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Initial results of the National Survey of Cardiovascular Risk Factors in Mexican women: «ENAFARC Mexico»

Resultados iniciales de la Encuesta Nacional de Factores de Riesgo Cardiovascular en la mujer mexicana: «ENAFARC México»

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Palabras clave:
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ABSTRACT

Introduction: cardiovascular disease (CVD) continues to be the leading cause of death worldwide in women, associated with different cardiovascular risk factors (CVRF), both traditional, sex-specific and emerging. **Objective:** to know the frequency of traditional and sex-specific CVRF in the Mexican female population based on the National Survey of Cardiovascular Risk Factors (ENAFARC Mexico) results. **Material and methods:** surveys collected by doctors, nutritionists or nursing staff were conducted in 23 cities in Mexico. An individual standardized questionnaire with closed answers, anthropometry and laboratory tests was applied, aimed at women who attended primary care, specialty care and detection campaigns in the open population. **Results:** analysis included 2,304 surveys. The average age was 53.4 to 15.8 years old. Rich carbohydrate and saturated fat diets were reported in 51 to 62%, sedentary lifestyle in 60.5%, obesity in 32.7%, hypertension in 41.2%, dyslipidemia in 34.5%, diabetes in 21.3%, and 51.2% had metabolic syndrome criteria. 54.4% were in the postmenopausal stage; of these, 22.1% with premature menopause and 47% had at least two added risk factors (OR 2.91, 95% CI 2.56-3.31). Hypertensive disorders of pregnancy were significantly associated with the development of chronic hypertension ten years after delivery (OR 2.53 with 95% CI 1.93-3.31). **Conclusions:** there is a high frequency of traditional, sex-specific and emerging CVRF in Mexican women, mainly in postmenopausal. The etiology seems to be multifactorial and importantly related to various sociocultural determinants.

RESUMEN

Introducción: *la enfermedad cardiovascular (ECV) sigue siendo la principal causa de muerte a nivel mundial en las mujeres, asociada a diferentes factores de riesgo cardiovascular (FRCV) tanto los tradicionales como los ligados al sexo y los emergentes.* ***Objetivo:*** *conocer la frecuencia de los FRCV tradicionales y sexo-específicos de la población femenina en México, con base en los resultados de la Encuesta Nacional de Factores de Riesgo Cardiovascular (ENAFARC México).* ***Material y métodos:*** *se realizaron encuestas recolectadas por médicos, nutriólogos o personal de enfermería, en 23 ciudades de México. Se aplicó un cuestionario individual estandarizado con respuestas cerradas, antropometría y exámenes de laboratorio, dirigidas a mujeres que acudían a consulta de atención primaria, de especialidad y campañas de detección en población abierta.* ***Resultados:*** *se incluyeron en el análisis 2,304 encuestas. La edad promedio fue de 53.4 ± 15.8 años. Con alimentación rica en carbohidratos en 62% y grasas saturadas en 51.2%, así como sedentarismo en 60.5%. Cursaban con obesidad 32.7%, 41.2% con hipertensión arterial, 34.5% con dislipidemia, 21.3% con diabetes y 51.2% con síndrome metabólico. Por otro lado, 54.4% estaban en etapa menopáusica, de éstas 22.1% con menopausia prematura y 47% contaban con al menos dos factores de riesgo agregado (OR 2.91, IC 95% 2.56-3.31). Los trastornos hipertensivos del embarazo se asociaron significativamente al desarrollo de hipertensión crónica 10 años después del parto (OR 2.53 con IC 95% 1.93-3.31).* ***Conclusiones:*** *existe una elevada frecuencia de FRCV tradicionales, sexo-específicos y emergentes en la mujer mexicana, principalmente durante la menopausia. La etiología parece ser multifactorial e importantemente relacionada a diversos determinantes socioculturales.*

