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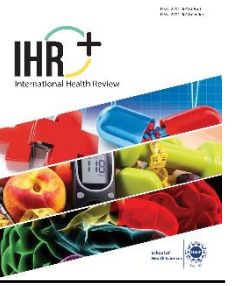

Title: **Depression and its Association with Binge Eating Disorder and BMI**

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Depression and its Association with Binge Eating Disorder and BMI

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ABSTRACT

Depression is a grave mental disorder that often results in persistent feelings of loneliness, anger and sadness. It has been found that depression is linked to binge eating disorder (BED) and higher body mass index (BMI). The main objective of this cross-sectional study was to assess the presence of binge eating disorder, obesity and dietary patterns among depressed patients, and to examine the association of these factors with depression. The study included 87 depressed patients, both male and female, aged 20-40 years. The Patient Health Questionnaire-9 (PHQ-9), Binge Eating Disorder Screener-7, and Food Frequency Questionnaire were used to determine depression, BED & dietary intake, respectively. BMI was calculated to observe weight in relation to height. The data was collected from Fountain House and Security Social Hospital, Lahore. Out of the total 87 patients, 19 did not have BED, 16 had mild BED, and 52 had moderate to severe BED. Regarding BMI, 7 patients were underweight, 42 had a healthy weight, 27 were overweight and 11 were obese. The study revealed that a higher BMI had an association with depression, but no significant association was observed between BMI and BED. The study showed no association between BED and depression. Poor dietary patterns were also observed in depressed patients.

Keywords: binge eating disorder screener-7, body mass index, food frequency questionnaire, patient health questionnaire-9.

Highlights

- There is no association between binge eating disorder and depression.
- There is no association between binge eating disorder and BMI.
- There is an association between depression and BMI.

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1. INTRODUCTION

Binge eating disorder is described as having multiple recurrent episodes of binge eating, with the intake of unusually huge amounts of food and a lack of control over overeating habits [1]. The occurrence of BED is anticipated by binge eating, compensatory habits, highly valuing weight and body shape, a fear of gaining weight, and feelings of being obese [2]. People who binge eat typically feel uneasy and commonly experience symptoms such as, eating quicker than usual, eating until uncomfortably full, eating a great deal even when not hungry, eating when alone out of humiliation and shame, feeling repulsive, depressed or ashamed about consuming too much food [3].

BED is one of the most common eating disorders, especially among women. In the United States, the occurrence of binge eating disorder is estimated at 1.25% in women and 0.42% in men [3]. DSM-5 BED has been estimated to affect 1.5% of women and 0.3% of men globally; an ongoing assessment of DSM-5 BED has been reported by 0.6-1.8% of women and 0.3-0.7% of men [4]. Binge eating disorder has been linked with a rise in mental illnesses like depression [5]. Depression is a mood disorder that denotes an individual's long-term grief, loss of interest, emptiness and irritability [6].

A total of 26 studies were reviewed involving 7,652 participants. It found that 42.66% of individuals reported depressive symptoms, though there was substantial variability across the studies. Out of 7,652 undergraduates, 3,549 claimed to have depressive symptoms, according to multiple methods of diagnosis [7]. The prevalence of depression in Germany is 9.2%, which is higher than the European average of 6.6%. In Germany, 10.8% of women report depressive symptoms, while prevalence of depressive symptoms is comparatively lower in men with 7.6% [8].

The relationship between depressive symptoms and food consumption is often explained implicitly through a BED assessment. That is, depressive symptoms impact whether or not one indulges in disordered binge eating. Some studies have shown that obese people that have binge eating disorder are more inclined to be depressed, as they may use food as a way to cope with negative emotions. They show a liking to "comfort food" as a means to fight off the negative emotions and in doing so, they might end up overeating even when not hungry. Consuming appetizing foods for a brief

period of time may make people feel emotionally good and in better spirits, but eating caloric dense foods over a prolonged timespan may result in weight gain and a greater vulnerability to depression [9]. It is important to note that being obese is not typically a symptom of BED, as it can happen to individuals who are considered overweight or at times normal weight. However, those with BED usually feel self-conscious and displeased with their weight and body shape which in turn ruins their self-esteem and could possibly lead to the development of depression [10].

