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The Association of Chronic Stress and Metabolic Syndrome in Mexican American Women Living in a Rural Community along the US-Mexico Border

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Abstract

Background: The prevalence of metabolic syndrome (MetS) is high in Latina women. Obesity is a major contributor to the development of cardiometabolic risk factors. Little is known about the contributions of other associated health factors in the development of MetS. **Purpose:** Describe the differences and associations in chronic stress, social support, health behaviors, and the presence of MetS in Mexican American women living in a rural community along the California U.S.-Mexico border. **Method:** This cross-sectional study involved 150 women of Mexican origin (M_{age} = 44.80 years); 66.7% spoke Spanish, and 70% had public health insurance. A scoring criteria was used to determine MetS. Chronic stressors were measured via Chronic Stress Burden Scale. **Results:** Of 86 (57%) participants with MetS, nearly 90% were obese; of 64 participants who did not have MetS, 75% were obese. The mean difference in the number of chronic stressors was statistically significantly higher among participants with MetS (2.47 [*SD* = 1.66]) than among those without MetS (1.94 [*SD* = 1.39]). The odds of having MetS increased 26% for each increase in the number of chronic stressors (OR: 1.26; 95% CI: 1.01, 1.7). Participants with MetS had twice the odds of being physically inactive or engaged in unhealthy eating. **Conclusion:** Early recognition of cardiometabolic risks and improving health behaviors are essential to avoid adverse health consequences for Mexican American women. **Implications for Nursing Practice:** Study findings may help nurses and other healthcare providers identify Mexican American women's psychosocial needs and develop appropriate evidence-based interventions for promoting healthy behaviors.

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Keywords

Metabolic Syndrome, Chronic Stressors, Mexican American Women

1. Introduction

In the last 20 years, there has been a significant increase in the number of individuals who identify as Hispanic/Latino/Latinx within the United States, making them one of the largest ethnic groups in this country [1]. Latina women from diverse subgroups living in the United States face multiple health challenges in comparison with non-Latina White women [2].

In rural areas along the US-Mexico border, Latina women experience significant disparities in health outcomes and are disproportionately impacted by various adverse social determinants of health (SDH). These factors include lower income levels, decreased educational attainment, higher rates of employment in hazardous jobs, and limited access to healthcare services, among others [3]. Latina women are at a greater risk of developing preventable cardiometabolic conditions, including metabolic syndrome (MetS). MetS is characterized by a cluster of metabolic abnormalities: elevated blood pressure, abnormally high glucose and lipid levels, and excess abdominal fat. MetS is associated with increased risks of type 2 diabetes, stroke, and cardiovascular disease—all of which are leading causes of death and disability in this Latino subpopulation [4]. Indeed, the cardiovascular disease risk disparity between young and middle-aged Latina women and young and middle-aged women of other races and ethnicities may be related to the Latina women's high rate of MetS [5].

2. Background

In the development of MetS, obesity is a common factor [5]. Gallo and colleagues (2014) have estimated that 36% of Latina women from different subgroups have MetS; 96% of the women in Gallo *et al.*'s study were obese [6]. Overweight and obesity are escalating epidemic risk factors linked to all three diseases associated with MetS: type 2 diabetes, stroke, and cardiovascular disease.

In addition to specific factors that directly lead to the development of MetS, Latinos as a population are disproportionately subject to a broad range of adverse social determinants that can impair health generally—and that can limit individuals' ability to avoid or respond to the development of MetS. Such determinants include, for example, lower socioeconomic status, a high percentage of dangerous jobs, and, as mentioned, limited access to healthcare assistance programs [3]. This is particularly relevant for Latinos living in the United States who are worried about their immigration status. Regardless of whether they have entered the United States with legal documentation, immigrant populations experience higher levels of stress, depression, and isolation [3]. Exacerbating these psychoso-

cial concerns are substantial structural barriers that immigrants encounter, including exacerbated challenges in obtaining health care, limited availability of health care coverage, low-income positions, transportation challenges, and language obstacles. The current political climate is having a significant impact on immigration policy, resulting in changes that are increasing the stressors associated with immigration. This is especially challenging for the historically disadvantaged and underserved Latino population, who often lack social support [5]. It is crucial for healthcare providers to comprehend the impact of social determinants of health in order to develop interventions that can prevent, reverse, or alleviate the development of Metabolic Syndrome (MetS).

3. Adverse Experience, Social Determinants of Health, and Chronic Stress

The number and severity of adverse experiences throughout life are associated with social determinants of health and chronic stress [7]. Chronic stress has negative biological effects on individuals. It increases allostatic load, which disrupts circadian rhythms and results in increased production of stress hormones. These disruptions and hormone production lead to multi-cytokine inflammatory responses. Inflammation is a primary physiological process underlying the classic symptoms of Metabolic Syndrome (MetS) and most chronic diseases, such as type 2 diabetes, cardiovascular disease, and cancer [8].

