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Relation of Anthropometric Characteristics in Women with different types of MS and Comparison with Health ones

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ABSTRACT

The purpose of this research was to determine anthropometric paticulars and somatotype with different types of MS in women. 54 patients with MS in three groups (27- Relapsing-Remitting, 16 secondary progressive, 11 primary progressive) and 20 health women as the control group participated in this research. Body Composition Analyzer was used to measure the particularities of anthropometry and Heath-Carter somathotype for determination of somatotype. Chi-square test was used to reviewe the relationship between research parameters with different types of MS. Independent t-test was used to compare the research parameters among health and MS women. The results demonestrated a meaningful relation among particularities of anthropometry in weight, body mass index, percent of fat, waist to hip ratio and lean body mass with different types of MS in women ($P<0.05$), and no meaningful relation with height, length of upper body and lower body index with different types of MS disease ($P> 0.05$). There is meaningful relation between somatotype and types of MS ($P<0.05$), meaningful difference among MS and health women in height, length of upper body and lean body mass, no meaningful difference between length of lower body, weight, body mass index, percent of fat, waist to hip ratio and fat mass. By regarding the results, MS women with relapsing-Remitting, fat and mesomorphs specially from types of progressive, is primary progressive ones.

Key Words: MS, Anthropometry, Somatotype.

INTRODUCTION

Multiple Sclerosis (MS) is the most common progressive nervous diseases and is one of the causes of crippledom during the youth [2]. Up to now, not only MS prevention, treatment and irradiation methods have remained veiled to the researchers, but also the main cause of MS has

not been discovered. In Europe, 30 out of 100,000 suffer from MS and 2.5 to 3.7 persons are added to the statistics annually [5]. Although nothing is known about the number of MS patients in Iran, there are signs that the cases of MS are increasing day by day.

Several specifications including standard of living, cultural aspects, family literacy, family problems, nutrition, nervous damages and problems and even geographical place of residence have been observed in MS patients [15]. Verheyden et al. (2006) reported that MS is a common illness among higher educators. It doesn't seem that Iranian and European societies differ significantly in terms of portent. Marital status has no effect on MS and 10.1% of the patients have positive family records. The main cause of MS is not known and MS rate is increasing but the researchers are to identify the effective factors and to treat this disease. Although by virtue of the literature MS is due to abnormality in nervous system, it can be expected that the disease can have anatomic and mechanical consequences. Therefore, identification of the physical specifications of MS patients is useful.

Anthropometry is a science that measures the body and determines the size, form, symmetry, composition, maturity and performance of man [15]. The discipline concerns the proportionality of length, perimeter and width of limbs, proportionality of the mass of body parts and the relationship of longitudinal proportions and mass of body parts. The researchers have agreed on a two-part model consisting of Lean Body Mass (LBM) and Fat Mass (FM) or Mass of Body Fat (MBF) for facilitating estimation of definite proportions of main body components[18]. As for body composition evaluation, FM includes all fat tissue components (lipid in addition to cellular matrix) and LBM describes all the tissues that are not part of FM. Indices such as BMI and WHR are used to study the relations among simple anthropometric indices.

Somatotype is the classification of people in terms of body structure and type. Heath & Carter's Somatotype is presently the method widely-used worldwide. This method includes a three-point scoring system. Endomorphy concerns body fatness. Regardless of distribution manner, endomorphy describes physical aspects of resemblance such as body perimeter, belly volume, etc. Mesomorphy concerns physical variables like visible body robustness in terms of muscle and bone, chest volume and possible hidden muscle mass. Ectomorphy concerns body thinness. Ectomorphy describes physical variables like thinness of body or delicacy of limbs in the absence of any muscle, fat or other tissues whatsoever.

Many factors affect the anatomic form, structure and mass of human body including age, sex, genetic aspects, environment and type and amount of activities [9]. Although the relationship of specific anthropometric features and body type, on one hand, and the possibility of some diseases, on the other hand, has been approved [10], nothing was found on the relationship between special anthropometric specifications together with body type and MS (including benignant, malignant, relapsing-remitting, secondary progressive and primary progressive) and no comparison has been done between healthy people and MS patients from this viewpoint. Only the research administered by Bergman et al. in 1978 aimed at determining body types of the patients suffering from different types of MS using Reference Point of Wanke. In this research it was shown there were anthropometric differences among MS male and female patients.

Thus, with the hypothesis that anthropometric specifications together with body type are related to MS, this research was done to determine the relationship of anthropometric specifications and somatotypes of MS female patients and the types of MS with a comparison with healthy people.

