

***Depression, Anxiety Symptoms and Eating Behavior: Prevalence and Association among Adolescents Studying in Public Schools of Delhi***

Preeti Khanna, Institute of Home Economics, University of Delhi, India  
Bani Aeri, Institute of Home Economics, University of Delhi, India

The Asian Conference on Psychology & the Behavioral Sciences 2018  
Official Conference Proceedings

**Abstract**

Data on the prevalence of mental health disorders indicates that 4.5% and 3% of the Indian population is suffering from depression and anxiety respectively. Depression is ranked by WHO (2015) as the single largest contributor to global disability, therefore there is a need to investigate the maturation patterns (gender specific) & its relationship with psychosocial & nutritional factors which impact the overall health of an adolescent. The present research was designed to study the prevalence & association of depression & anxiety with eating disorders & BMI among adolescent boys & girls (13-15 years) studying in public schools of Delhi. 300 adolescents participated in this cross-sectional study. For the assessment of depression and anxiety & eating disorders Child Behavior Checklist (CBCL; administered to the parents) and Three Factor Eating Questionnaire (TFEQ; administered to the subjects) were used respectively. Data were also collected on socio-demographic profile, dietary practices & consumption pattern, food intake (24hr recall, Food Frequency Questionnaire), & anthropometric (Weight, Height, BMI, Body fat %) profiles. Prevalence of depression & anxiety symptoms is 26%. 58% of the malnourished subjects are suffering from depression & anxiety. 89.7%, 83.3% and 87% of underweight, overweight and obese subjects (with symptoms of anxiety and depression) had reported Restrained Eating, Emotional Eating and Uncontrolled Eating respectively. This study highlights the association of mental health with eating disorders & nutritional status of adolescents. It will also serve as a strategic tool for mental health prevention & management policies designed for adolescents.

Keywords: adolescents, mental health, malnutrition, eating behavior

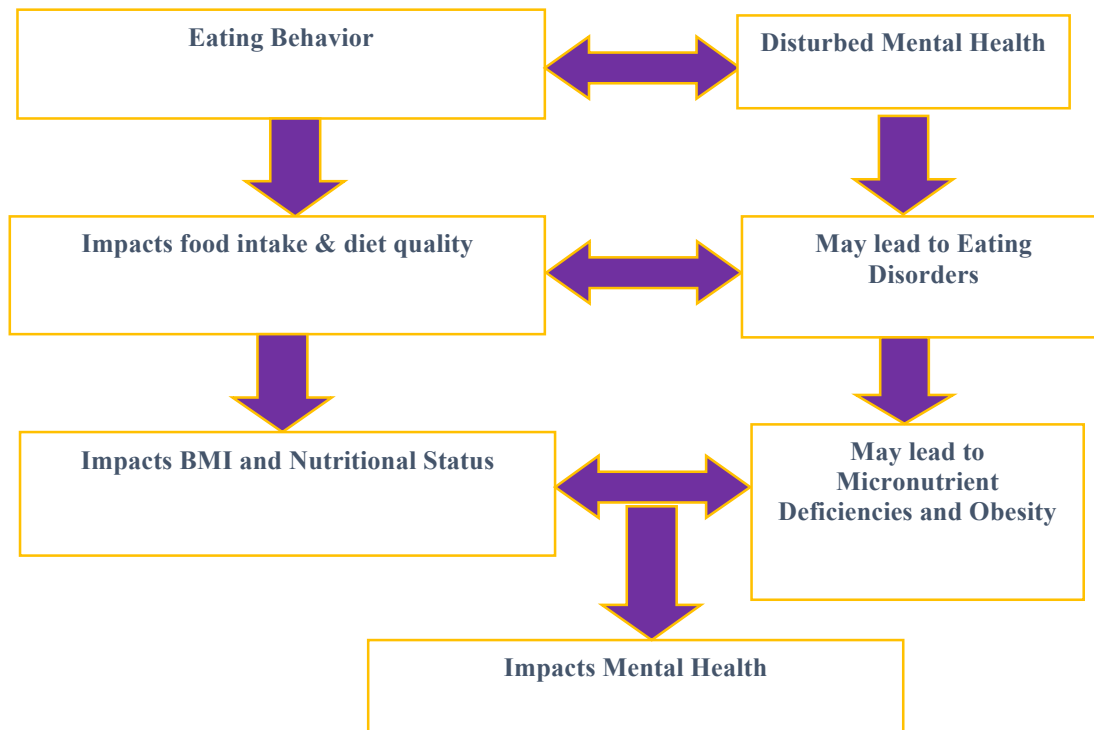
**iafor**

The International Academic Forum  
[www.iafor.org](http://www.iafor.org)