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INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of death worldwide. In women, CVD is the leading cause of morbidity and mortality in Mexico and throughout the world.[1,2] Overall, 1 in 3 women die of CVD, and 45% of women over the age of twenty have some CVD. Women in Mexico are twelve times more likely to die from acute myocardial infarction than from breast or cervical cancer. However, the information diffusion, awareness and education, both by health personnel and the population, is low, leading to its downplaying importance. Cardiovascular risk factors (CVRF) are essentially the same in men and women, known as traditional, such as hypertension, diabetes mellitus, dyslipidemia, obesity, sedentary lifestyle, and smoking. Additionally and related to the multiple activities that women carry out in daily life, in the family, at work and in the social environment, there are other risk factors called emerging or less recognized, such as depression, anxiety and other psychosocial disorders, which have an important role in the development of CVD.[3,4] Likewise, women have unique CVRF or sex-specific related to biological determinants (sex, age, genetics, race, ethnicity and family history), such as polycystic ovary syndrome, hormone replacement therapy, premature menopause (surgical or natural), conditions associated with pregnancy (gestational diabetes, hypertensive disorders, preterm delivery or low birth weight products) and systemic inflammatory and autoimmune diseases, which are not precisely specific to the female sex.[5-7] However, women are affected in greater proportion by these conditions than men. These CVRFs increase the future risk of CVD and are associated with an increase in the probability that women will develop CVD over the years, up to two or three-fold than in men, the disease will progress differently, and therapeutic response may not be the same.[3,8,9]

Women's life expectancy has increased, so by the year 2030; there will be 1,200 million women older than 50.[10] That is, they will be going through a critical period in terms of the presence of CVRF and the development of CVD, which manifests itself more frequently in women between 50 and 65 years of age. Often the importance and detection of traditional and sex-specific CVRF in women go unidentified by both women and the medical community (general practitioners, family doctors, gynecologists, cardiologists, and other specialists), which increases morbidity-mortality in women.

There are reports in the literature regarding the frequency of traditional CVRF in Mexican women. However, to date, no reports have also included in their analysis the frequency of sex-specific and emerging CVRF. Consequently, it is unknown which is the impact these may have on their cardiovascular health. Therefore, knowledge of them is essential to develop strategies to reduce cardiovascular risk in women, provide timely treatment and subsequently reduce CVD mortality. The objective of this article is to identify the frequency of traditional and sex-specific CVRF in Mexican females, based on the results of the National Survey of Cardiovascular Risk Factors (ENAFARC Mexico).

MATERIAL AND METHODS

The survey data was collected by medical doctors, nutritionists, or nursing staff in twenty-three cities in Mexico through direct interviews and filling out a survey consisting of a standardized questionnaire, controlled information with closed answers, physical measurements, and laboratory examinations *(Figure 1)*. The health personnel who supported the registration process received training and a manual standardized for measurements. The surveys included women who attended primary or specialty care consultation, as well as during community screening campaigns, who met the following selection criteria: older than 18 years, with or without a history of CVD, who had a complete register of the survey of CVRF in women (ENAFARC Mexico) and informed consent signature. Those cases that did not have complete lipid and glycemic profile laboratory tests were excluded. Standardized survey information included demographic data, pathological and non-pathological medical history, identification of traditional risk factors (diabetes, hypertension, dyslipidemia, obesity,

Researchers' specialty (N = 96)

- Cardiology
- Endocrinology
- Gynecology
- Family Medicine
- General Medicine
- Internal Medicine
- Other
- Nursing
- Nutrition

Participating institutions

- IMSS
- ISSSTE
- SSA
- Private practice
- Other

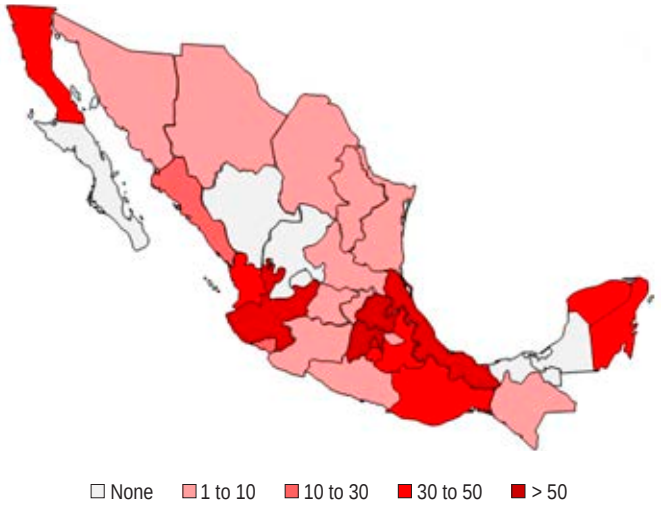

Figure 1: Participants in the survey registry.
IMSS = Mexican Social Security Institute. ISSSTE = Institute of Social Security and Services for State Workers. SSA = Secretary of Health.

metabolic syndrome), sex-specific and emerging risk factors, inflammatory diseases, including the clinical background of having suffered from COVID-19, thyroid disease and psychosocial factors (depression, anxiety disorders, family or workplace violence, sleep disorders), medical history of CVD and its treatment.

