Relationship between Behavioral Anger, Affective Control, Body Mass Index, Executive Functioning, Mental State, Anxiety and Depression in Female Patients with Anorexia Nervosa

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ABSTRACT

OBJECTIVES: To assess relationship between behavioral anger, affective control, body mass index, executive functioning, mental state, anxiety and depression in female patients with anorexia nervosa.

STUDY DESIGN: A cross sectional observational study.

PLACE AND DURATION: Bahawal Victoria Hospital, Civil Hospital Bahawalpur and Nishtar Hospital Multan, Pakistan from 7th April 2016 to 29th March 2017.

METHODOLOGY: Patients who were diagnosed with anorexia nervosa and demographically matched healthy individuals from local community took part in the study. Body mass index (BMI) of participants was calculated. Participants completed Hospital Anxiety and Depression Scale, Affective Control Scale, Behavioral Anger Response Questionnaire, Montreal Cognitive Assessment scale and Mini-Mental State Examination in a single testing session.

RESULTS: There was an evidence of executive functions deficits in patients with anorexia nervosa 16.01 ± 2.13 in contrast with healthy individuals 27.26 ±1.35, t (398)= 63.21, p < 0.001. Anorexics showed impaired mental state t (398)= 101.88, p < 0.001, 12.22 ±1.97 contrary with healthy adults 28.21 ± 1.02. Behavioral anger was higher in individuals with anorexia nervosa as compared to healthy individuals. Patients with anorexia nervosa t (398) = - 40.98, p < 0.001, 4.98 ± 0.77 showed lesser affective control as compared to healthy individuals 2.69 ± 0.19. BMI, affective control, executive functioning, anxiety and depression were significant predictors of mental state in patients with anorexia nervosa F(1, 398)= 1537.19, p<0.001, R²= 0.95.

CONCLUSIONS: Impaired mental state is associated with low affective control, BMI and executive functioning whereas high anxiety and depression in patient with anorexia nervosa.

KEYWORDS: Cognition; Behavior; Anorexia Nervosa; Body Mass Index; Emotion; Executive functions.

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INTRODUCTION

Anorexia Nervosa (AN) is an eating disorder characterized with reduced body weight, distorted perception of body weight and shape. AN is associated with several psychological disorders such as anxiety, mood, and substance use. Adult females are 3.6 times more susceptible to the disorder. Psychological studies have shown that AN is associated with impaired neuropsychological and emotional functioning. Compared with healthy females, patients with AN have more difficulties in decision making and social cognition. There are several factors involved in pathology of AN. Brain areas involved in cognitive and emotion processing are disintegrated in patients with AN. Dysfunctions of the Striatocortical circuit, Fronto-striatothalamic circuits, structural and functional abnormalities of cortical and subcortical structures underlie cognitive (rigidity to changing rules) and behavioral inflexibility (perseverative and stereotyped behavior) were observed in AN patients. AN patients had reduced fractional anisotropy due to white matter fiber alterations in myelin sheath. These alterations were extended to emotion related brain areas in young female diagnosed with AN. Further studies demonstrated that grey matter volume was reduced in brain regions monitoring cognitive and emotion
functioning in AN patients. In addition, AN patients had increased volume of somatosensory regions which are involved in mental representation of body. However, certain brain structural abnormalities (increased cerebrospinal fluid, reduced grey and white matter volumes) were not present after weight recovery in AN patients. Studies with these patients have shown that behavioral problems were also common in AN patients, for instance lack of empathy and poor interpersonal communication. Presence of anger attacks, depression, aggression, mood deregulation, and impulsive behavior in patients with eating disorder have been linked to serotonergic pathology.

Previous studies have shown that AN patients are deficient in cognition and neuropsychological performance but whether these abilities are linked to behavioral aspects is not clear. Keeping in view these studies, there is still gap in understanding whether behavioral anger and affective control are present in patients with AN. Another question is how behavioral anger, affective control and executive functioning affect mental state in this patient group. The present study was designed to examine relationship between behavioral anger, affective control, executive functioning, mental state, depression and anxiety in patients with Anorexia Nervosa. Another aim was to assess predictors of mental state in this patient group. Few hypotheses were formulated for this study. First, patients with AN would show higher behavioral anger, depression, and anxiety compared with healthy individuals. Second, in contrast with healthy individuals, AN patients would show executive functioning deficits, impaired mental state and affective control. Third, behavioral anger, affective control, body mass index, executive functioning, depression and anxiety would predict mental state. This study is conducted with an objective to assess relationship between behavioral anger, affective control, body mass index, executive functioning, mental state, anxiety and depression in female patients with anorexia nervosa.

