

## A Comparative Study Of Body Measurements In Post Graduate Female Students In Kashmir

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### Abstract:

Anthropometry is the scientific study of the measurements and proportions of the human body. Anthropometric measurements have been used to develop guidelines for nutritional status, growth, weight status and disease risk in both children and adults. The aim of study was to assess the anthropometric parameters of female day scholars and hostellers enrolled in different Universities of Kashmir. Using proportional allocation, a sample size of 525 female University students comprising of 350 hostellers and 175 day scholars were selected for the study. The parameters assessed during the study were weight, height, waist and hip circumference, Body Mass Index (BMI), Waist to Hip Ratio (WHR) and Waist Height Ratio (WhtR). Using SPSS software the data was subjected to descriptive analysis and various tests like mean, standard deviation, t test and f test, wherever required were used for interpretation. The mean BMI of married and unmarried respondents residing at home was 27.2 kg/m<sup>2</sup> and 24.32 kg/m<sup>2</sup> respectively whereas BMI of married respondents residing at hostel was 21.93 kg/m<sup>2</sup> and that of unmarried hostellers was 22.49 kg/m<sup>2</sup>. There was no significant difference in BMI of married day scholars and hostellers ( $t = 1.99$ ,  $p = 0.06$ ) whereas a significant difference was seen in BMI of unmarried day scholars and hostellers ( $t = 1.97$ ,  $p = <0.05$ ). The mean WHR of urban and rural day scholars was 0.86 and 0.84 respectively. However, WHR in urban hostellers was found to be 0.88 and in rural hostellers it was 0.87. A significant difference was seen in WHR of rural day scholars and hostellers, and hence the results were significant ( $t = 3.13$ ,  $p = <0.005$ ). It was concluded that the anthropometric indices with reference to BMI, were in normal range whereas the values depicted from the hostellers in terms of WHR were slightly greater than day scholars thus placing the former at more risk for developing various lifestyle disorders.

**KeyWords:** Anthropometry, day scholars, WHR, WhtR.

### INTRODUCTION:

Obesity is a medical state in which body fat gets accumulated in excess to such a great extent that it may have a negative effect on health. Both overweight and obesity are on rise in developing countries most commonly in urban settings. Obesity usually develops from the long term positive energy balance which is caused by imbalance in energy intake and energy expenditure.<sup>1</sup> A multiplicity of factors like faulty diet habits, lack of physical activities, genetic predisposition, physiological and psychological factors are responsible for the onset of obesity.<sup>2</sup> Obesity was once seen in developed countries but as of now it is seen growing in developed countries as well.<sup>3</sup> The risk of developing lifestyle related disorders like Diabetes Mellitus, myocardial infarction, stroke, hypertension and certain cancers increase with an increase in prevalence of overweight and obesity. Globally, overweight and obesity are the fifth leading factor for deaths across the world. At least 2 – 8 million adults die each year as a consequence of being overweight or obese.<sup>4</sup>

The aim of the study is to assess the different anthropometric parameters of female University students residing in different living arrangements enrolled in different Universities of Kashmir. Various relationships of anthropometric parameters with different living arrangements were studied.

**MATERIAL AND METHOD:**

The present study was a comparative one, done on female University day scholars and hostellers enrolled in different Universities of Kashmir. To draw a representative sample, four Universities were selected for the present survey. A sample size of 525 female University students in the age group of 21-24 years was selected from four Universities of Kashmir namely:

1. Sher-I-Kashmir University of Agricultural Sciences, Shalimar.
2. Islamic University of Science and Technology, Awantipora.
3. Central University, Ganderbal .
4. University of Kashmir, Hazratbal , Srinagar.

The formula used for deriving sample size is given below:

$$n = \frac{N \cdot X}{(X + N - 1)}$$

Where,

$$X = Z^2 \alpha/2 p (100-p)/MOE^2$$

$Z^2 \alpha/2$  is a critical value of normal distribution at  $\alpha/2$  and is equal to 1.96.

