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Original Article

Psychological Distress During COVID-19 Confinement in Persons After Metabolic Surgery.

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Abstract. – Background: *People suffering from obesity often experience distress and psychopathological symptoms that decrease after undergoing metabolic surgery; the confinement caused by the COVID-19 pandemic impacted the whole population in this regard. Given that individuals undergoing metabolic surgery are at increased risk of developing these disorders, it is important to identify them in order to prevent or treat them appropriately. Therefore, this study aims to determine the relationship between COVID-19-related psychological distress and psychopathological symptoms in people who underwent metabolic surgery.* ***Methods:*** *A cross-sectional study was conducted including 102 participants more than six months after undergoing metabolic surgery. Sociodemographic information was collected, as well as psychological distress related to COVID-19 and psychopathological symptoms measured using the SCL-90R. A Structural Equation Model was developed to evaluate the effects and correlation between variables.* ***Results:*** *90.2% of the participants were women, 84% had undergone gastric sleeve surgery while the rest had undergone Roux-en-Y gastric bypass surgery. The model obtained showed a significant correlation between the subscales of the SCL 90-R and COVID-19 related psychological distress and both were negatively correlated with the age of the participants. The COVID-19-related psychological distress factor had a significant effect on fear of contagion, perception and knowledge of risk of contagion, with risk perception being the most explained with 95.8% of variance explained. In addition, the final model showed adequate goodness-of-fit indicators.* ***Conclusions:*** *Psychological distress caused by pandemic and confinement is evidenced by higher scores on the SCL-90R instrument in persons with metabolic surgery. However, further studies and psychometric testing with more homogeneous samples in terms of sex and surgical technique are required.*

Keywords: Metabolic Surgery; Structural Equation Modelling; COVID-19; Gastrectomy; Psychological Distress.

1. Introduction

The COVID-19 pandemic disrupted people's daily lives due to the closure of schools, businesses, and changes in work routines. The confinement established by governments prevented the usual social interactions with family and community. Moreover, health systems had to adapt to deal with the emerging disease, which resulted in reduced access to primary and specialized care for people with other diseases[1].

These dramatic changes in daily routine, combined with limited social support, led

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to an increase in the levels of depression and anxiety on the population [2]. The most severely affected individuals in this regard were those facing more serious situations such as loss of employment, passing of family members, those with a history of mental illness, and those considered to be at high risk for severe COVID-19 infection, such as those with obesity[3–5].

However, it should be noted that not only people with obesity were vulnerable, but also those who underwent metabolic surgery (MS) and presented micronutrient deficiency caused by the surgical technique and lack of multivitamin supplementation[6–9]. These are a concern for this population since deficiencies such as vitamin D have been associated with the presence of anxiety, depression and suicidal ideation[10–12].

Furthermore, the accelerated weight loss that these persons experience require the patient to be able to cope and adapt quickly to their new body image, without having time to reconstruct the representation of their own body [13]. This leads to changes in the way they relate to their environment, it has been noted that, in the early postoperative stages, patients show problems in the organization of their body image causing distress or psychological discomfort such as depression due to the constant desire to achieve an unrealistic ideal figure[14].

The risk factors listed above, together with the lifestyle change (social isolation and confinement) caused by the COVID-19 pandemic[15], had a psychological impact on a significant proportion of the population, with symptoms of anxiety, depression and stress. Other reactions that were observed include uncontrolled fear of becoming infected, feelings of loneliness, frustration and boredom, all of which have been shown to decrease psychological well-being and quality of life as they have been related to higher scores of psychopathological symptoms such as somatization (SOM), obsession-compulsion (O-C), interpersonal sensitivity (IS), depression (DEP), anxiety (ANX), hostility (HOST), phobic anxiety (PANX) and psychoticism (PSY)[16].