METHODOLOGY

The is a cross sectional observational study. We conducted this study from 7th April 2016 to 29th March 2017 after approval of The Islamia University of Bahawalpur, Pakistan. Two hundred newly diagnosed patients with AN according to DSM-5 diagnostic criteria for AN at Bahawal Victoria Hospital, Civil Hospital Bahawalpur and Nishtar Hospital Multan, Pakistan participated in the study. Two hundred healthy individuals took part from local schools, colleges and university. Multiple regression calculator was used to assess the sample size. The inclusion criteria for patients was age range 16-22 years; female gender; education level above higher secondary school; body mass index-BMI 14.0-17.5 kg/m^2 as per DSM-IV and ICD-10 criteria (less than /equal to 17.5 kg/m^2) less calorie intake on regular basis to reduce body weight; extreme fear of weight gain; distorted self-perception of body weight and shape. Exclusion criteria for patients was history or present illness of any psychiatric disorder except AN and history or present complaints of any physiological/neurological disease such as Stroke, brain injury, head trauma, epilepsy, cardiovascular crisis, tuberculosis etc. Inclusion criteria for healthy individuals was female with age between 16 to 22 years; education level above higher secondary school; BMI=18.5-24.9 kg/m^2 was considered as normal weight; no self-imposed restriction of calorie intake; no intense fear of weight gain and no distorted perception of body weight or shape. Exclusion criteria used for screening healthy individuals was same as followed for patient group.

Neuropsychological Assessment

Affective Control Scale (ACS): ACS (42 items) examines control of emotions such as anger, depressed mood, anxiety and positive feelings. Items are responded on a 7-point Likert scale (1=strongly disagree-7=strongly agree). Higher score represents lesser affective control. The scale was translated into Urdu for the current study using back translation procedure (Cronbach alpha 0.82).

Behavioral Anger Response Questionnaire (BARQ): BARQ provides a comprehensive view of anger coping strategies such as direct anger out, avoidance, rumination, assertion rather than traditional anger coping strategies (anger in, anger out). The questionnaire has 37 items which are responded on 3-point scale (not true=0 – often true=2) with higher score showing high behavioral anger response. The scale was translated into Urdu for the current study using back translation procedure (Cronbach alpha 0.79).

Montreal Cognitive Assessment (MoCA): MoCA is a standard validated tool to screen executive functioning which is an umbrella term for neurological skills requiring mental control and self-regulation. Executive functions are controlled by frontal lobe of the brain. It is comprised of 30 questions and completion time is approximate 10 minutes. Total score ranges 0-30; 26 and higher reflects normal cognition. Urdu version of MoCA was used in this study.

Mini Mental State Examination (MMSE): MMSE is a brief screening tool for cognitive functioning in areas such as orientation, recall, attention, visual construction, etc. Total score is 0-30; 24-30 normal cognition; 19-23 mild impairment; 10-18 moderate impairment; 0-9 severe impairment. Completion time is approximate 5-10 minutes.

Hospital Anxiety and Depression Scale (HADS): HADS is a 14 item questionnaire assessing anxiety and depression. HADS was used in this study to assess anxiety and depression which could be present as a comorbid psychological condition. Scores are interpreted as 0-7 =normal; 8-10 borderline abnormal; 11-21=abnormal.

Data Collector Procedure: First, informed consent was obtained from participants, then BMI of participants were calculated. Afterwards, neuropsychological measures (ACS, BARQ, MoCA, MMSE, and HADS) were administered. Upon completion of measures, participants were thanked for their participation in this study.

Data Analysis: Data was analyzed using Statistical Package for Social Sciences version 20.0 (IBM, Chicago, IL, USA).
RESULTS

Table-I showed that there were two hundred patients with AN and two hundred healthy individuals in the sample. Among this number, 52% adults in each subject group had higher secondary school education. Graduates were 20.5% in healthy and 22.5% in patient group. Postgraduates were 27.5% in healthy and 25% in patients.