For a confidence level of 95%,  $\alpha$  is 0.05

MOE = Margin of error which is equal to 5%

P= Sample proportion

N= Population

Using proportional allocation, the sample size of hostellers in various Universities was 350 whereas the sample size of day scholars was calculated as 175 which was 20% of the enrolled students in different Universities. Since the population was homogenous, a random purposive sample was taken so that the power of test is 80%. The general details of the students like name, age, residence and family background were taken. The parameters assessed during the study were weight, height, waist circumference, hip circumference, Body Mass Index (BMI), Waist-to-hip Ratio (WHR) and Waist Height Ratio (WHtR).

Statistical analysis was done after collection of the data and it was analyzed and interpreted

**RESULTS**

The general profile of the respondents is given in the table below.

**TABLE 1**

S. No.	General Information	NumberN=525	Percentage
1.	<b>Accommodation</b>		
	➤ Day scholars	175	33.3%
	➤ Hostellers	350	66.6%
2.	<b>Marital status</b>		
	➤ Married	18	3.4%
	➤ Unmarried	507	96.6%
3.	<b>Name of the University</b>		
	➤ KU	334	63.6%
	➤ SKUAST	84	16.0%
	➤ IUST	46	8.7%
	➤ CU	61	11.6%
4.	<b>Habitation</b>		
	➤ Rural	338	64.4%
	➤ Urban	187	35.6%
5.	<b>Category</b>		
	➤ General	458	87.2%
	➤ Scheduled caste	10	1.9%
	➤ Scheduled tribe	14	2.7%
	➤ Other backward class	43	8.2%
6.	<b>Monthly family income (Rs.)</b>		
	➤ <10,000	8	1.5%
	➤ 10,000-20,000	17	3.2%
	➤ 20,000-30,000	81	15.4%

	➤ 30,000-40,000	91	17.3%
	➤ 40,000-50,000	130	24.8%
	➤ >50,000	198	37.7%

Table 1, reveals the general information of the respondents. In terms of accommodation, 350 (66.6%) respondents were hostellers and 175 (33.3%) were day scholars. Majority of the respondents 507(96.6%) were unmarried whereas only 18 (3.4%) were married. Out of 525 respondents, 334(63.6%) were enrolled in University of Kashmir, 84(16%) in Sher-I-Kashmir University of Agricultural Sciences, Shalimar, 61(11.6%) in Central University, Ganderbal and 46(8.7%) were enrolled in Islamic University of Science and Technology, Awantipora. As far as habitation is concerned, 338 (64.4%) of the respondents were from rural area and 187(35.6%) were from urban area. The respondents belonged to various social categories with majority 458 (87.2%) from general category, 10 (2%) from scheduled caste, 14 (2.7%) from scheduled tribe and rest of the respondents 43 (8.2%) belonged to other backward classes. In terms of economic conditions, 198 (37.7%) respondents had monthly family income of more than Rs. 50,000, 130 (24.8%) had in between Rs. 40,000 - 50,000, 91 (17.3%) between Rs. 30,000 - 40,000 , 81 (15.4%) between Rs. 20,000 – 30,000, 17 (3.2%) between Rs. 10,000 – 20,000 and 8 (1.5%) had below Rs. 10,000.

With regard to BMI, a majority (70.3%) of the day scholars were found to be having a normal body weight, followed by overweight, who formed 14.9% of the population, whereas, 72.6% hostellers were of normal weight and 19.1% were overweight. To ascertain the difference in BMI of day scholars and hostellers Z test was applied. The results reveal a significant difference in underweight day scholars and hostellers thus depicting an association in between BMI and type of living arrangement of respondents ( $Z = 2.26, p = <0.05$ ).

(Table 2).

**TABLE 2** Distribution of respondents according to BMI

BMI (kg/m <sup>2</sup> )	DAY SCHOLARS(N=175)		HOSTELLERS(N=350)		Z test	p value	Significance
	Frequency	Proportion	Frequency	Proportion			
<b>Underweight (&lt;18.5)</b>	23	0.13	25	0.07	2.26	<0.05	Sig
<b>Normal weight (18.5-24.9)</b>	123	0.70	254	0.72	0.47	0.63	Non Sig
<b>Overweight (25.0 – 29.9)</b>	26	0.15	67	0.2	1.42	0.15	Non Sig
<b>Obese Class 1(30.0 - 34.9)</b>	3	0.02	4	0.01	0.57	0.56	Non Sig

Significant at 0.05 level

Waist hip ratio assesses the abdominal obesity. The waist and hip circumference of the respondents depicted that most of the day scholars (62.9%) and 71.7% hostellers have high risk of developing metabolic disorders. The result of Z test, revealed that there was a significant difference in waist hip ratio of day scholars and hostellers in low risk group. The results were also significant in high risk day scholars and hostellers ( $Z = 2.08, p = <0.05$ ) as the ratio was higher in more hostellers than day scholars. Hence, there was a close association in between the waist hip ratio and the place of living. (Table 3).

