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Relationship of Dietary Diversity with the Nutritional Status of Female University Students in Kashmir

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ABSTRACT: Hostellers stay away from home and are free to consume food other than what is being provided by the hostel. Students at present times often tend to eat fast food which is nutritionally inadequate and unhealthy. Thus, there is a need to assess the nutritional status in terms of Dietary Diversity and anthropometric measurements. Certain challenges were faced during the study while collecting data in terms of both primary as well as secondary. Regarding primary data, the respondents owing to their busy schedule showed reluctance towards providing details regarding their dietary intake for which they had to be motivated for a positive attitude. Concerning secondary data, a very less number of research articles in the context of Dietary diversity and anthropometric measurements were available in India in general and Srinagar in particular. The study aimed to assess the Dietary diversity score and its relationship with anthropometric parameters of female day scholars and hostellers enrolled in different Universities in Kashmir. The food intake pattern of the respondents was recorded by 24 hours recall method and nine food groups were used for Dietary Diversity Score (DDS) information. DDS was calculated according to Low DDS (≤3 Food groups), Moderate DDS (4-5 Food groups) and High DDS (≥6 Food groups). The anthropometric 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. The result revealed that 42.9% of day scholars and 44.6% of hostellers with normal weight exhibit medium Dietary Diversity scores. A significant difference was seen in the dietary diversity scores of hostellers concerning their waist-to-height and waist-to-hip ratio.

Keywords: Anthropometry, day scholars, WHR, WHtR, IDDS, FVS.

INTRODUCTION

Obesity is a medical state in which body fat gets accumulated in excess to such a great extent that it may harm health. Both overweight and obesity are on the rise in developing countries most commonly in urban settings. Obesity usually develops from the long-term positive energy balance which is caused by an imbalance in energy intake and energy expenditure (Foote *et al.,* 2004). There is a big challenge to establish the preliminary database on the dietary intakes among the Indian women (Bharathi, 2021). Undernutrition leads to long-term effects, including cognitive and growth deficits and reduced immunity to infections (Anupamma *et al.,* 2022). The foods away from home and a western style of food i.e., the higher fast-food intake devoid of vegetables and fruits make them more prone to menstrual irregularities like dysmenorrhea, irregular menstrual bleeding and menstrual cycles (Mughal, Zaib-Un-Nisa *et al.,* 2021).

A multiplicity of factors like faulty diet habits, lack of physical activities, genetic predisposition, and physiological and psychological factors are responsible for the onset of obesity (WHO, 2014). Obesity was once seen in developed countries but as of now, it is seen growing in developed countries as well (Goodarzi *et al.,* 2020). The risk of developing lifestyle-related disorders like Diabetes Mellitus, myocardial infarction, stroke, hypertension and certain cancers increases with an increase in the 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 (Kumar *et al.,* 2020).

Dietary diversity is the number of foods consumed across and between food groups over a given time. It reflects the perception that with an increase in food diversity and food groups, an intake of essential macro and micronutrients also gets ensured and thus promoted good health. It is an important indicator of diet quality (Darnton-Hill and Mkparu 2015). It gives an idea about the intake of varieties of food and thus reflects the substitute measure of micronutrient adequacy (Victora *et al.,* 2021). A diversified diet is a marker of a

balanced diet, a regulator of normal weight status and has a protective action against the development of non-communicable diseases (Zhao *et al.,* 2017). University students are commonly found to adopt harmful eating habits such as high consumption of snacks (Assaf *et al.,* 2019; Schmidt, 2012), high consumption of fast foods (Hultgren *et al.,* 2019), inadequate intake of fruits and vegetables (insufficient consumption of fruit and vegetables (El Ansari *et al.,* 2018) and change in traditional healthy to unhealthy eating patterns (Hadjimbei *et al.,* 2016). These dietary habits increase the risk of developing obesity (Conklin *et al.,* 2014). In the present study, an attempt was made to assess the relationship between the Dietary Diversity Score and anthropometric parameters of postgraduate female students enrolled in different Universities and residing in different living arrangements in Kashmir.

