

Anthropometric indices and mental health of workers in health sector in Saltillo, México

Índices antropométricos y salud mental de trabajadores del sector salud en Saltillo, México

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Abstract:

Mental health problems are increasingly common and disabling in México, particularly among healthcare workers. This study aimed to estimate the prevalence of depression, anxiety, and stress, and to examine associations between anthropometric indices and psychological outcomes in healthcare workers in Saltillo, Mexico. A cross-sectional study was conducted with 258 healthcare workers from University Hospital of the Autonomous University of Coahuila. Sociodemographic and lifestyle data were collected using a validated questionnaire. Anthropometric measures (weight, height, mid- upper arm circumference, waist and hip circumferences) were obtained using standardized procedures. Mental health status was assessed with the Depression, Anxiety, Stress Scale (DASS-42). Multiple linear regression models were applied to explore associations, reporting regression coefficients (B), 95% confidence intervals, p-values, and R^2 . Depression, anxiety, and stress (ranging from mild to extremely severe) were present in 51.2%, 31.8%, and 25.2% of participants, respectively. Overweight and obesity were frequent, with 21.3% and 17.1% classified as grade I and II obesity. Regression analyses showed limited explanatory power of anthropometric indices ($R^2 = 0.60-0.66$). BMI and waist circumference were significantly associated with anxiety and stress, while alcohol consumption and smoking were more consistently related to depression and anxiety. High levels of depression and obesity were observed, but anthropometric indices explained only a modest proportion of psychological outcomes. Psychosocial and lifestyle factors appear more decisive. Preventive interventions should integrate physical health promotion with psychological support, and future longitudinal studies are needed to clarify causal pathways.

Keywords:

Mental health, Anthropometry, Depression, Anxiety, Stress, Healthcare workers.

Resumen:

Los problemas de salud mental son cada vez más comunes e incapacitantes en México, especialmente entre los trabajadores del sector salud. Este estudio tuvo como objetivo estimar la prevalencia de depresión, ansiedad y estrés, así como examinar las asociaciones entre índices antropométricos y resultados psicológicos en trabajadores de la salud en Saltillo, México. Se realizó un estudio transversal con 258 trabajadores del Hospital Universitario de la Universidad Autónoma de Coahuila, seleccionados mediante muestreo aleatorio simple. Se recolectaron datos sociodemográficos y de estilo de vida mediante un cuestionario validado. Las medidas antropométricas (peso, talla, circunferencias braquial media, cintura y cadera) se obtuvieron con procedimientos estandarizados. El estado de salud mental se evaluó con la Escala de Depresión, Ansiedad y Estrés (DASS-42). Se aplicaron modelos de regresión lineal múltiple para explorar asociaciones, reportando coeficientes de regresión (B), intervalos de confianza al 95%, valores p y R^2 . La depresión, ansiedad y estrés (de leve a extremadamente grave) estuvieron presentes en 51,2%, 31,8% y 25,2% de los participantes, respectivamente. El sobrepeso y la obesidad fueron frecuentes, con 21,3% y 17,1% clasificados en obesidad grado I y II. Los análisis de regresión mostraron un poder explicativo limitado de los índices antropométricos ($R^2 = 0.60-0.66$). El IMC y la circunferencia de cintura se asociaron significativamente con ansiedad y estrés, mientras que el consumo de alcohol y el tabaquismo se relacionaron de manera más consistente con depresión y ansiedad. Se observaron altos niveles de depresión y obesidad, pero los índices antropométricos explicaron solo una proporción modesta de los resultados psicológicos. Los factores psicosociales y de estilo de vida parecen más determinantes. Las intervenciones preventivas deben integrar la promoción de la salud física con apoyo psicológico, y se requieren estudios longitudinales para esclarecer las vías causales.

Palabras Clave:

Salud mental, Antropometría, Depresión, Ansiedad, Estrés, Trabajadores de la salud.

