

# STUDY ON WEIGHT OF SOME MORPHOLOGICAL ASPECTS OF BODY STRUCTURE OF THE UNIVERSITY POLITEHNICA OF BUCHAREST STUDENTS

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**Abstract.** The human body is a complex and dynamic aggregate of sub-systems, in a continuous inter-relation. Maintaining the structure and specific activity of these sub-systems within certain parameters is an essential factor of life in general, of its quality in particular. The components of the body mass are fat mass, metabolically inactive or with very low activity and fat-free mass, metabolically active. Overweight is a major risk factor in diseases with a major impact on health. The assessment of body composition especially in young population may be an effective factor of raising awareness of the body reality, with significant effects for preventing obesity. The aim of this study is to determine two elements of the morphological structure of a sample of students of the Polytechnic University of Bucharest: body composition and the ratio between weight and height. The goals of our research we aim to establish for each subject percentage of adipose tissue and the Body Mass Index. The tasks of this study are to report these to the average optimum values for the young population, to highlight gender differences relative to the accepted average values, to reveal possible differences between the I<sup>st</sup> year subjects versus II<sup>nd</sup> year in this field and to establish existing correlations for the investigated subjects between the body composition and the ratio between weight and body evidenced through the Body Mass Index.

*Key words: body composition, Body Mass Index, student.*

## Introduction

The human body is a complex and dynamic aggregate of sub-systems, in a continuous inter-relation. Maintaining the structure and specific activity of these sub-systems within certain parameters is an essential factor of life in general, of its quality in particular.

Wang and al, quoted by Cordun M [1] establishes five levels of the body composition: atomic, molecular, cellular, tissues, bodies and anatomic-functional systems and the body as a whole characterized by height, body mass and volume. The components of the body mass are fat mass, metabolically inactive or with very low activity and fat-free mass, metabolically active [1]. The fat mass is made up of essential fats (which are vital for the functioning of the spinal cord and of most organs) and deposit fats. The fat-free mass is made up of water (intra and extra-cellular), bone mineral mass and proteins (in muscles, tendons, ligaments and viscera).

The body composition can be determined through: direct methods and indirect methods [2]. The direct methods are based on anatomical and biochemical models. The indirect methods of determining body composition can be divided into two main categories: anthropometric methods carried out directly by the evaluator with simple tools (caliper, taliometer, scale and metric belt) and imagistic methods which comprise densiometric, imagistic and isotope explorations.

The anthropometric methods being easy to use are the most used in assessing body composition. The anthropometric measurements (height, weight, perimeters, skin folds), introduced in various mathematical formulas (over 100 are known) allow the calculation of indices based on which is determined either the ideal weight or the body composition (i.e. fat mass, fat-free mass [1].

The calculation of fat and fat-free mass through caliperometry is the indirect assessment, through mathematical methods of the fat-free mass based on the direct determination of fat mass [3]. The adipose tissue is determined through the measurement of 3 up to 10 skin skinfolds in various areas of depositing [4], based on body surface or body density. By reporting it to the body weight the fat and fat-free mass expressed in kg are determined.

Overweight is a major risk factor in diseases with a major impact on health. The assessment of body composition especially in young population may be an effective factor of raising awareness of the body reality, with significant effects for preventing obesity [5]

## Material and method

The hypothesis of this study are: by using adequate methods it can be determined to what extent the investigated subjects fall within the average values of normality accepted by the specialized literature in the field of body composition, there is a significant difference in

the field of body composition between the subjects in the I<sup>st</sup> and II<sup>nd</sup> year, the gender particularities in the field of body composition of investigated subjects are positively correlated with the reference data, here is a positive correlation between the optimum average values of the body composition and the adequate ratio between height and weight determined through Body Mass Index.

The aim of this study is to determine two elements of the morphological structure of a sample of students of the Polytechnic University of Bucharest: body composition and the ratio between weight and height. The goals of our research we aim to establish for each subject percentage of adipose tissue and the Body Mass Index. The tasks of this study are to report these to the average optimum values for the young population, to highlight gender differences relative to the accepted average values, to reveal possible differences between the I<sup>st</sup> year subjects versus II<sup>nd</sup> year in this field and to establish existing correlations for the investigated subjects between the body composition and the ratio between weight and body evidenced through the Body Mass Index.