**TABLE 3** Distribution of respondents according to WHR

WHR/Health risk	DAY SCHOLARS (N=175)		HOSTELLERS (N=350)		Z test	p value	Significance
	Frequency	Proportion	Frequency	Proportion			
<b>(≤ 0.80)/ Low</b>	32	0.18	30	0.08	3.40	<0.05	Sig

( 0.81- 0.85)/ Moderate	33	0.18	69	0.19	0.27	0.77	Non Sig
(≥ 0.86)/ High	110	0.62	251	0.71	2.08	<0.05	Sig

Significant at 0.05 level

The assessment of distribution of fat inside body is given by waist height ratio. The measurements revealed that according to the waist height ratio measurements, most of the day scholars (32.0%) were healthy and 25% were overweight. Moreover, 27% hostellers were very overweight and 24% were overweight. The application of Z test depicted that there was a significant difference in very overweight day scholars and hostellers ( $Z = 3.35$ ,  $p = <0.005$ ) revealing an association in between waist height ratio and type of living arrangement. (Table 4).

**TABLE 4** Distribution of respondents according to WHtR

WHtR	DAY SCHOLARS (N=175)		HOSTELLERS (N=350)		Z test	p value	Significance
	Frequency	Proportion	Frequency	Proportion			
Extremely slim ( $\leq 0.34$ )	3	0.01	9	0.03	1.43	0.15	Not Sig
Slim (0.35-0.41)	13	0.07	25	0.07	NA	-	NA
Healthy (0.42 – 0.48)	55	0.32	72	0.21	2.75	<0.005	Highly Sig
Overweight (0.49-0.53)	43	0.25	85	0.24	0.25	0.80	Non Sig
Very overweight (0.54-0.57)	24	0.14	96	0.27	3.35	<0.005	Highly Sig
Obese ( $\geq 0.58$ )	37	0.21	63	0.18	0.82	0.40	Non Sig

Significant at 0.05 level

The distribution of respondents as per their marital status and BMI with respect to their type of living arrangement is given in Table 6. The mean BMI of married day scholars and hostellers was  $27.2 \text{ kg/m}^2$  and  $24.32 \text{ kg/m}^2$  respectively. This depicted that BMI of married day scholars was more than that of hostellers. Moreover, it was also found that unmarried day scholars had less BMI than hostellers. The t test revealed that there was no significant difference in BMI of married respondents ( $t = 1.99$ ,  $p = 0.06$ ) whereas a significant difference was seen in BMI of unmarried respondents ( $t = 1.97$ ,  $p = <0.05$ ). Irrespective of type of living arrangement, the waist hip ratio of unmarried hostellers was more than day scholars and the differences were significant ( $p = <0.01$ ). The waist height ratio of respondents irrespective of their marital status residing in hostels was same however, the measurements of day scholars were higher in married respondents. (Table 5).

**TABLE 5** Distribution of respondents living in various living arrangements as per their anthropometric measurements and marital status

		Married				Unmarried			
BMI	Type of living arrangement	Mean ( $\text{kg/m}^2$ )	S.D	t value	p value	Mean ( $\text{kg/m}^2$ )	S.D	t test	p value
	Day scholars	27.28	2.70	1.99	0.06	21.93	3.04	1.96	<0.05
	Hostellers	24.32	3.08			22.49	3.08		
		Married				Unmarried			
WHR	Type of living arrangement	Mean	S.D	t value	p value	Mean	S.D	t test	p value
	Day scholars	0.81	0.04	4.10	<0.01	0.86	0.05	2.53	<0.01
	Hostellers	0.85	0.01			0.87	0.05		
		Married				Unmarried			
WHt.	Type of living	Mean	S.D	t value	p	Mean	S.D	t test	p