MATERIALS AND METHODS

This research is of applied and present-looking nature. The population of this research included female MS patients who were members of Tehran MS Society and healthy women. 54 female MS patients who could stand and walk and at least had the disease for 6 years with age mean and standard deviation of 38.2 and 6.02 years respectively were classified randomly into 3 experimental groups (27 relapsing-remitting (RR), 16 secondary progressive (SP) and 11 primary progressive (PP)). The control group included 20 healthy women living in Tehran with age mean and standard deviation of 37.6 and 8.7 years respectively who didn't suffer MS or any other physical crippledom were selected randomly.

In order to determine body composition of the subjects a wall-mounted standiometer was used to calculate height of subjects in standing and sitting modes; a chair was used to determine height in sitting mode and to determine the heights of upper and lower body; Venus 5.5 pneumatic composition analyzer manufactured in South Korea was used to determine weight, BMI, Waist to Hip Ratio (WHR), Percent Body Fat (PBF), fat mass and LBM.

Venus 5.5 had a face with places for feet. It also had a touch screen using which the data related to sex, age and height of the subjects could be entered. There were two bars next to the display with metal places for palm and fingers contact and a button to be pressed by the thumb. The output data were printed on a special form through a printer connected to the analyzer. The output included weight, BMI, WHR, Age Matched of Body (AMB), Basal Metabolic Rate (BMR), Total Energy Expenditure (TEE), PBF, MBF, LBM, muscle weight, body cellular mass, water composition percentage, muscle, protein, lipid, minerals, body type and desirable weight.

Fig. 1. Pneumatic Composition Analyzer

Fig. 2 .Calf fat measurement using a caliper

In order to measure upper body height (height in sitting mode minus the height of chair seat) and lower body height (overall height minus upper body height) and height of subjects in sitting mode were measured and recorded.

Heath & Carter's Somatotype was used to determine body type of subjects. The tools included: a flexible measurement tape for measuring arm and calf perimeter, a SH5020 fat caliper manufactured in South Korea for measuring the fat of calf, shoulder griddle, triceps and Supraspinatus muscle; a wall-mounted meter for evaluating height; and a short-jawed caliper for measuring thigh and arm widths.

Manual somatotype calculation method was used in this research. Manual somatotype calculation including 16 stages was done using Heath & Carter's Somatotype. Endomorphy related to the height of subjects in comparison with three subcutaneous fat values calculated in stages 2 to 5. Mesomorphy related to the relationship of height of subjects with two perimeters and two widths measured in stages 6 to 10. Ectomorphy related to height to cube root of weight measuring in stages 11 to 16. Having determined somatotype data, the researcher used a 7 point scale to determine body types of the subjects.

Descriptive and inferential statistics were used for data analysis. Descriptive statistics was used for determining mean and SD. Inferential statistics included Kolmogorov–Smirnov test was used for analyzing the normality of data distribution and X^2 test was used for analyzing the relations among variables. Also, where data distribution was normal, independent-groups t-test was used for comparing anthropometric specifications and somatotypes of healthy subjects and MS patients. Where data distribution was not normal Mann-Whitney U Test was used ($p<0.05$). SPSS (v. 15) was used for data analysis.

RESULTS

Table 1: mean (SD) of anthropometric indices of subjects

Index / Group	Healthy	RRMS	SPMS	PPMS	Total MS Patients	Total Average
Height (cm)	162.6 (5.3)	158.9 (6.99)	158.3 (5.7)	161.5 (6.70	159.3 (6.4)	160.2 (6.2)
Upper body height(cm)	84.4 (3.1)	83.4 (3.6)	81 (3.3)	83 (3.3)	82.6 (3.6)	83.1 (3.5)
Lower body cm	78.2 (4.7)	75.5 (4.4)	77.3 (5)	78.5 (3.4)	76.7 (4.5)	77.1 (4.6)
Weight kg	61 (6.4)	61.5 (10.8)	57.6 (10.1)	51.6 (6.5)	58.3 (10.4)	59.2 (9.6)
BMI(kg/m2)	22.3 (3)	24.5 (4.99)	22.9 (3.6)	19.8 (2.6)	23.1 (4.5)	23.1 (4.1)
WHR(Cm)	0.78 (0.09)	0.81 (0.1)	0.75 90.08)	0.68 (0.06)	0.77 (0.1)	0.77 (0.09)
PBF()%	28.5 (5)	29.2 (7.8)	29.2 (4.2)	24 (4.9)	28.2 (6.6)	28.2 (6.2)
MBF(Kg)	17.9 (4.6)	19.3 (8.2)	17.2 (5.7)	15.2 (9.8)	17.8 (8)	17.8 (7.2)
LBM(Kg)	43.4 (3.7)	40.3 (7.7)	40.1 (5.2)	38.6 (2.8)	39.9 (6.20	40.9 (5.8)

Table 1 shows central tendency and dispersion of anthropometric specifications of subjects separately. It can be observed that healthy women had higher means of height, upper body height, lower body height and LMB in comparison with ill subjects. Average of upper body height of SP subjects was the least in comparison with that of other groups. Taking all the groups into account PP group had the lowest weight, BMI, WHR, fat percentage, fat mass and mass without fat. RR group had the highest weight mean, BMI, MBF and WHR.

