Metabolic Syndrome, depression and patient safety culture in Mexican resident physicians*

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Abstract

Background: Medical residence can affect the well-being and health of resident physicians (RP), which are directly related to the quality of medical care and patient safety. El objective was to identify the prevalence of metabolic syndrome (MetS), depressive symptoms, and evaluate the culture of patient safety in resident physicians.

Methods: Cross-sectional analytical survey of 106 physicians residing in 13 medical specialties of a public hospital in Mexico. MetS was defined according to WHO criteria and depressive symptoms using the CESD-R scale; the culture of patient safety was evaluated with the Spanish version of the Hospital Survey on Patient safety.

Results: 53.7% had a combined prevalence of overweight/obesity and insulin resistance was found in 33%. 8.5% of RP had prediabetes and 2.5% diabetes. 23.6% of the sample presented two MetS components. The prevalence of MetS was 8.5% and depressive symptoms were found in 21.7% of RP. The evaluation of the culture of patient safety showed strength in the dimensions of teamwork in the unit-service, organizational learning-continuous improvement, expectations and actions of the direction and frequency of reported events, perception of patient safety culture was found in 8/10 RP.

Conclusions: A high prevalence of cardiometabolic alterations and depressive symptoms was found in Mexican RP. It is necessary to promote self-care for health and to strengthen the concept of patient safety culture among resident physicians.

KEY WORDS

Metabolic syndrome, depressive symptoms, culture of patient safety, resident physicians.

Síndrome metabólico, depresión y cultura de cuidado en los médicos residentes mexicanos

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Resumen

Introducción: Los médicos residentes pueden presentar afectación del bienestar y la salud durante la residencia, lo cual se relaciona directamente con la calidad de la atención médica y seguridad del paciente. El objetivo fue identificar la prevalencia de síndrome metabólico (SM), síntomas depresivos y evaluar la cultura de seguridad del paciente (CSP) en médicos residentes (MR).

Material y métodos: Encuesta transversal analítica en 106 médicos residentes de 13 especialidades médicas de un hospital público de México. El SM se definió con los criterios de la OMS y síntomas depresivos con la escala CESD-R; la CSP fue evaluada con la versión en español del Hospital Survey on Patient safety.

Resultados: El 53.7% presentó una prevalencia de sobrepeso/obesidad y resistencia a la insulina en el 33%. Por hemoglobina glucosilada se definió 8.5% de prediabetes y 2.5% de diabetes. El 23.6% de la muestra presentó dos componentes del SM. La prevalencia del SM fue del 8.5% y del 21.7% los síntomas depresivos. La evaluación de la CSP mostró fortaleza en las dimensiones del trabajo en equipo en la unidad-servicio, aprendizaje organizacional, expectativas y acciones de la dirección y frecuencia de eventos notificados; con una percepción de la CSP del paciente de 8/10.

Conclusiones: Se encontró alta prevalencia de alteraciones cardiometabólicas y síntomas depresivos en médicos residentes mexicanos. Es necesario promover el autocuidado para la salud y fortalecer el concepto de cultura sobre seguridad del paciente en médicos residentes.

PALABRAS CLAVE

Síndrome metabólico, síntomas depresivos, cultura sobre seguridad del paciente, médicos residentes.

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Introduction

The medical residency represents a period of high stress in which residents have to face extreme emotional situations, such as long hours of work, sleep deprivation, lack of autonomy and constant contact with human suffering. Such situations are reflected in a significant reduction of well-being and self-care[1-3] and a high risk to develop depression and anxiety.[4] The prevalence of depressive symptoms among resident physicians (RP) varies between countries: from 17% in India, 30.5% in Tunisia to 48% in Argentina.[5] In México, Jiménez-López et al.[6] reported a prevalence of depressive disorder of 4.6%, while in Brazil a combined prevalence of depression and anxiety was observed in 42% of RP.[1] Levy et al., in 2019[7] reported moderate depression in 19% of the RP in the Depress-Ohio study and, of these, 31.1% presented at least, suicide thoughts. Mata et al.[8] carried out a systematic review and meta-analysis of 54 studies that included 17 560 doctors in training, where an average prevalence of depression and depressive symptoms of 28.8% was found. Among other factors, it has been observed an association between effort-reward imbalance and depression (OR= 8.83, 95% CI: 2.87-27.12) between medical residents.[9] In addition, lifestyle during medical residence changes, resulting in modification of physical activity and dietary patterns that, consequently, will be reflected in the development of metabolic syndrome (MetS), including hypertension, central obesity, insulin resistance and atherogenic dyslipidemia.[10, 11] In Mexican RP, the prevalence of MetS oscillates between 10.8% and 35.7%.[12, 13]