Physical measurements included: weight, height, abdominal circumference, blood pressure, heart rate, respiratory, temperature, laboratory examination: lipid profile and glycemia. Weight was measured on a weighing machine with the woman wearing light clothing without shoes, and the body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters. Overweight or obesity was defined as BMI ≥ 24.0 kg/m^2. Cardiovascular risk stratification included the calculation of the atherogenic index, risk calculation using the ASCVD (atherosclerotic cardiovascular disease) algorithm,[11] and the Globorisk prediction model.[12] We consider exercise when carrying out the planned physical activity of moderate intensity for at least 150 min per week. Diagnosis of diabetes mellitus was considered based on the diagnostic criteria of the American Diabetes Association: for new cases (fasting glucose ≥ 126 mg/dL, casual glucose ≥ 200 mg/dL plus symptoms or tolerance curve with glucose ≥ 200 mg/dL at 2 hours) or the history of the diagnosis reported by the patient or glycated hemoglobin ≥ 6.5%. For blood pressure assessment, we used an aneroid sphygmomanometer or electronic (oscillometric) devices; three measurements were made with an interval of one min between each measurement, with the patient at resting, in a sitting position for three minutes, and the highest pressure was recorded. Hypertension was considered when the systolic blood pressure was equal to or greater than 140 mmHg or diastolic equal to or greater than 90 mmHg, according to the European Society of Cardiology classification, the European Society of Hypertension and the Consensus on systemic arterial hypertension in Mexico;[13,14] when the woman surveyed referred to having antihypertensive treatment or having no history of previous diagnosis, in the presence of high blood pressure and once external factors that could cause transient elevation of blood pressure had been ruled out, such as recent physical or mental exertion, intake of coffee, tea, or any other stimulating substance in at least one hour prior to taking blood pressure. Dyslipidemia was considered if there was a previous diagnosis or treatment or if laboratory tests reported elevated levels of cholesterol (≥ 240 mg/dL), triglycerides (> 150 mg/dL), low-density lipoproteins (LDL-c) > 130 mg/dL or decreased high-density lipoproteins cholesterol (HDL-c) < 50 mg/dL. Active

smoking was defined if, at the time of inclusion or in the previous six months, they had smoked or had a history of smoking in the five years before presenting any cardiovascular pathology. A former smoker was considered when they had quit smoking more than six months before their inclusion or more than five years before any CVD diagnostic, and non-smoker when she had never smoked or had smoked less than 100 cigarettes in her entire life.

We defined metabolic syndrome using the National Cholesterol Education Program Adult Treatment Panel III (ATP III) criteria. The habit of a healthy diet was considered if they consumed more than five servings of fruits and vegetables per day, consumption of fish or foods rich in omega-three fatty acids at least two times per week, and predominance in the frequency of unsaturated or polyunsaturated fats, low in the fat of animal origin and carbohydrates, at least six days per week. Pregnancy complications included were: gestational hypertension, preeclampsia, eclampsia, HELLP syndrome, carbohydrate intolerance, gestational diabetes, gestational dyslipidemia, preterm delivery, and macrosomic product. Moreover, the psychosocial factors were: previous diagnosis of depression, anxiety syndrome, sexual or work-related violence, sleep disorders (defined as difficulty falling asleep or staying asleep, trouble getting adequate rest or waking up tired, sleepiness or excessive fatigue during the day, history of obstructive sleep apnea, and sleeping time of fewer than eight hours).

Statistical analysis: only the surveys with 100% of the registered information were considered for analysis. The dichotomous variables are presented by means of frequencies and percentages. The results obtained from the continuous variables are expressed by measures of central tendency and dispersion according to their distribution, such as median and interquartile ranges (25 and 75%) or mean with standard deviation (SD). The bivariate evaluation of dichotomous variables was performed with the χ^2 test and the odds ratio with a 95% confidence interval.

Table 1: Demographic characteristics and lifestyle habits (N = 2,304).

