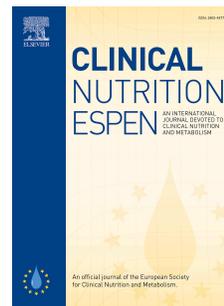


Journal Pre-proof

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PII: S2405-4577(21)00264-3

DOI: <https://doi.org/10.1016/j.clnesp.2021.07.013>

Reference: CLNESP 1059

To appear in: *Clinical Nutrition ESPEN*

Received Date: 26 March 2021

Revised Date: 26 June 2021

Accepted Date: 12 July 2021

Please cite this article as: Moradi F, Heshmati J, Daneshzad E, Ahmadi A, Jafari T, Persad E, Fazelian S, Association between dietary satisfaction and depression, anxiety and stress in obese and overweight patients during the coronavirus pandemic, *Clinical Nutrition ESPEN*, <https://doi.org/10.1016/j.clnesp.2021.07.013>.

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Association between dietary satisfaction and depression, anxiety and stress in obese and overweight patients during the coronavirus pandemic

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Funding None.

Abbreviations: D-Sat: Diet Satisfaction Questionnaire, COVID-19: Coronavirus disease 2019, BMI: Body Mass Index, WC: waist circumference, WL: Weight Loss, DASS: Depression, Stress and Anxiety scale,

Acknowledgment: We would like to thank the study participants for their cooperation, the present study was financially supported by Shahrekord University of Medical Sciences.

Ethical Consideration: The present study was approved by the medical ethics committee of Shahrekord University of Medical Sciences (approval number: IR.SKUMS.REC.1399.074).

Conflict of Interest: The authors have no conflicts of interest to declare

The authors' Declaration: Fateme Moradi and Siavash Fazelian and Javad Heshmati: designed the study; Fateme Moradi and Siavash Fazelian conducted the data collection; Ali Ahmadi and Elnaz Daneshzad: conducted the statistical analysis, evaluated and reported the results; Javad Heshmati and Tina Jafari and Emma Persad: wrote the article's draft; and all authors: carefully evaluated the final draft of the manuscript and approved it.

Association between dietary satisfaction and depression, anxiety and stress in obese and overweight patients during the coronavirus pandemic

Abstract:

Background & Aim: The coronavirus disease-2019 (COVID-19) pandemic is a global health threat. The aim of this study was to evaluate the association between D-Sat and depression, anxiety and stress in obese patients during the coronavirus pandemic.

Methods: A cross-sectional study in 228 obese and overweight women on a weight loss diet was conducted through use of a questionnaire. General characteristics, anthropometric indices, D-Sat and mental status were assessed in these patients.

Results: The greatest weight loss (WL) and waist circumference (WC) change was associated with the highest tertile of the D-Sat score in the first four months of the coronavirus pandemic ($P < 0.05$). Participants with the highest tertile of all D-sat scores compared to those with the lowest had an 85% risk of depression. The highest tertile was also associated with increased odds of anxiety (OR: 0.32 95%CI: 0.14; 0.68 and OR: 0.77, 95%CI: (0.34; 1.71), respectively. The adjusted odds of stress score were negatively associated to the highest tertile of the D-Sat score (OR: 0.31 95% CI: 0.12, 0.81 and OR: 0.09, 95%CI: (0.03, 0.23), respectively. (WL) was inversely related to stress ($P < 0.05$). Participants with higher WL and WC reduction had fewer depressive symptoms ($P < 0.05$). Sleep time and family income was associated with obesity.

Conclusions: D-Sat and positive personal and family dynamics can improve the mental status of obese and overweight patients during quarantine.

Keywords: Diet Satisfaction Questionnaire, COVID-19, weight loss, mental status

Introduction:

The coronavirus disease-2019 (COVID-19) pandemic is a global health threat and has been the largest outbreak of atypical pneumonia since Severe acute respiratory syndrome (SARS)¹. Studies show that the proportion of patients with obesity and severe obesity who are infected with COVID-19 will be more prominent compared to the H1N1 outbreak, and the disease is likely to run a more severe course².

Overweight and obesity are medical conditions defined as excessive fat accumulation with negative implications on health and socioeconomic status³. The prevalence of obesity and overweight is increasing rapidly and in 2016, 61.6% of adults were overweight and 25.8% were obese in Iran⁴. Overweight and obesity are associated with several complications that have a negative impact on quality of life, such as diabetes, cardiovascular disease, cancer, and psychiatric disorders^{5,6}. Depression and anxiety are two of the most common psychiatric disorders amongst these patients and have a higher likelihood of developing compared to the general population⁷. Medication, behavioural therapy, diet therapy, and surgery are the most widely applied treatments⁸.

