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Research Paper

The prevalence of abdominal obesity among pupils with visual impairment in Poland

Magdalena Wrzesińska, Ph.D. [a,*], Beata Urzędowicz, M.D., Ph.D. [b], Tadeusz Nawarycz, Ph.D. [c], Sławomir Motylewski, Ph.D. [d], Lucjan Pawlicki, M.D., Ph.D. [b]

[a] Department of Psychosocial Rehabilitation, Medical University of Lodz, Lodz, Poland
[b] Department of Internal Medicine and Cardiac Rehabilitation, Medical University of Lodz, Lodz, Poland
[c] Department of Biophysics, Experimental and Clinical Physiology, Medical University of Lodz, Poland
[d] Department of Methodology of Teaching Motor Skills, Medical University of Lodz, Lodz, Poland

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ABSTRACT

Background: Obesity particularly affects young people with disabilities, whose ability to participate in health promotion programs is reduced.
Objective: The aim of the study is to determine the prevalence of abdominal obesity among students with visual impairment in Poland according to waist-to-height ratio, including indicators such as gender, age or certain additional coexisting disabilities or disorders.
Methods: A total of 238 students who were blind or partially-sighted, aged 7.35–23.35 years (mean age 15.5; ±3.9 years), were included in the study. Abdominal obesity was estimated using waist-to-height ratio; a cutoff point of $\geq$0.50 was determined as central obesity.
Results: Abdominal obesity was identified among 26.9% [N = 64] of the participants: 33.1% [N = 41] of male students and 20.2% [N = 23] of female students (ch2 = 5.02; p = 0.025; Phi = 0.145). Of all the students, the multivariate logistic regression showed that abdominal obesity was one and a half times more likely to be detected in the 7–9 year age group (OR = 1.56; 95% CI 0.58–4.18; P = 0.376) than the 19–23 year age group. However, among the female subjects, abdominal obesity was over six times more common in the 7–9 year group (OR = 6.48; 95% CI 1.29–32.5; P = 0.022) than in the group of early adults. Central obesity was detected almost three times more frequently among students with visual impairment and additional intellectual disability (OR = 2.99; 95% CI 0.52–17.1; P = 0.215) than those with only visual impairment.
Conclusion: Prevention programs aimed at reducing abdominal obesity among pupils with visual impairment from special schools are needed.

The World Health Organization (WHO) reports that obesity is particularly common in people with disabilities.[1] Excessive body weight is recognized as a secondary consequence of disability, the one which intensifies already existing health problems and could be a cause of other disorders.[2,3] Moreover, economic analysis indicates that excess weight in those with disabilities could result in higher expenditures incurred by the health care system.[2]

Obesity particularly affects young people with disabilities whose ability to actively participate in health promotion programs is reduced due to several barriers.[4] Apart from a lack of preventive activities and limited access to leisure equipment, there is a shortage of professional personnel to implement health promotion programs.[5–7] In addition, the social and emotional aspect of disability, manifested by social isolation, contributes to higher inequalities in the disabled, resulting in lower rates of participation in physical activities.[7–10]

It is estimated that more than 4% of the general population is

Abbreviation: AO, abdominal obesity; BMI, body mass index; HD, hearing disability; ID, intellectual disability; Max, maximum; Me, median; Min, minimum; n, sample size; p, probability value; SD, standard deviation; WC, waist circumference; WHO, World Health Organization; WHtR, waist-to-height ratio; VI, visual impairment; z, result of Mann-Whitney *U* Test.

* Corresponding author. Medical University of Lodz, Department of Psychosocial Rehabilitation, Pl. Hallera 1, 90-647, Lodz, Poland.
E-mail address: wrzesinska.m@wp.pl (M. Wrzesińska).

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visually impaired, including 3.65% with low vision and 0.58% with blindness. The risk of visual impairment increases with age, and it has been confirmed that about 7% of children and adolescents in the 0–14 age group, over 28% of people in the 15–49 age group and over 65% of people aged 50 and older were blind or poor-sighted.[11] People with visual impairment are particularly susceptible to social and economic discrimination.[11–13] Additionally, children with visual impairment typically master life and community skills later than sighted children.[14,15]

Young people with visual impairment are less physically active, which predisposes them to an excessive body weight. They have limited access to various forms of physical activities.[16,17] Moreover, a small body of data indicates that between 18.4% and 63% of young blind people and those with low vision are overweight or obese.[18–20]

For many years, body mass index (BMI) has been used for evaluating the risk of cardiovascular disease. Currently, abdominal obesity (AO) is regarded as a better indicator of chronic disease, metabolic syndrome or cardiovascular diseases.[21–23] Recent cross sectional or prospective studies indicate that identifying a waist-to-height ratio ≥ 0.5 (WHtR$\geq$ 0.5) is a much more useful way of screening adults, children or adolescents for cardiometabolic risk than BMI or waist circumference.[24–27] Additionally, waist-to-height ratio has recently been acknowledged as a simpler and more predictive indicator of "early health risk" associated with AO, than the more complex "matrix" based on traditional boundary values for BMI and waist circumference.[28] Moreover, an analysis of cardiometabolic risk factors among the group defined as "healthy" according to BMI and WHtR ≥ 0.5 found them to have significantly higher cardiometabolic risk factors than those with "healthy" BMI but WHtR< 0.5. A number of studies confirm that waist-to-height ratio is also recommended in pediatric or General Practice, because of its lack of dependence on age, gender, race or ethnicity.[27]