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INTRODUCTION

Anthropometry is a rapid, inexpensive and non-invasive technique that provides valuable information on body composition, particularly fat and muscle distribution, and serves as a key indicator of nutritional status (López-Solís et al., 2022). Mental health problems and emotional disorders are increasingly common and disabling in Mexico. Among healthcare professionals, mental health problems are common, with nearly one-third experiencing psychological distress, burnout, or sick leave worldwide (Dadar Singh et al., 2022). Although anxiety and depression are prevalent globally, their distribution varies depending on economic, social, cultural and biological factors (Zurutuza-Lorméndez et al., 2024).

Workers' mental health has become a critical concern, particularly in emerging nations. Understanding and addressing the mental health issues that employees experience is essential as the workplace changes and gets more demanding (G.O, 2023).

Mental disorders among workers might be on the increase and to avoid health problems that could impair job performance, it is essential to assess and monitor mental diseases like depression and anxiety in the workplace. Healthcare workers are particularly vulnerable due to occupational stress, excessive workloads, and monotonous tasks, which compromise personal well-being. (Arthur et al., 2023; Balderson et al., 2021, Dollard & Winefield, 2002; Lucas-Hernández et al., 2022). The COVID-19 pandemic further intensified psychological distress across sectors (Karakitsiou et al., 2025).

Interventions such as aromatherapy (Cutshall et al., 2024) and forest therapy (Kweon et al., 2024) have shown modest but notable benefits. However, sustaining psychological health requires a holistic understanding of how environmental, social, and occupational factors interact to shape resilience. Healthcare workers, in particular, have reported increased anxiety, depression, stress, and trauma symptoms in the post-pandemic period (Smith et al., 2021, Gilbert et al., 2023).

This study aimed to (1) estimate the prevalence of depression, anxiety, and stress among healthcare workers in Saltillo, Coahuila, Mexico, and (2) explore associations between anthropometric indices among health outcomes. We hypothesized that higher levels of obesity and abdominal adiposity would positively be associated with greater psychological distress.

METHODS

A cross-sectional study was conducted among 258 healthcare workers at the University Hospital of the Autonomous University of Coahuila between January and June 2025.

The study was reviewed and approved by the Research and Ethics Committee of the Nursing Faculty, Autonomous University of Coahuila (Approval No. FAENUS-CI-EX-2023-32). Written informed consent was obtained from all participants.

Participants were selected using a simple random sampling from the hospital staff database. Each worker was assigned

a number, and a random generator was used to select 300 eligible staff members. Sample size was calculated to achieve a 95% confidence level and 5% margin of error. Out of the 300 workers invited, 258 completed the survey, yielding a response rate of 86%. Multiple reminders were sent to encourage participation, and incomplete questionnaires were excluded from the final analysis.

Participants were required to be adults, apparently healthy, employed at the University Hospital, and willing to provide informed consent.

Sociodemographic information (age, sex, marital status, number of children), dietary habits, and lifestyle factors (alcohol consumption, smoking, fruit and vegetable intake) were collected using a prevalidated questionnaire.

Mental health status was assessed using the Depression, Anxiety and Stress Scale (DASS-42) which has demonstrated high internal consistency (Cronbach's alpha: 0.92 for depression, 0.84 for anxiety, 0.91 for stress) (Bados et al., 2005). The DASS-42 consists of three subscales (depression, anxiety, stress), each with 14 items rated on a 0-3 scale (0 = "did not apply to me", 3 = "applied to me very much"). Scores for each subscale range from 0 to 42. Classification thresholds were applied as follows (Lovibond and Lovibond, 1995):

- Depression: Normal (0-9), Mild (10-13), Moderate (14-20), Severe (21-27), Extremely severe (28+).
- Anxiety: Normal (0-7), Mild (8-9), Moderate (10-14), Severe (15-19), Extremely severe (20+).
- Stress: Normal (0-14), Mild (15-28), Moderate (19-25), Severe (26-33), Extremely severe (34+).

Anthropometric and Clinical Measurements.

