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Association of body composition parameters with the health related quality of life among young adult males

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Abstract
Background: Body mass index is considered to correlate positively with several indicators of health and for public health the valid and appropriate indicator, which has been highly acknowledged is the health related quality of life (HRQOL). However there is scarcity of data regarding the body composition and HRQOL among the young adult males. The aim of the present study was to explore the association of HRQOL with the various body composition parameters.
Methods: A cross sectional study was conducted to investigate the body composition and HRQOL of 750 college going adult male's using simple random sampling method. One way ANOVA was used to analyze the group differences based on BMI and Pearson's product moment correlation were used to analyze the relationship among the variables.
Results: There were significant differences between the groups based on BMI in the physical component summary (PCS), mental component summary (MCS)and total health scores (THS) as shown by the univariate analysis ($P<0.005$). Pearson's product moment correlation showed that there were significant relationships between the body composition parameters especially the BMI and percent body fat with HRQOL. ($p<0.005$).
Conclusion: In the present study using SF-36 instrument and TANITA body composition analyzer (TBF-300) we assessed the relationship between HRQOL and various body composition parameters like BMI, Percent body fat, fat mass and fat free mass. The results indicate that body composition parameters affect the HRQOL and there is a significant difference in HRQOL among underweight, overweight, obese and normal category among the young adults based on BMI.

Keywords: HRQOL, SF-36, TBF-300, body composition, young adult males

1. Introduction

For individual as well as population, growth plus body composition are regarded as the key components of health. Several parameters of body composition, in particular the distribution and amount of body fat is now considered as an important health outcome. The importance of body fat for both short term and long term health is highlighted by the ongoing epidemic of obesity [1]. The measurement of body composition occurs in a wide variety of fields and the assessment ranges from simple and inexpensive field methods to highly complex and expensive laboratory methods/ procedures [2]. There are various methods used for assessing body composition like under water densitometry, dual energy X-ray absorptiometry and magnetic imaging resonance which are expensive, inconvenient and not feasible to conduct in the field because they require large specialized equipment [3]. We utilized the bioelectrical impedance analysis method to estimate the various body composition parameters viz. weight, body mass index, percent body fat, fat mass and fat free mass. With the possibility of utilizing at field settings BIA is known to give a fast, non- obtrusive and moderately exact estimation of body composition [4]. With a range of reference strategies including hydro-density, MRI and DEXA, validity of the BIA had been provided by the large scale population studies conducted earlier [5, 6, 7]. Body composition makes an important component of the individual's level of physical fitness and there is an inverse relationship between body fat levels and physical performance [8]. Physical fitness is having a great influence on one's general health status, especially the health related physical fitness components like flexibility, strength etc.

It is rightly said that the wealth of a nation resides in the health of its citizens. No doubt modernization and technological advancements have raised our standard of living but at the same time offers a sedentary life style which is destroying the good conditions of a human body [9]. Health has been defined by the WHO as a state of complete mental, physical and social-wellbeing and not merely the absence of disease or infirmity [10]. However the standard of living should not be confused with the quality of life. Quality of life is a general well-being of individuals and societies whereas standard of living is primarily based on economic conditions. Quality of life is defined by the WHO as the living conditions associated with the standards, expectations, corresponding goals and concerns of each individual under various cultural and social set-ups [11, 12]. The quality of life is mainly measured by using the rating scales. The Medical Outcomes Short Form health survey (SF-36) instrument is a widely used generic HRQOL consisting of 36 questions. The SF-36 instrument measures health in eight dimensions; physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional and mental health [5]. The

overall impact on the physical, mental and social well-being of an individual by some medical condition is defined as HRQOL [13]. Research of recent time has a goal to test the strategies so as to improve the HRQOL in general population, such as increased physical activity.

Several aspects of health and quality of life are associated with the various body composition parameters and this association has been consistently reported in the literature [14, 15]. However there is limited evidence available about the relationship between body composition parameters with specific dimensions of HRQOL among adult males. The present study assessed the association between various body composition parameters and HRQOL. We aimed in this study to explore the self-reported HRQOL using the SF-36 instrument; inter-relationship amongst body composition parameters and HRQOL and finally to compare the HRQOL scores between the different BMI groups viz. underweight, normal. Overweight and obese.