MATERIAL AND METHODS

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

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

The formula used for deriving sample size is given below:

$n=N.X/(X+N-1)$

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%, α 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 the test is 80%. For calculating IDDS, an interview method was employed to collect information regarding foods they had taken for the previous 24 hours. 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 AND DISCUSSION

The results given in Tables 1-7 revealed the assessment of the Dietary Diversity Score, anthropometric measurements and the relation between these parameters.

1. Dietary Diversity Score (DDS): Dietary diversity is the number of food groups consumed by an individual over some time. It is an indicator of diet quality. The majority of respondents (63.4%) day scholars and 65.1% hostellers depict a medium diversity score which means that they consumed food items from 4-5 food groups whereas a high dietary diversity score (≥6) was shown by 27.5% day scholars and 26.3% hostellers. However, the difference in diversity scores of respondents concerning their living arrangements was not significant (p=0.92). This indicated that there was no relation between dietary diversity score and type of living arrangement.

2. Body Mass Index (BMI): Concerning BMI, a majority (70.3%) of the day scholars were found to be having a normal body weight, followed by overweight, which formed 14.9% of the population, whereas, 72.6% of hostellers were of normal weight and 19.1% were overweight. Thus, it is seen that more hostellers were overweight as compared to day scholars. To ascertain the difference in BMI of day scholars and hostellers Z test was applied. The results revealed a significant difference in underweight day scholars and hostellers thus depicting an association between BMI and the type of living arrangement of respondents ($Z = 2.26$, $p = <0.05$).

3. Waist to Height ratio (WHtR): The assessment of the distribution of fat inside the 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% of hostellers were very overweight and 24% were overweight. The application of the 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 between waist height ratio and type of living arrangement.

4. Waist to Hip ratio (WHR): Waist hip ratio assesses abdominal obesity. The waist and hip circumference of the respondents depicted that most of the day scholars (62.9%) and 71.7% hostellers have a high risk of developing metabolic disorders. The result of the Z test revealed that there was a significant difference in the waist-hip ratio of day scholars and hostellers in the 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 between the waist-hip ratio and the place of living.

5. Body Mass Index and Dietary Diversity Score: Most of the respondents, (42.9%) day scholars and 44.6% hostellers with normal weight exhibit medium dietary diversity scores. Moreover, 3.4% of day scholars and 2.3% of hostellers who as per their BMI were overweight depicted high diversity scores. The difference in dietary diversity score of respondents in the context of BMI and residence was not significant, thus, validating the fact that there is no association between dietary diversity score and BMI concerning the type of living arrangement.

6. Waist to Height ratio and Dietary Diversity Score: Among day scholars, 20.6% of respondents with a

healthy waist-height ratio revealed a medium dietary diversity score whereas in hostellers, the same diversity score was shown by 17.1% of respondents who were very overweight. A significant difference was seen in the dietary scores of hostellers for their waist height ratio (p=<0.001). Thus, with an increase in dietary diversity score, the waist-to-height ratio also gets increased in hostellers.

7. Waist to Height ratio and Dietary Diversity Score: The majority of the respondents, (40%) day scholars and 46% hostellers who showed medium dietary diversity score had a high risk of developing the metabolic disease as their waist-hip ratio was ≥0.86. A significant difference was seen in dietary diversity scores and risk of developing metabolic disorders in hostellers (p=<0.001).

Students residing in hostels are independent in making food choices. With the inclusion of food outside their hostel they usually increase their dietary diversity. Kumar *et al.,* (2020) stated that poor eating habits are the most important health concern among young adults who switch to college or university life when they are exposed to stress and lack of time. These factors pose a hindrance to the adoption of healthy behaviours and can therefore result in poor eating habits. The study conducted by Papadaki *et al*. (2007) revealed that students living away from home develop unhealthy eating habits than students residing at their home. The regular consumption of market-available food over a long period leads to weight gain, particularly among hostellers. Satapathy *et al*. (2021) found that more hostellers (40%) were overweight as compared to 21% of day scholars. High consumption of fast food, junk food, high calorie and high-fat food items outside hostels along with a sedentary lifestyle make hostellers more prone to the development of obesity and its related disorders. Waist-hip ratio and waist-height ratio are the determinants of abdominal obesity and the overall distribution of fat in the body. When these parameters are above normal levels, this indicates the risk of an individual developing metabolic disorders. As per the findings of the study, the waist-hip ratio of hostellers was higher than day scholars. Pallavi *et al*., (2020) studied the anthropometric parameters of working women residing in hostels and reported that the majority (76%) of the hostellers were at high risk of developing metabolic disorders according to their waist-hip ratio.