Characteristic	n (%)
Age in years [mean ± SD]	53.41 ± 15.77
Occupation	
Freelance worker or professional	270 (11.72)
Employee	841 (36.50)
Retired	195 (8.46)
Homemaker	926 (40.19)
Unemployed	42 (1.82)
Student	30 (1.30)
Economic income level	
Higher	136 (5.90)
Middle	1,099 (47.70)
Lower	901 (39.11)
Poor or near-poor	168 (7.29)
Exercise	837 (36.33)
Intense	38 (4.54)
Moderate	302 (36.08)
Mild	497 (59.38)
Sedentary	1,394 (60.50)
Exercise duration	
> 150 min	409 (48.86)
< 150 min	428 (51.14)
Dietary habits	
1. Intake of vegetables and fruit:	
≥ 5 servings/day	639 (27.73)
< 5 servings/day	1,665 (72.27)
2. Consumption of fish and omega 3 products at least 2 times a week	859 (37.28)
3. Predominant consumption of mono and polyunsaturated fats	1,041 (45.18)
4. Saturated fat or trans-fat intake excess	1,175 (51.00)
5. Carbohydrates intake excess	1,429 (62.02)
6. Daily salt intake	
< 1.5 g/day (low)	486 (21.09)
1.5 to 2.3 g/day (limited)	1,517 (65.84)
> 2.3 g/day (rich)	280 (12.15)
Consumption of alcoholic beverages	
Never	1,431 (62.11)
One or fewer drinks per day, or < 7 drinks per week	847 (36.76)
Two or more drinks per day, or 8 or more drinks per week	27 (1.17)

RESULTS

Of the total of 2,499 participants, 159 were excluded because the information was incomplete, and 36 were duplicated; 2,304 were included in the analysis. The average age was 53.4 ± 15.8 years; 48.1% were married, 25% single, 12.3% widows, 7.7% lived in free union, and 6.8% divorced. Regarding the level of education, 33.1% completed college, 8% had postgraduate studies, 23.5% reached senior

Table 2: Frequency of the most common traditional and emerging risk factors (N = 2,304).

Risk factors	n (%)
Traditional risk factors	
Sedentary lifestyle	1,394 (60.5)
Current smoking	200 (8.7)
Diabetes	492 (21.3)
Hypertension	1,124 (48.8)
Dyslipidemia	1,417 (61.5)
Metabolic syndrome	1,181 (51.2)
Obesity/overweight	1,576 (70.0)
Overweight	849 (36.8)
Obesity	754 (32.7)
Emerging risk factors	
Thyroid disease	216 (9.4)
COVID-19	588 (25.5)
Depression	568 (24.6)
Anxiety disorders	666 (28.9)
Domestic violence	252 (10.9)
Workplace violence	109 (4.7)
Sleep disorders	1,188 (51.6)
Physical examination [median and interquartile ranges 25 and 75%]	
BMI (kg/m^2)	27.57 [64.3-13.7]
Abdominal perimeter (cm)	90 [156-44]
SBP (mmHg)	120 [220-60]
DBP (mmHg)	75 [120-50]
Laboratory examination [median and interquartile range 25 and 75%]	
Glucose (mg/dL)	98 [89-109]
Total cholesterol (mg/dL)	174 [148-203]
Triglycerides (mg/dL)	155 [108-187]
LDL-c (mg/dL)	100 [76-127]
HDL-c (mg/dL)	46 [38-57]
No c-HDL (mg/dL)	125 [100-155]

Frequency of the most common traditional and emerging risk factors. Traditional and emerging risk factors are frequent in the women surveyed.
SD = standard deviation. DM = diabetes mellitus. BMI = body mass index. SBP = systolic blood pressure. DBP = diastolic blood pressure. LDL-c = low-density lipoprotein cholesterol. HDL-c = high-density lipoprotein cholesterol. No c-HDL = no c-HDL cholesterol. Values are expressed as median and interquartile ranges due to the non-normal distribution of the data.

high school or technical career, 14.8% junior high school, 17.1% only had some elementary school level, and 2.7% without scholar education. Two-fifths of the women (40.2%) were housework, and 48.2% additionally worked (the majority as some company employees and only 24% were self-employed or independent professionals); 86.8% had a medium or low-income level. The proportion of women who exercised at moderate to high intensity and ate a healthy diet was only 17% and 8.8%, respectively; however, a diet rich in carbohydrates (62%) and saturated fats (51%), low in consumption of vegetables or fruits (72.3%) predominated; most of the women reported having a low alcohol consumption, 62.1% denied consumption of alcoholic beverages *(Table 1)*.

