Welfare and society – measured versus self-reported body height and body mass in medicine students of Wroclaw Medical University

Key words: student awareness, BMI, body mass, body height, young adults, risk factors
The basic anthropometric parameters, such as body weight and body height, are the data most frequently analyzed during a physical examination. Being aware of one's body weight and height not only allows the proper selection of material goods, but also has great significance in leading a healthy life-style, inter alia in assessing the degree of obesity. Being familiar with these basic anthropometric data is of great significance in medical sciences. It allows the stratification of the cardio-vascular risk in adults. Inappropriately high body weight is one of modifiable risk factors [1, 2]. Overweight and obesity increase the values of arterial pressure [3]. Inappropriately high body weight influences the incidence of lipid disorders [4]. Overweight and obesity have a statistically relevant relationship with type 2 diabetes [5]. High body weight is directly proportional to the risk of developing coronary artery disease [6], and insignificantly influences the incidence of stroke among men in Northern European countries [7].

The assessment of body fat in healthy subjects can be performed by direct measurement of body weight. The measurements can also be performed by measuring waist circumference, or shoulder-to-hip ratio, or with a “pinch test” [8]. The assessment of body fat is one of the means of assessing the degree of obesity in patients, which requires several anthropometric measurements. The easiest, most frequently used and least consuming method of assessing the degree of obesity is based on BMI (body mass index) [9]. Inappropriate, increased BMI is considered a significant modifiable cardiovascular risk factor [10].

The available data indicate that there is a strong correlation between the data obtained from direct measurements and the data compiled from surveys conducted among youths and young adults. The degree of correlation varies between 0.86 and 0.99, depending on the authors [11, 12, 13, 14]. Krzyżanowska and Umlawska show that such a degree of correlation is enough to base the assessment of body weight and height on subject-reported data [15]. The question remains, whether answers based on the data obtained 10 years ago are still valid. In the last decade Poland has joined the European Union, underwent great changes in the social sphere and in the life-style of youth, all of which can have significant influence on the results of studies. Moreover, introducing BMI into the standards of assessing the degree of obesity requires, according to the authors, gathering more precise anthropometric data. The BMI is calculated according to the following simple formula:

\[
BMI = \frac{\text{Weight (kg)}}{\text{Height}^2 (m^2)}
\]

Calculating BMI with this formula increases the results of possibly incorrect data obtained in the survey. Therefore, there is a possibility that even slight, initially insignificant statistical changes can cause the statistically significant differences in the study results between subject-reported data and actual data.

Thus, prior to commencing a big project on the state of students’ awareness of cardiovascular disease risk factors, an assessment of the students’ awareness of their body weight was carried out. In our opinion, detailed knowledge of one’s body weight and height is highly desirable, especially among those from the medical
profession, who should place special care on the prevention of civilization diseases. A medical doctor should know their body weight and height in order to be able to calculate their own BMI. Knowing their actual BMI will allow a doctor to intervene when the result is inappropriate. For how can a medical doctor, who is obese, does not know their own BMI and does nothing to change their life-style, credibly motivate their patients to change their life-styles and start a diet. Therefore, we believe that such a simple study, conducted among medicine students carries both scientific and, more importantly, educational significance, as it teaches to pay attention to easily modifiable civilization diseases risk factors.

MATERIAL AND METHODS

We analyzed a group of 88 healthy individuals, 39 women (mean age about 19.97 years) and 49 men (mean age about 19.87 years), students of the 1st year of the Faculty of Medicine, Wroclaw Medical University. The study has been conducted between February and March 2014. The mean age of the participants was 19.92 years.

Persons with ailments influencing body height (e.g. amputations) and persons with conditions that could in a short period of time affect the current body weight (e.g. uncompensated heart failure, renal failure, thyroid gland condition) have been excluded from the study.

The participants were assessed based on a survey, especially prepared for this study. The participants answered on their own, if they had any doubts they consulted one of the investigators. The gathered data have been coded to ensure anonymity and confidentiality. The respondents were asked to give their body height and weight.

Furthermore, a three-person study team comprising of trained students from student scientific club “Clinical and Dissecting Anatomy,” working under the supervision of a member of the Department of Anatomy, has verified the self-reported data. Measurement of body height and weight were performed before noon. Body weight was measured with certified scales, Radwag, with measurement accuracy up to 0.00001kg. Body height was measured with certified anthropometer, Holtain, with measurement accuracy up to 0.0001m. Each measurement was performed three times and the mean of all three measurements was used for statistical analysis. The instruments used in the study are CE certified and in accordance with directive MDD93/42EEC on medical instruments and appliances.