Blood pressure was measured following the recommendations of the American Society of Hypertension (Thomas et al., 2020). Participants rested for at least 30 minutes, refrained from smoking, exercising, or consuming coffee for 30 minutes prior, and measurements were taken in silence. A digital sphygmomanometer was used to record three readings from each arm at two-minute intervals; the average was used for analysis. Hypertension was defined as systolic ≥ 140 mmHg or diastolic ≥ 90 mmHg; stage II hypertension as systolic ≥ 160 mmHg or diastolic ≥ 100 mmHg (Thomas et al., 2020).

Weight was measured to the nearest 0.1 kg with participants in light clothing, and height to the nearest 0.5cm without shoes. Body Mass Index (BMI) was calculated as weight (kg) divided by height squared (m²) and classified according to WHOH (2008): underweight (<18.5), normal (18.5-24.9), overweight (25-29.9), obesity grade I (30-34.9), grade II (35-39.9), and grade III/morbid obesity (≥ 40) (WHO, 2008).

The hip circumference (HC) was measured at the widest portion of the buttocks, and waist circumference (WC) at the midpoint between the upper border of the iliac crest and the lower border of the lower ribs, both to the nearest 0.5cm. Waist to Hip ratio (WHR) was computed as WC/HC. Men were classified as having a WHR of > 1.01 (obesity), 0.96 to 1.0 (overweight), and < 0.95 (normal), while women were classified as having a WHR of ≥ 0.85 (obese), 0.80 to 0.84

(overweight), and < 0.80 (normal) (WHO, 2008). The participants were divided into two groups: those with and without obesity. According to a WHO expert consultation report, we separated WHR into two categories: normal and obese. Waist circumferences more than 88 cm and greater than 102 cm for men and women, respectively, and waist to hip ratios greater than 0.85 for women and greater than 102 cm were regarded as elevated indicators of abdominal obesity.

Mid upper Arm Circumference (MUAC)

The mid-upper arm circumference (MUAC) was measured with the arm relaxed, midway between the olecranon and acromion, using a non-stretch tape. The tape was positioned midway between the olecranon and the acromion tip. The tape was gentle but firmly wrapped around the arm to avoid compressing the soft tissue. According to WHO guidelines, a value of less than 23 cm was considered low, and a value of more than 23 cm was considered normal (WHO, 2008).

Statistical Analysis

Data were analyzed using SPSS version 25. Descriptive statistics were reported as means and percentages. Associations between anthropometric indices and mental health outcomes (depression, anxiety, stress) were examined using multiple linear regression models. Each outcome was treated as a dependent variable, with BMI, waist circumference, alcohol consumption, and smoking as independent predictors. Regression coefficients (B), 95% confidence intervals, p-values, and R^2 were reported. Model fit was assessed using R^2 , and multicollinearity was assessed using variance inflation factors.

RESULTS

Sociodemographic Characteristics

Table 1 summarizes the demographic characteristics of the participants. A higher percentage (58.9%) of the participants were between 40-59 years of age, while thirty-nine (39.5%) were in the 18-39 age group. Most respondents were female (77.1%). Regarding marital status, 76.7% were divorced, separated, single, or widowed. Nineteen percent (19.4%) reported having one to two children, and 7% had three to four children. A considerable proportion (42%) of participants were employed in the Nursing department.

Table 1.

Demographic characteristics of the health sector workers in Saltillo, Mexico (N = 258).

Parameter	Frequency	Percentage
Age (years)		
18-39	102	39.5
40-59	152	58.9
60+	4	1.6
Sex		
Male	59	22.9
Female	199	77.1
Marital Status		
Married	60	23.3

Parameter	Frequency	Percentage
Divorced, Separated, single, widow	198	76.7
Number of children		
1-2	50	19.4
3-5	18	7.0
Sectors		
Administrative	26	10.1
Health Professionals	19	7.4
Nursing	110	42.6
Doctors	27	10.5
Students	76	29.4

Lifestyle and Dietary Habits

Table 2 presents lifestyle and dietary habits. More than half of the participants (54.7%) reported alcohol consumption, while 45.3% did not. Among alcohol consumers, 1.2% drank two to three times per week, 3.1% drank four to five times per week, and 50.4% consumed alcohol occasionally. Cigarette smoking was reported by 25.6% of respondents, while 74.4% did not smoke. Of the smokers, 9.3% smoked two to three times per week, 2.3% smoked four to five times per week, and 14.0% smoked occasionally.