4. Deficits in Research on MetS in Latina Women

Few studies have examined factors that may lead to the development of MetS in Latinos. Only one study—the Multi-Ethnic Study of Atherosclerosis (MESA) [4] has examined the effects of both stressors and other factors (e.g., social support) on Latino subgroups' risk of developing MetS. Recently, Esquer's (2021) [9] dissertation work found no comprehensive population-based study that examines the correlation between chronic stress burden, psychosocial factors, and the onset of Metabolic Syndrome (MetS) in Latina women. Also unresearched are factors such as language barriers, inadequate access to food, and limited transportation that could constrain Latina women's access to primary care services [2]. Some researchers have proposed that the relationship between food access and obesity is that foods that are easily accessible and less expensive tend to be higher in calories, glycemic index, fat, and sodium and have less nutritional value. These high-calorie foods might contribute to the obesity epidemic in the development of Mets [9] [10]. In addition, the evidence from multiple studies suggests that several factors—lack of healthy food access, physical inactivity, poor healthy habits, and low socioeconomic status—are strongly associated with the development of MetS [9] [11].

5. Study Purpose and Aims

The primary purpose of Esquer's (2021) [9] research was to study the differences

and associations between chronic stress, social support, and health behaviors and the presence of metabolic syndrome as determined by the ATP III-NCEP [12] in Mexican-American women residing in a rural community along the California United States-Mexican border. Specifically, the researchers were interested in the women's eating habits, physical activity levels, food access, and family safety.

The study had three aims. First, the researchers aimed to describe the sociodemographic characteristics of the participants and the presence of metabolic syndrome. Second, they aimed to identify any significant differences between selected sociodemographics (chronic stress, social support, health behaviors, and the presence of metabolic syndrome. Lastly, the third aim was to determine the odds of meeting the metabolic syndrome criteria for the independent variables identified as significant in the bivariate analysis while also accounting for any covariates consistent with the study's conceptual model. The present study addressed deficits in research evidence by identifying and describing the associations between metabolic syndrome, chronic stress, social support, and health-promoting behaviors that may delay the possible development of type 2 diabetes and cardiovascular disease in Mexican American women.

6. Theoretical & Conceptual Framework

The present study's theoretical framework utilized two models: McEwen and Stellar's (1993) [13] allostatic load model and Pender's (1982) health promotion model [14]. The allostatic load model helped evaluate disease development and enabled clinicians to measure and estimate the magnitude of patients' physiological responses to stressors, determining how physiological stress may affect their patients' health. The health promotion model offered a valuable framework for examining the various factors and intersections contributing to health-promoting behaviors. This model facilitated a deeper understanding of how health factors enhance individual health and quality of life. Moreover, it allowed for quantifying health outcomes, providing a comprehensive view of the benefits of engaging in positive health behaviors [14]. The concept of allostatic load has been applied in research across various disciplines, and findings have generally confirmed that the cumulative effects of social and environmental stressors increase the risks for physiological dysregulation and poor mental and physical health, especially among vulnerable groups [15]. More studies are needed to affirm the role of allostatic load as a potential mediator between multiple chronic stressors and health outcomes. **Figure 1** [9] depicts how these two theoretical concepts were incorporated into the study and the hypothesized relationships from the literature.

7. Methods

7.1. Study Design

This research conducted by Esquer (2021) [9] followed a cross-sectional design and selected a random subsample of 150 participants meeting inclusion criteria

from prior electronic medical data (EMR) data collected in 2019. The study's design permitted an efficient way to gather initial data and identify associations that can be investigated further in another study.

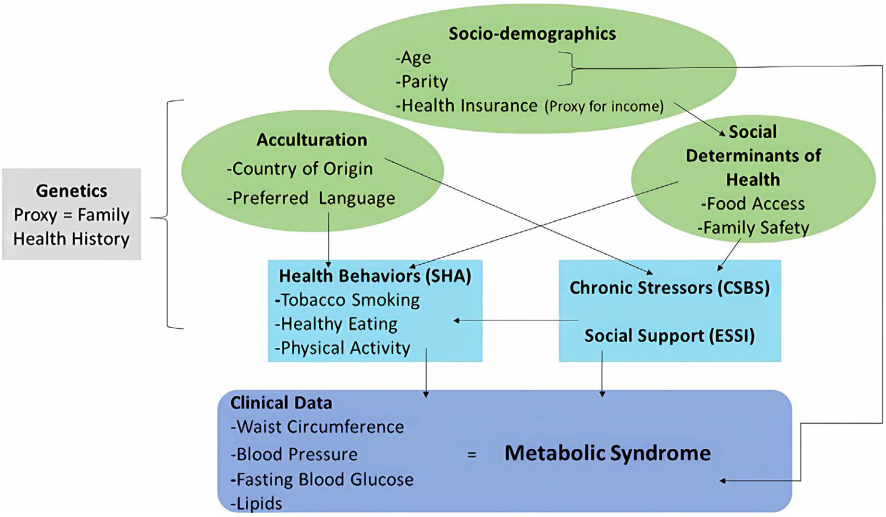

Figure 1. Study framework—Conceptual model for the study of the associations of chronic stress, social support, health behaviors and metabolic syndrome.