A diet that helps control hunger through eating satisfactory amounts of food can increase diet adherence and lead to weight loss⁹, and measuring satisfaction with one's current diet is important in weight management. In behavioural weight-loss interventions, the degree of adaptation and maintenance of the prescribed diet is a strong predictor of the continuation of a long-term weight-loss trend¹⁰. This cross-sectional study sought to investigate the relationship between dietary satisfaction in overweight and obese patients with depression, anxiety and stress during the outbreak of coronavirus.

Methods:

This cross-sectional study was performed in the spring of 2020 during the coronavirus outbreak in 228 overweight and obese Iranian women on a weight loss diet. Inclusion criteria included the willingness to cooperate with the plan, literacy for reading and writing, obesity or overweight (BMI above 25), being on a weight loss diet under the supervision of a nutritionist and being in quarantine for 4 months (from February to May 2020). Because women made up a larger percentage of clients and had higher compliance in weight loss and quarantine so only included women in the study. Patients with incomplete information, pregnant, under 18 years old, on a lower than 800 kcal diet, and those that had experienced unfortunate events in the last six months, were excluded. Additional exclusion factors were patients with a history of diabetes, heart disease, liver disease, and cancers, due to the impact of these diseases on inflammatory factors and clinical depression. All women participating in the study consented to the research method and data collection.

General information of participants including age, level of education, level of physical activity, average sleep time and average sleep duration were collected using a questionnaire.

Individual weights were measured with a digital scale to the nearest 0.1 kg. Height was also measured using a tape measure with an accuracy of 1 cm. Body Mass Index (BMI) was calculated using the weight (kg) divided by height squared (m^2). Waist circumference was measured using an inelastic tape measure without imposing any pressure and with an accuracy of 0.1 cm.

Diet satisfaction was evaluated using a 45-item D-Sat Questionnaire (DSat-45) including seven scales that measure the effects of weight loss diet on various aspects of life, namely healthy lifestyle, convenience, cost, family dynamics, preoccupation with food, negative aspects, and meal planning and preparation ¹¹.

The 21-item Depression, Stress and Anxiety Scale (DASS) was used to assess participants' mental status. This questionnaire uses a four-point scale from 0 to 3 and is confirmed to be one of the most reliable tools for measuring the symptoms of negative emotions, depression, anxiety and stress^{12 13}. Each of the DASS-21 subscales contains seven questions, the final score of each is obtained through the sum of the scores of the related questions.

The present study was approved by the medical ethics committee at the '[removed for blind peer review]'. All collective data in this study were kept confidential by the researchers.

Quantitative variables were presented as mean and standard deviation. Independent sample t-tests were conducted to compare the two groups and analysis of covariance (ANCOVA) was performed and adjusted for baseline values. P-values < 0.05 were considered as significant. The Statistical Package for Social Science version 20 (SPSS Inc., Chicago, Illinois) was used to run statistical analysis in this study.

Using binary logistic regression, predisposing mental health disorders and D-Sat tertiles were presented in different models. Age, education and income level, sleep time and duration, physical activity, and BMI were moderated in the adjusted model. Finally, linear regression as a continuous statistical method was used to present the association between weight change, WC change and BMI with and mood disorder, aspects of D-Sat. SPSS version 16 was used to analyse the data.

Results

Mean age of women was 32.39 years. The D-Sat score were divided into three tertiles. Total characteristics and anthropometric indices of participants and across tertiles of d-sat scores are indicated in Table 1. Prevalence of depressive symptoms, anxiety and stress were 68.4%, 70.6% and 70.2%, respectively.

WL and WC change in the first four months of the coronavirus quarantine was greater in the highest tertile of d-sat score ($P < 0.05$).

Table 2 illustrates the odds of mental health of d-sat-21 among tertiles of d-sat scores. Participants with the highest tertile of all d-sat scores compared to women within lowest tertile had an 86% decreased risk of depression (OR: 0.14, 95% CI: 0.06; 0.34). The adjusted odds of anxiety score negatively had relation to highest tertile of d-sat score (OR: 0.32 95%CI: 0.14; 0.68 and OR: 0.77, 95%CI: 0.34; 1.71), respectively. The adjusted odds of stress score negatively had relation to highest tertile of d-sat score (OR: 0.31 95% CI: 0.12, 0.81 and OR: 0.09, 95%CI: 0.03, 0.23, respectively. Our findings indicate that almost every scale of the satisfaction-sat questionnaire had a significantly negative correlation with depression, anxiety and stress (Table 3, $P < 0.05$).