## **Introduction**

Adolescence is a critical period for onset of eating disorders. Research suggests that 90% of cases of anorexia nervosa and bulimia nervosa begin before 20 years of age (Hudson et al, 2007) whereas binge eating typically occurs during late adolescence (Marcus and Kalarchian, 2003). Apart from these disorders, many adolescents suffer from disordered eating whose symptoms are not specified. Research investigations from project EAT (Eating Among Teens) in Minnesota, involving 4700 adolescents from public schools reported that 56.9% of females and 32.7% of the males engaged in unhealthy eating behaviours, including fasting and skipping meals, as a measure to control weight (Neumark-Sztainer et al, 2002). The research findings also concluded that 3.1% girls and 0.9% boys met the criteria for a binge eating disorder and an additional 7.9% of girls and 2.4% of boys indicated subclinical levels of binge eating disorder (Ackard, et al, 2002).

Also, adolescence is a transitional life phase with the onset of depressive symptoms and mental health disorders. During preadolescence, the prevalence rate of depressive symptoms are higher in females than in males and from the age of 15 and above, rates of depression in females are nearly twice than that of their male peers. Current research evidence also concludes that eating disorders and depression are both more prevalent in females than among males during adolescence and young adulthood (Herpertz-Dahlmann et al, 2015). Cross-sectional studies have reported that, depressive symptoms during adolescence are related to an increased likelihood of participation in adverse health behaviors like smoking and suicidal ideation in adulthood. Moreover, an association between binge eating, low self-esteem, obesity and depressive symptoms is also reported. Few studies have also concluded that there is a 'reciprocal relationship' between depressive and bulimic symptoms. Shared pathways (Figure 1) of these comorbidities have also been reported. (McCaffery, 2008; Qualter et al, 2010; Ackard et al, 2011; Stice et al, 2005).



**Figure 1: Proposed mechanism of Comorbidities and Shared Pathways**  
 (Source: Adapted From Qualter et al, 2010; Ackard et al, 2011)

### ***Body Weight, Emotional Eating and Mental Health***

Deviance from normal weight is associated with mental health disorders, lower BMI scores relate to greater problems, more specifically to anxiety/depression and social problems, higher BMI is associated with withdrawness (T.F.M. ter Bogt et al, 2006).

Response to negative emotions like depression, disappointment and feelings of loneliness results in inclination to eat, known as emotional eating (Gossens et al, 2008). Because of its association with higher body weight and intake of unhealthy foods, emotional eating is considered as a problematic eating style (Elfhag and Linné, 2005). Moreover, emotional eating behavior increases the risk of obesity and might be a precursor to eating disorders because of food cravings and overeating pattern (van Strien, 2007; Alberts et al, 2012). Research evidence from large cross sectional survey reports that emotional eating affects body weight status by enhancing palatable and energy-dense foods in women. Thus, abnormal eating behavior leads to high risk of weight gain in emotionally vulnerable population (Camilleri et al, 2014).

With advancing urbanization and westernization, a culture fostering both obesity (with the availability of an abundance of high-calorie food) and ideals of leanness and muscularity (supported by media coverage of television personalities and models), it is becoming hard for more and more adolescents to meet the social standards of body weight and image. The self - perception of being too heavy is the most substantial

trigger of wide range of mental health problems (including depression and eating disorders) in young adolescents (T.F.M. ter Bogt et al, 2006).

Taking the above mentioned research findings into consideration the present study was designed with the following objectives; to study the prevalence of depression and anxiety symptoms and eating behavior among apparently healthy adolescents and to explore the association of these disorders with Body Mass Index.