7.2. Study Sample

The pool of eligible patients from the Imperial County clinic included middle-aged Latina women 35 - 55 years old who had initial wellness examination case data, did not have type 1 diabetes, and were not pregnant during the study's timeframe of July 2019-August 2020 (MetS) parameters do not apply to pregnant women [16]. From the set of eligible patients, researchers randomly selected 150 individuals whose data was manually abstracted using an individual first timepoint.

7.3. Study Site and Setting

Esquer's (2021) research was conducted at a community clinic in Imperial County, situated in the southeastern part of California and bordered by Arizona and Mexico. The clinic is run by a diverse team of experienced nurse practitioners and other primary care health professionals. Moreover, 70% of the clinic's patients are insured by the Centers for Medicare and Medicaid Services.

7.4. Measurements

In this study, determination of the presence of MetS used the Adult Treatment Panel III (ATP III) criteria of the National Cholesterol Education Program; these criteria are endorsed by two major national U.S. organizations—the National Heart Lung, and Blood Institute and the American Heart Association [9] [12]. The criteria for MetS diagnosis was meeting three or more of the following MetS components:

Blood pressure: systolic blood pressure, 130 mmHg or higher, and/or diastolic blood pressure, 85 mmHg or higher;

Abdominal obesity/waist circumference: more than 35 inches;

Triglycerides: greater than or equal to 150 mg/dl;

HDL cholesterol: less than or equal to 50 mg/dl; or

Fasting glucose: greater than or equal to 100 mg/dl.

7.5. Chronic Stress

Chronic stress was measured using the Chronic Stress Burden Scale (CSBS)—An eight-item scale that measures the number of current ongoing problems in major life domains (financial, work, relationship, health problems in self or close other, drug or alcohol problems in close other, caregiving, and other chronic stressors) lasting 6 months or longer [6] [9] [17] [18].

The CSBS was developed by the landmark epidemiological Hispanic Community Health Study/Study of Latinos (HCHS/SOL) Sociocultural Ancillary Study. Each item is answered as *yes* or *no*. In addition, participants who provided a *yes* response were also asked to indicate how stressful the problems were on a scale in which "1" represented *not very stressful*, "2" represented *moderately stressful,* and "3" represented *very stressful*. The number of *yes* responses that were rated as moderately stressful or very stressful were summed, giving a total score range from 0 to 8. Participants' CSBS responses were analyzed both as a continuous variable and a categorical variable. Levels of chronic stress were defined in prior research [9] [18]; a total score of 0 indicated low chronic stress, a score of 1 indicated medium chronic stress, and scores of 2 or higher indicated high chronic stress.

The CSBS has been used in prior multiethnic cohort studies, including the Hispanic Community Health Study—Study of Latinos [6] [9] [18]. This instrument, which is available in English and Spanish, has shown to be psychometrically sound and appropriate for the Latino population. Most constructs were represented by multiple indicators to provide a thorough approach and estimated reliability of measurement. The CSBS has been found to have strong internal consistency in both languages (English, Cronbach's $\alpha = 0.86$; Spanish, Cronbach's $\alpha = 0.84$ [6] [9]). The instrument was used to measure five domains: health (self), health (loved one), job, partner relationship, financial problems, and whether any ongoing problems lasted for 6 months or longer.

7.7. Social Support

Social support was measured using the Enriched Social Support Inventory (ESSI), a self-administered seven-item scale instrument [9] [19]. The ESSI evaluates three aspects of social support. First, *structural support* (the presence of a partner) is measured with one item. Second, *instrumental support* (i.e., presence of tangible help) is measured with one item. Third, *emotional support* (characterized as caring) is measured with five items. Structural support response options include *yes*

and *no*. People completing the ESSI's six instrumental and emotional support items provide responses via a five-point Likert scale (range: "1", *none of the time*; "5", *all of the time*). Scores for the six items can range from 6 to 35 (five points are given for the presence of a partner). To evaluate the overall social support score, the three aspects of social support are summed. The resulting total scores indicate overall social support, with total scores less than or equal to 12 representing low social support and scores greater than 12 representing moderate social support [9] [20].