Table-II showed that healthy individuals were not different from patient group on age (M ± SD 18.48 ± 1.91 vs. 18.50 ± 1.93), education level and height in ft-inch (M ± SD 5.43 ± 0.45 vs. 5.31 ± 0.13). However, both groups were different on their weight in kg (healthy group M ± SD 62.78 ± 4.42, patients 43.34 ± 2.63) and BMI (healthy group M ± SD 23.19 ± 1.45, patients 16.61 ± 0.91).

Table-III showed that patients with AN showed lesser affective control t (398)= -40.98, p<0.001, M ± SD 4.98 ± 0.77 compared with healthy individuals M ± SD 2.69 ± 0.19. AN patients showed higher behavioral anger response t (398)=-26.50, p<0.001, M ± SD 1.06 ± 0.07 than healthy individuals M ± SD 0.85 ± 0.08. There was executive functioning deficit in patients with AN t (398) = 63.21, p < 0.001, M ± SD 16.01 ± 2.13 contrary with healthy individuals M ± SD 27.26 ±1.35. AN patients had impaired mental state t (398)= 101.88, p < 0.001, M ± SD 12.22 ± 1.97 in contrast with healthy individuals M ± SD 28.21 ± 1.02.

Healthy individuals had lesser depression t (398) = -115.16, p < 0.001, M ± SD 3.37 ± 1.14 than AN patients M ± SD 18.21 ± 1.42. Likewise, healthy individuals had reduced anxiety t (398) = -108.32, p < 0.001, M ± SD 2.75 ± 1.41 than AN patients M ± SD 18.23 ± 1.45.

Table-IV showed that BMI, affective control, executive functioning, depression and anxiety were significant predictors of mental state F (1, 398) = 1537.19, p < 0.001, R² = 0.95, BMI β = 0.07, t= 2.68, p < 0.01, ACS β = -0.04, t= -2.14, p < 0.05, MoCA β=- 0.19, t= -2.54, p < 0.01, depression β = -0.48, t= -10.99, p < 0.001 and anxiety β = -0.29, t= -6.92, p < 0.001 whereas behavioral anger failed to reach significance level β = -0.02, t= -1.26, p = 0.20.

Table-I: Educational level of healthy individuals and patients with Anorexia Nervosa (N= 400)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Healthy (n = 200) n (%)</th>
<th>Patients (n = 200) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Secondary School</td>
<td>104 (52.00)</td>
<td>105 (52.5)</td>
</tr>
<tr>
<td>Graduation</td>
<td>41 (20.5)</td>
<td>45 (22.5)</td>
</tr>
<tr>
<td>Post Graduate</td>
<td>55 (27.5)</td>
<td>50 (25.00)</td>
</tr>
</tbody>
</table>

Table-II: Frequency of demographic variables for healthy individuals and patients with Anorexia Nervosa (N= 400)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Healthy (n = 200)</th>
<th>Patients (n = 200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in Years</td>
<td>M ±SD</td>
<td>Range (min-max)</td>
</tr>
<tr>
<td></td>
<td>18.48 ±1.91</td>
<td>(16-22)</td>
</tr>
<tr>
<td>Height (ft-inch)</td>
<td>5.43±0.45</td>
<td>(5.4-5.5)</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>62.78±4.42</td>
<td>(58-70)</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>23.19±1.45</td>
<td>(18.5-24.9)</td>
</tr>
</tbody>
</table>

Table-III: Scores on BARQ⁴, ACS⁵, MoCA⁶, MMSE⁷ and HADS⁸ for healthy individuals and patients with Anorexia Nervosa (N= 400)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Healthy (n = 200)</th>
<th>Patients (n = 200)</th>
<th>t (df), p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BARQ</td>
<td>M ±SD</td>
<td>Range (min-max)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.85 ±0.087</td>
<td>(0.68-1.09)</td>
<td></td>
</tr>
<tr>
<td>ACS</td>
<td>2.69±0.19</td>
<td>(2.25-3.24)</td>
<td></td>
</tr>
<tr>
<td>MoCA</td>
<td>27.26±1.35</td>
<td>(25-30)</td>
<td></td>
</tr>
<tr>
<td>MMSE</td>
<td>28.21±1.02</td>
<td>(27-30)</td>
<td></td>
</tr>
<tr>
<td>Depression (HADS)</td>
<td>3.37±1.14</td>
<td>(4-7)</td>
<td></td>
</tr>
<tr>
<td>Anxiety (HADS)</td>
<td>2.75±1.41</td>
<td>(4-7)</td>
<td></td>
</tr>
</tbody>
</table>

A: Behavioral Anger Response Questionnaire
B: Affective Control Scale
C: Montreal Cognitive Assessment
D: Mini Mental State Examination
E: Hospital Anxiety and Depression Scale

Note. Read BARQ = Behavioral Anger Response Questionnaire; ACS = Affective Control Scale; MoCA = Montreal Cognitive Assessment; MMSE = Mini Mental State Examination; HADS = Hospital Anxiety and Depression Scale.
Assessment; MMSE= Mini Mental State Examination; HADS= The Hospital Anxiety and Depression Scale.

