



Assessment Of Nutritional Status And Eating Behavior Among Undergraduate Nursing Female Students Of Birbhum District Of West Bengal: A Cross-Sectional Pilot Study

Shaonee Saha¹, Dr. Reetapa Biswas^{2*}

¹ Department of Food and Nutrition, West Bengal State University, Barasat, North 24 Parganas, West Bengal, India, Pin code-700126, Email: shaonee.saha2@gmail.com

^{2,*}Department of Food and Nutrition, West Bengal State University, Barasat, North 24 Parganas, West Bengal, India, Pin code-700126, Email: biswasreetapa@gmail.com

***Corresponding author: Dr. Reetapa Biswas**

Department of Food and Nutrition, West Bengal State University, Barasat, North 24 Parganas, West Bengal, India, Pin code-700126, Email: biswasreetapa@gmail.com

Abstract

One of the most common psychological and lifestyle disorders of adolescent girls of 21st century is eating disorder(ED) especially among students of health background; characterized by preoccupation with food, body size and shape. Food restriction, overeating both are categorized under ED. The objective of the study is to determine the prevalence of ED among female nursing students of Birbhum and its association with Body mass index(BMI), anemia and menstruation frequency. The pilot study was done on 100 students of a private nursing college of 19-20 years with self-reported Eating Disorder Examination Questionnaire(EDE-Q). Participants were selected by random sampling method. Height, weight and skin fold measurements were taken. Clinical signs of anemia were checked. Pearson's Correlation between ED and BMI, body fat percentage and Chi-square test for association of ED with anemia and menstruation frequency were done. 11% students were detected to have ED. Among them, 4 persons were overweight and 5 were obese. 24% population were detected with mild anemia among them 5 girls has ED. 3% students have both ED and irregular menstruation and only 4% students of the rest have irregular menstruation. Weight and shape concern of ED population was also found to be positively correlated. Overweight and irregular menstruations are associated with ED that should be taken into consideration during any ED prevention programme.

CC License
CC-BY-NC-SA 4.0

Keywords: Body fat percentage, Body mass index, Eating disorder, Nursing students, Obesity.

1. INTRODUCTION:

A serious psychological and lifestyle related disorder of adolescent girls of 21st century is eating disorder (ED). ED is characterized by excessive preoccupation with food, body image and weight mainly during the adolescent

age. The disorder mainly arises from psychological domain where several emotional, social and behavioral factors affect the mentality of young adolescent girls to be thin (1,2,3). Along with severe weight reduction; another type that is, feeling out of control while eating with no concern on body weight was identified, named binge eating disorder and categorized under the umbrella of ED in Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-V) (4-9). Among various types of ED, anorexia nervosa was the first identified eating disorder among young females of middle- and upper- class families of western countries. Media, peer influence, family pressure are some common causes of the disorder (10). Gradually, the concept of desire to be thin with perfect body structure has spread all over the world with rapid globalization and influence of social media and ED becomes very common problem among females in recent years worldwide (11), along with faulty and irregular food habit and poor lifestyle management (1,2). According to WHO, unhealthy eating behaviors increases the risk of malnutrition and several chronic diseases (12).

Some studies revealed that adolescents or young adults from health background in India were more likely to develop ED but the exact cause of developing this problem in such background was not clearly defined (13). A quite high percentage of ED was observed in different states of India in last 10 years. Among female medical and nursing students some of the latest prevalence in India are 13.6% in a private college of South India in 2020 (13), 48.2% in Bangalore in 2017 (14), 29.2% in Karnataka in 2016 (15), 16.9% in Adichunchanagiri in 2015 (16). The latest work in Howrah district of West Bengal on adolescent girls of 14-21 years revealed 38.3% eating disorder case along with family and peer pressure on body image (17). So, the present cross-sectional study is carried out to observe the eating related behaviors among female nursing students of Birbhum district of West Bengal. The aims of our study are-

- i) To find out prevalence of ED among undergraduate nursing students of Birbhum
- ii) To determine their nutritional status
- iii) To find out relation between nutritional status and eating disorder.