7.8. Health Behaviors

Understanding the implementation of psychosocial variables associated with health behaviors plays an essential role in reducing health disparities and developing successful interventions for this culturally diverse research population. All of these factors contributed to the identification of high-risk health behaviors, preventative screening measures, and health education in Latina women during routine healthcare visits. In addition to the above measurements, four additional factors related to health behaviors—healthy eating, physical activity, food access, and family safety—were measured with multiple items from the Staying Healthy Assessment (SHA) that was developed by the Department of Health Care Services.

The SHA was developed in the late 1990s and updated in 2013 for use in its MediCal-managed program. The assessment's aims are to facilitate health care providers' and patients' development of a personalized plan of care and to facilitate documentation of certain Healthcare Effectiveness Data and Information Set (HEDIS) quality measures [9]. Different SHA surveys are specific to different age groups, and the surveys are available in more than 10 languages. For this cross-sectional study, the Spanish and English adult surveys were used to screen the study population during their initial wellness examination visit. Although the managed care program requires completion of the assessment every 3 - 5 years in this study setting, the SHA is routinely re-administered during subsequent wellness follow-up visits. An exhaustive literature search indicated that the present study is the first to use the SHA to identify research participants' high-risk health behaviors. According to Esquer (2021), [9] no psychometric statistics are available for the assessment, and no evidence could be found for the assessment's use in any other research studies.

The Adult SHA's 27 items are answered as *yes, no,* or *skip;* these responses are summed individually. The assessment was designed to examine six aspects of health: nutrition and food access (seven items); family safety (five items); physical activity (one item); alcohol, tobacco, and drug use (four items); sexual issues (six items); and a final item for other health concerns. The present study measured four of these aspects of health: healthy eating, physical activity, food access, and family safety. In the survey responses, *healthy eating behavior* was indicated by a participant's responding with "yes" to three or more out of four items that referred to healthy choices and with "no" to fewer than two items that referred to unhealthy eating behavior.

8. Sample Size

We used estimates from MESA to base our power calculations: Everson-Rose *et al.* (2014) [21] and Gallo *et al.* (2014) [6] reported standard deviations of the CSBS as 1.88 and 1.21, respectively; Mitchell and colleagues (2003) found a standard deviation for the ESSI of 5.7. Assuming a two-tailed alpha of 0.05 and 80% power, a sample size of 150 would be sufficient for detecting a standardized effect size of 0.5 (medium effect size) [22] using Java Applets software.

Statistical Analysis

Descriptive statistics, including percentages, means, and standard deviations, were used to address study aim 1. For study aim 2, bivariate analysis was conducted to determine significant differences between two independent groups, and the presence of metabolic syndrome (yes/no) independent sample t-test was used. T-tests of association for all variables measured with continuous variables and chi-square for categorical variables were used. Aim 3 used multivariable logistic regression modeling with backward stepwise procedure. Odds ratios and 95% confidence intervals were calculated. The Statistical Package for Social Sciences (SPSS) version 26 for IBM was used to perform the required statistical analysis.

9. Procedures

In May 2020, the community clinic's administration leadership and staff were informed about the study and its purpose, and the administrative leaders granted permission to collect data. Thereafter, the research proposal was presented to the dissertation committee, and the research proposal was submitted to and approved by the Institutional Review Board (IRB) at the principal investigator's university. After obtaining IRB approval, we performed a search of the electronic medical record database to identify cases that met the study's inclusion criteria. Consequently, we compiled a list of 389 potential participants. We applied simple random sampling techniques to ensure an unbiased selection process. Using advanced software, we generated a random code number to assign to each potential participant. Ultimately, from this initial pool, we carefully selected a subset of 150 patients to participate in the research study, ensuring a representative sample for our analysis.

Patient data from Esquer's (2021) [9] research were obtained from EMR from initial wellness examinations. The following measures were obtained: a) basic social demographics including country of origin, preferred spoken language, health insurance, parity, and family history; b) vital signs including blood pressure, waist circumference, and BMI; c) lipid parameters and fasting blood glucose; d) CSBS; e) ESSI; f) SHA data; g) criteria for determining the presence of MetS (i.e., waist circumference, systolic and diastolic blood pressures, fasting blood glucose, triglycerides, and HDL-cholesterol levels).

10. Protection of Human Subjects Considerations

To ensure confidentiality, each participant's data was assigned a unique study identification number. This approach allowed for the secure and private storage of all sensitive information.

11. Results

Study Sample Characteristics

The mean age of the Latina women in the study sample was 44.81 years (*SD* = 6.32). Over 70% of the women had public health insurance or no insurance (see Table 1). More than half (56.8%) of the women were born in Mexico; 39% were born in the United States. Two-thirds (67.4%) of the participants preferred Spanish as their primary language. More than half (52.8%) of the participants reported being married or living with a partner (see Table 1).

Table 1. Characteristics of study participants, including differences based on metabolic syndrome status.