This study is of great relevance given the vulnerability of persons with MS, since no study has specifically described the psychological distress this population during the confinement caused by the COVID-19 pandemic in Latin America, which tend to present this type of symptomatology[17]. This could end up jeopardizing the success of the surgery while putting these persons in danger, since in addition to presenting "emotional intake" derived from poor self-control and a limitation in coping with stressful situations, with eating behavior being a mediator between these conditions[18]. This was corroborated during the confinement with people with metabolic surgery suffering from symptoms of depression and anxiety and a significant percentage of them reported taking antidepressants during this period[19].

1.1. Aim

The present study aims to identify the possible psychological distress caused by

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the COVID-19 pandemic and its relationship with the development or increase of psychopathological symptoms, as well as self-perceived risk of infection by the virus after metabolic surgery in adults from the northwestern border of Mexico.

2. Materials and Methods

2.1 Study Design and Participants

The present project is a cross-sectional study conducted in the City of Tijuana municipality of the state of Baja California, México between September and November 2021. We included men and women (>18 years old), of Mexican nationality, residents of the City of Tijuana who had been submitted to Sleeve Gastrectomy (SG) or Roux-Y Gastric Bypass (RYGB) at least 6 months before the start of the study. The sample size was non-probabilistic, a database of N=250 persons was consulted and those who met the inclusion criteria were contacted by telephone by the treating surgeon that was not part of the research team to be invited. A total of n = 102 persons signed the informed consent (IC) format and were included in the study.

The study protocol was approved by the Bioethics Committee of the Autonomous University of Baja California, Mexico (1135/20-2) on January 16, 2021. To comply with the World Health Organization (WHO) derived from the COVID-19 pandemic and to keep social distancing[20] all the formats used were adapted to be answered online through the Google Forms platform, the instrument was applied to measure the variables of interest, all this was done in a single 30 minutes session.

2.2 Data Collection

Sociodemographic information was collected using an instrument that included seven items to evaluate the COVID-19 related psychological distress. Items: 1.- Have you gotten sick with COVID-19?, 2.- If you haven't gotten sick, are you afraid of getting sick?, 4.- Do you think you're at increased risk for COVID-19 due to metabolic surgery?, 6.- Have any close family members become ill with COVID-19? and 7.- Have any close family members died from COVID-19? had dichotomous answers (yes or no); The degree of confinement was measured with item 3.- How many days a week do you stay at home?, answer options were: 1-More than five days, 2-Between three and five, 3-Less than three, 4-None. Finally, item 5: Do you know what the risk factors are for contracting COVID-19? was an open answer question regarding the person's knowledge about the risk factors for contracting COVID-19 due to the metabolic surgery.

The participants answer was assessed by an infectology expert, depending on the degree of agreement between the information given by the participant and the reference information published by the WHO. The answers were categorized to "zero" when the information that the participant gave did not coincide with the reference information and "one", when the

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information coincided with the reference information.

2.2.1 Symptom Checklist 90-R

To measure the participants psychological distress, the modified Symptom Checklist 90-Revised (SCL 90-R) by Derogatis was used[21] . The SCL90-R is a self-report questionnaire, assessing general psychopathology and clusters of psychiatric symptoms, which was suggested by the American Society for Metabolic and Metabolic surgery[22] as a valid screening measure to be used in the psychosocial evaluation and demonstrated good internal consistency and validity among candidates for metabolic surgery, the coefficients of the 9 scales range between .76-.90[23,24].

The questionnaire consists of 90 items with Likert-type responses ranging from 0 to 4 (0 = not at all; 1 = a little; 2 = moderately; 3 = quite a bit; 4 = extremely). The participant responded to each item according to their discomfort during the week before the application of the questionnaire. The scores for each factor were obtained by looking for the scores average (sum of items divided by the number of items).

