

STUDY OF THE ASSOCIATION BETWEEN DISORDERED EATING, BODY IMAGE, MENTAL AND PHYSICAL HEALTH AMONG NUTRITION AND DIETETIC STUDENTS IN MUMBAI CITY

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Abstract: Introduction: This study investigates the association between disordered eating behaviors, body image perceptions, and mental and physical health of nutrition and dietetic students in Mumbai City. It aims to provide insights for tailored interventions. Methodology: Employing a cross-sectional design, 110 female students aged 18-25 were purposively sampled. Data collection included self-structured and validated questionnaires. Data analysis involved using SPSS to analyze data presented as Mean±SD or frequency (percentage). Statistical tests included chi-square, T-tests, Mann-Whitney U tests, and Pearson's correlations, with significance at p<0.05.

Results: Significant weight differences (p=0.05) were observed between individuals with and without eating disorders, with nondisordered individuals having higher mean weight. Higher macronutrient and micronutrient intake correlated with increased body weight (p<0.05), particularly in non-disordered female students (p=0.001). All dietary intake variables showed strong negative correlations with disordered eating attitudes (p=0.001) but positive correlations with body image and mental health indicators (p=0.001). Poorer body image and mental health were linked to higher disordered eating attitudes (p=0.001), associated with increased emotional eating behaviors (p=0.001). Positive body image perceptions were tied to better mental health (p=0.001), while increased emotional eating tendencies were associated with lower mental health and quality of life (p=0.001).

Conclusion: This study highlights the significant impact of disordered eating on both nutrition-related health indicators and mental well-being, urging comprehensive interventions.

Keywords: disordered eating, body image, mental health, nutrition students, eating attitudes, emotional eating

INTRODUCTION:

Eating disorders (ED) encompass irregular eating practices with serious mental health implications, influenced by genetic and environmental factors. Disordered eating, a subclinical form, is prevalent, often triggered by societal pressures and media portrayal of ideal body types. Among nutrition students, disordered eating may arise from a paradox between nutrition knowledge and societal body ideals [1,2,3,4,5]. Anorexia Nervosa (AN), characterized by low caloric intake and distorted body perception, affects primarily adolescent females. Bulimia Nervosa involves binge eating followed by compensatory purging behaviors, while Binge Eating Disorder entails recurrent episodes of overeating without compensatory behaviors [6,7,8]. EDs exhibit marked female preponderance and typically onset in adolescence, with varying prevalence rates worldwide [9,10]. Emotional Eating, a response to negative emotions, contributes to disordered eating patterns, particularly among college students (Frayn, M et al., 2018) [4,5]. EDs often co-occur with psychiatric comorbidities, impacting emotional well-being and social functioning. Psychological consequences, including low self-esteem and anxiety, exacerbate the disorder's severity [7]. Treatment strategies encompass pharmacotherapy, family-based

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interventions, and inpatient/outpatient approaches. Re-feeding syndrome poses a significant risk during nutritional restoration, necessitating careful monitoring and management [2]. Investigating disordered eating among nutrition students aids in understanding prevalence, identifying at-risk individuals, and enhancing empathy among future healthcare professionals. This study aimed to assess the association between disordered eating, body image, and mental/physical health among nutrition students in Mumbai City. Objectives of the study included evaluating disordered eating, body image dissatisfaction, and their impact on nutrition, mental health, and physical well-being among participants. Provide tailored nutrition education to address disordered eating behaviors.

METHODOLOGY:

The study utilized a cross-sectional design to explore the association between disordered eating, body image, mental health, and physical health among nutrition and dietetic students in Mumbai City. Ethical approval was obtained from the Inter System Biomedical Ethics Committee, and participants provided informed consent. Purposive sampling was employed to recruit 110 female students aged 18-25 years from Sir Vithaldas Thackersey College of Home Science. Data collection included socio-demographic questionnaires, anthropometric assessments, 24-hour dietary recalls, and validated instruments such as the Body-Image Questionnaire (BIQ), Eating Attitudes Test (EAT-26), Emotional Eater Questionnaire (EEQ), and Mental Health Quality of Life Questionnaire (MHQoL). Statistical analysis was conducted using SPSS version 25, with significance set at p<0.05.