Regarding BMI, most of the respondents depicted a medium dietary diversity score. The findings of the study by Khamis *et al.* (2021) revealed that a positive association was seen between Dietary diversity and BMI of female respondents which may be because females were more obese than males in all parameters concerned in the assessment of obesity. Kumar *et al*. (2020) found that most of the respondents (37.5%) in their study sample scored medium dietary diversity score and had normal weight, thus supporting the fact that there is no association between BMI and dietary diversity score of day scholars and hostellers. A study by Madlala *et al.* (2002) concluded that Dietary diversity was not related to nutritional status and cardiometabolic risk factors, except for the relationship of low Dietary diversity with an increased likelihood of elevated triglycerides. However, an association was seen in waist height ratio and dietary diversity score of hostellers in contrast to the study of Goodarzi *et al.* (2020) where the findings showed no association between the two. Nupo *et al.* (2019) found that dietary diversity scores are associated with waist-hip ratio which was in support of the findings of the study as an association between waist-hip ratio and dietary diversity score was seen in hostellers.

Table 1: Distribution of respondents according to their Dietary Diversity Score (DDS).

Dietary Diversity Score	Day Scholars (N=175)	Hostellers (N=350)	x^2	p-value
Low DDS (≤3)	16 (9.1%)	30 (8.6%)	0.15	0.92
Medium DDS (4-5)	111 (63.4%)	228 (65.1%)		
High DDS (≥6)	48 (27.5%)	92 (26.3%)		

Significant at 0.05 level

Table 2: Distribution of respondents according to BMI and type of living arrangement.

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

Significant at 0.05 level

Table 3: Distribution of respondents according to WHtR and type of living arrangement.

WHtR	Day Scholars (N=175)		Hostellers (N=350)		Z value	p-value	Significance
	Frequency	Proportion	Frequency	Proportion			
Extremely slim (≤ 0.34)	3	0.01	9	0.03	1.43	0.15	Non -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 (≥ 0.58)	37	0.21	63	0.18	0.82	0.40	Non-Sig

Significant at 0.05 level

Table 4: Distribution of respondents according to WHR and type of living arrangement.

WHR/Health risk	Day Scholars (N=175)		Hostellers (N=350)		Z value	p-value	Significance
	Frequency	Proportion	Frequency	Proportion			
(≤ 0.80)/ Low	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

Table 5: Distribution of respondents according to their BMI and Dietary Diversity Score (DDS).

BMI (kg/m^2)	Day Scholars (N=175)			Hostellers (N=350)		
	Low DDS (≤3)	Medium DDS (4-5)	High DDS (≥6)	Low DDS (≤3)	Medium DDS (4-5)	High DDS (≥6)
Underweight (<18.5)	2(1.1%)	17(9.7%)	4(2.3%)	1(0.3%)	16(4.6%)	8(2.3%)
Normal weight (18.5-24.9)	11(6.3%)	75(42.9%)	37(21.1%)	23(6.5%)	156(44.6%)	75(21.4%)
Overweight (25.0 – 29.9)	2(1.1%)	18(10.3%)	6(3.4%)	5(1.4%)	54(15.4%)	8(2.3%)
Obese Class 1 (30.0 - 34.9)	1(0.6%)	1(0.6%)	1(0.6%)	1(0.3%)	2(0.6%)	1(0.3%)
x^2	4.45			11.75		
P value	0.61			0.68		
Phi	0.15			0.18		
Cramer's V	0.11			0.13		

Significant at 0.05 level

Table 6: Distribution of respondents according to their Waist Height Ratio (WHtR) and Dietary Diversity Score (DDS).

