# Somatotype Characteristics of Patients with Type 2 Diabetes mellitus of Bulgarian ethnicity

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## Abstract

Patients with type 2 diabetes mellitus (T2DM) constitute about 6-8% of the Bulgarian population with a tendency to fast increase. The aim of the present study was to determine the somatotype of Bulgarian patients with T2DM. Two-hundred and twelve female and 169 male patients were enrolled in the study. The control group comprised 80 healthy Bulgarians, divided by sex and age. The somatotype components were measured by the Heath-Carter anthropometric method.

Results: The mean somatotype of 40-60 year-old diabetic female was mesomorph-endomorph. The mean somatotype of 40-60 year-old healthy females was mesomorphic endomorph. The mean somatotype of 61- 80 year-old diabetic female was endomorphic mesomorph. The mean somatotype of 61-80 year-old healthy females was mesomorph-endomorph. The endomorph component was dominant in the group of 40-60-year-old diabetic females (endo 6.59, meso 6.09, ecto 1.57), and the group of 61-80-year-old diabetic females presented with dominating mesomorph component (meso 9.41, endo 5.39, ecto1.55).

The mean somatotype of 40-60 year-old diabetic males (endo 5.03, meso 6.57, ecto 2.01) and healthy controls was endomorphic mesomorph. The mean somatotype of 61-80 year-old diabetic males (endo 4.14, meso 5.88, ecto 1.64) and healthy controls was endomorphic mesomorph. The mesomorph component was dominant, followed by the endomorph and the ectomorph far behind.

Conclusion: The somatotype of diabetic females suggests that they have a relatively robust skeleton with well-developed muscles and greater body weight relative to height. The Bulgarian diabetic males present with dominant mesomorphy. The results are original for the Bulgarian population.

**Key words**: type 2 diabetes mellitus, Bulgarians, somatotype

## Introduction

The number of diabetes mellitus patients in Europe is expected to increase from 52 millions in 2014 to 68.9 millions by 2035, according to the International Diabetes Federation (IDF). In Bulgaria patients with T2DM amounted to about 6-8% of the population, with a trend of rapid growth. The most researchers are interested in etiology, pathogenesis, clinical course and treatment of the disease. The anthropological status of diabetic patients enjoys little attention.

The **aim** of the present study was to determine the somatotype of Bulgarian patients with T2DM

## Patients and Methods

***Patients.*** The study involved 212 female and 169 male patients with T2DM. They were recruited from the Department of Endocrinology, Medical University-Plovdiv. The inclusion criteria were: Bulgarian ethnicity, duration of disease more then four years and compensated diabetes at the time of the study. Patients were divided by sex and age into four groups: 40-60-year-old males, 61-80-year-old males, 40-60-year-old females, 61-80-year-old females. The study involved 80 healthy controls divided by sex and age into the same groups.

***Methods.*** *Anthropometric measurements:* height, weight, biepicondylar breadth of humerus and femur; circumferences: upper arm relaxed/contracted, forearm, waist, hip, thigh and calf girths; 9 skinfolds: subscapular, over X rib, suprailiac, abdominal, triceps, biceps, forearm, thigh and calf. The components of somatotype were calculated using the Heath-Carter method of somatotyping.

## Results and Discussion

**Women**. The mean somatotype of 40-60 year-old diabetic females was **mesomorph-endomorph** (endo 6.59, meso 6.09, ecto 1.57). The mean somatotype of 40-60 year-old healthy females was *mesomorphic endomorph* (endo 6.82, meso 5.65, ecto 2.75). The mean somatotype of 61- 80 year-old diabetic females was **endomorphic mesomorph** (meso 9.41, endo 5.39, ecto 1.55). The mean somatotype of 61-80 year-old healthy females was *mesomorph-endomporph* (meso 6.70, endo 6.66, ecto 2.95).

The endomorphic component was dominant in the group of 40-60 year-old diabetic females, but in the group 61- 80 year-old diabetic female the mesomorphy was the dominant component. The endomorphic component was dominant in the group 40-60 year-old healthy females. The values of mesomorphy were significantly higher in the diabetic females than in the controls ($p<0.05$). The somatotype of diabetic females suggests that they have a relatively massive skeleton with well-developed muscles and greater body weight relative to height.

fig. 1 Mean somatotype, female aged 40-60 years

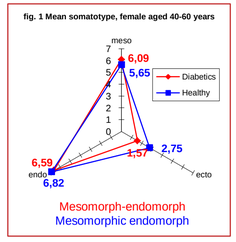


fig 2 Mean somatotype, female aged 61-80 years

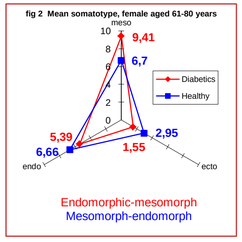


Table 1 Mean somatotype of diabetic females and controls subject aged 40-60 years

| Somatotype components | Diabetics | | Controls | | t | P |
|---|---|---|---|---|---|---|
| | N | Mean±SEM | N | Mean±SEM | | |
| **Endomorphy** | 92 | 6.59±0.24 | 40 | 6.82±0.32 | 0.70 | >0.05 |
| **Mesomorphy** | 92 | 6.09±0.23 | 40 | 5.65±0.25 | 1.56 | <0.05 |
| **Ectomorphy** | 92 | 1.57±0.16 | 40 | 2.75±0.26 | 5.87 | <0.001 |
| **Mean Somatotype** | **Mesomorph-endomorph** | | **Mesomorphic endomorph** | | | |