The research methods used were: the study of the scientifically-methodical literature, statistical and mathematical methods.

## Results

The data obtained by investigating the 124 subjects (weight, waist, value of adipose tissue folds value at tricipital, subscapular, on flank, para-umbilical and 1/3 anterior – superior of the thigh were tabulated. Based on them was calculated for each subject the body surface, the

Determination of the body composition was performed through the caliperometry method, i.e. Parisckova Method which measures five folds of adipose tissue (triceps, subscapular, suprailiac, abdominal, thigh).

The measurements were performed by the same examiner, on the right side of the body, the subject was relaxed, the value was read within a 2 seconds interval.

The calculation formula used was:

% adipose tissue =  $\sum \text{five skinfolds} \times 0,15 + \text{B.S.}$  (body surface in m<sup>2</sup>).

The body mass index was calculated according to the formula: weight in kg reported to the height squared in meters.

A number of 124 students were tested: 91 female students (53 from the first year and 38 from the II<sup>nd</sup> year) and 33 students (16 from the I<sup>st</sup> year and 17 from the II<sup>nd</sup> year).

The research was carried out during 1 March – 1 May 2012 within the Sports Complex of the Polytechnic University of Bucharest.

Literature quotes relative fat mass differences between boys and girls aged between 18 – 24 in average of 4 % - 9 % and 16 % - 25% for girls and 12 % - 16% for boys.

adipose tissue percentage and the body mass index (B.M.I.).

Structuring of the sample of subjects according to the optimal average values of the adipose tissue percentage (female, young population) is shown comparatively in the I<sup>st</sup> year versus the II<sup>nd</sup> year in figure 1.

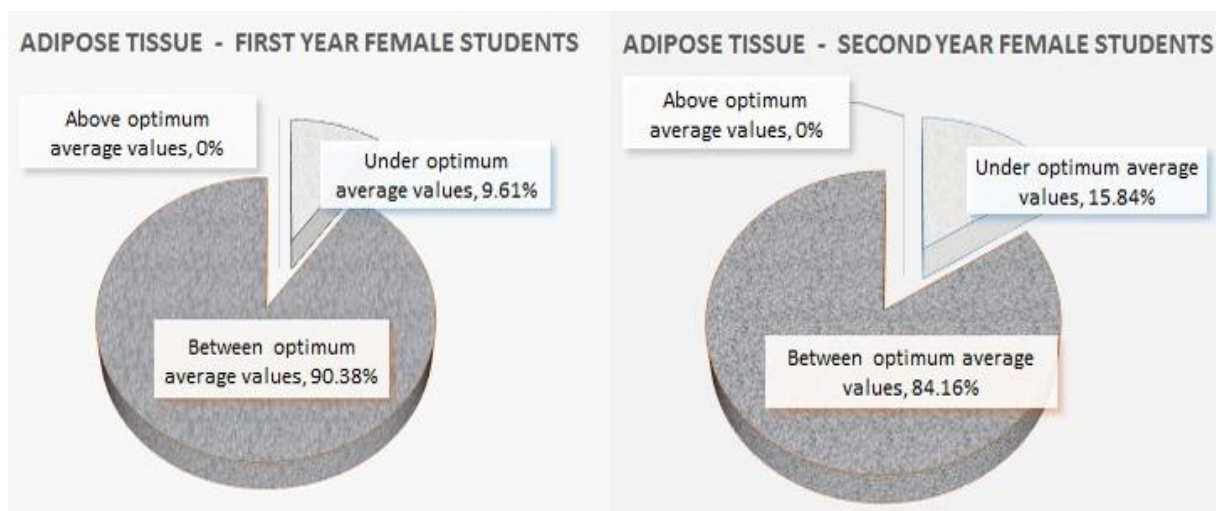


Figure 1. Adipose tissue female students

Allotment of tested female students in weight classes determined based on the B.M.I. values is suggestively separately

represented for the I<sup>st</sup> and II<sup>nd</sup> year in figure 2.