Body mass index (BMI) was calculated as the patient’s weight in kilograms divided by the squared height in metres. The following WHO classes were used for classification: normal range, defined as BMI <24.9kg/m2; overweight, defined as BMI 25–29.9kg/m2, and obesity, defined as BMI ≥30kg/m2 [16].

Statistica 11 PL software was used for statistical analysis. The basic statistical parameters were calculated for the studied group. Student – T test for dependent
means and Yates’ chi square test were used. Analysis of variance was used for some of the parameters.

The study was approved by the Bioethics Committee of Wroclaw Medical University.

RESULTS

Collected data of self-reported and actual measurements of body weight and height are presented in Table 1.

Table 1. The mean self-reported and measured base anthropometric values in the studied group of medicine students

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maksimum</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age [in years]</td>
<td>88</td>
<td>19.92045</td>
<td>18.00000</td>
<td>25.00000</td>
</tr>
<tr>
<td>self-reported mass [kg]</td>
<td>88</td>
<td>68.11364</td>
<td>41.50000</td>
<td>106.00000</td>
</tr>
<tr>
<td>self-reported height [m]</td>
<td>88</td>
<td>1.73886</td>
<td>1.52000</td>
<td>1.95000</td>
</tr>
<tr>
<td>Measured mass [kg]</td>
<td>88</td>
<td>69.73580</td>
<td>42.30000</td>
<td>123.40000</td>
</tr>
<tr>
<td>Measured height [m]</td>
<td>88</td>
<td>1.73131</td>
<td>1.52600</td>
<td>1.92300</td>
</tr>
</tbody>
</table>

Table 2 contains the data for female participants.

Table 2. The mean self-reported and measured base anthropometric values among the females from the studied group of medicine students

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maksimum</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>self-reported mass [kg]</td>
<td>39</td>
<td>58.21795</td>
<td>41.50000</td>
<td>92.00000</td>
</tr>
<tr>
<td>self-reported height [m]</td>
<td>39</td>
<td>1.65641</td>
<td>1.52000</td>
<td>1.86000</td>
</tr>
<tr>
<td>Measured mass [kg]</td>
<td>39</td>
<td>58.93205</td>
<td>42.30000</td>
<td>93.30000</td>
</tr>
<tr>
<td>Measured height [m]</td>
<td>39</td>
<td>1.65238</td>
<td>1.52600</td>
<td>1.84200</td>
</tr>
</tbody>
</table>

Table 3 contains the data for male participants.

Table 3. The mean self-reported and measured base anthropometric values among the males from the studied group of medicine students

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maksimum</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age [in years]</td>
<td>49</td>
<td>19.87755</td>
<td>18.00000</td>
<td>23.00000</td>
</tr>
<tr>
<td>self-reported mass [kg]</td>
<td>49</td>
<td>75.98896</td>
<td>51.00000</td>
<td>106.00000</td>
</tr>
<tr>
<td>self-reported height [m]</td>
<td>49</td>
<td>1.80449</td>
<td>1.68000</td>
<td>1.95000</td>
</tr>
<tr>
<td>Measured mass [kg]</td>
<td>49</td>
<td>78.33469</td>
<td>50.90000</td>
<td>123.40000</td>
</tr>
<tr>
<td>Measured height [m]</td>
<td>49</td>
<td>1.79413</td>
<td>1.66400</td>
<td>1.92300</td>
</tr>
</tbody>
</table>
The analysis of body weight values for the study population revealed statistically significant differences between the self-reported data and actual measurements (Figure 1). The differences occurred during the analysis of all results, as well as during separate analyses for particular sexes (Figure 2 and Figure 3).

Figure 1. The differences between self-reported and measured mean body weight (p=0.0000)

Figure 2. The differences between self-reported and measured mean body weight among females (p=0.000003)
It has been proven that the students from the studied group report body weight significantly lower than their actual weight reported from measurements (Table 1). Furthermore, the analysis of mean body height and weight values showed a statistically significant difference between the self-reported and actual values for the study population. The collected data are illustrated on Figure 4.
The abovementioned difference was reported for male participants (Figure 5).