RESULTS:

Sociodemographic Characteristics (N=110)	Categories	Frequency (N)	Percentage (%)
Academic Year	SYBSc	37	33.6
	TYBSc	45	40.9
	FYMSc	28	25.5
Family Type	Nuclear	87	79.1
Interno	Joint 23		20.9
Family Members	1-2 members	5	4.5
	3-4 members	56	50.9
	5-6 members	32	29.1
Rezea	>7 members		15.5
Monthly Income	<=10000	3	2.7
	10,000 - 40,000	24	21.8
	40,000 - 70,000	22	20
	70,000 - 1,00,000	29	26.4

Table 1: Basic characteristics of the participants

	>=1,00,000	32	29.1
Marital Status	Married	0	0
	Unmarried	110	100
Medical History	None	93	84.5
	PCOS	10	9.1
	Depression and anxiety	2	1.8
	Hypothyroidism	2	1.8
	Diabetes	1	0.9
	Sinusitis	1	0.9
Menstrual Regularity	No	19	17.3
	Yes	91	82.7
Consulted Professional Dietary Advice	No	96	87.3
Interno	Yes	14	12.7

Table 1 presents the sociodemographic characteristics of the study participants (N=110) revealing important insights into their academic, familial, financial, and health-related backgrounds. The majority of participants were enrolled in their third year of undergraduate studies (40.9%), with a majority of them from nuclear families (79.1%) and having 3-4 family members (50.9%). Regarding monthly income, a considerable number of participants reported earning between 70,000 and 1,00,000 rupees (26.4%). Marital status indicated that all participants were unmarried. In terms of medical history, the majority reported having no medical issues (84.5%), while a small percentage disclosed conditions such as PCOS (9.1%), depression and anxiety (1.8%), hypothyroidism (1.8%), diabetes (0.9%), and sinusitis (0.9%). Menstrual regularity was prevalent among the majority (82.7%), and most participants had not consulted a professional for dietary advice (87.3%). External influences contributing to body dissatisfaction included social media (29.1%), peer pressure (11.8%), family (17.3%), and profession (31.8%). Among social media platforms, Instagram (10.9%) and YouTube (9.1%) were reported most frequently as sources of body image influence. This sociodemographic data provides an understanding of the diverse backgrounds of the participants.

Table 2: Comparison of Nutrient Intake between Participants with and without Eating Disorders

	Variables	No eating disorder(n=42) Mean (SD)	Eating disorder(n=68) Mean (SD)	P value
MACRONUTRIENTS				
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Energy (kcal)	1810 (225)	787 (214)	0.001**
Protein (g)	55.1 (13.0)	31.0 (8.4)	0.001**
Carbohydrate (g)	273.0 (39.9)	118.6 (33.3)	0.001**
Fat (g)	61.1 (7.0)	24.5 (6.3)	0.001**
RDA Energy (%)	109 (14)	47 (13)	0.001**
RDA Proteins (%)	120.7 (28.4)	67.8 (18.4)	0.001**
RDA Carbohydrates (%)	210.0 (30.7)	90.0 (27.3)	0.001**
RDA Fats (%)	305.7 (34.9)	122.6 (31.4)	0.001**
MICRONUTRIENTS			
Iron (mg)	13.6 (3.0)	8.2 (2.7)	0.001**
Calcium (mg)	718.8 (225.6)	434.8 (162.8)	0.001**
RDA Iron (%)	4 <mark>6.9 (</mark> 10.4)	28.1 (9.3)	0.001**
RDA <mark>Calcium (%)</mark>	71.9 (22.6)	43.5 (16.3)	0.001**

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**Indicates statistically significant (p<0.001)