Beyond the effects of depression at the individual level, depression in resident physicians (RP) has been linked to poor quality or suboptimal outcomes in patient care and increased medical errors, affecting patient safety.[4, 7, 8, 14] The patient safety culture is defined as an integrated pattern of individual and organizational behavior, based on beliefs and shared values, which is continuously looking to minimize the damage to the patient from the care process; this culture does not concern only to professionals, but also students who play a fundamental role in enhancing patients' safety in hospitals,[15] which should be the primary concern of the health system.[16] Thus, the aim of this study was to identify the MetS prevalence, depressive symptoms and to evaluate the culture of patient safety in resident physicians of a public hospital in Mexico.

Materials and methods

Study population

A cross-sectional study was carried out in Resident Physicians from 13 medical specialties in a Reference Hospital of the Mexican public Health System. 120 resident physicians were invited to participate and, finally, 106 (88.3%) of 6 surgical and 7 non-surgical specialties met the inclusion criteria. The specialties included were: Maxillofacial Surgery (n= 15), Imaging (n= 13), Medical Emergencies (n= 13), Orthopedics (n= 11), Internal Medicine (n= 9), General Surgery (n= 8), Critical Medicine (n= 8), Anesthesiology (n= 7), Family Medicine (n= 7), Neurosurgery (n= 6), Urology (n= 4), Plastic Surgery (n= 3) and Integrated Medicine (n= 2).

Written informed consent was obtained, following current ethical considerations. The study protocol was approved by the Research Ethics and Ethics Committee of the Medical Centre "Lic. Adolfo López", Health Institute of the State of Mexico.

Sociodemographic, anthropometric and clinical data

Sociodemographic data were collected using specific questionnaires to gather information about: age, sex, marital status, medical specialty and comorbidities.

Anthropometric measures were carried out by a trained nutritionist and following standard procedures from the International Society for the Advancement of Kinanthropometry.[17] Weight (kg) was measured using an electronic scale (In Body 230, U.S.A.) and height (meters) was measured with a portable stadiometer (SECA 206). The body mass index (BMI) was calculated as weight divided by the square of height, and categorized according to the WHO criteria as follows: ≥25 kg/m^2 was defined as overweight and ≥30 kg/m^2 as obesity.

Blood pressure was measured twice after a 5-minute rest, using a mercury sphygmomanometer (Welch Allyn). The average blood pressure was recorded by a trained nurse.

Depressive symptoms

To determine depressive symptoms, we used the Spanish version of the CESD-R scale (The Center for Epidemiologic Studies Depression Scale-Revised version) with 20 items that measure depressive symptoms in nine groups (Dysphoria, anhedonia, appetite, sleep, concentration/thoughts, guilt, fatigue, agitation/psychomotor alteration and suicidal ideation) with a range of 0 to 60 points and using a cut-off value ≥16 points.[18] We used the algorithm proposed for the scale to determine four groups: 1) without clinical relevance, 2) subthreshold depression, 3) possible major depressive episode, 4) probable major depressive episode, 5) with clinical symptoms of a major depressive episode.

Biochemical evaluation

Blood samples were extracted after overnight fasting, greater than 12 hours. A venous blood sample was obtained and analysed for serum glucose concentrations and lipid profile (triglycerides, total cholesterol, HDL-c, LDL-c, VLDL-c) by spectrophotometry and Glycohemoglobin (HbA1c%) by immunoturbidimetric test and plasma insulin by chemiluminescence. The atherogenic index was calculated as follows: total cholesterol/HDL.