2. Materials and Methods

A cross sectional study was conducted of a random sample of young male adults selected from five different regions (viz. Pulwama, Shopian, Srinagar, Ganderbal and Baramulla) of the Kashmir valley of Jammu & Kashmir state. Young adult males in the present study refer to those who were pursuing their Bachelor's Degree in five different Government Degree Colleges. These five regions represent typical levels in respect of the regions geographical distribution which are South (Pulwama & Shopian), Central (Srinagar) and North Kashmir (Ganderbal & Baramulla). These five regions represent the characteristics of different types. Therefore the survey of young adult males from these regions could well represent the HRQOL and body composition parameters of young adult males of Kashmir. A total of 750 adults were selected for this study through simple random sampling method, with an average of 150 samples from each college. However only 516 samples were used for the statistical analysis because the data obtained from 54 samples were not complete (Questionnaire left incomplete) and 82 samples does not meet the inclusion criteria. However 98 samples from the target sample size does not respond at all. The inclusion criteria for the study was Physical Activity Readiness Questionnaire (PARQ) framed by the American College of Sports Medicine (ACSM). For the present study the age of adult males ranged between 18-25 years which was confirmed from the admission registers of the respective colleges.

2.1 Criterion measures

The data for the present study was collected during the months of April-November 2015. The data was collected in two parts. The first part included the physical measurement of standing height with the help a stadiometer in centimeters and the age of the subjects was calculated in years. For the calculation of age in years the following formula was adopted, which means the subject whose age was some years and more than 6 months he was treated as the next higher year of age.

(a). X + 6 months + some days = X+1 year.
(b). X + up to 6 months = X years
Where X = age in years

As the body composition parameters were assessed with the help of TANITA Body Composition Analyzer, Model TBF-300 which needs height in centimeters and age in years as the input to calculate several parameters of body composition. In addition to age and height the model needs an input of gender, target body fat percent and approximate weight of the clothes worn by the subject. The gender was selected as male in each case because the sample selected for the study were college going male adults and the target body fat was kept at 15%. However the subjects were asked to take out the things worn like belts, wallets, watches etc. so as to reach the minimum cloth weight of about 0.5 kilograms. This cloth weight was used as input to the machine (TBF-300) so as to subtract it to get the actual weight of the subject.

The second part was the HRQOL measurement scale; the SF-36 questionnaire. SF-36 is a self-reported instrument containing 36 items which measure the health in 8 dimensions by using a multi-item scale. These 8 scales were scored from 0 (worst possible health status measured by the questionnaire) to 100 (best possible health status) and the scoring was done with the help of Quality Metrics Health Outcome scoring software version 4.5. The SF-36 is a reliable and validated instrument for the measurement of HRQOL.

2.2 Statistical Analysis

The collected data was treated statistically by using the SPSS for windows version 20. The statistical description of mean and standard deviation were used for body composition parameters and HRQOL scores. Frequencies and percentages were used for different BMI groups. After calculating the descriptive statistics, Pearson's Product Moment correlation was adopted to establish the relationship among selected variables. Additionally One-way ANOVA was used to assess the group differences based on BMI with respect to their statistical significance.

3. Findings and Results

3.1 Descriptive statistics of selected parameters.

Total 750 participants were randomly selected and 652 (86.95%) responded to the study. Among them 516 (79.15%) samples were included in the data analysis. Table 1 reveals that the mean and standard deviations of height and weight of young male samples are 173.15 ± 6.697 and 59.94 ± 8.26 respectively. The mean and standard deviations of BMI, %BF, FM and FFM are well depicted in the table 1 which are 20.007 ± 2.6537, 5.814 ± 4.2721, 9.171 ± 5.3925 and 54.120 ±5.3913 respectively. The table further highlights the percentage frequency of the samples based on the body mass index category viz. underweight, normal, overweight and obese.

Table 1: Descriptive statistics of body composition parameters and BMI categories.