WL change and WC change were associated with lower mental health, sleep time, sleep duration and D-sat scores in first four-months of quarantine (Table 4). WL was inversely related to stress ($P < 0.05$). Participants with higher WL and WC reduction had less depressive symptoms ($P < 0.05$). Family income was associated with BMI inversely.

Discussion

The purpose of the current cross-sectional study was survey of diet-satisfaction relation to mental status and anthropometric indices in women with overweight and obesity that had consulted a nutritionist before or at the time of the corona outbreak. Our findings indicate that all seven subscales of the D-Sat questionnaire were significantly inversely related to participants' mood disorders. More specifically, increasing dietary satisfaction was associated with improved mental health and higher WL and WC reduction were associated with a significant reduction depressive symptoms. Last evidences have shown a diet that leads to weight loss improves the quality of life,

but to the best of our knowledge this is the first study to examine the mood of obese patients on a weight-loss diet during coronavirus quarantine. It also measures the relationship between dietary satisfaction and mental health-related factors. On the other hand, it has been reported low-calorie diets for weight loss affect all aspects of a person's life ¹⁴ , it is important to evaluate dietary satisfaction to prevent mood problems including depression, stress and anxiety. As the results of our study showed, quarantine is also effective in increasing the prevalence of mood disorders, so the use of a diet satisfaction questionnaire in the weight loss program is relevant to gather insight into patient's mental health status in COVID-19 outbreak. According to the results of our study WL and WC reduction were also significantly associated with depression but there were no significant relationships with stress and anxiety. In the weight loss process, can be understood type and healthy of diet was more important than its fat mass reduction result in the short term.

The findings showed that the coronavirus pandemic and resulting quarantine increases the prevalence of mental disorders, so the use of a diet satisfaction questionnaire in the weight loss program is relevant to gather insight into patient's mental health status. The results also show that a diverse and varied diet that the patient is comfortable with is important in improving the mental health of obese and overweight people. Restricted and very low calorie diets focused on high weight loss in a short period of time have psychological consequences, such as depression^{15, 16} Low calorie and low carbohydrate diet may be related to some psychological symptoms such as depression ¹⁷ Alternatively, higher activity levels and a broad food section has also been shown to improve mental health status in obese patients ¹⁸. Prescribing a healthy diet that gives the patient satisfaction, especially during quarantine with and the potentially elevated incidence of mental health disorder development, can ensure adherence to the diet and sustainable weight management

^{19, 20}. This association illustrates how diet satisfaction can improve mental health and quality of life and should be considered going forward during the pandemic.

One limitation of our study was that we only included female patients and diet satisfaction may differ in male patients. Another limitation was that we did not collect a food record in participants, which would have led to more accurate results.

Overall, diet satisfaction in obese and overweight women and positive individual and family dynamics can improve mental status during quarantine. Obese and overweight patients aiming to lose weight should be aided in diet management and ensure their satisfaction with the planned diet.

Acknowledgment:

We would like to thank the study participants for their cooperation, the present study was financially supported by Shahrekord University of Medical Sciences. Fateme Moradi and Siavash Fazelian and Javad Heshmati: designed the study; Fateme Moradi and Siavash Fazelian conducted the data collection; Ali Ahmadi and Elnaz Daneshzad: conducted the statistical analysis, evaluated and reported the results; Javad Heshmati and Tina Jafari and Emma Persad: wrote the article's draft; and all authors carefully evaluated the final draft of the manuscript and approved it.

The authors have no conflicts of interest to declare.

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Table 1.