Metabolic syndrome (MetS)

We considered the MetS definition proposed by the World Health Organization (WHO) in 1998.[19] The criteria included insulin resistance, plus two of the following criteria: serum glucose ≥110 mg/dL, dyslipidemia (triglycerides ≥150 mg/dL, HDL-c: <35 mg/dL in men and <40 mg/dL in women), BMI ≥30 kg/m^2, blood pressure ≥140/90 mmHg. To assess insulin resistance, HOMA-IR was calculated as follows: [fasting insulin (μUI/mL) fasting glucose mg/dL)]/405. In this study, the lower value of the last quintile of the HOMA-IR value in normal subjects (BMI <25kg/m^2 and no other metabolic disorders) was considered as the cut-off point, which corresponded to 2.72. In our sample (n= 106), the values of the 5 quintiles were distributed as follows: 0.38-0.81, 0.82-1.13, 1.14-1.59, 1.60-2.71, 2.72-10.95. Glycated hemoglobin was categorized as normal (<5.7%), prediabetes (5.7-6.4%) or diabetes mellitus (≥6.5%).

Safety culture of the patient

We used the Spanish version of the Hospital Survey on Patient Safety, developed by the Agency for Healthcare Research and Quality (AHRQ).[20] The survey contains 42 items and 12 dimensions concerning the security culture, which were categorized as strengths or as an opportunity for improvement.

Statistical analyses

Non-parametric tests were applied for the analysis using medians and interquartile ranges for the description of the data. Mann-Whitney U and Fisher's exact tests were applied and a value of p <0.05 was considered as significant.

Results

We evaluated 106 resident physicians, within an age range from 24 to 43 years. The sample characteristics are shown in table 1. Most residents were single (76.4%), 14.2% were married and 9.4% lived in a consensual union. A combined prevalence of overweight/obesity of 54.8% was found, such prevalence was higher in men (65.2%) than women (37.5%) (p <0.05). The overall prevalence of depressive symptoms was 21.7%. Depressive symptoms were more prevalent in women (30%) than men (16.7%) with no statistically significant differences found by sex (p >0.05).

In our sample of medical residents, it was observed that 6.6% had hypertension, 2.8% had hyperglycemia, 23.6% hypercholesterolemia, 22.6% hypertriglyceridemia, 22.6% had suboptimal levels of HDL-c. The results from HbA1c% showed that 8.5% had prediabetes and 2.8% had diabetes. It is noticeable that a third of the sample presented insulin resistance, and 2.8% presented abnormal fasting glucose levels ≥100 mg/dL.

Table 2 presents the results for biochemical measurements in Resident Physicians by Metabolic syndrome. RP with MetS had significantly higher median values of BMI, fasting glucose, triglycerides, VLDL-c, atherogenic index, insulin and HOMA-IR, than those without the syndrome. Lower HDL-c levels were observed for women with MetS as compared to healthy women.

The prevalence of MetS and the number of its components in Resident Physicians are shown in table 3. The overall prevalence of MetS was 8.5%, no significant differences were observed by type of specialty, sex or depressive symptoms. In resident physicians with 3 MetS components, insulin resistance was present in 88.9%.

Figure 1 shows the results of different dimensions assessed by the CESD-R scale. We identified a lower mean of certain dimensions such as thinking/concentration (2.33), fatigue (1.76), sleep (1.67), dysphoria (1.61), anhedonia (1.41), movement (1.54), guilt (1.26), appetite (0.93) and suicidal ideation (0.33) in those without depressive symptoms as compared to those RP who had depressive symptoms (p <0.01)

With regards to the perceptions of patient safety culture, a median score of 8/10 was observed (figure 2). In medical residents with depressive symptoms, a lower median was identified (7.9) than in those without depressive symptoms (8.6), with statistically significant differences between them (p = 0.045). Among dimensions of culture on patient safety considered as strengths, the highest scores

Table 1

General characteristics, type of specialty and depressive symptoms in Resident Physicians from a public hospital in Mexico‡