Characteristics	Total Sample (*N* = 150) *n* (%)	Metabolic Syndrome (*N* = 86) (57.3%) *n* (%)	No Metabolic Syndrome (*N* = 64) (42.7%) *n* (%)
Age: years (SD)	44.81(6.32)	44.66 (6.51)	45.81 (6.09)
Health Insurance			
Medicaid	98 (65.3)	**63 (73.3)**	**35 (54.7)**
Private Insurance	44 (29.3)	17 (19.8)	27 (42.2)
Medicare	5 (3.3)	4 (4.7)	1 (1.6)
Uninsured	3 (2.1)	2 (2.3)	1 (1.6)
Place of Birth *missing*: 4			
Mexico	83 (56.8)	49 (58.3)	34 (54.8)
United States	57 (39.0)	31 (36.9)	26 (41.9)
Other	6 (4.1)	4 (4.8)	2 (3.2)
Preferred Language			
Spanish	100 (66.7)	58 (67.4)	42 (65.6)
English	50 (33.3)	28 (32.6)	22 (34.4)
Married or living with a partner	75 (52.8)	44 (31)	31 (21.8)
Parity Status *missing*: 6			
0	13 (9.0)	7 (8.5)	6 (9.7)
1	28 (19.4)	15 (18.3)	13 (21.0)
2	37 (25.7)	23 (28.0)	14 (22.6)

Continued

3	48 (33.3)	26 (31.7)	22 (35.5)
4	15 (10.4)	10 (12.2)	5 (8.1)
5 or more	3 (2.1)	1 (1.2)	2 (3.2)
Health Habits			
Tobacco Smoking *missing*: 6	24 (16.8)	15 (18.1)	9 (15.0)
Family Disease History			
Heart Disease/Stroke *missing*:10	100 (71.4)	**65 (79.3)**	**35 (60.3)**
Diabetes *missing*: 8	92 (64.8)	58 (69.9)	34 (57.6)
Cancer *missing*: 8	50 (35.2)	27 (32.5)	23 (39.0)

Note. **Bolded:** p-value ≤ 0.025.

During the women's initial wellness visit, they also provided family and obstetric history and health habit information. Family history of chronic illness was prevalent, with 71% having family heart disease or stroke history, followed by diabetes (65%) and cancer (35%). Given the age criteria for study eligibility, unsurprisingly, over 70% of the women were multipara. Tobacco use was reported by 17% of women. The only other statistical difference between those with and without MetS was health insurance type and family history of heart disease or stroke.

11.1. Characteristics of MetS in the Study Sample

$N = 86$ women—57.3% of the study's participants—met the criteria for MetS. Of these women, almost half (46.5%) met three MetS criteria. In addition, 30.2% (of 86 women) met four criteria, and 23.2% met five or more of the criteria. In the sample, the most prevalent MetS condition was a large waist circumference (more than 35 inches); the second-most prevalent MetS condition was increased systolic blood pressure (see Table 2). Nearly 90% of the sample were considered overweight or obese on the basis of the classification of weight status guidelines endorsed by the World Health Organization (see Table 3). Approximately 62% of women in the sample were classified as obese with more than one-third in the class II and III categories. As expected, the study's participants with MetS had statistically significantly higher BMIs than did those without the syndrome.

11.2. Sociodemographic Characteristics

The present study found that having a family history of heart disease or stroke was statistically significant among study cases with MetS ($p = 0.015$). In addition, having public medical insurance (Medi-Cal) was statistically significant among study cases with MetS ($p = 0.003$).

Table 2. Components of metabolic syndrome of the sample population based on atp iii criteria mean (sd) and number (percent) meeting criteria.

Metabolic Syndrome Criteria	Total Sample (N = 150) Mean (SD)	Cut-off criteria met n (%)
Waist Circ. (inches)	36.46 (6.55)	99 (66.0)
Fasting Blood Glucose (mg/dL)	101.41 (28.28)	69 (46.0)
Triglycerides (mg/dL)	143.20 (77.28)	70 (46.7)
HDL-Chol (mg/dL)	55.37 (16.65)	52 (34.7)
Systolic Blood Pressure (mm/Hg)	128.33 (16.65)	77 (51.3)
Diastolic Blood Pressure (mm/Hg)	78.33 (9.32)	42 (28.0)

Table 3. Classification of weight status by BMI on study population, and by metabolic syndrome status (WHO Guidelines 2014).