Table 2 provides a detailed comparison of mean nutrient intake between individuals with and without eating disorders, along with their standard deviations and corresponding p-values. Notably, the mean energy intake was significantly higher among girls without eating disorders compared to those with eating disorders, as indicated by a p-value of 0.001. Similarly, statistically significant differences were observed in mean protein (p=0.001), carbohydrate (p=0.001), fat (p=0.001), iron (p=0.001), and calcium (p=0.001) intake between the two groups. Comparing the mean nutrient values among both groups with the Recommended Dietary Allowances (RDA) for a healthy adult Indian woman – 1660 kcal for energy, 45.7g for protein, 130g for carbohydrates, and 20g for fats – highlights that girls without eating disorders notably had higher nutrient intake compared to those with eating disorders. Moreover, the table includes RDA percentages for each nutrient, indicating the percentage of RDA fulfilled by participants' intake. It reveals that girls without eating disorders had significantly higher RDA energy % (p=0.001), RDA proteins% (p=0.001), RDA carbohydrates% (p=0.001), RDA fats% (p=0.001), RDA iron% (p=0.001), and RDA calcium% (p=0.001) as compared to girls with eating disorders. Overall, these findings suggest that individuals without eating disorders consume greater quantities of macronutrients and a more adequate amount of essential nutrients compared to those with eating disorders.

EATING ATTITUDES TEST-26

The Eating Attitudes Test-26 (EAT-26) is a self-report questionnaire designed to assess attitudes and behaviors related to eating disorders, such as anorexia nervosa and bulimia nervosa.



Figure 1: EAT-26 Total Score

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The Eating Attitudes Test-26 (EAT-26) questionnaire scores among the girls ranged from a minimum of 0 to a maximum of 43. Out of the participants, 42 girls (38.2%) were identified as not having an eating disorder based on their EAT-26 scores, while 68 girls (61.8%) were identified as having an eating disorder. This distribution provides insight into the prevalence of eating disorders within the study participants as assessed by the EAT-26 questionnaire.

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Variables	No eating disorder (n=42) Mean (SD)	Eating disorder (n=68) Mean (SD)	P value
Feeling terrified of being overweight	0.4 (0.7)	2.4 (1.0)	0.001**
Avoiding eating when hungry	0.0 (0.0)	1.1 (1.0)	0.001**
Engaging in eating binges	0.1 (0.4)	1.2 (1.1)	0.001**
Cutting food into small pieces	0.3 (0.7)	1.0 (1.2)	0.001**
Being aware of the calorie content of foods	1.6 (0.9)	2.0 (1.0)	0.006*
Avoiding high-carbohydrate foods	0.5 (0.8)	0.6 (0.8)	0.534
Others would prefer if ate more	0.3 (0.7)	0.6 (1.0)	0.021*
Vomiting after eating	0.0 (0.0)	0.0 (0.2)	0.264
Feeling extreme guilt after eating	0.0 (0.0)	1.7 (1.1)	0.001**
Preoccupied with the desire to be thinner	0.2 (0.5)	2.0 (1.1)	0.001**
Thinking about burning calories during exercise	<mark>0.6 (0.9</mark>)	2.0 (1.3)	0.001**
Perceived by others as too thin	<mark>0.4 (0.8)</mark>	0.8 (1.2)	0.104
Preoccupied with the thought of having fat on the	0.2 (0.6)	1.7 (1.1)	0.001**
body	ngi kezeg	ren Journ	91
Take longer than others to eat meals	0.5 (0.9)	1.5 (1.3)	0.001**
Avoid foods with sugar	0.4 (0.9)	0.7 (0.9)	0.014*
Feeling that food controls life	0.1 (0.4)	1.4 (1.2)	0.001**
Display self-contro <mark>l aro</mark> und food	0.5 (0.9)	1.0 (1.0)	0.005*
Feeling pressured by others to eat	0.1 (0.5)	0.5 (0.8)	0.005*
Giving excessive time and thought to food	0.1 (0.5)	1.3 (1.1)	0.001**
Feeling uncomfortable after eating sweets	0.1 (0.4)	0.7 (1.1)	0.001**
Engage in dieting behavior	0.2 (0.5)	1.1 (1.0)	0.001**
Preferring an empty stomach	0.1 (0.3)	0.7 (1.1)	0.001**
Have impulse to vomit after meals	0.0 (0.0)	0.2 (0.4)	0.009*
Enjoy trying new rich foods	1.6 (1.2)	1.8 (1.1)	0.442

* Indicates statistically significant (p<0.05)