Variables		Total (N=106)	Metabolic Syndrome		
			No (n= 97)	Yes (n=9)	P*
Age (years)		29 (28 - 31)	29 (27-31)	30 (28-31)	
Sex					
	Women	40 (37.7%)	38 (39.2%)	2 (22.2%)	0.478
	Men	66 (62.3%)	59 (60.8%)	7 (77.8%)	
Specialty					
	Non-surgical	59 (55.7%)	53 (54.6%)	6 (66.7%)	0.728
	Surgical	47(44.3%)	44 (45.4%)	3 (33.3%)	
Weight status					
	Low weight	1 (0.9%)	1 (1.0%)	0	<0.001
	Normal-weight	47 (44.3%)	47 (48.5%)	0	
	Overweight	41 (38.7%)	38 (39.2%)	3 (33.3%)	
	Obesity	17 (16.1%)	11 (11.3%)	6 (66.7%)	
Depressive symptoms					
	No clinical significance	83 (78.3%)	77 (79.4%)	6 (66.7%)	0.191
	Possible major depressive episode	20 (18.9%)	18 (18.6%)	2 (22.2%)	
	Probable major depressive episode	2 (1.9%)	1 (1.0%)	1 (11.1%)	
	Major depressive episode	1 (0.9%)	1 (1.0%)	0	

‡ Median (interquartile range) or n (%) are shown. * Fisher's exact test.

Imagen hipodensa, en forma de cuña (A), sin captación de contraste (B) en región talámica izquierda.
Source: Own elaboration.

Table 2

Biochemical measurements in Resident Physicians with and without Metabolic syndrome‡

Variables	Total	Metabolic syndrome		
	(N=106)	No (n=97)	Yes (n=9)	P*
	Median (Interquartile range)			
BMI (kg/m^2)	25.7 (23.2 - 28.4)	25.1 (23.15-27.99)	30.1 (28.3-32.2)	<0.001
Systolic Blood Pressure (mmHg)	120.0 (117.0 – 128.0)	120.0 (117-128)	121.0 (106.5-130.5)	0.880
Diastolic Blood pressure (mmHg)	74.5 (70.0 – 80.0)	74.0 (70-80)	75 (72-79.5)	0.660
Glucose (mg/dL)	86.3 (78.5 – 94.8)	84.8 (77.6-92.6)	96.9 (91.5-110.4)	0.001
Total Cholesterol (mg/dL)	178.3 (159.3 – 198.7)	175.8 (157.3-196.5)	204.0 (167.9-220.7)	0.079
Triglycerides (mg/dL)	96.6 (72.2 – 145.0)	94.6 (71.2-132.6)	164.1 (140-245.7)	0.001
HDL-c (mg/dL)				
Women	52.0 (91.2 – 125.8)	53.5 (44.1-67.2)	33.6 (26.8-40.5)	0.041
Men	41.6 (35-47.8)	41.7 (36.7-47.8)	34.4 (32.2-48.4)	0.328
LDL-c (mg/dL)	106.7 (91.2-125.8)	106.4 (90.7-124)	142.9 (93.5-151.2)	0.141
VLDL-c (mg/dL)	19.3 (14.4 – 29.0)	18.9 (14.25-26.5)	32.8 (28-49.1)	0.001
Atherogenic index	3.9 (3.0 – 4.8)	3.7 (2.9-4.5)	5.7 (4.7-6.6)	<0.001
HbA1c (%)	5.2 (5.0 – 5.4)	5.2 (4.9-5.4)	5.3 (4.9-5.6)	0.812
Insulin (µUI/mL)	9.9 (5.5 – 14.5)	8.8 (5.4-13.4)	24.1 (13.4-30.4))	<0.001
HOMA-IR (units)	2.0 (1.1-3.17)	1.9 (1.1-2.8)	5.8 (3.1-8.2)	<0.001

‡ Medians (interquartile ranges) are shown. * Mann-Whitney U test. Abbreviations: BMI, body mass index; HDL-c, high-density lipoprotein cholesterol; LDL-c, low-density lipoprotein cholesterol; VLDL-c, very-low-density lipoprotein cholesterol; HbA1c, glycated haemoglobin A1c; HOMA-IR, homeostasis model assessment of insulin resistance.
Source: Own elaboration.