Table- IV: Regression analysis with BMI, scores on BARQ, ACS, MoCA, and HADS as independent variables and scores on MMSE as independent factor for healthy individuals and patients with Anorexia Nervosa (N= 400)

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>t</th>
<th>F (df)</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>0.07</td>
<td>2.68, p&lt;0.01</td>
<td>(1,398)=1537.19, p&lt;0.001</td>
<td>0.95</td>
</tr>
<tr>
<td>ACS</td>
<td>-0.04</td>
<td>-2.14, p&lt;0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MoCA</td>
<td>-0.19</td>
<td>-2.54, p&lt;0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression (HADS)</td>
<td>-0.48</td>
<td>-10.99, p&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety (HADS)</td>
<td>-0.29</td>
<td>-6.92, p&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BARQ</td>
<td>-0.02</td>
<td>-1.26, p&lt;0.20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Read BMI = Body Mass Index; ACS = Affective Control Scale; MoCA= Montreal Cognitive Assessment; MMSE= Mini Mental State Examination; HADS = The Hospital Anxiety and Depression Scale; BARQ = Behavioral Anger Response Questionnaire.

DISCUSSION

The present study was conducted to compare behavioral anger, affective control, executive functioning, mental state, anxiety, depression and BMI of AN patients and healthy individuals. Another aim was to find out predictors of mental state in AN patients.

Our results showed that AN patients were deficient in affective control compared with healthy individuals. Previous research showed that AN patients avoided to experience and express emotions. Further, these patients had difficulties in emotion regulation and they used maladaptive strategies to regulate emotions. These findings were in line with our result which suggested that AN patients had deficient emotion-related control.

Another important result in this study illustrated that patients with AN were higher in behavioral anger, anxiety and depression compared with healthy individuals. Presence of higher behavioral anger and lesser affective control compared to healthy individuals in the present study was consistent with previous findings of aggression and impulsivity in individuals with AN. Few studies have shown that AN patients exhibit behavioral disorders, for example anger out bursts, mood fluctuations, impulsivity which in turn is associated with serotonergic abnormalities.

Neuropsychological assessment in this study showed that AN patients had executive functioning deficits and abnormal mental state in contrast with healthy matched group. These findings were consistent with psychological studies which showed that patients with AN had cognitive deficits. These deficits were associated with disintegrated brain circuits, demyelination and atrophy of grey matter volume in brain regions involved in psychological functioning.

BMI, affective control, executive functioning, anxiety and depression were strong predictors of mental state whilst behavioral anger failed as a significant predictor. Lesser BMI, executive functioning, and affective control whereas higher anxiety and depression were associated with abnormal mental status in AN patients. Studies with Pakistani anorexic subjects showed that AN is associated with several physiological complications such as osteoporosis, infertility, etc. and these patients need dietary counseling. Prevalence of AN is at increase in postgraduate female students in Pakistan which is 59% in adults with normal weight and 21% in under-weight female students. These adults consider themselves as being over-weight. Thus, AN is a disorder affecting overall quality of life in patients with AN.

CONCLUSION

Impaired mental state is associated with low affective control, BMI and executive functioning whereas high anxiety and depression in patient with anorexia nervosa.

LIMITATIONS AND IMPLICATIONS

As examination of mini mental state is a routine test in clinical practice. Conduction of this test at early stage of AN would be helpful in identification of executive, emotion and behavioral functioning deficits in such patients. Including psychotherapy in treat plan may prevent further deterioration in these psychological processes and would accelerate rehabilitation.

ACKNOWLEDGEMENTS

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CONTRIBUTION OF AUTHORS

Gul A: Conceived idea, Designed methodology, Manuscript writing
Jamal S: Data Collection and analysis.

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Conflict of Interest: None.
Source of Funding: None.

REFERENCES

Amara Gul et al