In Pakistan, there is limited research on binge eating disorder mainly because patients with binge eating disorder go undiagnosed. Although BED is said to be more widespread than other types of eating disorders, it can go undiagnosed due to a lack of awareness among healthcare practitioners, who may not be familiar with the disorder or may fail to address it with those affected [11]. The aim of this research study is to identify the presence of binge eating among those patients that are suffering from depression and to determine how common it is in this population. As the depression rate is increasing rapidly in the Pakistani population there are high chances that they could be suffering from binge eating disorder [11]. Binge eating disorder can further lead to metabolic syndrome and obesity. This study will not only provide valuable insights into the occurrence of Binge Eating Disorder among depressed patients but also help create awareness among masses. If binge eating disorder is diagnosed at early stages it can be controlled with the help of psychological therapy, dietary interventions and physical activity [11].

2. METHODOLOGY

2.1. Sample

The design of this study was cross sectional and the sample size of this study was 87, both male and female aged 20 to 40 years, all of whom were suffering from depression. Tools like food frequency questionnaire (FFQ), patient health questionnaire (PHQ-9) [12], and binge eating disorder screener (BEDS-7) were used to determine dietary intake, depression and binge eating disorder respectively. BMI was calculated to observe weight in relation to height. The data was collected from Fountain House and Social Security Hospital in Lahore, Pakistan.

2.1.1. Inclusion Criteria. The inclusion criteria involved people aged 20 to 40 years, of both genders, who are suffering from depression.

2.1.2. Exclusion Criteria. The people under 20 years and over 40 years were excluded from the study. Pregnant women and people suffering from other mental disorders were also excluded.

2.2. Data Collection

The data for this study was collected through self-administered questionnaires, which were distributed to the patients. The questionnaire included a variety of closed ended questions and it also consisted of the following components:

2.2.1. Demographic Profile. Patients were asked about their age and gender.

2.2.2. Body Mass Index for Obesity. The body mass index (BMI) is the metric currently in use for defining anthropometric height/weight features in adults and analyzing them into groups. Participants were asked to report their height and weight, which were used to calculate their BMI.

2.2.3. Food Frequency Questionnaire (FFQ). Patients were given a limited checklist of foods and beverages with a frequency response section for subjects to report how often each item was consumed over a specified period of time. The options of none, twice a week, three to four times a week and five to seven days a week were given for each group to assess the frequency of that particular food group [12].

2.2.4. PHQ-9 Screening for Depression. It is a diagnostic tool used for depressive patients by health care professionals. The PHQ-9 is the 9-unit depression apart from the full PHQ. Vital depression is determined if 5 or more of the 9 depression indication tests have been present at the minimum more than half the days in the past weeks and one of the indications being depressed mood. PHQ-9 has been extensively endorsed and is advised in a two-stage screening process [13].

2.2.5. BEDS-7 for Binge Eating Disorder. It is a quick, self-reported 7- item screening tool, which is drawn to screen for binge eating disorder symptoms by preference rather than to make a diagnosis so it recognizes individuals with probable BED. The seriousness of the disorder which set on by the number of episodes per week, has 4 classes it is mild moderate severe and extreme [14].

2.3. Data Collection Procedure

Through convenient sampling all depressed patients were given questionnaires to fill out. Before giving out the questionnaires, informed consent was taken from all the patients. The patients were asked to fill out a Patient Health Questionnaire to evaluate the depressive symptoms, Binge eating disorder to aspect BED symptoms, Food Frequency Questionnaire FFQ to assess dietary habits and as well as their height and weight to obtain BMI. Moral guidelines were purely abided all through for the whole of the data collection procedure to ensure patients' privacy.

2.4. Data Analysis Procedure

SPSS Statistics 28.0 was used to analyze the data. Analysis was done through descriptive statistics in order to calculate the frequencies and percentage. Chi square was used to see the association.

3. RESULTS

3.1. Social Demographics

A total of 87 participants between the age of 20 to 40 years were selected for the survey, of which 33 were males and 54 were females.