Table 2: Central tendency and dispersion of somatotype numbers of subjects

Group / Parameter	Healthy	RRMS	SPMS	PPMS	Total MS Patients	Total Average
endomorphy	5.7 (1.3)	6.5 (1.3)	4.3 (2.2)	2.8 (1.8)	5.1 (2.2)	5.2 (2.1)
mesomorphy	4 (1.4)	4 (1.4)	2.5 (1.6)	1.6 (1.2)	2.5 (1.4)	2.9 (1.5)
ectomorphy	1.9 (1.1)	1.6 91.4)	2.5 (1.6)	4 (1.2)	2.4 (1.7)	2.2 (1.6)

Table 2 includes findings related to mean and SD of somatotype (endomorphy, mesomorphy and ectomorphy) of ill subjects. Mean and SD of body type has no scale. In terms of mesomorphy and endomorphy RR group had higher mean in comparison with that of other groups especially

PP group (1.6). In terms of ectomorphy, PP group (4) had higher means in comparison with that of all patients (2.5), especially the RR group (1.6). Somatotype mean of healthy subjects in all three modes to RR patients was higher than that of other groups.

Table 3: K-score for studying the relationship between anthropometry and type of MS

Statistic / index	K-score	Degree of Freedom	P
Height	1.76	4	0.78
Weight	6.23	4	0.032
Upper body Height	4.51	4	0.341
Lower body	6.16	4	0.341
BMI	6.72	4	0.023
PBF	12.27	4	0.015
MBF	6.24	4	0.080
LBM	5.82	4	0.046
WHR	1.87	4	0.000

Table 3 shows that most of healthy and ill subjects, in terms of somatotype, were endomorph. Frequency percentage of healthy women in somatotype ectomorphy, mesomorphy, endomorphy-ectomorphy and ectomorphy-mesomorphy was zero. Ill women were neither mesomorph nor ectomorph- mesomorph.

With regard to the data entered in table 3 it can be concluded that there is no significant relationship between height, upper body height, lower body height and type of MS ($P>0.05$). The relations among weight, body mass, fat percentage, fat mass and lean body fat and type of MS are significant ($P<0.05$).

Table 4: the results of independent-groups T-test for comparing anthropometric specifications of healthy and MS subjects

Parameter / Statistic	Difference Mean	T value	P
Height (cm)	3.38	2.18	0.038
Upper body Height (cm)	1.85	2.05	0.044
Lower body Height (cm)	1.53	1.29	0.201
Weight (kg)	3.11	1.25	0.216
BMI (kg/m2)	0.2	0.18	0.857
WHR (cm)	0.01	0.29	0.773
PBF(%)	0.31	0.19	0.85
MBF (kg)	0.94	0.05	0.961
LBM (kg)	3.5	2.37	0.02

P (table 4) shows that the difference between healthy and MS subjects in terms of height, upper body height and LBM is significant while the two groups aren't significantly different in terms of lower body height, weight, BMI, PBF, WHR and MBF.

Table 5: Results of K-score test for studying the relationship between body type and MS type in female subjects

K-Score	30.667
Degree of Freedom	8
P	0.000

Taking p in table 5 into account, zero hypothesis or lack of significant relationship between dynamic balance parameter at anterior-posterior and MS type is rejected ($P<0.05$).

Table 6: Results of t-test for independent groups for comparing somatotype status of healthy and MS subjects

Statics / Index	Difference mean	T value	P
Endomorphy	0.64	1.51	0.237
Mesomorphy	0.36	4.04	0.000
Ectomorphy	0.41	-1.234	0.221

Findings in table 6 show that the difference between endomorphy and ectomorphy between healthy and MS subjects is not significant (P>0.05). P shows that in terms of mesomorphy healthy and MS subjects are significantly different (P<0.05).