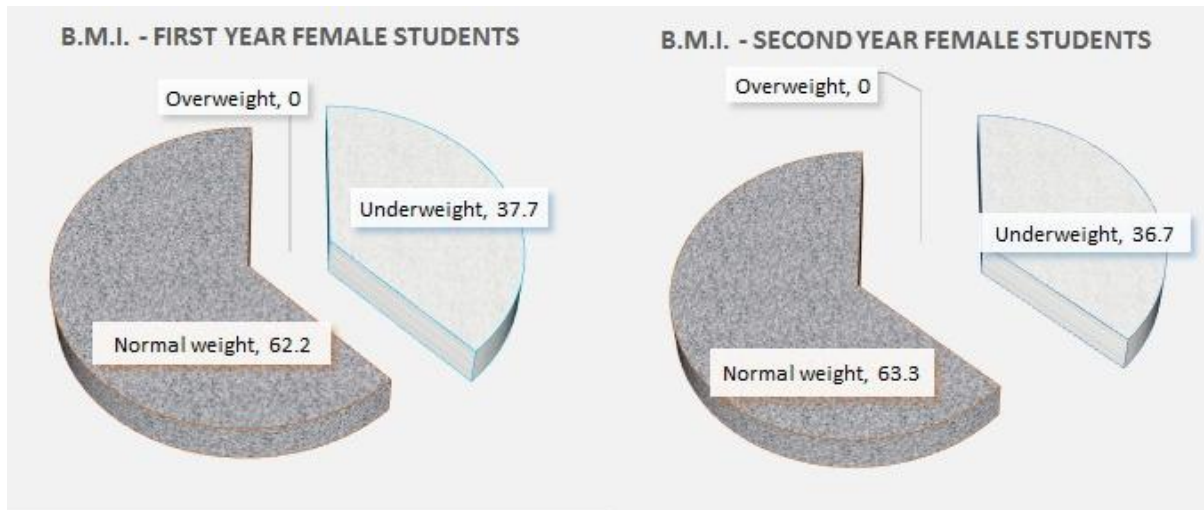


Figure 2. B.M.I. female students

Grouping of students from the I<sup>st</sup> and II<sup>nd</sup> year according to the optimal average

values of the adipose tissue percentage is comparatively presented in figure 3.

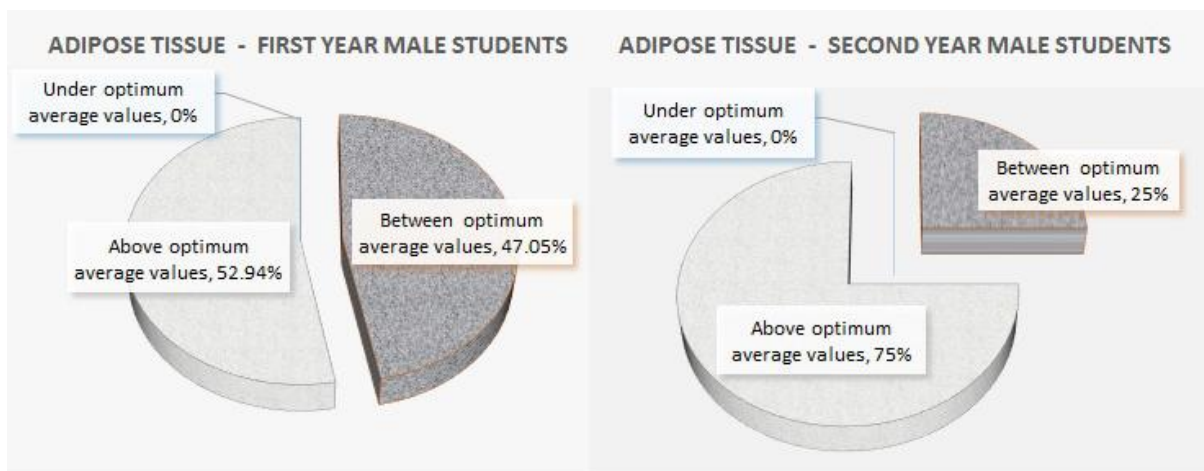


Figure 3. Adipose tissue male students

Weight categories of tested students, established according to the B.M.I. values,