WHtR	Day Scholars (N=175)			Hostellers (N=350)		
	Low DDS (≤3)	Medium DDS (4-5)	High DDS (≥6)	Low DDS (≤3)	Medium DDS (4-5)	High DDS (≥6)
Extremely slim (≤ 0.34)	1 (0.6%)	1 (0.6%)	1 (0.6%)	1 (0.3%)	3 (0.9%)	5 (1.4%)
Slim (0.35-0.41)	2 (1.1%)	7 (4%)	4 (2.3%)	1 (0.3%)	23 (6.6%)	1 (0.3%)
Healthy (0.42 – 0.48)	9 (5.1%)	36 (20.6%)	10 (5.7%)	5 (1.4%)	47 (13.4%)	20 (5.7%)
Overweight (0.49-0.53)	2 (1.1%)	31 (17.8%)	10 (5.7%)	4 (1.1%)	45 (12.8%)	36 (10.3%)
Very overweight (0.54-0.57)	1 (0.6%)	12 (6.8%)	11 (6.3%)	9 (2.6%)	60 (17.1%)	27 (7.7%)
Obese (≥ 0.58)	1 (0.6%)	24 (13.7%)	12 (6.8%)	10 (2.9%)	50 (14.3%)	3 (0.9%)
x^2	16.21			41.83		
p-value	0.09			<0.001		
Phi	0.30			0.34		
Cramer's V	0.21			0.24		

Significant at 0.05 level

Table 7: Distribution of respondents according to their Waist Hip Ratio (WHR) and Dietary Diversity Score (DDS).

WHR/Health risk	Day Scholars (N=175)			Hostellers (N=350)		
	Low DDS (≤3)	Medium DDS (4-5)	High DDS (≥6)	Low DDS (≤3)	Medium DDS (4-5)	High DDS (≥6)
(≤ 0.80)/ Low	Nil	25 (14.3%)	7 (4%)	1 (0.2%)	24 (6.8%)	5 (1.4%)
(0.81- 0.85)/ Moderate	4 (2.3%)	16 (9.1%)	13 (7.4%)	12 (3.4%)	43 (12.3%)	14 (4%)
(≥0.86)/High	12 (6.9%)	70 (40%)	28 (16%)	17 (4.8%)	161 (46%)	74 (21.1%)
x^2	8.1			12.05		
p-value	0.08			<0.01		
Phi	0.21			0.18		
Cramer's V	0.15			0.13		

Significant at 0.05 level

CONCLUSIONS

The BMI of most of the students was normal however the other parameters of assessing obesity which include waist hip and waist height ratio were exceeding the normal range. A strong association was seen in dietary diversity scores and anthropometric parameters of students, particularly in hostellers. They were found to be at more risk of developing sedentary lifestyle disorders as was evident from their dietary diversity and anthropometric indices.

FUTURE SCOPE

With the help of dietary diversity score, researchers can further assess the nutrient adequacy of diets in young adults, particularly among University day scholars and hostellers.

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Conflict of Interests. None.

REFERENCES

Anupama, C., Shwetha B. N., Mallika Meti and Doddabasappa, B. (2022). A Study on Impact of Demonstration of Nutrition Garden for Year-round Nutrition Security in Farm Families. *International Journal of Theoretical & Applied Sciences, 14*(2), 47-51.

Assaf, I., Brieteh, F., Tfaily, M., El-Baida, M., Kadry, S. and Balusamy, B. (2019). Students University healthy lifestyle practice: a quantitative analysis. *Health information science and Systems*, *7*, 1-12.

Bharathi, R. (2021). Dietary and Nutrient Intakes of Rural and Urban Women: A Study from South India. *International Journal of Theoretical & Applied Sciences, 13*(1), 19-25.

Conklin, A. I., Forouhi, N. G., Surtees, P., Khaw, K. T., Wareham, N. J. and Monsivais, P. (2014). Social relationships and healthful dietary behaviour: evidence from over-50s in the EPIC cohort, UK. *Social science & medicine*, *100*, 167-175.

Darnton-Hill, I. and Mkparu, U. C. (2015). Micronutrients in Pregnancy in Low and Middle-Income Countries. *Nutrients, 7*(3), 1744–1768.

El Ansari, W., Ssewanyana, D. and Stock, C. (2018). Behavioural health risk profiles of undergraduate university students in England, Wales, and Northern Ireland: a cluster analysis. *Frontiers in public health*, *6*, 120.

Foote, J. A., Murphy, S. P., Wilkens, L. R., Basiotis, P. P. and Carlson, A. (2004). Dietary variety increases the probability of nutrient adequacy among adults. *The Journal of Nutrition*, *134*(7), 1779-1785.