## **Methods**

### **Study Population**

In this cross-sectional study a sample of 300 adolescents, aged 13-15 years, studying in private schools (n=3) in Delhi from 7<sup>th</sup>, 8<sup>th</sup> & 9<sup>th</sup> grade were enrolled based on the inclusion-exclusion criteria. The sample size was statistically computed on the basis of prevalence of depression among adolescents, considering 95% confidence interval, relative precision of 5% and dropout rate of 10%. The study was approved by the Institutional Ethics Committee, Institute of Home Economics, University of Delhi, India.

### **Inclusion Criteria**

Age 13-15 years, no prior history of any disease. Apparently healthy adolescents willing to participate in the study were enlisted; subjects were enrolled only after clearly stating the aim, purpose and the motive of the study. At the end of it, only those whose parents gave a written consent (and who themselves had signed a written assent) for their child's participation in the study were selected.

### **Data Collection**

Prior to data collection, a pilot study was done (n=30) to pre-test the questionnaires. Information about socio-demographic profile, family history of diseases, physical activity pattern, health awareness, food intake & consumption pattern, body image perception, locus of control and eating behavior was gathered using pre-tested two interview cum questionnaire schedules. This was followed by anthropometric (height, weight and body fat %), dietary intake (24 hr recall & food frequency) and mental health assessment (depression & anxiety symptoms).

## **Measures and Tools**

**Anthropometric measurements:** Height of the subjects was measured using a stadiometer in cm (to nearest 0.5cm). While measuring the height, the subjects were standing straight, with their feet together, knees straight and heels, buttocks and shoulder blades were in contact with the vertical wall. Chin was held firmly to maintain the Frankfurt plane (an imaginary line joining the tragus of the ear and corner of the eye). Shoulders were relaxed and arms were hanging loosely at the sides with palms facing the thighs. Subjects were asked to take a deep breath and stand tall to aid the straightening of the spine.

For the assessment of weight and body fat percentage, TANITA's Body Fat Monitor (UM-076) was used. The scale has a patented design of electrodes (US patent no.5415176; EU patent no. 0545014) which passes a safe low level electric signal in the subject's body. It has a maximum capacity of 150kgs. Subjects were weighed bare foot, with minimal clothing. The subjects were made to stand facing ahead. They were not leaning against or holding any support, while the weight was recorded. Zero error of the weighing scale was checked and the scale was calibrated as per Legal Metrology Act (2009). To avoid variations, measurement of weight & body fat were recorded early in the morning as and when the subjects use to reach the school.

After gathering height and weight data, age and gender specific z scores Body Mass Index (BMI) were calculated and were used to define underweight (-1SD), normal weight, overweight (+1SD) and obesity (+2SD) (WHO, 2007).

### **Assessment of Mental Health Symptoms:**

For this purpose, we used the Child Behavior Checklist (CBCL) for ages 6-18 years. The CBCL was developed in the US and has been translated into 85 different languages including nine Indian languages, using a variety of translation methods (Hindi, Bengali, Gujarati, Kannada, Malyalam, Urdu etc). This was administered to the parents of the subjects. This is a standardized measure of parent-reported behavioral problems, with responses graded on a Likert scale, as 0-2. The responses are then summated as directed by the instrument to yield scores for nine behaviour syndromes. The summation of the responses of some of the individual syndromes yields scores for internalizing behaviors (IS), externalizing behaviors (ES), and overall scores for total behaviour problems (TS). Internalizing behaviors include behaviours such as anxious/depressed, withdrawn/depressed, and somatic problems; and externalizing behaviours include rule-breaking, aggression, and inattention. Higher scores for internalizing behaviors indicate an elevated level of depressive symptomatology (Achenbach and Rescorla, 2001). In the present study CBCL 6-18 (ISBN 978-0-938565-73-4) was used. Prior permissions were taken for the use of this tool from concerned authorities.