according to specialized literature references are presented in figure 4

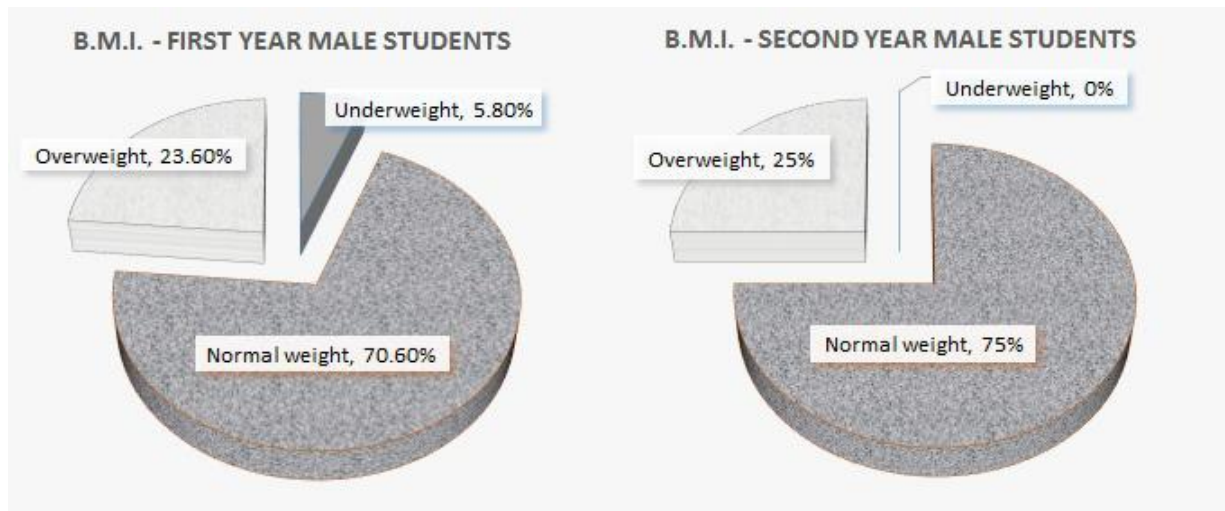


Figure 4. B.M.I. male students

### Discussion and conclusions

For most female students (I<sup>st</sup> year – 90.38%, II<sup>nd</sup> year – 84.16%) the adipose tissue percentage fits in the optimal average values.

We notice two aspects: no female student has the adipose tissue percentage over the optimal average values and 9.61 % of the I<sup>st</sup> year female students and 15.84% of the II<sup>nd</sup> year female students have the value of the adipose tissue percentage under the optimal average values highlighted in the specialized literature.

The BMI values for female students positively correlate with the adipose tissue percentage, some differences ensuing in favour of the adipose tissue percentage. Thus in the normal weight category (according to the BMI values) fit 62.2% of the I<sup>st</sup> year female students and 68.3% of the II<sup>nd</sup> year and according to the adipose tissue percentage between the optimal average values fit 90.38% of the I<sup>st</sup> year 84.16% of the II<sup>nd</sup> year female students. In the field of body composition there is a significant difference between the I<sup>st</sup> and II<sup>nd</sup> year male students. Thus, 47% of the I<sup>st</sup> year male students fit in the optimal average values for the adipose tissue percentage and only 25% of the II<sup>nd</sup> year male students.

Male students in a significant percentage (52.94% for the I<sup>st</sup> year and 75% in the II<sup>nd</sup> year) have the value of the adipose tissue over the optimal average, there is no subject presenting values under the optimal value.

A very low correlation within male students between the adipose tissue percentage and BMI is highlighted, according to which 70.4% of the I<sup>st</sup> year male students and 75% of the II<sup>nd</sup> year fit in the normal weight category.

Female students fit in a much higher percentage than male students in the optimal average values

of the body composition (I<sup>st</sup> year 90.38% female students versus 47% male students, II<sup>nd</sup> year 84.16% female students versus 25% male students).

There is a significant difference (59.84%) between the female and male students in the II<sup>nd</sup> year in the field of body composition (optimal average values) much over the limit shown in the specialized literature (4-9%).

Between the body composition, highlighted through the method of the five skinfolds and the weight classes revealed through the BMI there is a positive correlation only at the level of female students. We believe that this is due especially to the higher attention that the female students pay to their appearance, which is reflected especially in the quality and quantity of food eaten.

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