	Total N = 148 n (%)	Metabolic Syndrome N = 85 n (%)	No Metabolic Syndrome N = 63 n (%)
Body BMI			
<24 (Normal Weight)	18 (12.2%)	2 (2.4)	16 (25.4)
25 - 29.9 (Overweight)	38 (25.7%)	8 (9.4)	30 (47.6)
30 - 34.9 (Obesity Class I)	41 (27.7%)	31 (36.4)	10 (15.9)
35 - 39.9 (Obesity Class II)	23 (15.5%)	19 (22.4)	4 (6.3)
>40 (Extreme Class III)	28 (18.9%)	25 (29.4)	3 (4.8)

11.3. Chronic Stress

Of the study's participants, 87.6% had at least one stressor that lasted longer than 6 months and that woman affected by the stressor rated as either "moderately stressful" or "very stressful". The number of chronic stressors ranged from 0 to 7 with an overall mean of 2.238 (SD = 1.6). Using original CSBS chronic stress categories, participant ratings were low in 12%, moderate in 25%, and high in 63%. More than one in five women reported experiencing four or more chronic stressors. The mean difference in the number of stressors indicated by participants' scores on the Chronic Stress Burden Scale (CSBS) was statistically higher among women with MetS than among those without MetS (p = 0.040; see **Table 4**). Of the seven major subscales measured, women with MetS indicated that they had had nearly twice the rate of moderately stressful or very stressful events for someone close to the participant with an ongoing health problem, job difficulties, financial challenges, and relationship difficulties (see **Table 4**).

Table 4. Reported moderate-very stressful chronic stressors by metabolic syndrome status.

Chronic Stressors	Metabolic Syndrome *n* (%)	No Metabolic Syndrome *n* (%)
Personal health		
1) Have you had a serious ongoing health problem?	25 (64.1%)	14 (35.8%)
Close significant other health		
2) Has someone close to you had a serious ongoing health problem?	42 (61.7%)	26 (38.2%)
Job related		
3) Have you had ongoing difficulties with your job or ability to work?	45 (61.6%)	28 (38.3%)
Financial strain		
4) Have you experienced ongoing financial strain?	47 (62.6%)	28 (37.3%)
Relationship		
5) Have you had ongoing difficulties in a relationship with someone close to you?	37 (61.6%)	23 (38.3%)
Alcohol/drugs		
6) Has someone close to you had an ongoing problem with alcohol or drug use?	21 (55.2%)	17 (44.7%)
Caregiving		
7) Have you been helping someone close to you, who is sick, limited or frail?	22 (55%)	18(45%)
Other Problem		
8) Have you had another ongoing problem not listed here?	23 (57.5%)	17 (42.5%)

The results indicated that for every increase in a moderate to severe chronic stressor, the odds of meeting the criteria for metabolic syndrome increase by 26% (OR: 1.26; 95% CI: 1.01, 1.57; see Table 5). For those with a greater number of stressors, this is an important increased risk. Those with metabolic syndrome were nearly 7 times increased odds of being aware of their weight. At the same time, they have over twice the odds of not being physically active or eating healthy. Those with metabolic syndrome had 3.81 increased odds of lack of access to healthy food independent of public health insurance status.

11.4. Social Support

Nearly all (97%, $n = 138$) study participants indicated that they had moderate social support (as indicated by an ESSI score of greater than 12). The overall mean ESSI score was 22.60 ($SD = 5.6$). Social support score means of women with MetS and of women without MetS were not significantly different ($p = 0.521$).

11.5. Social Determinants of Health Behaviors

Several social determinants of health behaviors measured on the SHA differed clinically and statistically according to MetS status. Women with MetS were more

conscious of their weight than were those without MetS. However, women with MetS were also more likely to have limited food access, less likely to report healthy eating habits, and less likely to report that they were physically active. All of these findings were highly statistically significant. The only factor with no difference by metabolic status was living in a safe environment.

Table 5. Unadjusted and adjusted odd ratios for chronic stress and psychological factors associated with the presence of metabolic syndrome.

Variables	Metabolic Syndrome (N = 82)	No Metabolic Syndrome (N = 62)	Unadjusted Odds Ratio (95%CI)	Adjusted Odds Ratio (95%CI)*
	n (%) or m*ean* (*SD*)	*n* (%) *or mean (SD*)		
Chronic Stress (CSBS)	2.47 (1.66)	1.94 (1.39)	1.26 (1.01, 1.57)	-
Healthy Eating				
Yes	34 (45.9)	38 (64.4)	Ref	
No	40 (54.1)	21 (35.6)	2.13 (1.05, 4.30)	-
Healthy Food Access				
Yes	45 (54.9)	51 (82.3)	Ref	ref
No	37 (45.1)	11 (17.7)	3.81 (1.74, 8.34)	3.18 (1.42, 7.14)
Conscious of Weight				
Yes	75 (89.3)	35 (54.7)	6.91 (2.96, 16.13)	-
No	9 (10.7)	29 (45.3)	Ref	
Physical Activity				
Yes	27 (32.5)	34 (54.0)	Ref	
No	56 (67.5)	29 (46.0)	2.43 (1.24, 4.78)	-

*Adjusted for health insurance status.

12. Discussion

According to Jurgens *et al.* (2023) [23], chronic stress has been identified as a risk factor for metabolic syndrome. However, the intermediate pathways underlying this relationship are not well understood. Inflammatory markers, such as cortisol dysregulation, maybe one way stress contributes to metabolic dysregulation.