Table 2.

Lifestyle behaviors and dietary habits of health sector workers in Saltillo, México (N = 258).

Parameter	Frequency	Percentage
Alcohol consumption		
Yes	141	54.7
No	117	45.3
Frequency of consumption		
2-3 times a week	3	1.2
4-5 times a week	8	3.1
Occasionally	130	50.4
Cigarette Smoking		
Yes	66	25.6
No	192	74.4
Frequency of smoking		
2-3 times a week	24	9.3
4-5 times a week	6	2.3
Occasionally	36	14.0
3 Meals consumption per day		
Yes	64	24.8
No	194	75.2
Meals skipped		
Breakfast	113	43.8
Lunch	11	4.3
Dinner	1	0.4
Fruits Consumption		
Yes	113	43.8
No	145	56.2
Frequency of Consumption		
Daily	111	43.0
2-3 times a week	82	31.7
4-5 times a week	1	0.4

Parameter	Frequency	Percentage
Occasionally	2	0.8

Anthropometric Characteristics and Hypertension

Table 3 shows anthropometric and blood pressure data. Two participants (2.7%) were underweight, 35.3% had normal weight, 23.6% were overweight, 21.3% percent grade I obesity, and 17.1% had grade II obesity. Most participants (83.7%) had normal MUAC. Based on waist circumference, 69.4 % were classified as obese.

Regarding blood pressure, 67.4% had normal systolic values, 15.1% were classified as high-normal, 10.5% had stage I hypertension, and 7.0% had stage II hypertension. For diastolic blood pressure, 69.4% were normal, 10.1% high-normal, 10.9% stage 1 hypertension, and 9.6% stage II hypertension.

Table 3.

Anthropometric characteristics and hypertension status of health sector workers in Saltillo, México (N = 258).

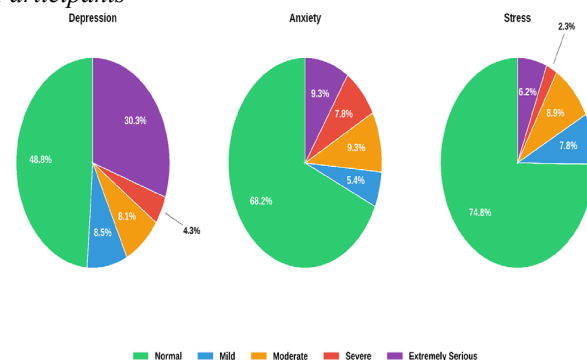
Parameter	Frequency	Percentage
Body Mass Index		
Underweight	7	2.7
Normal Weight	91	35.3
Overweight	61	23.6
Obesity grade 1	55	21.3
Obesity grade 2	44	17.1
MUAC		
Low	42	16.3
Normal	216	83.7
Waist Circumference		
Normal	79	30.6
Obese	179	69.4
Waist to Hip Ratio		
Normal	79	30.6
Abdominal Obesity	179	69.4
Systolic Blood Pressure		
Normal	174	67.4
High Normal	39	15.1
Hypertension stage 1	27	10.5
Hypertension stage 2	18	7.0
Diastolic Blood Pressure		
Normal	179	69.4
High Normal	26	10.1
Hypertension stage 1	28	10.9
Hypertension stage II	25	9.6

Mental Health Status

Figure 1 illustrates the classification of depression, anxiety and stress among participants. For depression 8.5% were mild, 8.1% moderate, 4.3% severe, and 30.3% extremely severe. In the anxiety group, 68.2% were normal, 5.4% mild, 9.3% moderate, 7.8% severe, and 9.3% extremely severe. For stress, 74.8% were normal, 7.8% mild, 8.9% moderate, 2.3% severe, and 6.2% extremely severe.

Figure 1

Depression, Anxiety, and Stress Classification of Participants



Note. Percentages represent the distribution of participants across severity levels for depression, anxiety, and stress. $N = 258$.