DISCUSSION

The overall aim of this research was to determine the relationship between anthropometric specifications and somatotype on one hand and MS in female subjects on the other hand. Another secondary objective of this research was determination of the relationship between anthropometric specifications of MS patients and type of MS. The results showed that there was no significant relationship between height and MS type. Also, it was found that there was no relationship between upper body and lower body heights and MS type. It seems that anthropometric specifications such as length of limbs and rations have no relationship with MS type. In other words, apt people with any height, upper body height and lower body height may get any three types of MS. Since no other research has been administered so far, the validity of research results is subject to further research. However, since all the subjects were of a single race and nationality, the lack of relationship seems reasonable.

The results of the research show that the difference between MS and healthy subjects in terms of height and upper body height was significant. MS patients' heights, especially upper body heights, decrease after getting MS. The cause may be the involvement of the patients' spinal columns and the feeling of ache and insentience at the zone. The cause may be the compactness of vertebrae at the spinal column zone in MS patients. RR patients had higher upper body height and lower body height average in comparison with those of progressive patients. Although the difference is not significant, the severity of disease in progressive group in comparison with RR group results is more in terms of spinal column problems and thus, they suffer from more compactness of vertebrae and decrease of height. The literature didn't have any similar study.

The other objective of the research was to determine the relations among anthropometric parameters such as weight and mass of different body parts in MS female patients and type of MS. The results showed that the relations of weight, BMI, PBF, MBF, LBF, WHR and MS type were significant. In PP group WHR, PBF and MBF were less than those in RR group. Although no literature was found in this case, it seems that most PP patients are slim and light and most RR patients are corpulent and weighty.

Averages of BMI in PP, SP and RR groups were normal-underweight, average and normal-overweight respectively. No research has been found on BMI in MS patients. However, like other anthropometric features, RR and P groups differed in terms of BMI. Probably BMI to height in RR female patients is higher than that in P group, especially PP group. According to the findings the overall tendency of MS female patients was not towards underweight or overweight. The results showed that weight/height ratio in RR group was more than that in P group, especially in PP group.

PBF was the same in RR and SP groups, higher than that in PP group but the PBF averages of the three groups fell in normal limit (20-30%). Although PBF averages of the two RR and SP groups were equal, but the average of the former was slightly higher than the latter. Meanwhile, PBF of RR group was higher than of PP group in conformity with other anthropometric variables. It shows that the body fat and weight in RR female patients are higher than SP female patients.

MS and healthy groups didn't show any significant difference in terms of LBM. Lack of difference may be attributed to the high averages of this parameter in RR group in comparison with those in healthy subjects. It is probable that MS results in increase of fat mass and weight in RR group. This is quite contrary to PP group probably due to severe effects of the disease. It is probable that slim people get more severe types of MS due to deficiency in fat mass. As mentioned earlier, deterioration of myelin sheath, a layer of fat covering myelin [11], may be the reason. Maybe limitation of fat makes the person more susceptible to MS. Also, about 4% of the total fat of the body protect spinal cord [14]. No literature was found for or pro this claim.

The results related to the relationship between body type and type of MS in female subjects showed that the relationship between body type and type of MS was significant. The results showed that RR group was more endomorphic than the P group and in fact were in high extents of endomorphy. In terms of mesomorphy, RR group had higher average in comparison with P group but the difference in terms of endomorphy was much lower. P group, especially PP group, had higher ectomorphy scores in comparison with those of RR group. The results of this research do not conform to the findings of Bergman et al (1978), the only research concerning the distinction of MS types in terms of body types. The cause may be Bergman et al only dealt with overall type of patients. There are studies in which differences among MS groups are reported. The reported differences relate to sex. Furthermore, somatotype method used in that research was different from Heath & Carter's method used here, a fact that makes comparison difficult. The noticeable thing is the compatibility of the results of Heath & Carter's somatotype method and those of hydraulic body composition device. In both methods RR group members were more muscular than PP and SP group members. On the other hand, P group members are thinner than RR patients. In both cases the difference was more noticeable between RR and PP groups than RR and SP groups. The difference may be the effects of disease on the victim or the parts involved. Probably the length of disease in P group, especially in PP group, in comparison with RR group cause deterioration of fat and muscle in patients, resulting in thinness or non-muscularity of such patients.

The differences between healthy and ill patients in terms of body type were only significant in terms of mesomorphy. This finding conforms to the finding of LBM anthropometry index. P group members were thinner than healthy people and had less fat and muscle masses. On the other hand, RR patients were equally muscular as healthy subjects and had equal fat masses; this renders differences insignificant.

CONCLUSION

P group of MS patients are thin and have limited fat and muscle masses in comparison than healthy people while RR group of MS patients have similar body types or even are more muscular than healthy people. Distribution of height and limbs height ratio in MS paints is rather the same, being less than healthy people. Upper body height of MS patients is less than that of healthy people.

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