2. METHODS:

• Study area and population:

The study was conducted on undergraduate female nursing students of 19-20 years age from a private nursing college of Birbhum district, West Bengal, India. Depending on researcher's feasibility 3 private nursing colleges of Birbhum was approached for conducting the survey work and only one college gave consent. The students of 1st semester were surveyed. The batch comprises of 145 students. The inclusion criteria for the study were gender (only female), age (19-20 years), unmarried and residing at college hostel. From sample size determination formula, required sample size became 107. The students were asked for participation in the survey work. 120 students showed interest and among them 107 was selected randomly. Out of 107 students who were not from Birbhum (n=3), did not reside in college hostel (n= 3) and having PCOD (n=1) were excluded. So, the final survey was done on 100 students. Sample size was calculated from Yamane's formula-

$$n = \frac{N}{1+N(e^2)}$$

[n= sample size, N= Population size, e= level of precision] (18)

Here, population number was (N)= 145; if maximum variability is equal to 50% at 95% confidence level with $\pm 5\%$ precision level the required sample size is-

$$n = \frac{145}{1+145(.05^2)} = 106.422 \approx 107$$

• Ethical consideration:

Participant consent forms were signed by the participants. They were made aware about the problem of ED, objective of the study and nature of the questionnaire. Confidentiality of all the data was maintained and it was assured to the participants. All procedures performed in the study regarding human participants were in accordance with the 'Ethical Guidelines for Biomedical Research on Human Subjects' of Indian Council of Medical Research (ICMR), revised version of 2006. The study was approved by West Bengal State University Institutional Ethics Committee (IEC) for Research on Human Subjects (approval no. WBSU/IEC/30/05).

- **Sociodemographic data:**

Sociodemographic data were taken for monthly family income and family type. Family income influences food buying capacity and food choice and family type also influences individual's eating habits (19) developed from childhood.

- **Anthropometric data:**

Anthropometric measurements (height, weight, waist and hip circumference, skin fold measurements at three sites) were taken with standard protocol. Body mass index (BMI) was calculated from current height and weight. Height was taken using anthropometric measuring rod at bare foot on flat surface. Weight was measured on digital weight machine. Waist-hip circumference was taken using non stretching measuring tape and ratio was determined (20). Skin fold measurements were taken by skin fold callipers at three sites- triceps, supriliac, and thigh portions and the average value was taken. From there body fat percentage was calculated using Jackson and Pollock body fat percentage formula (21). The data were collected by trained researcher in a secret room.

- **Clinical signs:**

Clinical signs for anemia and eczema were observed. Bowel habits of individuals were asked. All the data were collected by investigator herself.

- **Eating behavior:**

Eating attitude behavior was assessed by using Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn et al., 2014) (21). EDE-Q is a 28 items self-report questionnaire. It includes eating habit and body shape behavior of last 28 days. It consists of four subscales (restraint, eating concern, shape concern, and weight concern), based on 22-item responses measured on 7 point Likert scale, assessing ED psychopathology and six items measuring the occurrence and frequencies of key eating disorder behaviors. All the questions were described to them and then they were asked to fill the questions accordingly. Students scoring equal to or more than cut off level that are 4 were considered 'at risk of eating disorder'. Participants scoring below 4 were determined as 'control' group. The questionnaire also includes menstruation frequency, use of pill to influence menstruation in past three months.

- **Dietary history:**

Dietary history of the participants was recorded by 24-hours recall method for three days in a printed questionnaire. The amount of energy, carbohydrate, protein, fat consumed were calculated by using Indian Council of Medical research (ICMR) food composition table, 2017 (22). Average consumption of each macronutrient was calculated. Mean dietary intake of participants was compared with Indian Recommended Dietary Allowances (RDA) 2010 (23).

All participants live in hostel and consume meal provided from hostel canteen. In such case, dietary inventory method is generally used (20). But some students skip breakfast, or take food from outside and all the students take lunch from either college canteen or outside. So, individual dietary intake varies. 24 hours dietary recall method helps to analyse individual dietary intake.

- **Analysis of data:**

Descriptive statistics (pie chart, bar diagram) were used to show various data. Correlation of was performed for ED global score with body fat percentage, BMI and WHR and subscale scores was obtained by Pearson's r correlation test. Chi-square test was performed to determine the association of anemia and menstruation frequency with ED. 95% confidence level was set for p value <0.05. Data were analysed in IBM-SPSS (version 16).