The test is divided into nine subscales, Somatization (SOM): Discomfort related to different bodily dysfunctions (cardiovascular, respiratory, gastrointestinal) and physical pain (headache, low back pain, myalgia); Obsessive-Compulsive (OC): Thoughts, actions and impulses that are experienced as inevitable or unwanted; Interpersonal Sensitivity (IS): Feelings of inferiority and inadequacy, especially when the person compares himself to others; Depression (DEP): Dysphoric moods, lack of motivation, low energy, hopelessness and suicidal ideation; Anxiety (ANX): Symptoms of nervousness, tension, panic attacks and fears; Hostility (HOS): Characteristic thoughts, feelings and actions of the presence of negative affections of anger; Phobic Anxiety (PANX): Persistent fear responses that are irrational and disproportionate to the stimuli that provoke them (specific people, places, objects, situations); Paranoid Ideation (PI): Paranoid behaviors, thoughts of suspicion and fear of loss of autonomy; Psychoticism (PSY): States of loneliness, schizoid lifestyle, hallucinations and thought control; and additional items referring to clinical symptoms (CS): Loss of appetite, trouble sleeping, thinking about dying or dying, overeating, feeling guilty. The instrument also includes the three global scales, the Global Severity Index (GSI), Positive Symptom Distress Index (PSDI), and the Positive Symptom Total (PST).

2.3 Data analysis

Descriptive statistics were obtained from the sociodemographic data, the ten subscales of the instrument and the three global scales. Spearman and Pearson correlations were also carried out between the SCL-90-R instrument subscales, the sociodemographic variables and the COVID-19 related psychological distress items. SPSS version 25 software

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for Windows was used for data processing and analysis. A p-value smaller than 0.05 indicated statistical significance.

2.4 Structural Equations Model

A hypothetic model was created using the SCL90-R and the COVID-19 related psychological distress items as endogenous variables and the internal perceived psychological distress (Factor 1) as well as COVID-19 related psychological distress (Factor 2) as exogenous variables.

A maximum-likelihood solution for the hypothetic model was obtained using an Analysis of Moment Structure Program[25].

The latent factors internal perceived psychological distress and COVID-19 related psychological distress were used to estimate the sample variance–covariance matrix. The model fit was measured by the chi-square goodness-of-fit test as well as the generally accepted measures of global fit root mean square error of approximation (RMSEA); the Comparative Fit Index (CFI); Parsimony Normed Fit Index (PNFI) and Akaike Information Criterion (AIC)[26].

Acceptable fit values for chi-square goodness-of-fit test, CFI and PNFI are close to 1.0[27] with acceptable RMSEA cutoff values being close to 0.06 and lower values of AIC indicate a better fit[26,28].

3. Results

3.1 Sample Characteristics

The sample's sociodemographic data indicated that 90.2% of the participants were women with a mean age of *M*= 39.77, *SD*= 1.05, and 9.8% men with a mean age of *M*= 39.8, *SD*= 9.7; 84% had been submitted to SG while the rest underwent RYGB. Regarding the elapsed post-surgery time, 50% had been under surgery between one and three years ago, followed by 27.5% between six months and one year, and 22.5%, more than three years, the rest of the sociodemographic data can be seen in Table 1.

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Table 1. Sociodemographic characteristics of the sample included in the study.

Variable	%	n
Sex		
Male	9.8%	(n=10)
Female	90.2%	(n=92)
Sample size	n=102	
Surgical Technique		
Sleeve gastrectomy	84%	(n=85)
Roux-Y Gastric Bypass	16%	(n=17)
Time since surgery		
6 months to 1 year	27.5%	(n=28)
1 to 3 years	50%	(n=51)
Over 3 years	22.5%	(n=23)
Marital status		
Single	33.4%	(n=34)
Married	48%	(n=49)
Divorced	7.8%	(n=8)
Consensual union	8.8%	(n=9)
Widower	2%	(n=2)
Education		
Elementary school	5.9%	(n=6)
Middle school	12.8%	(n=13)
High school	23.5%	(n=24)
University	49%	(n=50)
Master	8.8%	(n=9)
Occupation		
Unemployed	2.9%	(n=3)
Housewife	20.6%	(n=21)
Employee	50%	(n=51)
Businessman	22.6%	(n=23)
Student	2.9%	(n=3)
Retired	1%	(n=1)
Employment situation during the pandemic		
Working from home	52%	(n=53)
Leaving home to work	34.3%	(n=35)
Unemployed since before the pandemic	4.9 %	(n=5)
Unemployed due to the pandemic	8.8%	(n=9)

%: Prevalence, n=Frequency

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3.3 SCL 90-R scores.