Previous research indicates that chronic stress is associated with increased systemic inflammation and that alterations in inflammatory activity contribute to the development of metabolic syndrome. While the precise mechanisms underlying these relationships are still being explored, there is a significant overlap between inflammatory pathways and those linked to the stress response and metabolism. However, sustained exposure to stress can result in a blunted cortisol secretion pattern due to the ongoing activation of an immune response [23]. In this study,

it was surprising to identify that more than half of the participants met the criteria for MetS. Notably, women who had MetS reported encountering more stressors than their counterparts without MetS. However, there were no noticeable differences in the level of social support reported by either group. Moreover, the research revealed that Mexican-American women living in a rural, underserved community affected by MetS had limited access to food, engaged in unhealthy eating habits, and were less inclined to engage in physical activity.

Food insecurity, food deserts, and the lack of access to affordable, nutritious food are associated with a higher risk of various chronic health conditions, especially in underserved areas. Food insecurity disproportionately affects individuals from racial and ethnic minorities, as well as socioeconomically disadvantaged populations [24].

The aforementioned research study serves as a solid foundation for conducting more thorough epidemiological studies into the disadvantaged rural communities situated along the U.S.-Mexico border [9].

The prevalence of metabolic syndrome in this study at nearly 60% was surprisingly higher compared to other published data. It was more than twice the prevalence reported by the National Health and Nutrition Examination Survey (NHANES), which showed an overall metabolic syndrome prevalence of 25% among Mexican American women 30 - 49 years of age, the highest rate compared to non-Hispanic Blacks and Whites [2] [9]. It is also much higher than the 36% prevalence found in the Hispanic Community Health Study [6] [9], which included different Latino subgroups of women.

Previous research has shown the devastating impact of the obesity epidemic on middle-aged Latina women. In this study, it was found that nearly 90% of the sample cases were considered overweight/obese based on the classification of weight status guidelines endorsed by the World Health Organization. Study findings from the landmark epidemiological Hispanic Community Health Study showed a 96% rate of obesity among middle-aged Latino women. Based on this study sample findings, this research study can also confirm the alarming obesity epidemic health concern among this high-risk group in the United States. All these factors are related to the defining characteristics of metabolic syndrome, such as large waist circumference or abdominal fat, abnormal high blood glucose, elevated lipids, and high blood pressure.

In this study, the concept of chronic stress was operationalized through the use of the CSBS scale that measured current ongoing major life stressors lasting ≥6 months [6] [9]. The study identified that some psychosocial study variables, including having public health insurance, unhealthy eating, lack of physical activity, limited healthy food access, and family history of heart disease, may contribute to the allostatic load and are potential mediators between multiple chronic stressors and the presence of metabolic syndrome [9] [13]. Therefore, the clinical importance of allostatic load serves as an important measurement for screening high-risk health behaviors and, at the same time, leads into health promotion in-

terventions that may prevent the occurrence of chronic stressors, metabolic syndrome and other potential chronic health disabilities affecting Mexican American women. Clearly, this study's theoretical framework provides direction for future conceptually oriented research.

Another important study variable examined in this study was social support. In this study sample, no mean differences in social support scores were found between those participants with metabolic syndrome. Social support was not associated with the presence of metabolic syndrome among study cases. Nearly 97% of the study sample reported moderate social support [9]. An analysis from the MESA study among multi-varied Latino groups also concluded that social support was not associated with the presence of metabolic syndrome [4]. In this study, no mean differences between the groups were identified. When nearly everyone had the same level of social support. This instrument may not capture perceived social support among Mexican American women. Therefore, future research may require qualitative studies and instrument development among Latina subgroups.

It was unsurprising that a large majority of the study sample had public health insurance or no health insurance (70.7%), given the geographical location of the study [9]. Based on some quality health indicators among underserved populations affected by chronic disease and other disabilities, Medi-Cal beneficiaries are in worse health than people with private health insurance [25]. This study finding suggests Mexican American women with public or no health insurance, generally from a lower socioeconomic status, could be at a greatest risk of developing heart disease, type 2 diabetes, or associated high-risk health behaviors such as lack of physical activity, unhealthy eating habits, limited healthy food access. Historically, lack of healthcare access has been a challenge for the Latino population living on the United States-Mexico border.

As other studies have found, in this study, a family history of heart disease or stroke was strongly statistically significant associated with metabolic syndrome ($p = 0.015$). However, the high prevalence of metabolic syndrome in Latinos highlights a probable underlying genetic risk. It is clear that for metabolic syndrome and other cardio-metabolic diseases, there is a strong gene-environmental interaction, including epigenetic changes that may be responsible for the clinical criteria for metabolic syndrome [9] [26]. Therefore, there is a critical importance of focusing on cardiovascular health promotion and preventive measures among Mexican-American women and their families starting at an early age. Preventive health behaviors, including lifestyle modifications, can reduce cardiovascular disease risks. These include changes in nutrition, increased physical activity, and methods to lessen the effects of chronic stress.