### **Assessment of Eating Behaviour:**

Three Factor Eating Questionnaire – Revised 18 (TFEQ – R 18) developed by Karlsson et al (2000) was used to distinguish different eating patterns of the subjects. It consists of 18 items measuring eating behaviour on a 4-point scale (Never/Occasionally/Often/Always). It measures three aspects of eating behaviour i.e., **restrained eating** (conscious restriction of food intake in order to control body weight or to promote weight loss), **uncontrolled eating** (tendency to eat more than usual due to a loss of control over intake accompanied by subjective feelings of hunger), and **emotional eating** (inability to resist emotional cues).

## Statistical Analysis

Statistical analysis was performed using SPSS (Statistical Package for Social Sciences; SPSS). Mean and standard deviations were derived for numerical data. Prevalence is reported in percentages.

## Results

### *Socio-demographic Profile*

The socio-demographic profile of the respondents is represented in Table 1.

**Table 1: Socio-demographic profile of the study population**

PARAMETER	CATEGORIES	TOTAL (n = 300)
AGE (years) (Mean +/- SD)	13 +/- 0.5	100
	14 +/- 0.5	100
	15 +/- 0.5	100
GENDER	Males	150
	Females	150
GRADE	VII	100
	VIII	100
	IX	100
TYPE OF FAMILY	Nuclear	156
	Joint	140
	Single Parent	4
z-scores for BMI n (%)	Underweight	55(18.5)
	Normal Weight	163 (54.3)
	Overweight	22 (7.3)
	Obesity	60 (20)

Out of 300 adolescents, 150 were males and 150 were females studying in 7<sup>th</sup>, 8<sup>th</sup> & 9<sup>th</sup> grade of the schools; 156, 140 and 4 subjects' belonged to nuclear, joint and single parent families respectively. Average age of the subjects was 14 +/- 0.5 years. As far as nutritional status is concerned, BMI of the subjects ranged from -1SD to +2SD (16.5-31.5 kg/m<sup>2</sup>).

### *Prevalence of Mental Health Symptoms*

Prevalence rates of the mental health disorders are represented in Table 2. Based on the responses of the parents, the overall prevalence of depression and anxiety

symptoms was 26%. These disorders were affecting more females (36.4%) than males (27.5%).

**Table 2: Prevalence of mental health symptoms among study population**

<b>PREVALENCE</b>	<b>TOTAL n = 300 (%)</b>	<b>BOYS n=150 (%)</b>	<b>GIRLS n= 150 (%)</b>
Depression & Anxiety	78 (26)	41 (27.5)	55 (36.4)

***Distribution of Mental Health Symptoms according to BMI categories***

*(a) Prevalence of depression and anxiety symptoms in various BMI categories*

Prevalence of depression and anxiety according to four BMI categories is represented in Table 3. It is interesting to note that, an equal percentage of the subjects with depression and anxiety symptoms were falling in underweight (25.20%) and obese (25.27%) categories. On the other hand only 4.62% subjects in the normal weight category are assessed with depression and anxiety symptoms.

**Table 3: Distribution of prevalence of depression and anxiety symptoms in BMI categories among study population**

<b>PARAMETER</b>	<b>UNDER WEIGHT n (%)</b>	<b>NORMAL WEIGHT n (%)</b>	<b>OVERWEIGHT n (%)</b>	<b>OBESE n (%)</b>
<b>Depression &amp; Anxiety</b>	<b>39 (25.20)</b>	<b>7 (4.62)</b>	<b>12 (7.96)</b>	<b>39 (25.27)</b>
Boys ( n = 41)	16 (10.7)	2 (1.67)	6 (4.02)	17 (11.07)
Girls (n = 55)	23 (14.7)	5 (2.95)	6 (3.94)	21(14.2)

**Prevalence and association of eating behavior with BMI and Mental Health Symptoms**

As discussed in Table 4, it is interesting to note that 89.7% of underweight subjects (with symptoms of anxiety and depression) had reported Restrained Eating, 83.3% of overweight subjects (with symptoms of anxiety and depression) had reported Emotional Eating and 87% of obese subjects (with symptoms of anxiety and depression) had reported Uncontrolled Eating.