No statistically significant differences were reported for the analysis of mean body height values among females (Figure 6). Thus, it has been shown that male medicine students declare body height values that are statistically significantly higher than actual data.
The comparison of BMI calculated on the basis of data obtained from surveys $\text{BMI}_{\text{dek}}$ and direct measurements $\text{BMI}_{\text{real}}$ showed statistically significant differences between these values (Figure 7). The differences were reported for both male ($p=0.000$) and female students ($p=0.000891$).

![Figure 7. The difference between self-reported and measured mean BMI](image)

While analyzing the data, we also assessed the education level of the participants’ parents. Most of the participants came from higher education background. Figure 8. illustrates the education data for the fathers and Figure 9. the education data for the mothers.

![Figure 8. The education level of the participants’ fathers](image)
Statistical analysis did not show any relationship between the education level and BMI of the participants.

Even though the percentage for parents with higher medical education (medical doctor, pharmacist, nurse, paramedic) was calculated, no relationship was shown between the parents’ medical education and overweight or obesity among the participants (Table 4).

Table 4. The number of parents with medical education

<table>
<thead>
<tr>
<th>Medical Education [No]</th>
<th>Medical Education [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>32</td>
</tr>
<tr>
<td>Father</td>
<td>19</td>
</tr>
</tbody>
</table>

Additionally, while conducting the study, we assessed the number of participants declaring to be active smokers and the number of people declaring drug use. The percentage for smoking students is illustrated on Figure 10.
Questions about drug use provided information about reported occasional use of the so called recreational drugs, i.e. marijuana and ecstasy. Among the persons using, the number of males was significantly higher than the number of females (Figure 11).

OVERVIEW OF OUR OWN RESEARCH RESULTS

The mean body height of 2014 medicine students amounted to 1.73 [m], which is higher than in the population of peers, who are not students [17]. Krzyżanowska et
al. suggest that one of the reasons of this finding is that students possess better genes than their peers [15].

The relationship between BMI, body height or weight and parents’ level of education is not clearly defined. Many Polish authors point out that higher education of parents corresponds to greater stature of children [18,19]. Charzewski points to the relationship between the father’s higher education and the children’s greater height [20]. The presence of a higher educated parent is believed to contribute to a more varied family diet, more regular mealtimes and higher level of hygiene. We did not show any relation between body weight, height and BMI and the level of education of the parents of our participants. Krzyżanowska et al. suggest that the student population is in some way privileged and thus more homogenous, and that is why the relationships between basic anthropomorphic parameters and social factors are not as clearly visible in this group[15].

The comparison between the self-reported and actual data for body weight has revealed the presence of underestimation of weight among the studied population, on the level of 1.62kg. Stewart et al. have published similar results. They have assessed a group of 1,598 residents of Australia in the 1980s, reporting an underestimation of weight at a level of 2.4kg [11]. On the other hand, researchers from Sweden have shown only 1kg difference between the self-reported and actual data, while analyzing, inter alia, a group of young adults living near Stockholm [21]. The difference between self-reported and measured data for body weight are therefore varied and population specific. In the Wroclaw study population, a markedly higher difference in body weight data was shown for males (ca. 2.5kg), rather than females (ca. 1.0kg). This finding is very interesting and requires further research, as in the available data world-renowned authors, such as Mc Adams at al. present contrary reports. In their analysis, women are the ones who misrepresent their body weight [22]. The reasons of this discrepancy are unknown.

The analysis of data concerning body height of the participants revealed that only men, medicine students, overestimate their height. The analysis of data for female students did not yield any statistically significant differences between self-declared and measured data. Interestingly, in her 2000 study on a group of students, Krzyżanowska et al. has shown that women report data on their height that are statistically significantly overestimated, while men give accurate data [23]. One of the interesting unproven hypothesis, which could explain this phenomenon, is discontinuing mandatory military service in Poland. Previously, young men, ca. 18-19 years old, were examined in detail by the draft board. Therefore they were more aware of their precise body weight and height than women, who were not subject to mandatory military service. Since 2014, such detailed examinations are no longer taking place, as there no longer is a mandatory military service. What is also interesting is that the height of the male and female students in Wroclaw did not change between 2000 and 2014, and oscillates around ca. 165cm for women and ca. 179-180cm for men.
Even though the students from the study population have overestimated their height and underestimated their body weight, and even though the differences between self-reported and measured data are statistically significant, surprisingly the comparison of BMI_{self} and BMI_{actual} did not yield such big discrepancies. They are statistically significant, however the WHO-classification-based comparison of self-reported and actual data did not significantly affect the classification of obesity (Table 5).