3.2. Binge Eating Disorder * Depression Cross Tabulation

In the following table, the association between binge eating disorder and depression has been assessed:

Table 1. Association of Binge Eating Disorder with Depression

			Depression				
			Mild	Moderate	Mod severe	Severe	Total
Binge eating disorder	None	Count	0	7	2	10	19
			0.0%	8.0%	2.3%	11.5%	21.8%
	Mild	Count	2	7	5	2	16
			2.3%	8.0%	5.7%	2.3%	18.4%
	Moderate to Severe	Count	2	14	18	18	52
			2.3%	16.1%	20.7%	20.7%	59.8%
	Total	Count	4	28	25	30	87

Table 2. Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.261[a]	6	.081
Likelihood Ratio	12.540	6	.051
Linear-by-Linear Association	.010	1	.918
N of Valid Cases	87		

Chi square was applied on two variables i.e. Binge Eating Disorder and depression. The results were nonsignificant, i.e. The P. value was greater than 0.05. Out of the 87 participants, 19 had not been suffering from binge eating disorder, and in these 19 participants, 7 had moderate depression, 2 had moderate severe depression, whereas 10 had severe depression. 16 participants had mild Binge Eating Disorder symptoms. Out of 16, 2 of the participants had mild depression, 7 had moderate depression, 5 had moderate severe depression and 2 had severe depression. 52 participants had moderate to severe binge eating symptoms, in those 2 had mild depression, 14 had moderate, 18 had moderate severe depression, whereas 18 had severe depression.

3.3. Depression * BMI Cross Tabulation

In the following table the association between depression and body mass index has been assessed:

Table 3. Association Of Depression With BMI

			Depression				
			Mild	Moderate	Mod Severe	Severe	Total
BMI	Underweight	Count	0	0	0	7	7
			0.0%	0.0%	0.0%	23.3%	8.0%
	Normal	Count	0	12	13	16	41
			0.0%	42.9%	52.0%	53.3%	47.1%
	Over Weight	Count	3	11	9	4	27
			75.0%	39.3%	36.0%	13.3%	31.0%
	Obese	Count	1	5	3	3	12
			25.0%	17.9%	12.0%	10.0%	13.8%
	Total	Count	4	28	25	30	87

Table 4. Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.540[a]	9	.006
Likelihood Ratio	26.134	9	.002
Linear-by-Linear Association	11.286	1	.001
N of Valid Cases	86		

Chi square was applied to two of the variables, depression and BMI. The results were significant i.e. the value was less than 0.05. 4 participants had mild depression, of which 3 were overweight and 1 was obese. 28 participants had moderate depression, of which 12 had a normal BMI, 11 were overweight and were obese. 25 participants had moderate severe depression in which 13 had a normal BMI, 9 were overweight and 3 were obese. 30 participants had severe depression, of which 7 were underweight, 16 were normal, 4 were overweight and 3 were obese.

3.4. Binge Eating Disorder * BMI Cross Tabulation

In the following table the association between binge eating disorder and body mass index has been assessed:

Table 5. Association of Binge Eating Disorder with BMI

			BMI				
			Under weight	Normal	Over weight	Obese	Total
Binge eating disorder	None	Count	3	6	7	3	19
			3.5%	7.0%	8.1%	2.3%	20.9%
	Mild	Count	1	9	3	3	16
			1.2%	10.5%	3.5%	3.5%	18.6%
	Moderate to Severe	Count	3	26	17	6	52
			3.5%	30.2%	19.8%	7.0%	60.5%
	Total	Count	7	41	27	11	87

Table 6. Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.832[a]	6	.566
Likelihood Ratio	4.642	6	.590

	Value	df	Asymptotic Significance (2-sided)
Linear-by-Linear Association	.051	1	.822
N of Valid Cases	86		

Chi square was applied on two variables i.e. binge eating disorder and BMI. The results were not significant, i.e. the p value was greater than 0.05.

Out of 87 participants, 18 had not been suffering from binge eating disorder and in these 19 participants 3 were underweight, 6 were normal, 7 were overweight and 3 were obese. 16 participants had normal to mild binge eating symptoms. Out of 16, only 1 was underweight, 9 had a normal BMI, 3 were overweight and 3 were obese. 52 participants had moderate to severe, out of the 52 participants 3 were underweight, 26 were normal, and 17 were overweight and 6 obese.