3. RESULTS AND DISCUSSIONS:

ED cases were found to be more among students belonging from nuclear family. Personal likings, pampering of parents make them to fulfill their desires and it develops more eating preferences among them.

In Indian circumstances, study revealed more cases of mental disorders among children or adolescents of nuclear family due to parent-child conflict, demand of parents for academic excellence, not fulfilling undesirable demands of children, lack of regulation by head of family aggressiveness of children etc. puts them on emotional eating (24).

Family wise distribution of ED is shown in *table 1*.

Table 1: Presentation of ED according to sociodemographic data

	EDE score >4	EDE score <4
Family type		
<i>Nuclear</i>	8	62
<i>Joint</i>	3	27
Family income		
<i>Less than 15K</i>	1	36
<i>Between 25-40K</i>	5	50
<i>Above 40K</i>	2	6

≠ED is present among students belonging from both the family types and all range of incomes.

The prevalence of ED among the population is shown in *table 2*. Out of 100 students, 11 were found to have ED as they scored above the cut-off marks i.e., 4 in the questionnaire. So, 11% population had ED with a mean of 4.22. The prevalence of ED of our study is consistent with the study by Thangaraju et al. (13) where ED prevalence was found 13.6% by the same questionnaire. But this the least prevalence rate in India till date among this age group.

Table 2: Response in EDE-Q (n=100)

EDE-Q score	n(%)	Mean \pm SD
More than or equal to 4	11	4.22 \pm 0.21
Less than 4	89	0.77 \pm 0.66

≠11% students scored more than 4 in the questionnaire and detected to have eating disorder with mean and SD of 4.22 \pm 0.21.

Distribution of BMI is shown in *table 3*. The table shows 4% students are overweight and 5% are obese who also have ED. Among rest of the population most of them i.e., 44% are in normal BMI category and 27% are underweight. This value is comparable with the study of Balhara et. al in 2012 where underweight value was 31.1% among medical and nursing undergraduate students (25). Only a little percentage shows overweight (21%) and this may be due to genetic pattern or abnormal hormonal response. 5% obesity has been found among people having ED which is similar to the study done by Shashank et. al (15) where 3% overweight and obesity was observed among females medical students with ED assessed by SCOFF questionnaire and 2% obesity by EAT-26 questionnaire. 17.4% overweight was found by Ramaiah in 2015 among female medical students living in hostel though prevalence of ED was slightly higher in that study (16).

Difference in prevalence rate of ED among various places may be due to cultural variation, nature and lifestyle of participants, and usage of different questionnaires. This study indicates almost similar prevalence of overweight or obesity among female students of health background especially those having ED. This brings the urgent need to find out proper cause of ED among them and its prevention method to overcome such concern.

Table 3: Distribution of BMI among the population (n=100)

Body mass index	EDE score >4	EDE score <4	Total
Underweight (<18.5)	1	27	28
Normal (18.5-24.9)	1	44	50
Overweight (\geq 25- 29.9)	4	17	21
Obesity (\geq 30.0)	5	1	6
Total	11	89	100

≠Body mass index classification was done according to WHO range where half of the population belonged in normal weight. 21% were overweight and out of them 4 students has eating disorder.

Table 4 shows that the mean intake of calorie and protein are lower, and more fat compared to RDA of 2010 (23). RDA of carbohydrate was not given in the revised RDA chart 2010. But amount of carbohydrate consumed by the participants was calculated along with other macronutrients and mentioned in the table.

The cases of overweight and obesity were high among participants having ED. Incident of secret eating or avoidance of food for prolonged time to reduce weight are another hidden cause of overweight. During investigation, it was seen that most of the students skip breakfast due to late rising, study pressure or rush for

classes. Monotony to hostel foods results in food avoidance. Some students prefer to skip breakfast or lunch for weight reduction. The body functions differently in response of insulin after a long-time meal gap. Food consumption after a meal skipping increases hunger and causes insulin surge that ultimately brings insulin resistance that reduces carbohydrate utilization which triggers weight gain (26). Further, high amount of food intake at a time increases insulin secretion which stimulates lipogenesis by triggering expression of lipogenic enzymes and suppresses lipolysis by inhibiting hormone-sensitive lipase (27).