Traditional CVRF

A history or confirmed diagnosis of diabetes mellitus was reported in 21.3% (n = 492). Additionally, 76 women without a confirmed diagnosis had fasting blood glucose > 126 mg/dL; hypertension in 41.2% (n = 949), but it was found that 175 women without a previous diagnosis of hypertension had pressures equal to or greater than 140/90 mmHg, giving a total of 48.8% (n = 1,124); and dyslipidemia in 34.5% (n = 795). However, in women without having been previously diagnosed, total cholesterol levels > 240 mg/dL were found in 81, triglycerides > 150 mg/dL in 599, HDL-c < 50 mg/dL in 584 and LDL-c > 130 mg/dL in 260, that is, in 622 additional women were detected with some dyslipidemia, which added to those previously diagnosed gives a total of 61.5% (n = 1,417). The median evolution time of diabetes, hypertension and dyslipidemia was nine, ten and three years, respectively. Overweight or obesity was found in 70% (n = 1,634) of all women (32.7% with BMI > 30 kg/m^2), 70.3% (n = 1,620) with abdominal obesity, 99% of these were associated with a diet rich in carbohydrates and saturated or trans fats. 24.6% (n = 566) of the participants had an earlier diagnosis of metabolic syndrome. Additionally, it was found that 615 women met three or more criteria according to the ATP III definition, giving a total of 51.2% (n = 1,181) women with metabolic syndrome. *Table 2* shows the frequencies and values reported from the physical measurements and laboratory examinations.

Regarding diabetic women, 48% had different obesity degrees, and 36.6% were overweight. Similarly, in hypertensive women, the frequency of obesity was high 41.8% and overweight 38.8%. Current smoking was reported by only 8.7% (n = 200) and 5.1% (n = 118) had quit smoking within the last five years.

Sex-specific and emerging CVRF

We found that premature menopause was the most frequent sex-specific factor (n = 277), followed by postmenopausal hormone replacement therapy (n = 171), use of hormonal contraceptives (n = 521), early menarche (before 11 years of age) and polycystic ovary syndrome (n = 203 and n = 165, respectively). More than half of the women (54.4%) included were in the menopausal and postmenopausal stage (n = 1,253); of these, 76.1% were overweight or obese, 58.5% (n = 733) with hypertension, 48.3% (n = 607) dyslipidemia and 28.7% (n = 360) diabetes; 47% had at least two risk factors (OR 2.91, 95% CI 2.56-3.31) and 34.2% (n = 428) with metabolic syndrome (OR 2.70, 95% CI 2.30-3.18).

In the women who reported having had at least one pregnancy (n = 1,914), the most common history was preterm delivery in 22.8% (n = 316), followed by hypertensive disorders of pregnancy 22.1% (n = 277), of which preeclampsia was the most frequent 44.4% (n = 122); low birth weight product 10.1% (n = 194) and macrosomic product in 8.6% *(Figure 2)*. Half of the women with a history of hypertensive disorders during pregnancy developed hypertension ten years after delivery (OR 2.53 with 95% CI 1.93-3.31). A low percentage of women reported having had diabetes or gestational dyslipidemia (2.4% and 0.73%, respectively).

Regarding inflammatory and immunological diseases, a history of systemic lupus erythematosus was found in 0.8% (n = 12), rheumatoid arthritis in 2.8% (n = 65), and thyroid disease in 9.4% (n = 216). A history of breast cancer was recorded in 1.48% (n = 34), and 28 of them received chemotherapy, radiotherapy or combined therapy. Confirmed diagnosis of COVID-19 was reported in 25.5% (n = 588), 70 received oxygen therapy, only 36 with intrahospital treatment, and four required mechanical ventilatory support.

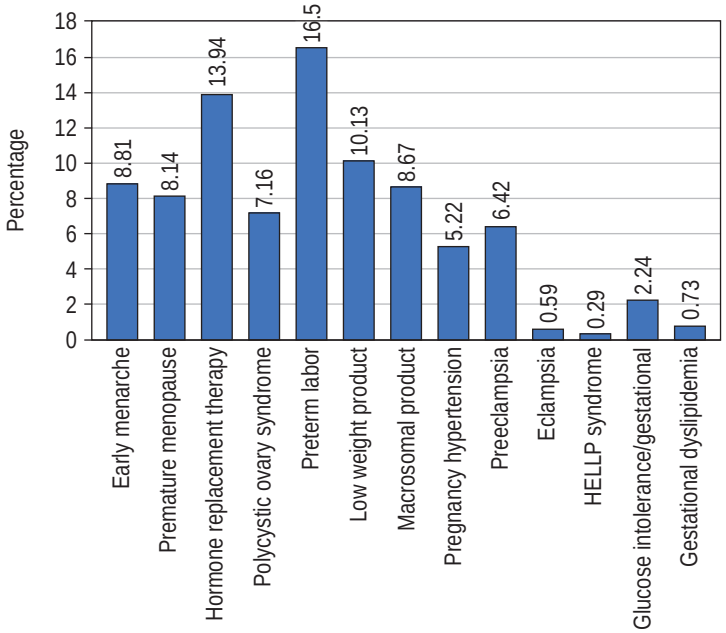

Figure 2: Sex-specific risk factors frequency. Frequency of sex-specific factors in percentage frequency.
HELLP syndrome = hemolysis syndrome, elevated liver enzymes, thrombocytopenia.