Parameters	Mean	SD	N	%age
HEIGHT (Cm)	173.15	6.697	516	100%
Weight (Kg)	59.933	8.2687	516	100%
Body Mass Index	20.007	2.6537	516	100%
Fat Mass In Kgs	5.814	4.2721	516	100%
% Body Fat	9.171	5.3925	516	100%
Fat Free Mass	54.120	5.3913	516	100%
Underweight Category	17.535	.7324	160	31.0%
Normal Category	20.644	1.6393	333	64.5%
Overweight Category	27.353	1.2668	19	3.7%
Obese Category	30.985	.3903	4	0.8%

3.2 HRQOL of young college going adult males

Table 2 shows the scores of HRQOL among young college going adult males. The PCS has a mean value of 54.97 with standard deviation of 5.48, MCS has a mean value of 49.84 with SD of 9.72 and THS has the mean value of 52.39 and SD 6.14.

Table 2: HRQOL of Young Adult Males

Scale		Mean	SD
Physical Component Summary		54.9716	5.48399
	PHYSICAL FUCNTIONING	54.3066	4.51445
	ROLE PLAYING	50.8864	8.14457
	BODILY PAIN	56.4756	8.39315
	GENERAL HEALTH	52.4822	9.27754
Mental Component Summary		49.8312	9.72956
	VITALITY	57.0142	9.94134
	SOCIAL FUNCTIONING	49.4701	9.34240
	ROLE EMOTIONAL	48.7060	9.74218
	MENTAL HEALTH	51.3399	10.86453
Total Health Score		52.3968	6.14548

3.3 Correlation Analysis

To analyze the relationship between different body composition parameters and the physical and mental component summary of the HRQOL including the total health scores, Pearson's Product Moment Correlation was conducted. The correlation analysis depicted in the table 3 shows relationships of both positive and negative nature between the various variables. The striking results of the table are negative significant correlation between BMI, %BF and FM with THS (r-value=-0.163, -0.226 and -0.236 respectively). The table further reveals a positive correlation between % BF, FM and FFM with BMI (r value=0.941, 0.953 and 0.482 respectively).

Table 3: Relationship among selected variables of young aged adult males.

	Height	Weight	BMI	%BF	FM	FFM	PCS	MCS	THS
Height	1	.374**	-.237**	-.319**	-.151**	.693**	.132**	.038	.055
Weight		1	.806**	.695**	.815**	.888**	-.029	-.105*	-.109*
BMI			1	.941**	.953**	.482**	-.121**	-.144**	-.163**
%BF				1	.963**	.302**	-.173**	-.195**	-.226**
FM					1	.457**	-.164**	-.204**	-.236**
FFM						1	.086	.000	.020
PCS							1	.186**	.417**
MCS								1	.901**
THS									1

** Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at 0.05 level (2-tailed).

3.4 Univariate Analysis

Association between various BMI categories and HRQOL is shown in table 4. The table shows significant differences ($P<0.05$) between various BMI categories and both PCS and MCS of HRQOL. The obese group and overweight group had lower scores than underweight and normal groups especially in the total health score having F value of 23.82 which is very much statistically significant. The F value of various BMI groups in PCS and MCS are 12.2 and 14.854 respectively which are also statistically significant. The table further reveals the highest mean values of PCS, MCS and THS in the normal weight category as compared to other three categories.

4. Discussion

The findings of this study reveals a statistically significant relationship between body composition parameters and

HRQOL. The study showed that BMI was inversely correlated to the scores of total health as well as Physical and mental component summary scores. In addition, normal BMI category adults had better HRQOL as compared to the underweight, overweight and obese counterparts as shown in figure 1 by the line graph. These results are in consistent with the previous studies [16, 17]. The BMI index is considered to correlate positively with several health and longevity indicators [18, 19]. As compared to the previous studies, we aimed to analyze the impact of body composition on HRQOL among the young adult males of Kashmir. Obese adults were having the highest impaired HRQOL which further strengthens the literature [14, 20]. The impaired HRQOL in this study after obese BMI category was followed by overweight BMI category. The overweight and obese adults reported statistically significant impairment not only in the total health scores but also in both the components of HRQOL i.e. physical component summary and mental component summary scores. On the basis of BMI categories, adults with BMI greater than or equal to 25 had the lowest HRQOL scores, as assessed by the Medical Outcomes Short Form health survey (SF-36). As the inclusion criteria for the study was Physical Activity Readiness Questionnaire, we find less number of overweight (3.7%) and obese (0.8%) samples as compared to underweight (31%) adults. The findings reveal that underweight participants had worse mental component summary scores as compared to the physical component summary scores and this finding is in consistent with the previous studies [21, 22].

