771**	**0,026143**
BMI & Systolic pressure *	**12**	**0,766267**	**3,77131**	**0,003654**
BMI & Diastolic pressure *	**12**	**0,806358**	**4,31148**	**0,001534**
BMI & Glucose on empty stomach	12	0,489510	1,77520	0,106252
BMI & HDL cholesterol	12	-0,510490	-1,87736	0,089914
BMI & LDL cholesterol	12	0,273205	0,89812	0,390234
BMI & Total cholesterol	12	0,097902	0,31109	0,762122
BMI & Triglycerides	12	0,419580	1,46172	0,174519
Waist circumference & Systolic *pressure *	**12**	**0,801061**	**4,23196**	**0,001738**
Waist circumference & Diastolic pressure *	**12**	**0,784843**	**4,00503**	**0,002498**
Waist circumference & Glucose on empty stomach	12	0,409808	1,42070	0,185824
Waist circumference & HDL cholesterol	12	-0,553416	-2,10115	0,061958
Waist circumference & LDL cholesterol	12	0,287719	0,95002	0,364497
Waist circumference & Total cholesterol	12	0,108582	0,34541	0,736944
Waist circumference & Triglycerides	12	0,469353	1,68087	0,123706
WHR & Systolic pressure *	**12**	**0,713542**	**3,22064**	**0,009165**
WHR & Diastolic pressure	12	0,545788	2,05978	0,066412
WHR & Glucose on empty stomache	12	0,321678	1,07434	0,307910
WHR & HDL cholesterol	12	-0,300699	-0,99704	0,342260
WHR & LDL cholesterol	12	0,504379	1,84716	0,094485
WHR & Total cholesterol	12	0,349650	1,18018	0,265239
WHR & Triglycerides	12	0,391608	1,34587	0,208063

Table IV. Correlations of Spearman's rank in the group of men, between the age, body weight, BMI, and WHR, and arterial blood pressure, glucose, HDL-cholesterol, LDL, as well as total and triglycerides

	N	R - Spearman	t(N-2)	p
Age & Body weight	12	0,515930	1,90457	0,085972
Age & BMI	12	0,339242	1,14040	0,280695
Age & Waist circumference	12	0,497365	1,81294	0,099921
Age & WHR	12	0,544200	2,05126	0,067367
Age & Systolic pressure	12	0,170820	0,54824	0,595555
Age & LDL cholesterol	12	0,000000	0,00000	1,000000
Body weight & Systolic pressure	12	0,281697	0,92840	0,375065
Body weight & Diastolic pressure	12	0,136603	0,43606	0,672054
Body weight & HDL cholesterol*	**12**	**-0,601399**	**-2,38036**	**0,038588**
Weight & Triglycerides	12	0,559441	2,13436	0,058589
BMI & Age	12	0,339242	1,14040	0,085972
BMI & Systolic pressure	12	0,359164	1,21698	0,251553
BMI & Diastolic pressure	12	0,220666	0,71544	0,490702
BMI & Glucose on empty stomach	12	-0,097902	-0,31109	0,762122
BMI & HDL cholesterol*	12	-0,615385	-2,46885	0,033170
BMI & LDL cholesterol	12	0,175440	0,56353	0,585489
BMI & Total cholesterol	12	0,335664	1,12684	0,286123
BMI & Triglycerides	12	0,447552	1,58264	0,144586
Waist circumference & Systolic pressure	12	0,352739	1,19208	0,260750
Waist circumference & Diastolic pressure	12	0,203509	0,65731	0,525823
Waist circumference & Glucose on empty stomach	12	-0,136603	-0,43606	0,672054
Waist circumference & HDL cholesterol	12	-0,553416	-2,10115	0,061958

c.d. Table IV. Correlations of Spearman's rank in the group of men, between the age, body weight, BMI, and WHR, and arterial blood pressure, glucose, HDL-cholesterol, LDL, as well as total and triglycerides