4. DISCUSSION

BED is a globally widespread eating disorder that is usually dismissed and not taken seriously, mainly because of the lack of awareness and knowledge. Even though it's widespread, there is scarcity of research studies being conducted on binge eating disorder, especially in patients that are suffering from depression in Pakistan [14].

The studies that have explored the association between depression and binge eating have revealed that people suffering from depression may overindulge in binge eating as a way to cope with their emotions. This overindulgence may lead to obesity as they may lose control over their eating behaviors [9]. The main aspects of this study was to investigate the prevalence of binge eating disorder, obesity and dietary patterns of patients suffering from depression, as well as to assess the associations among these factors.

This research study included 87 depressed patients, aged between 20-40 years. Among the participants, 17 were males and 44 were females. Out of the 87 depressed patients, 19 did not meet the criteria for binge eating disorder, while 68 did. Within the binge eating group, 16 had normal to mild symptoms, and 52 had moderate to severe symptoms. This study also assessed obesity in patients suffering from depression, in which 11 patients were obese, 27 were overweight, 41 had a normal BMI, and 7 were

underweight. With the help of a food frequency questionnaire their dietary intake was assessed.

It was assessed that the majority consumed grains most days of the week, especially chapati, paratha, bread and rice. Most individuals consumed full fat milk and full fat yogurt compared to low fat milk and low-fat yogurt. The recall also assessed that more than half the people consumed oil as well as desi ghee and dry fruits. Majority people also included fruits and vegetables in their diet, with preference for. Cooking vegetables rather than consuming them in raw form. In the meat and meat products people mostly consumed chicken and lentils.

This research concluded that there was no significant association between binge eating and depression, as the chi square test revealed that the P value was more than 0.05%. The results concluded that 19 patients suffering from depression didn't have a binge eating disorder, in which 7 had moderate depression, 2 patients had moderately severe depression and 10 patients had severe depression. 16 patients had normal to mild symptoms of binge eating disorder, of which 2 had mild depression, 7 had moderate depression, 5 were moderately depressed and only 2 were severe cases of depression. The remaining 57 patients had moderate to severe symptoms of depression, among which only 4 had mild depression, whereas 14 patients were moderately depressed, 18 had moderately severe depression and the other 18 had severe depression. In total 30 patients were severely depressed, 25 had moderate severe depression, 28 had moderate depression and only 4 displayed mild depression.

A study conducted by professor Luttamam, and assistant professor bilage on the effect of depression and spontaneous impact on binge eating disorder and obesity in turkey 2015 had similar results. Their results concluded that there was no significant difference evident in depression between the group suffering from binge eating disorder and the group without binge eating disorder. Depression was prevalent in both the BED group and the non-BED group but there wasn't any association between these two variables. It was rather impulsivity that was more commonly seen in people with binge eating disorder but not in obesity. Their finding also suggests that binge eating disorder was more commonly found in females than in males [15].

Professor Lut and assistant professor bilage study also had another similar outcome to this study, it concluded that obesity was linked with depression. The chi square test showed a significance between obesity and depression, the value was less than 0.05%. Out of the 87 depressed patients, 11 participants fell in the obesity category of whom only 1 had mild depression, 5 were moderately depressed, 3 were moderately severely depressed and 3 were severely depressed. 27 fell in the overweight category in which 3 had mild depression, 11 had moderate depression, 9 had moderate severe depression and 4 had severe depression. 41 had a normal body mass index in which 12 had moderate depression, 13 had moderate severe depression and 16 had severe depression and only 7 of the participants fell in the underweight category in which all 7 of the patients were severely depressed [15].The association of obesity in people suffering from binge eating disorder discloses that out of 87 depressed patients, 11 were considered obese, among which 3 did not have a binge eating disorder, 3 had normal to mild symptoms and 6 had moderate to severe binge eating disorder symptoms. 27 were overweight, among these 7 didn't have a binge eating disorder, only 3 had mild symptoms and the rest 17 patients had moderate to severe binge eating disorder symptoms. 41 were considered normal, in which 6 didn't have a binge eating disorder, 9 had normal to mild symptoms and the rest 26 had moderate to severe binge eating symptoms and 7 were considered underweight, in these 3 didn't have binge eating disorder, only 1 had mild symptoms and 3 had moderate to severe symptoms. The result showed there was no association between binge eating disorder and obesity. Dr. Alexandra in the United States of America conducted a similar study that showed no association between binge eating disorder and the individuals' BMI. People who aren't considered obese or overweight still suffer from binge eating disorder. More recognition of non-obese individuals with BED is needed [16].