Table 4: Association of BMI categories with the PCS, MCS and THS of the HRQOL.

	BMI Category	Mean	Std. Deviation	Std. Error	F	P
Physical Component Summary	Underweight	54.4289	5.49396	.43434	12.200	0.000
	Normal	55.6217	4.93040	.27018		
	Overweight	50.3621	8.29398	1.90277		
	Obese	44.4625	10.75380	5.37690		
Mental Component Summary	Underweight	49.0951	10.26343	.81140	14.854	0.000
	Normal	50.9876	8.75324	.47967		
	Overweight	39.7679	10.88183	2.49646		
	Obese	30.8100	13.30459	6.65230		
Total Health Score	Underweight	51.6820	6.39938	.50592	23.820	0.000
	Normal	53.3519	5.30865	.29091		
	Overweight	44.8697	8.08011	1.85370		
	Obese	37.2300	2.88115	1.44057		

This is the first study to our knowledge that explored the association between body composition parameters and HRQOL among young adult males especially in India. However there were some limitations. Firstly we are not able to draw causal inferences about the relationship between body composition parameters and HRQOL because of the cross sectional nature of the study. Secondly HRQOL was assessed with a generic instrument, which may be less sensitive. However one of the most common instruments for assessing HRQOL in general population of different countries is SF-36. Thirdly for different categories of BMI, the important factors of HRQOL were not reported. Therefore further research is needed regarding the factors associated with the impaired HRQOL among different BMI categories.

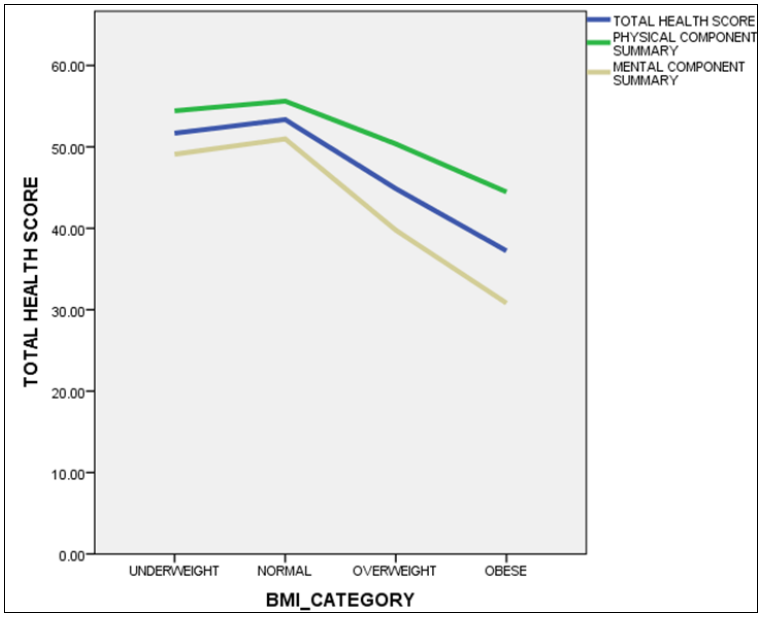

Fig 1: Showing line graph of HRQOL on the basis of BMI category.

5. Conclusions

Body composition parameters especially BMI has a predominant effect on the HRQOL, and BMI is having a strong positive correlation with the percent body fat. Not only overweight and obese category had impaired HRQOL but the underweight category also had a significant negative impact on mental component summary scores in particular and to the HRQOL scores in general. From the results and discussions of this study it can therefore be concluded that maintaining a normal BMI range can be beneficial the overall HRQOL. However the determinants of HRQOL are several and complex, the body composition possessed by the participants can serve as a good indicator of HRQOL.

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