Table 4: Mean nutrient consumption by the participants

Nutrients	Amount
Energy	1833.24 kcal
Carbohydrate	266.71 g
Protein	51.72 g
Fat	46.1 g

≠Nutritive value of the macronutrients and energy were calculated from their responses using Indian Food Composition Table, 2017 (IFCT).

Association between anemia and ED was assessed by chi-square test at 5% significant level. Only 24% population has been detected with mild anemia among them 5 persons have ED (table not shown). **The association is not statistically significant.** This means ED may not always develop anemia. Incidence of anemia is also low among the whole population. The hostel diet is inadequate in iron content that may be the reason of mild early stage of anemia among some students. Only clinical symptoms of anemia were seen. The study contradicts with study of Nivedita et al. where anemia case was lower among ED population but high among rest of the study population (28).

Table 5 shows association of ED with menstruation frequency. Irregular menstruation has been observed among 7% participants among them 3% students have ED. **A statistically significant (p<0.05) result has been found** indicating an association of irregular menstruation or loss of menstruation with ED. Though 24% population has been detected with mild anemia, it does not affect menstruation frequency but puts them at risk of developing severe form of anemia or irregular menstruation in future. Nutritional deficiency arising from ED adversely alters hormonal response and body storage of fat which leads to irregular menstruation.

Table 5: Association between menstruation frequency and eating disorder

Eating disorder	Menstruation		Total	Test for significance	
	Regular	Irregular		χ^2	p (2- tailed)
Yes	8	3	11	7.803 ^a	0.005
No	85	4	89		
Total	93	7	100		

a. 0 cells (0.0%) have expected frequency less than 5% and computed for 2*2 contingency table. p=0.005 (<0.05) indicates significant association between eating disorder and menstruation frequency and alternative hypothesis is accepted.

Statistically significant and positive correlation between mean ED global score, body fat percentage and body mass index are seen in table 6. That means BMI and body fat percentage increase with ED. The correlation of BMI and body fat percentage with ED is moderate. The high BMI and body fat percentage may be indicators of binge eating. So, these two factors should be considered as risk factors of ED.

The nutritional status greatly depends upon amount and type of food intake (29). Here some students reported to practice portion control or meal skipping mainly breakfast. Breakfast has important role in our nutrition. Skipping breakfast is associated with weight gain as it lowers satiety and increases hunger throughout the day, sometimes makes craving to the next meal or to some foods. This results in weight gain and high BMI (30).

Stress or hormonal imbalances are also responsible for increased body weight.

WHR is negatively related with ED but not significant. High WHR was shown as a protective factor from ED as fat deposition in the gluteal area is associated with obesity, body image dissatisfaction and negative weight control and eating attitudes (31).

Table 6: Correlation coefficient (r) between ED global score, body fat percentage and BMI

	Global score	p value
Body fat percentage	0.427*	0.000
BMI	0.441*	0.000
WHR	-0.047	0.660 (NS)

≠WHR= waist hip ratio, NS= not significant. *Correlation is significant at the 0.05 level (2-tailed). Significantly high positive correlation is observed between eating disorder global score and body mass index and body fat percentage.

Relation between ED subscale scores (restraint, eating, shape and weight concern) were seen by Pearson's r correlation test. There is statistically significant positive correlation between the subscale scores of the questionnaire. Among them, **strongly high relationship exists between weight and shape concern** indicating people who are very much conscious about body shape follow weight control behaviors. This is also applicable for people without having ED who try to influence their body weight and shape but responses in other subscales of the questionnaire is low. It is shown in *table 7*.

Though family type plays a role on emotional behavior of adolescents and development of ED (32), here role of family was nil as all the participants live in hostel.

Table 7: Correlation between subscale scores

	<i>Restraint scale</i>	<i>Eating scale</i>	<i>Weight scale</i>	<i>Shape scale</i>
<i>Restraint scale</i>		0.648*	0.687*	0.733*
<i>Eating scale</i>	0.648*		0.709*	0.750*
<i>Weight scale</i>	0.687*	0.709*		0.920*
<i>Shape scale</i>	0.733*	0.750*	0.920*	

*= Significant at 95% CI. Correlation is significant at the 0.05 level (2-tailed). Weight and shape concern shows strongly high positive correlation.