The means and standard deviation (raw scores) from the subscales of the SCL 90-R in the current sample are shown in Table 3.

It can be noted that the subscales of OC (0.71±0.62) and DEP (0.69±0.65) as well as AI (0.69±0.57) showed the highest means while PSY (0.28±0.48) was the lowest.

Table 3. Means and S.D for current sample.

Subscale	Mean	S.D
Somatization (SOM)	.65	.49
Obsessive-Compulsive (OC)	**.71**	.62
Interpersonal Sensitive (IS)	.52	.68
Depression (DEP)	**.69**	.65
Anxiety (ANX)	.47	.55
Hostility (HOS)	.53	.65
Phobic Anxiety (PANX)	.31	.54
Paranoid Ideation (PI)	.55	.69
Psychoticism (PSY)	.28	.48
Clinical Symptoms (CS)	**.69**	.57
Global Severity Index (GSI)	.55	.52
Positive Symptom Distress (PSD)	1.35	.40
Positive Symptom Total (PST)	33.23	2.91

S.D = Standard Deviation.
Bold indicate the highest means.

3.4 Psychopathological dimensions & COVID-19 related psychological distress.

Table 4 provides the correlation coefficients for the associations of the sociodemographic variables, COVID-19 related psychological distress items and the SCL 90-R subscales and global indices. A significant association was found between the age of the participants and OC, IS, DEP, HOS, PANX and PI as well as the GSI and PST. The only COVID-19 related items that showed a significant correlation with the SCL 90-R subscales were the Fear of contagion, Awareness of the risk of contagion due to metabolic surgery and Knowledge about COVID-19 risk, nonetheless they showed a significant correlation with all of the subscales as well as the general indices.

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Table 4. Correlations of the sociodemographic variables, COVID-19 related psychological distress and SCL 90-R subscales.

	Sociodemographic variables					
COVID-19 Related items	Sex	Age	Marital status	Education	Employment situation during the pandemic	Occupation
Have you gotten sick with COVID-19?	-.028	-.074	-.190	.006	**.453****	.101
If you haven't gotten sick, are you afraid of getting sick?	.069	.052	-.013	.078	-.003	.005
How many days a week do you stay at home?	-.139	.158	**.355****	-.085	-.071	.041
Do you think you're at increased risk for COVID-19 due to metabolic surgery?	**-.209***	-.011	.060	-.010	-.124	.090
Do you know what the risk factors are for contracting COVID-19?	**-.217***	-.026	.059	-.008	-.123	.094
Have any close family members become ill with COVID-19?	-.122	-.158	.027	.012	-.106	.119
Have any close family members died from COVID-19?	.015	-.171	.050	-.068	.174	-.031

	SCL 90-R Subscales and Global indices												
Sociodemographic variables	SOM	OC	IS	DEP	ANX	HOS	PANX	PI	PSY	CS	GSI	PSD	PST
Sex	-.072	-.090	-.064	.038	.034	-.082	-.093	-.043	.017	-.125	-.062	-.122	.170
Age	-.180	**-.261****	**-.263****	**-.279****	-.154	**-.208***	**-.257****	**-.243***	-.188	-.104	**-.250***	-.185	**-.273****
Marital status	.104	.086	.083	.053	.099	.156	.009	.089	.050	.052	.084	.090	.085
Education	-.095	-.037	-.168	-.043	-.017	-.130	-.062	**-.243***	-.079	-.064	-.085	-.128	.055
Employment situation during the pandemic	.067	-.035	.134	.011	.113	.168	.105	.097	**.253***	-.035	.072	.080	.032
Occupation	-.013	-.033	-.110	-.083	-.185	-.171	-.091	-.105	-.081	-.177	-.115	-.121	-.111