Table 2 Mean somatotype of diabetic females and controls subject aged 61-80 years

| Somatotype components | Diabetics | | Controls | | t | P |
|---|---|---|---|---|---|---|
| | N | Mean±SEM | N | Mean±SEM | | |
| **Endomorphy** | 120 | 5.39±0.18 | 40 | 6.66±0.29 | 4.38 | <0.001 |
| **Mesomorphy** | 120 | 9.41±1.88 | 40 | 6.70±0.26 | 6.56 | <0.001 |
| **Ectomorphy** | 120 | 1.55±0.14 | 40 | 2.95±0.24 | 5.42 | <0.001 |
| **Mean Somatotype** | **Endomorphic-mesomorph** | | **Mesomorph-endomorph** | | | |

## Results and Discussion

**Men**. The mean somatotype of 40-60 year-old diabetic males was **endomorphic mesomorph** (endo 5.03, meso 6.57, ecto 2.01). The mean somatotype of the healthy male controls was also *endomorphic mesomorph* (endo 5.01, meso 5.95, ecto 2.55). The mean somatotype of 61-80 year-old diabetic males was **endomorphic mesomorph** (endo 4.14, meso 5.88, ecto 1.64) and the mean somatotype of the healthy male controls was *endomorphic mesomorph* (endo 4.17, meso 5.58, ecto 2.77) too. The mesomorphy was dominant, followed by endomorphy and ectomorphy was far behind. The values of mesomorphy were significantly higher in the diabetic males aged 40-60 years than in the same age healthy controls ($p<0.05$).

fig. 3 Mean somatotype, male aged 40-60 years

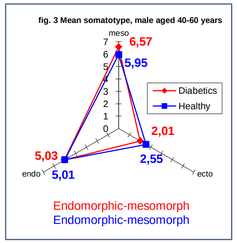


fig 4. Mean somatotype, male aged 61-80 years

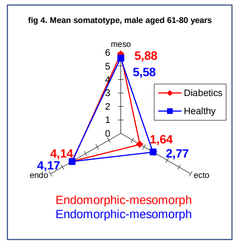


Table 3 Mean somatotype of diabetic males and controls subject aged 40-60 years

| Somatotype components | Diabetics | | Controls | | t | P |
|---|---|---|---|---|---|---|
| | N | Mean±SEM | N | Mean±SEM | | |
| **Endomorphy** | 53 | 5.03±0.24 | 40 | 5.01±0.29 | 0.06 | >0.05 |
| **Mesomorphy** | 53 | 6.57±0.18 | 40 | 5.95±0.21 | 2.43 | <0.05 |
| **Ectomorphy** | 53 | 2.01±0.19 | 40 | 2.55±0.20 | 2.07 | <0.05 |
| **Mean Somatotype** | **Endomorphic-mesomorph** | | **Endomorphic-mesomorph** | | | |

Table 4 Mean somatotype of diabetic males and controls subject aged 61-80 years

| Somatotype components | Diabetics | | Controls | | t | P |
|---|---|---|---|---|---|---|
| | N | Mean±SEM | N | Mean±SEM | | |
| Endomorphy | 97 | 4.14±0.16 | 40 | 4.17±0.28 | 0.11 | >0.05 |
| Mesomorphy | 97 | 5.88±0.16 | 40 | 5.58±0.22 | 1.19 | >0.05 |
| Ectomorphy | 97 | 1.64±0.16 | 40 | 2.77±0.23 | 3.99 | <0.001 |
| **Mean Somatotype** | **Endomorphic-mesomorph** | | **Endomorphic-mesomorph** | | | |

## Conclusion

The mean somatotype of diabetics females aged 40-60 years is mesomorph-endomorph, it differs from the mesomorphic endomorph somatotype of the healthy controls. Endomorphy and mesomorphy dominate significantly.

The mean somatotype of diabetic females aged 61-80 years is endomorphic-mesomorph with significant prevalence of mesomorphy. It differs from the somatotype of controls, where the mesomorphy and endomorphy are equally presented.

Our study reveals that both age groups of Bulgarian diabetic males are presented with endomorphic-mesomorph somatotype. The mesomorphy is significantly higher than endomorphy.

These results are original for Bulgarian population. They present characteristic somatotype of the Bulgarian diabetic patients. The data relate the role of factors such as lifestyle, diet, habits, environment and treatment.

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