Ratio	arrangement				value				value
	Day scholars	0.58	0.04	2.16	0.04	0.50	0.07	3.46	<0.01
	Hostellers	0.52	0.05			0.52	0.06		

Table 6 shows that the mean BMI of urban day scholars and hostellers was 21.97 kg/m<sup>2</sup> and 23.49 kg/m<sup>2</sup> respectively. In rural setting, the mean BMI of respondents was almost similar, however, the results were significant (p = <0.05). The mean waist hip ratio of urban respondents was more than the respondents in rural setting. The mean waist height ratio of urban day scholars and hostellers was 0.50 and 0.53, the differences though were statistically significant (p = <0.001).

**TABLE 6** Distribution of students living in various living arrangements as per their anthropometric measurements and habitation

		Urban				Rural			
BMI	Type of living arrangement	Mean (kg/m <sup>2</sup> )	S.D	t value	p value	Mean (kg/m <sup>2</sup> )	S.D	t test	p value
	Day scholars	21.97	3.14	0.49	<0.01	22.39	3.25	0.14	<0.05
	Hostellers	23.49	2.76			22.32	3.13		
		Urban				Rural			
WHR	Type of living arrangement	Mean	S.D	t value	p value	Mean	S.D	t test	p value
	Day scholars	0.86	0.05	2.57	<0.01	0.84	0.04	3.13	<0.05
	Hostellers	0.88	0.03			0.87	0.05		
		Urban				Rural			
Wht. Ratio	Type of living arrangement	Mean	S.D	t value	p value	Mean	S.D	t test	p value
	Day scholars	0.50	0.06	3.66	<0.001	0.51	0.08	1.00	0.31
	Hostellers	0.53	0.05			0.52	0.06		

## DISCUSSION

Hostellers stay away from home and are free to consume food other than what is being provided at hostel. . Students in the present times often tend to select fast foods which are nutritionally inadequate and unhealthy instead of the wholesome food cooked at home. This practice is found to be more common among those residing in hostels and rental rooms. Most of the times, food provided in hostel is non palatable and thus hostellers often skip their meals and they prefer to eat outside. As per theircalculated BMI, more hostellers (19.1%) were seen to be overweight as compared to 14.9% day scholars. However, majority of day scholars (70.3%) and 72.6% hostellers were of normal weight. The finding is supported by the study (Satapathy, A., Satapathy, A., & Rout, S. 2021) in which it was found that more hostellers (40%) were overweight as compared to 21% day scholars .High consumption of fast food, junk food, high calorie and high fat food items outside hostels along with sedentary life style make hostellers more prone to development of obesity and its related disorders.Due to certain physical and biological factors, married people tend to put on weight. The findings are supported by the study of (Tzotzas, T., 2010) where it was seen that BMI and abdominal obesity was seen more in married, divorced and widowed respondents as compared to unmarried ones.In this study, similarly anthropometric indices of married respondents were on high end when compared with respondents who were not married. Waist hip ratio and waist height ratio are the determinants of abdominal obesity and over all distribution of fat in the body. When these parameters are above normal levels, this indicates the risk of an individual to develop metabolic disorders. As per the findings of study, the waist hip ratio of hostellers irrespective of their marital status was higher than day scholars. The study by Pallavi, R., Deepa, R., & Devaki, C. S. (2020) on working women residing in hostels revealed that majority (76%) of the hostellers were in high risk of developing metabolic disorders according to their waist hip ratio. The study done by Manoj Kar & Sasmita Behera (2021) revealed that the BMI of urban adolescents is higher than the adolescents residing in rural setting and the difference in mean BMI of urban and rural adolescents is significantly different. Hence, an association in between place of residence and BMI and other indices cannot be ruled out.

## CONCLUSION

The study revealed that the BMI of majority of the students was normal however the other indices of obesity which includes waist hip and waist height ratio were exceeding the normal range. It indicates that university students both day scholars and hostellers are at risk of developing lifestyle related disorders like cardiovascular disease, diabetes mellitus, hypertension etc. Since the students residing in hostels stay away from their homes they usually develop faulty eating habits which leads to the development of several diseases. It is very important to encourage healthy lifestyle and healthy food habits so that the danger of risk of developing chronic diseases is prevented.

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