	N	R - Spearman	t(N-2)	p
Waist circumference & LDL cholesterol	12	0,217927	0,70612	0,496238
Waist circumference & Total cholesterol	12	0,395797	1,36292	0,202808
Waist circumference & Triglycerides	12	0,532400	1,98891	0,074756
WHR & Systolic pressure	12	0,119721	0,38133	0,710932
WHR & Diastolic pressure	12	-0,028021	-0,08865	0,931114
WHR & Glucose on empty stomach	12	-0,363636	-1,23443	0,245265
WHR & HDL cholesterol	12	-0,496503	-1,80878	0,100603
WHR & LDL cholesterol	12	0,400002	1,38014	0,197614
WHR & Total cholesterol	12	0,531469	1,98406	0,075362
WHR & Triglycerides	12	0,349650	1,18018	0,265239

Discussion

A literature search reveals that the mentally disabled in many countries are overweight or obese. This situation is reflected in our results. Those assessed as either overweight or obese were 49% of the examined, of which 21% were people who were obese, the other 28% were people who were overweight. In Poland, so far, there is little or no data on the prevalence of such situations in people with mental disabilities. However, a comprehensive analysis in this respect has been carried out in a population of healthy individuals. The most important research includes the NATPOL PLUS, WOBASZ, IDEA POLAND and PONS STUDY (The Polish Norwegian Study) [21, 22, 23, 24].

According to statistics presented in the IDEA POLAND study, 2/3 of all adult patients coming to primary care doctors are either overweight or obese. In our study, the figure was ½ of the total test population [23]. However, the limited size of the study population ensures that this figure is unreliable. It should be noted, however, that in the study, a diagnosis of overweight was more common that an assessment of obesity. Moreover, the average age of patients was relatively low at 36 years (standard deviation + /-8,7 years).

In the NATPOL PLUS study, 28.5% of all women and 39,1% of all men were overweight, while 19,3% of women and 18.9 % of men were obese. According to the IDEA POLAND study, these indicators were: overweight, 32.6% of all women, 40.8% of all men; obese, 32,7% of all women and all men [22, 23]. In our study, these indicators were slightly lower and as follows: overweight was diagnosed in 25% of all women and men, and obesity was assessed in 16% of all women and 23% of all men. As in the research on the mentally healthy population, the number of men designated as obese was greater than the number of women assessed so. In relation to existing research carried out the mentally disabled population, our degree of obesity assessment was similar to that obtained in the UK (27 %) and Ireland (32 %) [10,11]. It should be noted that our study had a test population consisting of individuals diagnosed as having mild or moderate mental disabilities. According to available literature, such a state seems to favour the disposition of excessive adipose tissue, which translates to greater freedom of life [12, 7]. Our test population enjoyed great personal freedom, some even ran their own households. Moreover, all were participants within daily assisted-living centres, or home support establishments or supported employment enterprises. In all these living situations, importance is given to health education and social development.

One of the main goals of our study was to look at the issue of metabolic syndrome as present within the intellectually disabled. So far, in Poland, little work has been done on this issue. Indeed, world-wide there is not much literature on the combination of the metabolic syndrome and reduced cognitive functions. However, a Japanese study consisting of a group of 302 patients diagnosed as being mental disabled shows that 13.6% of the entire study population was co-assessed as displaying the metabolic syndrome (diagnosed on the basis of NCEP-ATP III definitions), more often, this was seen in the male part of the test population [13]. A Dutch study conducted in a group of mentally disabled persons over 50 years of age, has shown that the prevalence of the metabolic syndrome (MS) in the mentally disabled is greater than in a population without such illnesses. Their estimation amounted to 25,1%. Furthermore, MS was observed more frequently in persons with mild cognitive disabilities [25].

In our study, 12.5% of the study population was assessed as showing the metabolic syndrome.

Similarly to the Japanese studies, most of these individuals were men (17% versus 8% of all women). Emphasis in scrutinizing these results should be placed upon the age factor. In our study, the general age of the test population was low. Moreover, all had benefited or are benefiting from institutional aid, where caregivers pay attention to potential health problems.