	SCL 90-R Subscales and Global indices												
COVID-19 Related items	SOM	OC	IS	DEP	ANX	HOS	PANX	PI	PSY	CS	GSI	PSD	PST
Have you gotten sick with COVID-19?	.001	-.029	.066	-.037	-.078	-.016	.012	.008	.15	-.024	-.015	-.013	-.045
If you haven't gotten sick, are you afraid of getting sick?	.182	-.134	-.145	.051	.112	-.147	-.112	-.146	-.022	.111	-.026	-.033	.102
How many days a week do you stay at home?	**.244***	**.297****	**.308****	**.239***	**.325****	**.359****	**.323****	**.227***	**.291****	**.295****	**.325****	**.300****	**.272****
Do you think you're at increased risk for COVID-19 due to metabolic surgery?	**.228***	**.399****	**.446****	**.386****	**.234***	**.363****	**.305****	**.292****	**.333****	**.376****	**.422****	**.379****	**.400****
Do you know what the risk factors are for contracting COVID-19?	**.221***	**.398****	**.452****	**.413****	**.261****	**.375****	**.355****	**.356****	**.359****	**.379****	**.427****	**.387****	**.406****
Have any close family members become ill with COVID-19?	.003	-.021	-.143	.109	-.019	-.044	-.042	-.068	-.016	.063	.002	.022	-.071
Have any close family members died from COVID-19?	-.007	.101	-.004	-.013	.131	.065	-.028	-.052	-.011	-.053	.007	.055	-.144

SOM = Somatization; OC = Obsessive-Compulsive; IS = Interpersonal Sensitivity; DEP = Depression; ANX = Anxiety; HOS = Hostility; PANX = Phobic Anxiety; PI = Paranoid Ideation; PSY = Psychoticism; CS=clinical Symptoms. *p< .05; **p< .01. Bold indicate statistical significance.