Restrained Eating pattern was observed more in females whereas Uncontrolled Eating is observed more in male subject.

**Table 4: Distribution and prevalence of eating behavior under BMI categories (with mental health symptoms) among study population**

<b>Eating Behaviour →</b>	<b>Restrained Eating</b>	<b>Emotional Eating</b>	<b>Uncontrolled Eating</b>
<b>BMI Category (with Depression and Anxiety Symptoms) ↓</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>
Underweight	35(89.7)	2(5.1)	2(5.1)
Normal Weight	3(42.8)	2(28.5)	2(28.5)
Overweight	-	10(83.3)	2(16.6)
Obese	-	5(12.8)	34(87.1)

### **Quality of Diet Consumed**

After assessing the 24 hour recalls and food frequency questionnaire of these subjects following observations were recorded. The diets

- were high in Saturated Fatty Acids (SFAs), Simple Sugars and Salt
- had high Glycemic Index (GI) foods
- were in dietary fibre and micronutrients
- were lacking in Omega-3 Fatty Acids

Research has supported the fact that diets with high GI foods impact the release of serotonin, high in saturated fat and low in omega -3 fatty acids increase free radical production (oxidative damage) which further impacts the release of Brain Derived Neurotropic Factor (BDNF), low in dietary fibre and high in sodium is itself a risk factor for development of obesity (inflammation process of the cells in obesity and depression are reported to be similar) (McIntyre, et al, 2010; Seaquist & Anderson, 2013; Wurtman et al, 2003).

### **Conclusions**

Human eating behavior develops rapidly from infancy to school age. Eating is necessary for survival but it can be perturbed leading to under nutrition, over nutrition and eating disorders. Complex interplay between child's motor, sensory & socio-emotional capability, neural reward systems and homeostatic mechanism are involved in development of feeding in humans. In addition to this, influence of parents & social environment (food environment) influence the development of eating behavior. Normal development of eating behavior should lead to adequate but not excessive or inadequate weight gain during childhood. Rapid expansion of new research in this field have lead to evidence-based prevention and treatment strategies for under nutrition, over nutrition and eating disorders in children & adolescents (Gahagan, 2012).



Also, eating behaviour is a modifiable risk factor for the onset of mental health disorders. Research suggests that noticeable food patterns which precede depression are the same as those occurring during depression (Rao, 2008).

Puberty is considered one of the critical risk periods for the development of eating disorders with associated mental health disorders. Traditional researches have focused on the psychosocial effects (increased body dissatisfaction) of physical changes associated with puberty (increased adiposity) & potential consequences for onset of eating disorders (Fornari & Dancyger, 2003).

According to American Psychiatric Association (2000) the incidence of disordered eating increases dramatically during puberty. Additionally, puberty onset marks a developmental shift in the relationship between biological & environmental influences on disordered eating.

The present ongoing study highlights the association of mental health symptoms and eating behavior with nutritional status of adolescents. As per the preliminary data, it is observed that a relationship exists between mental health symptoms, eating behavior and diets of the adolescents. BMI is assessment of nutritional status, which is impacted by food intake and eating behavior. An individual's food intake further impacts his brain development & mental health status. After the results are concluded, the study will serve as a strategic approach for mental health prevention & management policies designed for adolescents.

The study adds to the growing body of nutritional neuroscience as diet and nutrition offer key modifiable risk factors for the prevention and management of mental health disorders. This further needs to be framed into public health policies and programs.

### **Acknowledgements**

We would like to acknowledge the support and participation from subjects and their parents during the study.