**Indicates statistically significant (p<0.001)

Table 3 presents a comprehensive comparison of various attitudes and behaviors related to eating habits between individuals with and without eating disorders. Significant differences were observed across numerous factors. Individuals with eating disorders have higher mean scores for the majority of the variables and reported significantly higher levels of feeling terrified of being overweight (p=0.001), avoiding eating when hungry (p=0.001), engaging in eating binges (p=0.001), cutting food into small pieces (p=0.001), feeling extreme guilt after eating (p=0.001), being preoccupied with the desire to be thinner (p=0.001), thinking about burning calories during exercise (p=0.001), feeling that food controls life (p=0.001), giving excessive time and thought to food (p=0.001), and having impulses to vomit after meals (p=0.001), engaging in dieting behavior (p=0.001), preferring an empty stomach (p=0.001), and having impulses to vomit after meals (p=0.009) compared to those without eating disorders. Moreover, individuals with eating disorders had higher mean scores and were significantly more aware of the calorie content of foods (p=0.006), preoccupied with the thought of having fat on the body (p=0.001), took longer than others to eat meals (p=0.001), avoided foods with sugar (p=0.014), felt that others would prefer if they ate more (p=0.021), displayed self-control around food (p=0.005), and felt pressured by others to eat (p=0.005). These findings highlight the profound impact of eating disorders on various aspects of individuals' attitudes and behaviors toward food and body image.

BODY IMAGE QUESTIONNAIRE (BIQ)

The Body Image Questionnaire (BIQ) evaluates individuals' perceptions and attitudes toward their body image. It assesses factors such as satisfaction with body size and shape, as well as feelings of attractiveness.

Variables	No eating disorder (n=42) Mean (SD)	Eating disorder (n=68) Mean (SD)	P value
Healthy	3.6 (0.9)	2.7 (0.9)	0.001**
Physically attractive	3.0 (1.0)	2.0 (0.8)	0.001**
Features feel feminine	1.4 (0.6)	1.9 (1.0)	0.002*
Feel pure/clean	1.7 (0.9)	1.2 (0.5)	0.001**
Daring	3.6 (0.8)	2.9 (0.9)	0.001**
Feel worthy	4.6 (0.6)	3.0 (1.1)	0.001**
Something to be touched	4.3 (1.0)	3.3 (1.2)	0.001**
Tend <mark>er/lov</mark> ing	4.3 (0.9)	3.5 (1.1)	0.001**
Express appease	2.7 (1.1)	3.2 (1.2)	0.015*
Expressive	2.4 (1.0)	2.9 (1.2)	0.016*
Something to be hidden	1.6 (0.8)	2.5 (1.2)	0.001**
Nervous/worried	2.7 (1.0)	3.6 (1.0)	0.001**
Feel young	3.9 (1.0)	3.4 (1.1)	0.042*
Feel sexy	3.1 (1.2)	2.1 (1.0)	0.001**
Robust	4.2 (0.7)	3.0 (1.1)	0.001**
Cheerful	1.8 (0.7)	2.9 (0.9)	0.001**
Something to be looked at	4.3 (1.0)	3.3 (1.2)	0.001**

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Table 4. Comp	arative Analysis of	Rody Imag	e Percentions	hetween	ndividuals v	with and v	without Eati	ng Disorders
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Energetic	3.2 (0.9)	2.1 (0.8)	0.001**
 1 11 1 10 . (0.05)			

* Indicates statistically significant (p<0.05) **Indicates statistically significant (p<0.001)

Table 4 presents notable differences in perceptions and attitudes toward body image between individuals with and without eating disorders. Among those with no eating disorders, feelings of being healthy (p = 0.001), physically attractive (p = 0.001), pure/clean (p = 0.001), more daring (p = 0.001), worthy (p = 0.001), something to be touched (p=0.001), tenderness (p=0.001), feeling young (p=0.042), sexy (p=0.001), robust (p=0.001), something to be looked at (p=0.001) and feeling energetic (p=0.001) were statistically significant with mean scores higher than those with eating disorders. Whereas girls with eating disorders significantly reported feeling aligned with their gender (p=0.001) and they felt more nervous/worried (p=0.001) as evident through higher mean scores among them. Interestingly individuals with eating disorders reported being more expressive (p=0.016) and cheerful (p=0.001). These findings highlight the significant impact of eating disorders on perceptions of body image.

EMOTIONAL EATER QUESTIONNAIRE (EEQ)

The Emotional Eater Questionnaire is a tool designed to assess the relationship between emotions and eating habits. It typically consists of a series of questions that explore various aspects such as types of emotions that prompt eating, such as stress, sadness, or boredom. Through self-reflection, it provides insights into the psychological connection with food intake.