Nonetheless, as in the case of waist circumference, the prevalence of AO defined by WHtR$\geq$ 0.5 is heterogeneous across countries. Central obesity defined by WHtR$\geq$0.5, has been observed in over 16% of boys and almost 8% of girls in China, and in the every third child or adolescent in America.[29,30] In a comparative study of Polish and German schoolchildren, the prevalence AO was found to be similar for boys (6.7% vs. 8.5%) but significantly lower for the Polish girls (5.3%) than the German girls (12.7%).[31] However, no uniform consensus on waist-to-height ratio cut-off points for children and adolescents from different populations has yet been reached.[32,33]The predictive ability of waist circumference and waist/height ratio to indicate central adiposity in children is also controversial. The cutoff points suggested for these parameters vary among studies because of the lack of standardization of the anatomical site used for measurements or some differences are related to ethnicity.[34]

The present study serves as an attempt to raise general awareness of the problem of central obesity in young people with visual impairment in Central Europe. Its aim is to determine the prevalence of AO among students with visual impairment according to waist-to-height ratio, including indicators such as gender, age or certain additional coexisting disabilities or disorders.

Materials and methods

Procedure for realization of the project

Students with special needs may enrol in all types of schools in Poland based on individual mental or physical development and special need. School attendance in Poland is obligatory until the age of 18, but pupils with various types of disabilities may extend their schooling obligation to the age of 16 for primary school, 21 for junior high school and 24 for secondary school.[35,36]

After receiving consent from the Bioethics Committee of the Medical University of Lodz (no. RNN/291/14/KB), information about the planned research project was sent to all ten Polish special schools for blind and low vision pupils. The study was approved by four special schools in Łódź, Kraków, Wrocław and Dąbrowa Górnicza. In the second stage, 700 people aged seven to 24 were invited to participate in the project. Three hundred and twenty-eight gave their written consent to participate in the study. Two hundred and seventy-four subjects were included in the examination. Due to the fact that some school medical records were incomplete, and that some pupils could not cooperate or were absent during the day of data collection, 238 persons were ultimately qualified for the statistical analysis.

Characteristics of the study subjects

A total of 238 students aged 7.35–23.35 years (mean age 15.5 $\pm$ 3.9 years) were included in the study. All students had been diagnosed with visual impairment of varied etiologies. Each subject was classified as a pupil with special needs on the basis of specialist diagnosis before commencing study in the school. The majority (N = 199; 83.6%) were diagnosed with low vision and the rest were blind (N = 39; 16.4%). The level of visual impairment and identification of other disabilities or disorders were based on ICD-10 criteria.[37] Standardized protocols were used by trained examiners: a physician, public health professionals and an Anthropology specialist. In the schools, the team members cooperated with school staff and nurses.

All the studied subjects were diagnosed with visual impairment before the age of five years, and in 172 cases (72.3%), this disability was the only one present. In 37 (15.5%) of the subjects, visual impairment was concomitant with mild intellectual disability (ID), and 18 (7.6%) subjects also demonstrated mild hearing disability (HD), while four (1.7%) subjects had mild motor disability. Seven pupils (2.9%) displayed more than two other disabilities.

According to the medical records of the special schools, 11.3% of the studied subjects had neurological disturbances (n = 27), 5.5% with bronchial asthma (n = 13), 4.6% with endocrine disturbances (n = 11), 3.8% with genetic disorders (n = 9), 3.8% with Attention Deficit Hyperactivity Disorder (n = 9), 2.9% with diabetes (n = 7) and 1.7% with cardiac disorders after surgical correction (n = 4). All the studied subjects with the above disorders were placed under the care of a medical specialist.

Anthropometric measurements

While taking the medical history, the physician asked the subject about current complaints, chronic diseases (diabetes, celiac disease, cardiac disorders), headaches, abdominal pains, frequency of bowel emptying and diarrhoea, which might be a cause of potential underweight. The medical examination included an evaluation of the skin, mucous membrane, auscultation of the heart and lungs and palpation of the abdominal cavity. After the medical examination, each subject was classified according to anthropometry measurements.

The anthropology measurements were taken by the same team, a public health professional and an anthropology professional, based on a study protocol prepared earlier. All measurements were conducted in the office of the school nurse between 8:00 a.m. and 1:00 p.m. Subjects wore light clothes during the examination, but without shoes. The school nurses were responsible for the coordination of the study and preparing documents with the unnecessary information. The ages of the subjects were calculated from the dates of birth and the examination. All medical equipment