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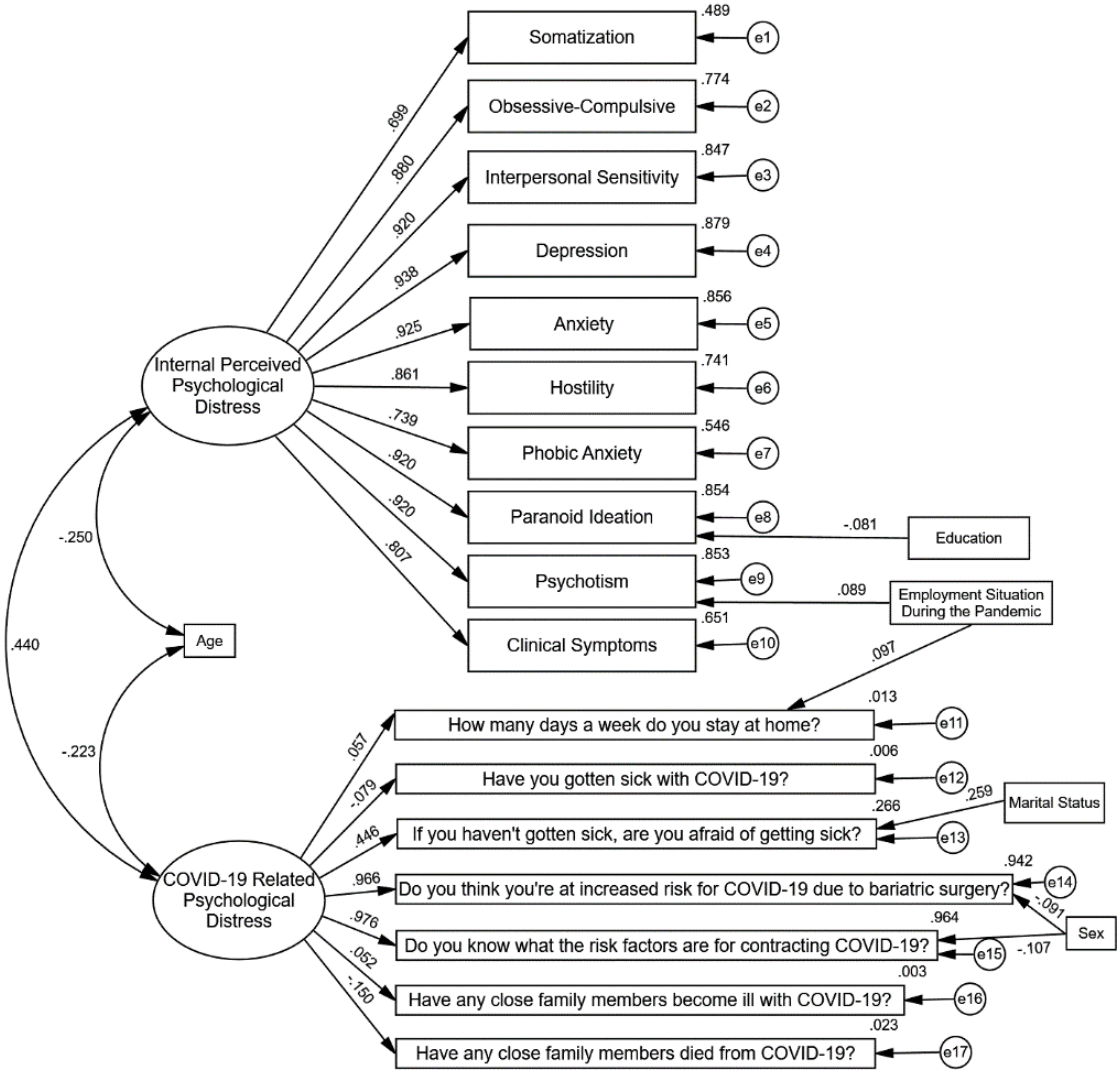
3.5 Structural Equation Modeling

A structural equation model (SEM) was proposed and modeled using AMOS, the model included the variables that showed a significant correlation with the SCL 90-R subscales. In the graphical representation, rectangles are observed variables while circles correspond to residual errors, the values on the one sided arrows are standardized regression weights and double sided arrows indicate correlations.

Figure 1. Hypothesized Structural Equation Model of the Symptom Checklist 90-Revised (SCL 90-R) and the COVID-19 related psychological distress items.



The rectangles represent the observed variables; the ovals represent the errors associated with the endogenous variables: e1-e10 correspond to the SCL 90-R subscales, e11-e17 correspond to the COVID-19 related psychological distress items. One way arrows are used to represent effects and two way arrows correlations. Goodness of fit indices: χ^2=401.535, *df*=205, *p*=0.000; RMSEA: .097, GFI: .750, CFI: .879; PNFI: .696; AIC: 497.535.