Regression Analysis

Table 4 presents the multiple linear regression models predicting psychological outcomes. Significant associations were observed between alcohol consumption, smoking, and depression ($p < 0.05$). Body mass index, waist circumference, and smoking were significantly associated with anxiety ($p < 0.05$). Similarly, BMI, waist circumference, and smoking showed significant relationships with stress ($p < 0.05$). Regression analyses revealed that anthropometric indices explained only a modest proportion of the variance in depression, anxiety, and stress ($R^2 = 0.60-0.66$). While BMI and waist circumference showed statistically significant associations with anxiety and stress, their explanatory power was limited. The strongest associations were observed for lifestyle factors, particularly alcohol consumption and smoking.

Table 4.

Multiple linear regression predicting psychological outcomes $p < 0.05$

Depression Model			
Predictor	B	95% CI	p value
Body Mass Index	-0.03	(-0.08, 0.01)	0.12
Waist Circumference	-0.01	(-0.03, 0.01)	0.28
Alcohol	1.45	(0.30, 2.60)	0.01
Smoking	0.90	(0.10, 1.70)	0.03
Weight	-0.08	(-0.07, 0.05)	-0.04
Height	0.03*	(0.02, 0.04)	0.09
$R^2 = 0.62$			
Anxiety Model			
Predictor	B	95% CI	p value
Body Mass Index	0.40	(0.10, 0.70)	0.01
Waist Circumference	0.03	(0.01, 0.06)	0.02
Alcohol	-0.25	(-0.80, 0.30)	0.37

Smoking	1.30	(0.40, 2.20)	0.01
Weight	-0.02*	(0.031, 0.01)	-0.03
Height	0.89	(0.80, 0.06)	0.75
$R^2 = 0.60$			
Stress Model			
Predictor	B	95% CI	P value
Body Mass Index	0.22	(0.02, 0.42)	0.03
Waist Circumference	0.02	(0.01, 0.06)	0.05
Alcohol	-0.10	(-0.80, 0.30)	0.69
Smoking	0.95	(0.40, 2.20)	0.02
Weight	-0.03	(0.20, 1.70)	-0.03
Height	0.84	(0.85, 1.20)	0.85
$R^2 = 0.66$			
Depression	1.05	(0.88, 1.22)	<0.01

DISCUSSION

This study identified a high prevalence of depression among healthcare workers in Saltillo, Coahuila. More than a half of the participants reported depressive symptoms, with 30.3% classified as extremely severe. These findings are consistent with (Juarez-Garcia et al., 2021) and international reports (Lai et al., 2020; Huang & Zhao, 2020; Zhang et al., 2021) and underscore the urgent need for workplace mental health interventions.

Demographic characteristics may contribute to this vulnerability. Most participants were women aged 40-59 years, and most reported being divorced, separated, single, or widowed. Previous studies suggest that single-parent or non-traditional households are more susceptible to anxiety and depression due to reduced resilience and increased financial stress (Behere et al., 2017). Lifestyle factors also play a significant role. Alcohol consumption was frequent among participants, and our findings support evidence that alcohol use is positively associated with depression and anxiety (Kwako et al., 2019). Our study seems to support this assertion as there is a positive significant relationship between frequency of alcohol consumption and depression and anxiety ($p < 0.05$).

Few of the workers smoked as revealed in the study. Smoking is a kind of "self-medication" for some people to reduce stress. However, studies have shown that smoking really makes people more tense and anxious. People smoke because they believe it lowers stress and anxiety because of the instant sense of calmness produced by nicotine. This sensation is fleeting and quickly gives way to cravings and withdrawal symptoms. Smoking and alcohol consumption are associated with chronic health diseases (Lee et al., 2021). Anthropometry is a rapid, easy, and inexpensive non-invasive technique. It offers comprehensive details on the different bodily parts based on physical measures,