Table 3

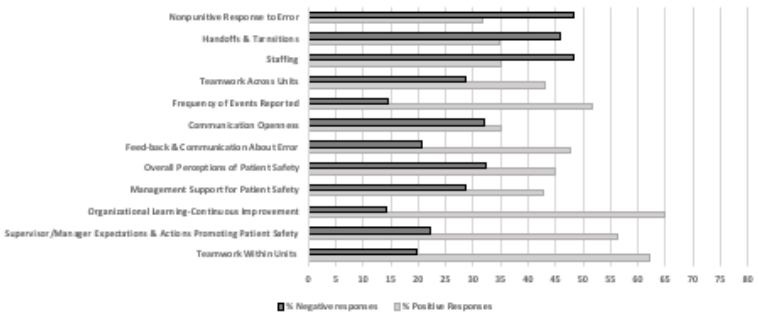
Prevalence of metabolic syndrome (MetS) and its components in Resident Physicians from a public hospital in Mexico

	N		MetS [n(%)]	Number of MetS components [n (%)]			
		p*	0	1	2	3	4
Total	106	9 (8.5%)	-	49 (46.2%)	22 (20.8%)	25 (23.6%)	9 (8.5%)	1 (0.9%)
Sex							
Women	40	2 (5.0%)	0.478	22 (44.9%)	9 (40.9%)	7 (28%)	2 (22.2%)	-
Men	66	7 (10.6%)		27 (55.1%)	13 (59.1%)	18 (72%)	7 (77.8%)	1 (100%)
Specialty								
Non-surgical	59	6 (10.2%)	0.728	24 (49%)	16 (72.7%)	13 (52%)	6 (66.7%)	-
Surgical	47	3 (6.8%)		25 (51%)	6 (27.3%)	12 (48%)	3 (33.3%)	1 (100%)

Abbreviation: MetS, Metabolic syndrome. *Chi-squared test.
Source: Own elaboration.

Figure 1

Dimensions of depressive symptoms in resident physicians (N=106)



Source: Own elaboration.

were found in teamwork within units, organizational learning/continuous improvement, expectations and actions of management and the frequency of reported events. The analysis of perceptions of patient safety culture by depressive symptoms showed a higher frequency of positive responses in the group without symptoms. Conversely, a higher frequency of negative responses was identified among RP with depressive symptoms. However, statistically significant differences were found in the positive responses for frequency of reported events ($p<0.05$) and shift change problems and transitions between services-units ($p<0.01$).

Discussion

This study provides early identification of MetS and depressive symptoms; as well as the perception of the culture on patient safety in RP of a third-level public hospital in Mexico. In the present investigation, a similar combined prevalence of overweight/obesity was observed than that reported nationwide in the National Health and Nutrition Survey in 2018 (ENSANUT 2018-19) (75.2%).[21] In the latter survey, overweight was present in 39.1% and obesity in 36.1% of Mexican adults.[21] The prevalence of overweight in this study was similar to ENSANUT, but a lower prevalence of obesity was found in Resident Physicians. According to sex, women had a prevalence of 76.8% (Overweight: 36.6% and Obesity: 40.2%) and men 73.0% (Overweight: 42.5% and Obesity: 30.5%); however, men in our study had higher prevalence than women for both overweight (13.9%) and obesity (13.7%). At a national level, the prevalence of hypertension was 34.1%,[21] while in our study such figure was lower (around 7%).

Regarding MetS, this study reports a prevalence of 8.5%, men had 5.6% higher prevalence than women applying the WHO definition where the presence of insulin resistance is required (calculated as HOMA-IR) plus two other criteria. In Mexico, Anguiano-Velázquez reported a MetS prevalence of 10.81% in RP, with a higher prevalence in men, applying ATP III criteria,[13] whose results are similar to those found in this study. Similarly, in another investigation conducted by Rodríguez-Medina et al.[12] (using IDF criteria) 35.7% of RP had MetS, mainly prevalent in men. Likewise, in a longitudinal study, Lavalle et al.[22] reported a prevalence of 9.8% in 2007 and 14.5% in 2013, with a higher prevalence in men (higher by 20%) in a population of medical students.