Our study has some strengths and limitations.

4. CONCLUSION:

Many studies on prevalence of ED have been performed in different parts of the world at different times but Indian studies are limited; especially in West Bengal. As per our knowledge, this is the second pilot study after Howrah. The present study shows that the adolescent nursing students are very concerned about their eating habits, body weight and shape. This study shows a positive correlation of ED global score with BMI and body fat percentage. These two factors can be regarded as risk factors of ED and their strength to develop ED should be determined. The response in different subscales is also very diverse. Proper understanding of dietary requirement and importance of adequate regular exercise by adolescent girls are required. The lessons can be promoted in school or colleges as awareness programs. A universal questionnaire and longitudinal study in the community are required to obtain a consistent result in a particular place. Our study result about prevalence rate is very close to some other studies but sample size was small. As the study area was only one college of Birbhum, the result cannot be generalized for all female adolescents of the district. But it provides information on health status and eating behaviors of adolescent nursing students. The response rates in questionnaire are solely based on their reply so some biasness may be present. Several studies can be carried out to find out the prevalence among medical students of other districts of West Bengal. Moreover, hemoglobin test of the students found anemic by clinical symptoms would obtain better result of anemic status of adolescent nursing students of the institution.

Acknowledgement:

The authors would like to thank each other for their contributions in data collection. I would also like to thank the corresponding author for her supervision, support and assistance in preparation of manuscript. We have no funding for the study.

Funding sources:

The authors received no financial support for the research, authorship, and publication of this article.

Conflict of Interest:

The authors declare no conflict of interest.

REFERENCES:

1. Zam W., Saijari R., Sijari Z. (2018). Overview on eating disorders. *Progress in Nutrition*, 20(2-S):29-35.
2. Jones J. M., Bennett S., Olmsted M. P., Lawson M. L., Rodin G. (2001). Disordered eating attitudes and behaviours in teenaged girls: a school-based study. *Cmaj*, 165(5):547-52.
3. Babu S. S., Aroor A. R. (2017). Eating disorder among Indian adolescent. *Ind J Youth Adol Health*, 4(1): 11-15.
4. Upadhyay A., Mishra R. (2014). Prevalence and risk factors for eating disorder in Indian adolescent females. *National Journal of Physiology Pharmacy and Pharmacology*, 4(2):153-157.
5. Smink F. R., Van Hoeken D., Hoek H. W. (2012). Epidemiology of eating disorders: incidence, prevalence and mortality rates. *Current psychiatry reports*, 14(4):406-14.
6. Fairburn C. G., Bohn K. (2005). Eating disorder NOS (EDNOS): an example of the troublesome “not otherwise specified”(NOS) category in DSM-IV. *Behaviour research and therapy*, 43(6):691-701.
7. Erriu M., Cimino S., Cerniglia L. (2020). The role of family relationships in eating disorders in adolescents: a narrative review. *Behavioral Sciences*, 10(4):71.
8. Vo M., Accurso E. C., Goldschmidt A. B., Le Grange D. (2017). The impact of DSM-5 on eating disorder diagnoses. *Int J Eat Disord*, 50(5):578-81.
9. Keel P. K., Brown T. A., Holland L. A., Bodell L. P. (2012). Empirical classification of eating disorders. *Annu Rev Clin Psychol*, 8:381-404.
10. Polivy J., Herman C. P. (2002). Causes of eating disorders. *Annu Rev Psychol*, 53(1):187-213.
11. Cruz-Sáez S. et al. (2013). Risky eating behaviors and beliefs among adolescent girls. *Journal of Health Psychology*, 0(0): 1-10.
12. Duarte L.S., Palombo C.N., Solis-Cordero K., Kurihayashi A.Y., Steen M., Borges A.L., Fujimori E. (2021). The association between body weight dissatisfaction with unhealthy eating behaviors and lack of physical activity in adolescents: A systematic review. *Journal of Child Health Care*, 25(1):44-68.
13. Thangaraju S. I., Karpagalakshmi R., Arumuganathan S., Usaid S., Devi S. S., Sethumadhavan V. (2020). A cross-sectional study on prevalence of eating disorder and body image disturbance among female undergraduate medical students. *Journal of Mental Health and Human Behaviour*, 25(1):53.
14. Vijayalakshmi P., Thimmaiah R., Reddy S. S. N., Kathyayani B. V., Gandhi S., Math S. B. (2017). Gender Differences in Body Mass Index, Body Weight Perception, weight satisfaction, disordered eating and Weight control strategies among Indian Medical and Nursing Undergraduates. *Invest Educ Enferm*, 35(3): 276-284.
15. Shashank K. J., Gowda P., Chethan T. K. (2016). A cross-sectional study to assess the eating disorder among female medical students in a rural medical college of Karnataka State. *National Journal of Community Medicine*, 7(06):524-7.
16. Ramaiah R. R. (2015). Eating disorders among medical students of a rural teaching hospital: a cross-sectional study. *International Journal of Community Medicine and Public Health*, 2(1): 25-28.
17. Ganguly N., Roy S., Mukhopadhyay S. (2018). Association of socio-culture factors with disordered eating behavior: An empirical study on urban young girls of West Bengal, India. *Anthropological review*, 81(4), 364–378.
18. Nanjundeswaraswamy T. S. & Divakar S. (2021). Determination of sample size and sampling methods in applied research. *Proceedings on Engineering Sciences*, 3(1), 25-32.
19. Burns C., Cook K., Mavoia H. (2013). Role of expendable income and price in food choice by low income families. *Appetite*, 71:209-217.
20. Das, S. (2014). Assessment of Nutritional Status. Textbook of Community Nutrition Second edition, 15-25.
21. Alizadeh Z., Rostami M. (2011). Body mass index and percentage of body fat as indicators for obesity in an adolescent athletic population: why the jackson-pollock formula?. *Sports Health*, 3(5):421.
22. Longvah T., Anantan I., Bhaskarachary K., Venkaiah K., Longvah T. Indian food composition tables. Hyderabad: National Institute of Nutrition, Indian Council of Medical Research; 2017.
23. Sesikeran B. Revised RDA for Indians. National Institute of Nutrition ICMR, Hyderabad. 2010.
24. Chadda, R. K., & Deb, K. S. (2013). Indian family systems, collectivistic society and psychotherapy. *Indian journal of psychiatry*, 55(Suppl 2), S299-S309.
25. Balhara Y. P. S., Yadav T., Arya K., Mathur S., Kataria D. K. (2012). A Cross-sectional study on body shape and eating attitude among Indian female healthcare students. *Int. J. Psychiatry in Medicine*, 43(4): 309-323.

27. Kobayashi F., Ogata H., Omi N, Nagasaka S., Yamaguchi S., Hibi M., Tokuyama K. (2014). Effect of breakfast skipping on diurnal variation of energy metabolism and blood glucose. *Obesity research & clinical practice*, 8(3):e249-57.
28. Vargas E., Joy N.V., Carrillo Sepulveda M. A. Biochemistry, Insulin Metabolic Effects In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. 2022; PMID: 30252239.
29. Nivedita N., Sreenivasa G., Rao T. S., Malini S. S. Eating disorders: Prevalence in the student population of Mysore, South India. *Indian journal of psychiatry*. 2018; 60(4):433.
30. Ali, S. I., Abber, S. R., & Keel, P. K. (2023). Purging Disorder: Impact on Diet and Nutritional Status. *Eating Disorders*, 1157-1171.
31. McCory M. A. (2014). Meal skipping and variables related to energy balance in adults: A brief review, with emphasis on the breakfast meal. *Physiology & Behavior*, 134: 51-4.
32. Babio, N., Canals, J., Pietrobelli, A., Pérez, S., & Arija, V. (2009). A two-phase population study: relationships between overweight, body composition and risk of eating disorders. *Nutrición Hospitalaria*, 24(4), 485-491.
33. Hochgraf A. A., Khan R. E., Kim-Spoon J. (2017). The Moderating Role of Emotional Reactivity in the Link between Parental Hostility and Eating Disorder Symptoms in Early Adolescence. *Eat Disord*, 25(5): 420–435.