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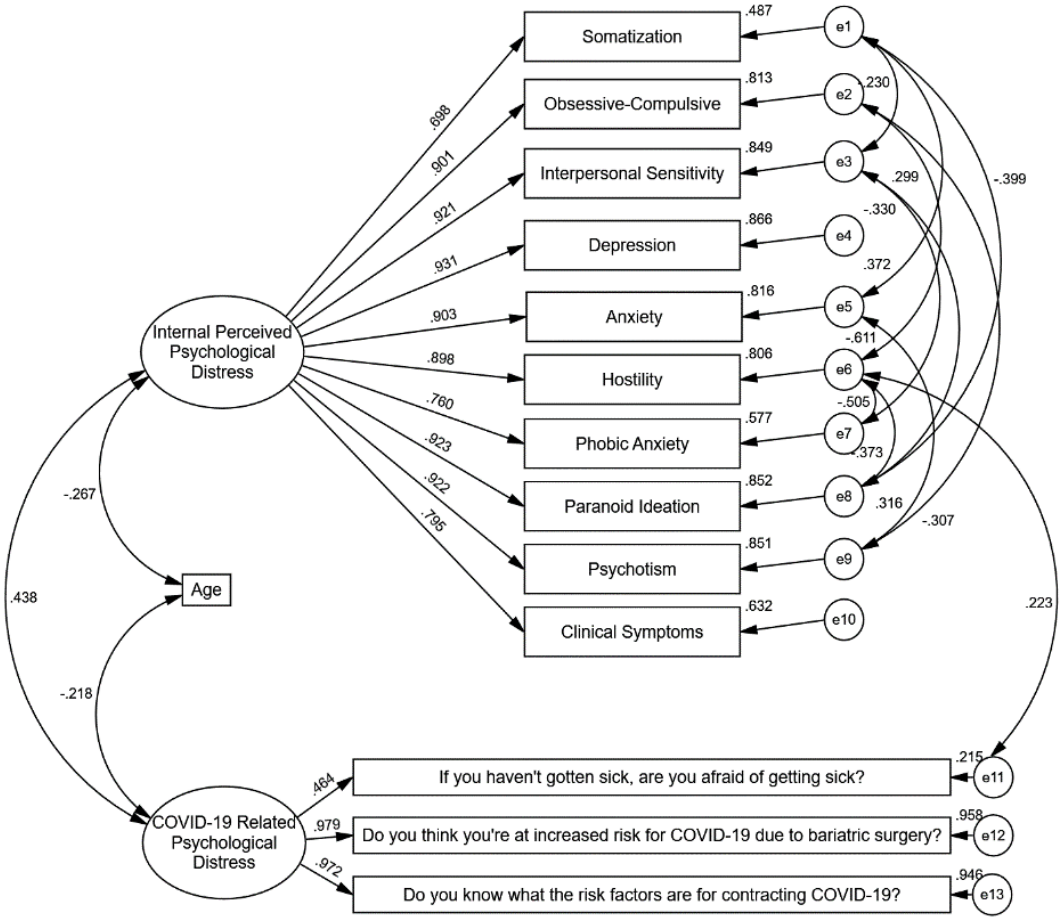
On the first SEM (Figure 1), the internal perceived psychological distress (Factor 1) explained a high percentage of all SCL 90-R subscales, and was significantly correlated to the COVID-19 related psychological distress (Factor 2), also, both factors were negatively correlated to the participants age. Furthermore, Factor 2 only had a significant effect over the fear of contagion, awareness of the risk of contagion due to the metabolic surgery and knowledge about COVID-19 risk. Lastly the sociodemographic variables of sex, education, employment status during the pandemic and marital status showed no significant effect over the subscales and COVID-19 related items that were previously correlated with. Considering these findings this SEM was modified to obtain a significant one with a better fit.

Figure 2. Final Structural Equations Model of the Symptom Checklist 90-Revised and the COVID-19 related psychological distress items.



The rectangles represent the observed variables; the ovals represent the errors associated with the endogenous variables: e1-e10 correspond to the SCL 90-R subscales, e11-e13 correspond to the COVID-19 related psychological distress items. One way arrows are used to represent effects and two way arrows correlations. Goodness of fit indices: χ^2=78.007, *df*=64, *p*=0.112; RMSEA: .047, GFI: .907, CFI: .991; PNFI: .670; AIC: 160.007.

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The final model (Figure 2) shows the same effect of the psychopathological symptoms factor on all the sub-scales of the SCL 90-R instrument, with DEP being the one that was explained in the highest proportion, with 86.6% of variance explained, and SOM the lowest with 48.5% of variance explained. At the same time, similar to what was found in the intercorrelation tests, a correlation was observed between the residuals of subscales.