Table 5. Clinical classification of the degree of obesity

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>Self-reported categories</th>
<th>Measured categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>71</td>
<td>64</td>
</tr>
<tr>
<td>Overweight</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>Obese</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

This finding is even more clear if we do a separate comparison for the data for males and females (Figure 12 and 13).

Figure 12. Comparison of the self-reported and actual data on the degree of obesity in females
The data from our observations correspond to those of other authors [21,22]. The statistically significant differences between self-reported and actual data do not pertain to false classification of the degree of obesity among students. We believe that the reason for the reported phenomenon is simple. Medicine students are mostly slim or only slightly overweight. Therefore even statistically significant discrepancies in self-assessment of body weight and height do not carry any clinical significance. Thus, we believe that when conducting a study that does not require exact data for body weight and height for medicine students, performing objective measurements of anthropomorphic data is not necessary. The observed differences can, however, have clinical significance in older age groups.

CONCLUSIONS


2. The students have overestimated their body height and underestimated their body weight.

3. The differences between $\text{BMI}_{\text{del}}$ and $\text{BMI}_{\text{cal}}$ calculated based on self-reported data are statistically significant. However, they carry no clinical significance.

4. When conducting a study among medicine students, self-reported data for body weight and height are sufficient for analysis and there is no need for objective measurements.
LIMITATIONS

1. Insufficient volume of the study group.
2. Carrying out the study on only one Faculty.

REFERENCES

ABSTRACT

The basic anthropometric parameters, such as body weight and body height, are the data most frequently analyzed during a physical examination. Being aware of one’s body weight and height not only allows the proper selection of material goods,
but also has great significance in leading a healthy life-style, inter alia in assessing the degree of obesity. Being familiar with these basic anthropometric data is of great significance in medical sciences. It allows the stratification of the cardio-vascular risk in adults. Inappropriately high body weight is one of modifiable risk factors.

The aim of the study was to assess the correct knowledge of these parameters in a group of students of the Faculty of Medicine. We analyzed a group of 88 healthy individuals, 39 women (mean age 19.97 years) and 49 men (19.87 years). We proved that participants do not know their body weight and height. A comparison of self-reported and actual data reveals statistically significant differences. The students have overestimated their body height and underestimated their body weight. The differences between BMIdkl and BMIreal calculated based on self-reported data are statistically significant. However, they carry no clinical significance. When conducting a study among medicine students, self-reported data for body weight and height are sufficient for analysis and there is no need for objective measurements.

**STRESZCZENIE**

Podstawowe parametry antropometryczne jakimi są masa ciała i wysokość ciała to jedne z najczęściej analizowanych danych podczas badania fizykalnego. Wiedza o własnej masie ciała i wzroście umożliwia nie tylko prawidłowy dobór dóbr materiałnych ale ma ogromne znaczenie w prowadzeniu przez poszczególnych osobników zdrowego stylu życia. Celem pracy było określenie stopnia znajomości własnej masy ciała i wzrostu przez studentów medycyny. Analizie poddano grupę 88 zdrowych ochotników, studentów I roku Wydziału Lekarskiego Uniwersytetu Medycznego we Wrocławiu. Średni wiek uczestników wyniósł 19,92 lat. W badaniu uczestniczyło 39 kobiet (średni wiek 19,97 lat) oraz 49 mężczyzn (średni wiek 19,87 lat). Analiza wartości masy ciała oraz wysokości ciała w badanej grupie studentów ujawniła obecność istotnie statystycznych różnic pomiędzy danymi deklarowanymi a rzeczywistymi pomiarami. Porównanie obliczonego wskaźnika BMI na podstawie uzyskanych danych z ankiet oraz pomiarów bezpośrednich – dla danych uzyskanych z bezpośrednich pomiarów wykazało znaczne, istotne statystycznie różnice pomiędzy tymi wartościami. Szczegółowa analiza ujawniła jednak że wykazane różnice nie mają jednak istotnego znaczenia klinicznego. W przypadku prowadzenia badań na grupie studentów medycyny można zatem odstąpić od pomiaru ich masy ciała i wzrostu i ograniczyć się tylko do danych deklarowanych.