Variables	Total	D-Sat tertiles			P value*
		1 (< 21.83)	2 (21.83-24.84)	3 (24.84<)	
Number	228	76	76	76	
		Mean ± SD			
Age (y)	32.39 ± 8.76	32.10 ± 8.42	31.71 ± 8.05	33.36 ± 9.75	0.478
Weight (kg)	78.89±13.77	80.66 ± 13.67	76.70±13.32	79.30±14.19	0.198
BMI (kg/m²)	29.70 ± 5.02	29.91 ± 4.97	29.13 ± 4.40	29.96 ± 5.66	0.492
WC (cm)	94.89 ±14.86	97.91 ± 16.73	92.87 ± 13.19	93.89 ± 12.50	0.073
Weight Change	-1.25 ± 4.77	0.09 ± 3.92	-1.25 ± 4.76	-2.59 ± 5.22	0.002
WC (cm) Change	-1.22 ± 6.11	0.30 ± 5.92	-1.39 ± 5.83	-2.57 ± 6.30	0.014
		% (n)			
PA					< 0.0001
Without PA	31.1 (71)	54.9 (39)	23.9 (17)	21.1 (15)	
1-2 time/wk	20.6 (47)	21.3 (10)	38.3 (18)	40.4 (19)	
3-4 time/wk	21.9 (50)	34.0 (17)	30.0 (15)	36.0 (18)	
5-6 time/wk	7.9 (18)	22.2 (4)	22.2 (4)	55.6 (10)	
Every day	18.4 (42)	14.3 (6)	52.4 (22)	33.3 (14)	
Education					0.26
Under diploma	15.8 (36)	36.1 (13)	25 (9)	38.9 (14)	
Diploma	23.2 (53)	22.6 (12)	37.7 (20)	39.6 (21)	
Academic	61 (139)	36.7 (51)	33.8 (47)	29.5 (41)	
Income					0.68
Low	17.5 (40)	42.5 (17)	32.5 (13)	25.0 (10)	
Moderate	78.5 (179)	31.3 (56)	33.5 (60)	35.2 (63)	
High	4 (9)	33.3 (3)	33.3 (3)	33.3 (3)	
Sleep time					0.38
Before 1:00am		30.3 (46)	34.9 (53)	34.9 (53)	
After 1:00am		39.5 (30)	30.3 (23)	30.3 (23)	
Sleep duration					0.78
<8 hour	66.2 (151)	31.8 (48)	33.8 (51)	34.4 (52)	
≥8 hour	33.8 (77)	36.4 (28)	32.5 (25)	31.2 (24)	

BMI: body mass index; WC: waist circumference; PA: physical activity

*P-values is calculated by one-way ANVOVA test.

Table 2.

Variables	D-Sat tertiles			P trend
	1 (< 21.83)	2 (21.83-24.84)	3 (24.84<)	
Depression (n= 156)				
Crude model	1	0.24 (0.10; 0.56)	0.14 (0.06; 0.34)	< 0.0001
Adjusted model	1	0.25 (0.10; 0.61)	0.15 (0.06; 0.36)	< 0.0001
Anxiety (n= 161)				
Crude model	1	0.73 (0.34; 1.58)	0.32 (0.15; 0.66)	0.002
Adjusted model	1	0.77 (0.34; 1.71)	0.32 (0.14; 0.68)	0.002
Stress (n= 160)				
Crude model	1	0.28 (0.11; 0.72)	0.08 (0.3; 0.21)	< 0.0001
Adjusted model	1	0.31 (0.12; 0.81)	0.09 (0.03; 0.23)	< 0.0001

P trend is calculated by binary logistic regression.

Age, education and income level, sleep time and duration, physical activity, and BMI were moderated in the adjusted model.

Data has presented as odds ratio (OR) and confidence interval (95%CI).

Table 3. Correlations among each seven-scale of Diet Satisfaction Questionnaire and Depression, Stress

Variables	Depression	Anxiety	Stress
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Healthy Life style	-0.497 (<0.0001)	-0.440 (<0.0001)	-0.473 (<0.0001)
Convenience	-0.117 (0.077)	-0.038 (0.571)	-0.133 (0.045)
Cost	-0.310 (<0.0001)	-0.241 (<0.0001)	-0.275 (<0.0001)
Family dynamic	-0.252 (<0.0001)	-0.140 (0.035)	-0.231 (<0.0001)
Preoccupation with food	-0.286 (<0.0001)	-0.266 (<0.0001)	-0.335 (<0.0001)
Negative aspect	-0.401 (<0.0001)	-0.285 (<0.0001)	-0.331 (<0.0001)
Meal planning and preparation	-0.255 (<0.0001)	-0.163 (0.014)	-0.280 (<0.0001)