## References

- Ackard DM, Neumark-Sztainer D, Story M, Perry C. (2003). Overeating among adolescents: Prevalence and associations with weight-related characteristics and psychological health. *Pediatrics*, 111, 67–74.
- Alberts HJ, Thewissen R, Raes L. (2012). Dealing with problematic eating behaviour. The effects of a mindfulness-based intervention on eating behaviour, food cravings, dichotomous thinking and body image concern. *Appetite*, 58, 847-51.
- American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders - Text Revision (DSM-IV TR)*. Handbook of Psychiatric Measures. American Psychiatric Association: Washington DC.
- Camilleri GM, Méjean C, Kesse-Guyot E, Andreeva VA, Bellisle F, Hercberg S, Péneau S. (2014). The associations between emotional eating and consumption of energy-dense snack foods are modified by sex and depressive symptomatology. *J Nutr*, 144, 1264-73.
- de Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. (2007). Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World Health Organization*, 85, 660-7.
- Elfhag K, Linné Y. (2005). Gender differences in associations of eating pathology between mothers and their adolescent offspring. *Obes Res*, 13, 1070-6.
- Fornari V, Dancyger IF. (2003). Psychosexual development and eating disorders. *Adolesc Med*, 14, 61-75.
- Gahagan S. *The Development of Eating Behavior - Biology and Context*. (2012). *J Dev Behav Pediatr*, 33, 261–271.
- Goossens L, Braet C, Vlierberghe VL & Mels S. (2009). Locus of control over eating in overweight youngsters: the role of anxiety, depression and emotional eating. *Eur Eat Disorders Rev*. 17, 68-78.
- Hudson JI, Hiripi E, Pope HG Jr, Kessler RC. (2007). The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biol Psychiatry*, 61, 348-58.
- Marcus MD, Kalarchian MA. (2003). Binge eating in children and adolescents. *Int J Eat Disord*, 34, S47-57.
- McCaffery JM, Papandonatos GD, Stanton C, et al. (2008). Depressive symptoms and cigarette smoking in twins from the National Longitudinal Study of Adolescent Health. *Health Psychol*, 27, S207-15.

McIntyre et al. (2010). Brain volume abnormalities and neurocognitive deficits in diabetes mellitus: Points of pathophysiological commonality with mood disorders? *Avd Ther*, 27, 63-80.

Neumark-Sztainer D, Story M, Hannan PJ, et al (2002). Weight-related concerns and behaviors among overweight and nonoverweight adolescents: Implications for preventing weight-related disorders. *Arch Pediatr Adolesc Med*, 156, 171-8.

Qualter P, Brown SL, Munn P, Rotenberg KJ. (2010). Childhood loneliness as a predictor of adolescent depressive symptoms: An 8-year longitudinal study. *Eur Child Adolesc Psychiatry*, 19, 493-501.

Rao SS, Asha MR, Ramesh BN and Rao KJ. (2008). Understanding nutrition, depression and mental illnesses. *Indian Journal of Psychiatry*, 50, 77-82.

Seaquist ER, Anderson J, Childs B, Cryer P, Dagogo-Jack S, Fish L, Heller SR, Rodriguez H, Rosenzweig J, Vigersky R. (2013). Hypoglycemia and diabetes: a report of a workgroup of the American Diabetes Association and The Endocrine Society. *Diabetes Care*, 36, 1384-95.

Stice E, Marti CN, Shaw H, Jaconis M. (2009). An 8-year longitudinal study of the natural history of threshold, subthreshold, and partial eating disorders from a community sample of adolescents. *J Abnorm Psychol*, 118, 587-97.

Stice E, Presnell K, Shaw H, Rohde P. (2005). Psychological and behavioral risk factors for obesity onset in adolescent girls: A prospective study. *J Consult Clin Psychol*, 73, 195-202.

Tom F.M. ter Bogt, Saskia A.F.M. van Dorsselaer, Karin Monshouwer, Jacqueline E.E. Verdurmen, Rutger C.M.E. Engels, and Wilma A.M. Vollebergh. (2006). Body Mass Index and Body Weight Perception as Risk Factors for Internalizing and Externalizing Problem Behavior Among Adolescents. *Journal of Adolescent Health*, 39, 27-34.

van Strien T. (2000). Ice-cream consumption, tendency toward overeating, and personality. *Int J Eat Disord*, 28, 460-4.

Wurtman RJ, Wurtman JJ, Regan MM et al. (2003). Effects of normal meals rich in carbohydrates or proteins on plasma tryptophan and tyrosine ratios. *Am J Clin Nutr*, 77, 128-132.

**Contact email:** preetikhanna.k@gmail.com, baniaeri@yahoo.co.in