In a multicenter study of metabolic syndrome in Latin America, 9.9% of young residents had MetS, in Mexico the prevalence was 7% (55.5% had one or more components), Paraguay 22.7%, Colombia 13%, Brazil 4.9% and Argentina 2.6%. Low HDL-c levels (27.5%) and abdominal obesity (29.7%) were the most prevalent components (23, 24). In our study, the main components were low HDL-c levels (22.6%), hypertriglyceridemia (22.6%) and insulin resistance (33.0%). 53.8% of resident physicians had one or more components of MetS. Even though one of the limitations of this study is the lack of waist circumference data, body composition was determined using an In Body analyzer and through this method, central obesity was found in 80% of resident physicians.

In addition, the residents included in this study showed a prevalence of more than 20% of depressive symptoms with a higher prevalence in women. It has been estimated that 4.4% (322 million people) of the global popula-

tion lives with depression, and it occurs more frequently in women (5.1%) than in men (3.6%). Depressive disorders led to an overall total of >50 million years lived with disability in 2015.[25] In Mexico it was reported a prevalence of depression of 4.2% and 866 544 years of life lost to disability (8.6% of the total years of life lost disability).[25] Depressive disorders are characterized by sadness, loss of interest or pleasure, feelings of guilt, disturbed sleep or appetite, tiredness, and poor concentration; affecting a person's ability to function at work, school, or daily life, even leading to suicide.[25] In the results of our study, the dimensions with the highest average scores were concentration, fatigue, sleep and dysphoria. Suicidal ideation was reported by 5 RP. Major depression is a common illness that severely limits psychosocial functioning and quality of life.[26] The findings of our study coincide with those reported in health professionals in the ICU, where a prevalence of 24% with mild depression and 6.5% with moderate depression symptoms was found.[27] Also, our prevalence of depressive symptoms is similar to the one reported by Levy et al.[7] and within the range published in a systematic review by Mata et al., from 20.9% to 43.2%.[8] However, other studies have found a lower prevalence, such as Jiménez-López (4.6%)[6] or higher, in the case of Marzouk et.al.[5] where the proportion of depressive symptoms was 31.5%.

The residency is the result of the interest of a general physician to expand their professional development with knowledge, skills and values regarding a medical specialty, it needs full availability of time, with respect and rights, without losing sight, found on a period of in-service education, resulting in a specialist physician with the necessary competencies for professional practice,[28] where the safety of both; the patient and the health professional will be essential. In our results, the mean score for perception of patient safety culture was 8 points. In a previous study conducted in 2500 Mexican RP, the average score was 6.9 and the main strength was identified in organizational learning and continuous improvement.[29] In the latter study, weaknesses were found in openness in communication, staff sufficiency, problems in shift changes and transitions between services/units, and non-punitive response to errors.[29] Our results showed as strength the organizational learning and continuous improvement. However, there was a percentage of neutral responses that did not help to identify weaknesses. It is necessary to consider the application of the questionnaire accompanied by qualitative techniques that help to improve the understanding of the culture on patient safety in RP, on the other hand, this study raises the research question on the relationship between patient safety and depressive symptoms. It is important to carry out studies in this regard to implement or improve psychological care for resident doctors and improve patient safety in hospitals. More studies are still required to identify other issues not only depression but also the RP health status and its impact on patient safety. We consider that evaluation and monitoring of the RP health status should be carried out periodically and in parallel with the patient safety culture, since it has an impact on the quality of medical care. This study exposes the need to promote and strengthen self-care for health in RP and the concept of culture on patient safety. Also, we consider that it is important to support academic and clinical training with close supervision to strengthen academic qualities on patient safety during the training of resident doctors with the aim of improving the quality of life of resident doctors and our future medical specialists; as well as the quality of medical care for patients in our institutions. Of course, emphasizing that the above is a co-responsibility between the resident doctor and the institutions that support him.

In summary, this investigation showed that prevalence of metabolic syndrome and depressive symptoms was high among RP and evidenced the need of health surveillance in resident physicians; in addition, design and implement programs to promote self-care to promote and maintain health of resident physicians, as well as the strengthening of the culture on patient safety in a third level hospital from Mexico.

Conflicts of interest:
Authors declare that there is no conflict of interest.

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