Variables	No eating diso <mark>rder (n=</mark> 42) Mean (SD)	Eating disorder (n=68) Mean (SD)	P value
Weight scales exert a significant influence	0.5 (0.6)	1.8 (1.0)	0.001**
There is a craving for specific foods	1.3 (0.7)	2.2 (0.7)	0.001**
Difficult to stop eating sweets	0.6 (0.9)	1.9 (1.0)	0.001**
Control over the intake of certain foods is difficult	0.5 (0.7)	1.8 (0.8)	0.001**
Eat when stressed/angry/ bored	0.7 (0.7)	2.3 (0.9)	0.001**
Eat more favorite food when alone	0.8 (0.8)	1.8 (0.9)	0.001**
Feel guilty after eating 'forbidden' foods	0.4 (0.6)	1.8 (1.0)	0.001**
Have less control over diet when tired	0.5 (0.7)	1.7 (0.8)	0.001**
Overeat fattening food on a diet	0.2 (0.4)	1.2 (0.8)	0.001**

Table 5: Comparison of Emotional Eating between Individuals with and without Eating Disorders

A feeling of being controlled by 0.5 (0.6) 1.8 (0.	8) 0.001**
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**Indicates statistically significant (p<0.001)

Table 5 reveals significant differences between individuals with and without eating disorders across various emotional eating tendencies. A substantial difference in scores for variables such as weight scale influence (p = 0.001), cravings for specific foods (p = 0.001), difficulty stopping eating sweets (p = 0.001), struggle to control food intake (p = 0.001), eating in response to stress (p = 0.001), indulging in favorite foods when alone (p = 0.001), feeling guilty after eating forbidden foods (p = 0.001), diminished control over diet when tired (p = 0.001), overeating while dieting (p = 0.001) and feeling controlled by food (p = 0.001) is observed, and through the differences in the mean scores between the two groups it is evident that participants with eating disorders displayed notably higher scores compared to those without, suggesting heightened emotional eating tendencies.

MENTAL HEALTH QUALITY OF LIFE QUESTIONNAIRE

This questionnaire evaluates various aspects of well-being related to mental health. It typically includes inquiries about emotional stability, social relationships, and psychological functioning. Through self-reported responses, overall mental health status can be assessed and areas for improvement or support can be identified.

Table 6: Comparison of Mental Health	Quality Of Life Between Individuals	with and Without Eating Disorders
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Variables	No eating disorder (n=42) Mean (SD)	Eating disorder (n=68) Mean (SD)	P value
Self Image	2.6 (0.8)	0.9 (0.5)	0.001**
Independence	2.5 (0.8)	1.1 (0.6)	0.001**
Mood	2.6 (0.7)	1.3 (0.5)	0.001**
Relationships	2.6 (0.7)	1.6 (0.6)	0.001**
Daily Activities	2.4 (0.7)	1.1 (0.5)	0.001**
Physical Health	2.7 (0.8)	2.0 (0.5)	0.001**
Fut <mark>ure</mark>	2.6 (0.8)	1.3 (0.5)	0.001**

**Indicates statistically significant (p<0.001)

Table 4.10 illustrates significant differences in various aspects of mental well-being between participants with and without eating disorders. In terms of self-image, those without eating disorders had markedly higher scores, indicating more positive perceptions of themselves (\square =0.001). Similarly, individuals without eating disorders demonstrated greater levels of independence compared to those with eating disorders (\square =0.001). Further participants without eating disorders reported significantly higher scores for mood (\square =0.001), relationships (\square =0.001), daily activities (\square =0.001), physical health (\square =0.001), and future outlook (\square =0.001) that indicate better emotional, social, and physical functioning, as well as greater optimism about the future. These findings suggest a clear association between mental well-being and the presence of eating disorders.