Research in Poland within the general population has revealed that the prevalence indicator of MS is estimated to be 20% (NATPOL PLUS research, by NCEP-ATP III criteria) to 39,5 % (PONS STUDY research, according to IDF criteria), and this indicator increases as the age of

patients increases. According to the PONS STUDY, within the youngest age group (45-49 years), this figure was 27%, and in the oldest age group (60-64 years), this figure rose to 47,1% [22,24]. However, attention should be paid to the regional differences in these figures. The WOBASZ study (criteria based upon NCEP-ATP III definitions), puts forward that the highest percentage figure was recorded in Wielkopolskie voivodeship (33% of all men), and the lowest in the Lubelskie voivodeship (16% of all men) and Podkarpackie voivodeship (17% of all women). Similarly to research in other countries, it was noted that the likelihood of MS occurrence increases with age, particularly in women [21]. Thus, the results obtained in our study in the male group are similar to that obtained in the Lubelskie voivodeship according to the WOBASZ study.

One of the components of the metabolic syndrome is abdominal obesity. This carries with it a number of negative consequences. In our research, 41,7% of the entire study group were assessed with abdominal obesity. In women, this indicator was 58.3%, in men - 50% (the criteria according to IDF). According to research conducted in Poland, in 2004, by NATPOL PLUS within the general population, abdominal obesity appeared in 37% of all women and 20% of all men. More recent research by IDEA POLAND, dating from 2011, indicates that this problem is has been exacerbated significantly, as on the basis of the NCEP-ATP III criteria, abdominal obesity was seen in 54 % of all women and 37% of all men.

Our results have shown that abdominal obesity is quite evident among the mentally disabled, but the gender differences in degree of MS presence is less clear than that within these other studies of general population. More or less, however, the figures mirror that of the other studies in that persons with an increased waist circumference had associated health problems such as hypertension, overweight and obesity, all of which increase with age.

In addition, it seems that hypercholesterolemia (46% of the total examined) was a major problem in the examined group. Our results were compared with that obtained previously in the area of Lublin by way of the WOBASZ study [19]. In this comparison, hypercholesterolemia was more significantly prevalent in the group of mentally disabled women (75%), than in the group of women (51%) drawn from the general population. Similarly, a significant difference was seen in our study group results in regard to lower HDL cholesterol concentration in the male population – at 25% of the total population versus 9% in the general population.

The limited size of the test group, must be taken into account, but the results of the study is of some concern regarding hypercholesterolemia, as the age of the study group was low. It is believed that this figure came about due to the duel nature of mental disability and the presence of associated mental diseases. Certain antipsychotic drugs (particularly second generation or 'atypicals') affect body weight and blood glucose levels. Because the study group was small, the obtained figures are not reliable.

It is possible that the reason for the higher degree of hypercholesterolaemia among our study group is due to environmental factors. As indicated earlier, differences in the level of LDL cholesterol and blood glucose between the rural population and the urban population indicate that diet, health awareness and degree of employment influence these figures. Our study saw that lower blood glucose concentration and lower total cholesterol concentration were evident amongst those with gainful employment, or who had experienced gainful employment.

In addition, those with gainful employment or who had experienced gainful employment showed to a lesser extent, abdominal obesity and lower total blood cholesterol. Our study saw that such individuals were rural dwellers and had better access to work and various vocational/ occupational development programs for disabled people. There is reason to believe, therefore, that work possibilities, and, hence, increases in social and physical activity has a beneficial effect on metabolic parameters.

Conclusions

Persons with mild and moderate mental disabilities were found to be, to a greater extent, overweight, to show abdominal obesity and have hypercholesterolaemia, in relation to the the general population. The degree of display of the metabolic syndrome was, however, similar. It is believed that the prevalence of metabolic disorders is dependent on life-style, environment influences and vocational activity.

The problem of overweight, abdominal obesity and hypercholesterolaemia among the mentally disabled requires further detailed research on a wider scale, taking account the distribution of persons inside society, their access to institutional aid, and their living conditions (whether living alone or with family or those considered family). We feel that special attention must be paid to environmental factors, which as demonstrated in our preliminary study, have significant impact on the state of health. It seems that the existence of possibilities for professional or work development has major effects on health. In the interests of disabled people and their families, but first and foremost in the interests of our health care system, support must, therefore, be given to these people so as to ensure their independence.

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