13. Implications for Nursing Practice

By focusing on potentially modifiable, health-relevant study variables, this research study may highlight healthy lifestyle opportunities for primary prevention of metabolic disorders in the high-risk population of Mexican-American women

[9]. Nurses and other health care providers play a significant role in addressing the healthcare needs of this underserved population. Data from this study may assist healthcare professionals in identifying Mexican-American women's unique social and healthcare needs. Pender's health promotion model may help more deeply understand the implementation of culturally appropriate interventions aimed at improving cardiometabolic health among this high-risk group [5] [9]. Specifically, these evidenced-based interventions should be designed to promote critically important health behaviors aimed at altering the epigenetic changes that likely occur between inherited genetics and these unhealthy behaviors. More studies are needed to investigate biological changes that may occur because of unhealthy food access, which may, in turn, create a greater propensity for obesity and metabolic diseases in Mexican American women.

14. Nursing Interventions

This study highlights the importance of developing interventions to assess chronic stress in the lives of Hispanic women to achieve better health outcomes. An effective strategy would involve collaboration across disciplines, incorporating social services, family counseling, nutrition and fitness guidelines, and behavioral and mental health support. Creating comprehensive, research-based women's health interventions that focus on culturally appropriate ways to cope with daily stressors is essential, emphasizing the significance of healthy eating, physical activity, relaxation techniques, and chronic disease management. Addressing all these healthcare challenges facing Latina women could assist in reducing the magnitude and accumulation of long-term chronic stressors. It will potentially improve their high-risk health behaviors, quality of life, and physical and behavioral health outcomes.

15. Nurse's Role in Education and Prevention

Nurses and other healthcare professionals should focus on educating and encouraging Latino women, families, and communities to participate in early health screenings and adopt behaviors that reduce cardio-metabolic risk. This includes weight management, healthy eating, physical activity, and access to nutritious food.

16. Limitations

This cross-sectional study design had several limitations. First, the sample was limited to women 35 - 55 years of age. The study's younger women might have a different acculturation process, including differences in sociodemographics, language preference, country of origin, cultural traditions, family lifestyles, and health behaviors. Second, the sample was limited to Mexican-American women who resided in a single community and who accessed the clinic for their preventive health care services. Third, almost all (98%) of the study's participants had some type of health insurance; the women did not identify lack of health care ac-

cess or lack of medical insurance as a barrier to obtaining care. Therefore, whether the study's results apply to a disadvantaged and uninsured population of women who live on the Mexican side of the U.S.-Mexican border will also require further research investigation. Fourth, generalizability was constrained by the study's having been conducted in a single agricultural U.S.-Mexican border city in a single U.S. state (i.e., California) and by the sample's demographic homogeneity (i.e., all participants were women of Mexican descent). Fifth, preexisting data were recorded by different members of the health care team; as a result, the data may have been subject to EMR data entry errors (e.g., data that were inaccurate, incomplete, and missing)—a threat to validity of study's data.

17. Recommendations for Future Research

Esquer's (2021) [9] study findings suggest that more scientific research is needed to describe the associations between chronic stress, adaptive coping behaviors for perceived stressors, and how they relate to cultural healthcare practices in Mexican-American women. Moreover, further research on the development of culturally appropriate health promotion and chronic disease prevention programs is needed, paying particular attention to the specific healthcare needs of Mexican American women living on the US/Mexican border. All these strategies might support and improve health-promoting behaviors in this high-risk group.

Thus, subsequent research will assist in formulating a better understanding of how Mexican American women promote their well-being within their own sociocultural context and the health barriers they encounter. Research-based interventions need to be innovative and collaborative to promote community engagement. Therefore, this collaboration will contribute to the avoidance of research bias and towards the advancement of scientific research in Mexican American women. Further research is needed to study ethnic-specific community-engaged interventions to address the obesity epidemic and health equity challenges associated with healthy food access.

18. Conclusion

In some instances, cardio-MetS risk factors are difficult for healthcare providers to recognize. For this reason, the theoretical and conceptual model used in this study may guide primary healthcare professionals in understanding how Mexican American women view their own health-promoting behaviors. To conclude, longitudinal health outcome research studies with a large and representative sample are needed to provide a more extensive analysis of the complex contributing factors affecting the health of subgroups of Latina women. Innovative research will provide evidence of effective disease-specific interventions and the integration into clinical guidelines in this understudied population. Early recognition of cardio-MetS factors and improving health-promoting behaviors are critical preventive measures for avoiding adverse health consequences for this high-risk group.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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