The psychological distress factor related to COVID-19 had a significant effect on the fear of contagion, risk perception and risk knowledge, with risk perception being the most explained with 95.8% of variance explained. As in the first model, a significant correlation was observed between both factors together with age. Also, the final model showed better goodness-of-fit indicators than the hypothetical model.

4. Discussion

Consistently with what has been found in Mexican individuals by[29] and other types of target groups[30] the instrument showed a high correlation between its subscales. Such results clearly indicate that all of these dimensions are part of the same measurement instrument and that they can be incorporated into a general dimension, which in this case is represented by the global indices.

The proposed structural equation model revealed a notable correlation among the psychopathological symptoms evaluated by the SCL 90-R subscales, the age of the participants, and the psychological distress caused by the COVID-19 pandemic. It has been demonstrated by earlier research that the SCL90-R not only measures internal perceived mental concerns but also evaluates external perceived mental health concerns, including the psychological distress caused by the COVID-19 pandemic[31].

The latter was explained only by three items, concerning the fear of COVID-19 contagion, the perceived risk of contagion due to bariatric surgery and the knowledge of the risk of COVID-19 contagion. The direct knowledge of people regarding the disease has been documented as a risk factor for the development of depressive symptoms during the SARS outbreak[32]. In a similar manner, the fear of COVID-19 has impacted people's mental health, manifesting in anxiety, loneliness, uncertainty, and panic[33].

Those who were more conscious of the risk associated with a history of obesity and bariatric surgery, along with being aware of the risks associated with COVID-19 infection, expressed a greater level of fear of being infected by the virus, which in turn led to psychological discomfort, particularly in the form of hostility. This discomfort, as well as the other psychopathological symptoms evaluated,

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were negatively correlated with the age of the participants, as the youngest were the ones who showed higher scores in the instrument dimensions.

A correlation between age and psychological distress due to the pandemic has been reported in other populations, where younger persons showed greater distress than their older counterparts[34]. This may be explained by the fact that significant differences have been found in the coping mechanisms used by young and older adults in dealing with stress and depression[35].

5. Conclusion

In conclusion, our study sheds light on the impact of the COVID-19 pandemic on the mental health of individuals who underwent metabolic surgery. Our findings suggest that the pandemic has had a significant effect on psychopathological symptoms, particularly obsessive-compulsive behavior, depression, and clinical symptoms. The positive and significant correlation between these symptoms and the distress caused by COVID-19 underscores the need for healthcare providers to address the mental health needs of these patients during the pandemic.

It is important to note that the SCL 90-R was not originally designed to evaluate the discomfort caused by a pandemic. Nevertheless, our results demonstrate that the scores for various dimensions of the SCL 90-R increased as a result of the distress caused by COVID-19. Of particular concern is the high score obtained in factor 10 (CS), which may contribute to the development of eating disorders and severe manifestations of depression and hostility. Therefore, it is imperative to implement interventions that aim to improve the mental health of individuals who underwent metabolic surgery.

However, our study has limitations, primarily the high prevalence of female participants and those who underwent SG in our sample. Further studies and psychometric tests are necessary to clarify the effect of the pandemic and confinement on a more diverse sample of bariatric surgery patients, including those who underwent different surgical techniques. Overall, our study provides valuable insights into the mental health needs of individuals who underwent metabolic surgery during the COVID-19 pandemic.

6. Declarations

6.1 Ethics approval and consent to participate

The study was approved by the ethics committee of the Faculty of Medicine and Psychology of the Autonomous University of Baja California (approval number: D245). All procedures involving human participants were in accordance with the ethical standards outlined in the 1964

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World Medical Association Declaration of Helsinki and its later amendments or comparable ethical standards.

6.2 Competing interests

The authors declare that they have no conflict of interest.

6.3 Funding

Not applicable.

6.4 Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

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