particularly the parts that are made up of muscle and fat. It has been demonstrated to be a significant indicator of a population's nutritional status (López-Solís et al., 2022). In the study, anthropometric data revealed high rates of overweight (23.6%) and obesity (21.3%) confirming that these remain major public health concerns in Mexico (Mercado-Mercado, 2022). According to the trends in obesity evaluated using ENSA-2000 and Ensanut (2006, 2012, 2018-19) in Mexico national survey, obesity outcomes was 36.1%, overweight was 39.1%, and abdominal adiposity was 81.6% (Ensanut, 2022). The rate of overweight and obesity discovered in this study was high, compared with the report of other researchers in similar studies from other countries (Lai et al., 2020). The differences could be due to the dietary transition in Mexico and geographical location. Since employees spend more hours at work each week than at home, these overweight and obesity statistics should inspire the organization to make a real commitment to interventions to ensure more productivity as studies have shown that there is a strong correlation between staff absences, overweight and obesity (Lai et al., 2020). Abdominal obesity was strongly associated with depression, consistent with evidence linking central adiposity to metabolic and hormonal changes that increase vulnerability to depressive states (Hryhorczuk et al., 2013 ; Jantarantotai et al., 2017).

While weight and height showed no significant associations with psychological outcomes, body mass index (BMI) and waist circumference (WC) were significantly related to anxiety and stress, echoing findings from Tand and Leung (2021). Overall, our results suggest that anthropometric indicators alone are insufficient to predict psychological outcomes. However, BMI and WC should be considered alongside psychosocial and lifestyle factors to better understand mental health risk in healthcare workers.

Most participants had normal blood pressure, although a minority presented with hypertension. This may reflect preventive programs implemented by the Mexican Social Security Institute (IMSS) which emphasize multidisciplinary approaches to health promotion among healthcare personnel (Borrayo-Sánchez, 2022).

Taken together, the regression analyses demonstrated significant associations between anthropometric indices and mental health outcomes, particularly depression, anxiety, and stress, alone.

Importantly, anthropometric indices explained only a small fraction of the variability in psychological outcomes. This suggests that emotional, behavioral, and environmental factors may play a more decisive role than physical measures alone. The observed associations between BMI, waist circumference, and stress/anxiety may reflect the psychological burden of obesity management, frequent medical care, and related complications, rather than direct causal pathways.

From a psychological perspective, models of occupational stress and emotional regulation provide a useful framework. Chronic workplace stress, combined with lifestyle factors such as alcohol and smoking, may exacerbate vulnerability to depression and anxiety. These findings highlight the need

for integrated interventions that address both physical health and psychosocial resilience.

Study Limitations

The study has some limitations. Its cross-sectional design prevents establishing causal inferences; therefore, the findings should be interpreted as associations, not directional relationships. Self-reported measures may have been influenced by social desirability bias or personality traits, especially given the sensitivity of mental health issues. Furthermore, shift work was not considered, as most participants reported fixed schedules. To avoid stigmatization, depression, anxiety, and stress were not stratified by sex, occupation, or age. Future longitudinal studies are needed to clarify the complex interactions between anthropometric, psychosocial, and lifestyle factors.

Despite these limitations, this study represents the first attempt to examine the relationship between anthropometry and mental health among healthcare workers in Mexico. Its strengths include the use of validated instruments, the collection of original data, and a representative sample size.

CONCLUSION

Obesity and depression are highly prevalent among healthcare workers in Saltillo. While anthropometric indices showed limited associations with psychological outcomes, lifestyle and psychosocial factors appear to have a greater influence. Preventive interventions should prioritize holistic approaches that integrate physical health promotion with psychological support and stress management. Policy initiatives that strengthen mental and occupational health protections are urgently needed. Further research is essential to deepen our understanding of these sensitive and critical issues in Mexican populations.

Acknowledgments

We extend our gratitude to the hospital administration for funding this project and to the staff member who generously participated in the study.

Funding

This research was funded by the University Hospital of the Autonomous University of Coahuila, which covered the costs associated with the principal investigator and the execution of the study.

Conflicts of interest

The authors declare that there are no commercial or financial relationships that could be interpreted as a possible conflict of interest in carrying out this study.

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