Global health observatory data. WHO fact sheets.

Goodarzi, G., Keshavarz, S. A., Hosseini-Esfahani, F. and Ataie-Jafari, A. (2020). Associations between Dietary Diversity Scores and Obesity Phenotypes in Women. *Nutrition and Food Sciences Research*, *7*(4), 13-18.

Hadjimbei, E., Botsaris, G., Gekas, V. and Panayiotou, A. G. (2016). Adherence to the Mediterranean diet and lifestyle characteristics of university students in Cyprus: A cross-sectional survey. *Journal of Nutrition and Metabolism*, *2016*.

Hultgren, B. A., Turrisi, R., Cleveland, M. J., Mallett, K. A., Reavy, R., Larimer, M. E. and Hospital, M. M. (2019). Transitions in drinking behaviours across the college years: A latent transition analysis. *Addictive behaviours*, *92*, 108-114.

Khamis, A. G., Ntwenya, J. E., Senkoro, M., Mfinanga, S. G., Kreppel, K., Mwanri, A. W. and Kwesigabo, G. (2021). Association between dietary diversity with overweight and obesity: A cross-sectional study conducted among pastoralists in Monduli District in Tanzania. *Plos one*, *16*(1), e0244813.

Kumar, A., Ayub, A., Roy, R., Rai, A., Ameta, B., Latheef, A. and Kumar, P. (2020). Assessment of diet diversity and eating pattern of undergraduate students: a Pan India study. *International Journal of Medicine and Public Health*, *10*(2), 58-63.

Madlala, S. S., Hill, J., Kunneke, E., Kengne, A. P., Peer, N. and Faber, M. (2022). Dietary diversity and its association with nutritional status, cardiometabolic risk factors and food choices of adults at risk for type 2 diabetes mellitus in cape town, South Africa. *Nutrients*, *14*(15), 3191.

Mughal, Zaib-Un-Nisa, Zai, J.A., Kazi, M.A., Gill, N.P., Mangrio, F.W., Brohi, N., Hussain, A., Majeed, S., Gulab, A. and Shaikh, R. (2021). Association of Menstrual Disturbance with Lipid Profile and Food Habits in Female University Students. *International Journal on Emerging Technologies, 12*(2), 31–36.

Nupo, S., Oguntona, C., Oguntona, B., Nupo, A., Akinlotan, J. and Ilori, A. (2019). Association Between Dietary Diversity, Waist to Hip Ratio and Cardiovascular Diseases Among Selected African Women (P10-079-19). *Current Developments in Nutrition*, *3*(Supplement_1), nzz034-P10.

Pallavi, R., Deepa, R., & Devaki, C. S. (2020). A Study on Assessment of Nutritional Status and Nutritional Knowledge of Working Women Residing in Hostels at

Mysuru City. *Journal of Food Processing and Technology*, *11*, 841.

Papadaki, A., Hondros, G., Scott, J. A. and Kapsokefalou, M. (2007). Eating habits of university students living at, or away from home in Greece. *Appetite*, *49*(1), 169-176.

Satapathy, A., Satapathy, A. and Rout, S. (2021). Dietary Habits and Prevalence of Obesity in OUAT Girls Hostel, Bhubaneswar, Odisha, India. *International Research Journal 2021*, Vol II.

Schmidt, M. (2012). Predictors of self-rated health and lifestyle behaviours in Swedish university students. *Global Journal of Health Science*, *4*(4), 1.

Victora, C. G., Christian, P., Vidaletti, L. P., Gatica-Domínguez, G., Menon, P. and Black, R. E. (2021). Revisiting Maternal and Child Undernutrition in Low-Income and Middle-Income Countries: Variable Progress towards an Unfinished Agenda. *Lancet*, *397*(10282), 1388–1399.

WHO (2014). WHO fact sheet on overweight and obesity, 2014. Available at:http://www.WHO.int/mediacentre/fact sheets/fs 416/en/. Accessed 5 May 2014.

Zhao, W., Yu, K., Tan, S., Zheng, Y., Zhao, A. and Wang, P. (2017). Dietary diversity scores: an indicator of micronutrient inadequacy instead of obesity for Chinese children. *BMC Public Health, 17*(1), 440.

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