Table 7 Correlation of EAT-26, BIQ, EEQ, and MHQOL with Nutrient Intake

Variables	EAT -26	BIQ	EEQ	MHQOL
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	r Value	P value						
Energy (kcal)	-0.891	0.001**	0.638	0.001**	-0.704	0.001**	0.810	0.001**
Protein (g)	-0.786	0.001**	0.560	0.001**	-0.549	0.001**	0.658	0.001**
Carbohydrate (g)	-0.879	0.001**	0.622	0.001**	-0.690	0.001**	0.804	0.001**
Fat (g)	-0.895	0.001**	0.656	0.001**	-0.743	0.001**	0.819	0.001**
Iron (mg)	-0.728	0.001**	0.540	0.001**	-0.501	0.001**	0.595	0.001**
Calcium (mg)	-0.646	0.001**	0.445	0.001**	-0.491	0.001**	0.535	0.001**

**Indicates statistically significant (p<0.001)

Table 7 displays the correlations between nutritional intake and the Eating Attitudes Test (EAT-26), Body Image (BIQ), Emotional Eating (EEQ), and Mental Health Quality of Life (MHQOL) scores. All dietary intake variables demonstrated strong negative correlations with EAT-26 scores, with p-value=0.001, indicating that higher intake of energy, protein, carbohydrate, fat, iron, and calcium is associated with healthier eating attitudes, as reflected by lower scores on the EAT-26 questionnaire. On the contrary, all dietary intake variables, including energy, protein, carbohydrate, fat, iron, and calcium, demonstrated positive correlations with BIQ scores. These correlations are statistically significant with p-value=0.001, indicating that increased consumption of these nutrients is associated with more positive perceptions of body image. The table illustrates significant negative correlations between dietary intake variables and EEQ scores, with all p-values indicating statistical significance at P=0.001. Specifically, higher consumption of energy, protein, carbohydrate, fat, iron, and calcium is associated with lower scores on the EEQ, suggesting reduced tendencies towards emotional eating. Lastly, the table displays positive correlations between dietary intake variables and MHQOL scores, with all p-values indicating statistical significance at p=0.001. This implies that higher consumption of energy, protein, carbohydrates, fat, iron, and calcium is associated with better mental health and quality of life among participants. Thus higher nutritional intake is associated with healthier eating attitudes, better body image perception, lower emotional eating tendencies, and higher mental health quality of life.

DISCUSSION

The socio-demographic profile highlighted that most participants were in their third undergraduate year, from nuclear families, with moderate monthly incomes. Medical issues were uncommon, while menstrual regularity was prevalent. Significant differences in mean nutrient intake between individuals with and without eating disorders were noted, with those without disorders consuming significantly higher amounts of energy, protein, carbohydrates, fat, iron, and calcium (p=0.001). This aligns with previous research by Chiurazzi, C. et al., (2017) that indicated individuals with disordered eating patterns often have lower nutrient intake compared to healthy counterparts. Individuals without eating disorders reported higher mean scores for feelings of health, attractiveness, and vitality (p=0.001). This mirrors findings from previous research by Cash, T. F. et al., (2011) indicating that individuals with eating disorders often experience distorted perceptions of their bodies, characterized by negative self-image and dissatisfaction. Individuals with eating disorders exhibited markedly higher scores in emotional eating tendencies across various factors (p=0.001). This corresponds with existing literature by Bongers et al., (2013) indicating a strong association between eating disorders and emotional eating behaviors, characterized by increased consumption in response to emotional triggers. Participants without eating disorders exhibited notably higher mental well-being (p=0.001). This aligns with prior research by Tomba, E., (2014) indicating that individuals with eating disorders often experience poorer mental health outcomes, including lower self-esteem and impaired emotional functioning. Higher nutritional intake, encompassing energy, protein, carbohydrate, fat, iron, and calcium, is strongly linked to improved eating attitudes, body image perceptions, emotional eating control, and mental health quality of life, as evidenced by significant negative correlations

with EAT-26 and EEQ scores and positive correlations with BIQ and MHQOL scores (p=0.001). This aligns with Laska et al.'s (2016) study indicating enhanced mental health outcomes with increased nutrient consumption.

CONCLUSION:

In conclusion, the study highlighted the prevalence of disordered eating among nutrition and dietetic students and their association with various variables. By correlating disordered eating behaviors with dietary intake, anthropometric measurements, and mental health indicators, the study emphasized the significant impact of disordered eating on both physical and mental well-being. Thus while addressing disordered eating behaviors, both physical and mental health aspects must be considered.

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