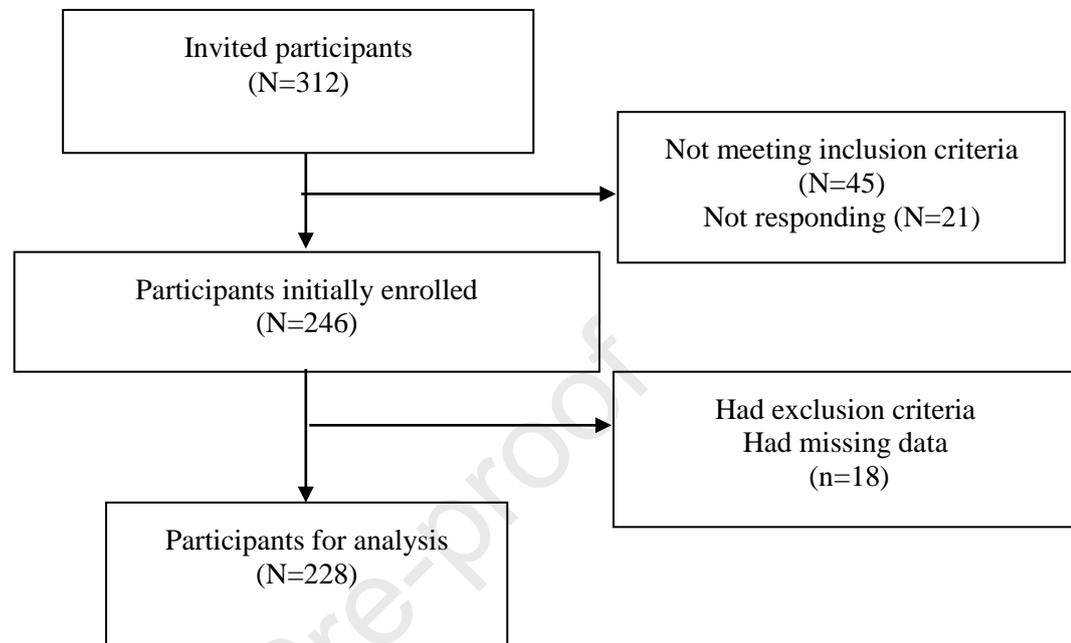
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Variables	Weight Change(kg)	WC Change(cm)	
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	Crud B	Adjusted Beta	95% C I for B	P *	Crud B	Adjusted Beta	95% C I for B	P *	Crud B
Depression	-0.089	-0.231	(-0.146, 0.002)	0.002	-0.107	-0.218	(-0.182, -0.032)	0.005	-0.031
Anxiety	-0.066	-0.136	(-0.134, 0.003)	.060	-0.039	-0.063	(-0.129, 0.052)	0.401	-0.015
Stress	-0.080	-0.188	(-0.143, -0.017)	0.013	-0.076	-0.140	(-0.160, 0.007)	0.072	-0.026
Income	1.264	0.118	(-0.117, 0.073)	0.073	0.391	0.028	(-1.428, 2.209)	0.672	-1.767
Sleep time	1.265	0.146	(0.185, 0.022)	0.022	1.108	0.100	(-0.314, 2.531)	0.126	1.088
Sleep duration	-0.447	-0.064	(-1.345, 0.328)	0.328	-1.128	-0.126	(-2.311, 0.055)	0.062	-0.014
Healthy lifestyle	-1.332	-0.237	(-2.228, 0.004)	0.004	-1.752	-0.244	(-2.932, -0.572)	0.004	-0.973
Convenience	-0.803	-0.094	(-1.938, 0.165)	0.165	-0.490	-0.045	(-1.986, 1.006)	0.520	-0.292
Cost	-0.395	-0.074	(-1.262, 0.369)	0.369	-0.292	-0.042	(-1.433, 0.849)	0.615	-0.057
Family dynamics	-0.445	-0.084	(-1.206, 0.250)	0.250	-0.553	-0.081	(-1.555, 0.449)	0.278	0.970
Preoccupation with food	-0.467	-0.079	(-1.365, 0.306)	0.306	-0.162	-0.021	(-1.344, 1.021)	0.788	0.395
Negative aspect	-0.702	-0.113	(-1.759, 0.192)	0.192	-0.268	-0.034	(-1.661, 1.124)	0.704	-0.975
Meal planning and preparation	0.470	0.086	(-0.441, 0.310)	0.310	-0.102	-0.014	(-1.302, 1.098)	0.867	0.255

P trend is calculated by linear logistic regression. Age, education and income level, sleep time and duration, physical activity, were moderated in the adjusted beta.

Figure 1: Flow chart of the process of the study selection.



Highlights

- All seven subscales of the D-Sat questionnaire were significantly inversely related to participants' mood disorders
- Dietary satisfaction was associated with improved mental health
- Higher WL and WC reduction were associated with a significant reduction in depressive symptoms