DISCUSSION

To our knowledge, this is the first report evaluating the frequency of traditional and sex-specific risk factors in the same population of Mexican women. We found that overweight or obesity, hypertension, and dyslipidemia were positioned as the three main traditional risk factors for CVD. The predominant risk factor, and apparently with the greatest impact on health in the women participating in our study, was overweight or obesity, with its highest frequency in the menopausal and postmenopausal stages. The frequency of hypertension that we found was similar to that reported in the INTERHEART study,[15] which included women who had undergone myocardial infarction cared for in medical units in 52 different countries and which reported 53% with hypertension. Nevertheless, in this study, abdominal obesity and psychosocial problems report with a lower frequency (45.6% and 45.2%, respectively) than we found.

On the other hand, the prevalence of abdominal obesity reported in large studies carried out in the community in our country, such as ENSANUT[16] and the National Study of Health and Aging in Mexico (ENASEM)[17] was higher (89.6%), but less frequency of dyslipidemia and hypertension. Similarly, we found a higher frequency of hypertension and dyslipidemia than that reported in the FRIMEX IIa study,[18] which reported 71.5% of obesity in women, but 21.5% hypertension and 40% dyslipidemia. It is important to note that 52% of the women in our study had not been previously diagnosed with dyslipidemia.

Being overweight and obese was associated with a poor-quality diet, rich in carbohydrates and fats of animal products, and a lack of exercise, according to our study. It is important to highlight that in women in the menopausal and postmenopausal stages, hypertension and dyslipidemia were found more frequently, as well as the clustering of two or more risk factors than in women in the premenopausal stage, mainly in overweight and obese women. A high percentage of women with diabetes and hypertension have different degrees of obesity, which suggests that their treatment does not include a comprehensive approach with lifestyle changes, healthy eating, and exercise. Furthermore, the high frequency of psychosocial factors such as depression, anxiety, and sleep disorders reported in our study population could also contribute. It is known that sleep disorders, both in quantity hours of sleep and in quality, have an impact on CVRF, mainly in the development of obesity and metabolic syndrome; this alteration occurred in a high percentage of the population studied, and it was mainly significantly associated in the menopausal and postmenopausal stage.

In contrast to what was reported by Benschop L et al. in 2019,[19] that up to 32% of women with hypertensive disorders during pregnancy developed chronic hypertension in the first ten years after delivery, compared to 11% of women with normotensive pregnancies, we found that 50% of the women who reported having the history developed hypertension in the same period, indicating the need to carry out long-term follow-up and establish preventive measures in women with this disorder in our population.

Despite our population's economic and cultural development, urban changes, lifestyle behaviors, and poor nutrition favor the presence of different CVRFs and, therefore, the rapid increase in cardiovascular morbidity and mortality related to them. Timely scrutiny and management of both traditional, sex-specific, and emerging risk factors are important to consider as part of the clinical evaluation of women at all life cycle stages, which should include laboratory examinations with complete lipid profiles as well as and blood glucose analysis.

Limitations

Although the study covered different cities in our country and an open population, almost half of the cases included in this study were obtained from surveys conducted in consultation with medical specialists, and most of the women lived in urban areas, which could be overestimating the frequency of factors such as hypertension and dyslipidemia, as well as psychosocial factors. The results presented are preliminary in the first analysis of ENAFARC Mexico.

CONCLUSIONS

In this first analysis of ENAFAC Mexico, we found a high frequency of traditional, sex-specific, and emerging CVRF in Mexican women, mainly after menopause. The etiology appears multifactorial and is importantly related to various sociocultural determinants in women. Unhealthy lifestyles in women have undoubtedly favored the high frequency of obesity and overweight in our population. The metabolic problems in women in the menopausal stage are associated with an increase in the presence of different risk factors and an increase in their cardiovascular risk. It is necessary to establish strategies in a timely manner for the early detection of all CVRF in women, and they must be informed of their higher risk and implement measures for a healthy lifestyle.

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