The FFQ was used to assess or find out the dietary consumption of patients suffering from depression on a weekly basis. The questionnaire consisted of 7 categories which included bread and cereal, dairy products, fats and oils, junk foods/ fast food, fruits, vegetables, meat and meat products and dessert. The participants had options of never, 1-2 days, 3-4 days, and 5-7 days. 26 participants consume bread 5-7 days in a week. More than half the participants consumed chapati 5-7 days in a week. Around 30 patients ate paratha 5-7 days in a week. Less than half the patients, around 19 individuals consumed rice 5-7 days a week. Only 7 consumed porridge

5-7 days a week and 5 participants reported consuming cereal 5-7 days in a week. Moreover, around 10 people consumed naan 5-7 days a week and 8 people ate popcorn 5-7 days a week.

Many of the participants preferred full fat milk over low fat milk as more than half of them don't drink low fat milk, only 6 drank low fat milk 5-7 days. Compared to low fat milk around 24 people consumed full fat 5-7 days a week. Same with low fat and full fat yogurt. Only 5 consumed low fat 5-7 days. 12 people consumed full fat yogurt 5-7 days.

24 participants consumed desi ghee 5-7 days a week, while oil was used by more than half the people in 5-7 days. Only 11 consumed cheese 5-7 days, more than half didn't consume cheese at all. Majority of the participants reported consuming tea 5-7 days a week. Only 15 people consumed butter 5-7 days a week, compared to butter, margarine was only consumed by 7 people 5-7 days a week. 21 participants, out 87 consumed dry fruits 5-7 days. While seeds were consumed by only 3 participants.

22 people consumed fat foods like burgers, shawarmas, and pizzas 5-7 days of the week. Chocolates were consumed by 26 participants 5-7 days a week. Fruits like pomegranates were consumed only by 11 individuals 5-7 days a week. Fruits like oranges were consumed by 19 people in 5-7 days. Apples were consumed by 20 people out of 87 people 5-7 days a week. Cooked vegetables were eaten by 39 people 5-7 days a week. In comparison to raw salad, it was eaten by 32 people 5-7 days a week. Fruits and vegetables were not consumed generously by the participants.

Only 6 participants consumed beef 5-7 days a week. Fish was consumed by 7 people only 5-7 days a week. 8 people consumed lab or mutton 5-7 days a week. Out of 87, 28 consumed chicken 5-7 days a week. Only 7 people consumed fried chicken 5-7 days a week. Only around 5 people consumed frozen food 5-7 days a week. 30 people had daal/lentils 5-7 days a week. Only 13 people consumed desserts 5-7 days a week.

4.1. Conclusion

In conclusion, the study revealed that there was no significant association between binge eating disorder and depression. While the study showed no association between obesity and binge eating disorder, an association was seen between obesity and depression. Majority of the participants were not consuming cereal, vegetables, fruits, dairy and meat (excluding chicken) nearly on a daily basis. The minority of the patients

who did consume dairy opted for more full fat dairy products compared to low fat options. The majority only consumed oils from the fat group. Their diet wouldn't be considered healthy, as the important food groups weren't being consumed on a daily basis, however the majority of the participants didn't consume junk foods/fast foods and saturated fats like cheese, beef or butter on a daily basis.

4.2. Limitations

- The time limit for the study was quite short, it should've been longer.
- The research study was conducted on a smaller scale including less participants.
- The patients were not very cooperative.
- Many patients were reluctant to admit they were depressed.
- There are less clinics and facilities that treat depression.

4.3. Recommendations

- Further studies should include a larger sample size.
- More tools should be used to assess and identify obesity.
- Further studies should use laboratory examination for cortisol levels so that their association with depression and binge eating disorder can be explored. Cortisol levels are usually raised when people are stressed.

CONFLICT OF INTEREST

The author of the manuscript has no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

DATA AVAILABILITY STATEMENT

The data associated with this study will be provided by the corresponding author upon request.

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No funding has been received for this research.

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