Original Article

Early atherosclerotic signs in middle-aged women with a history of pre-eclampsia

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Este artículo también está disponible en español

ABSTRACT

Introduction: In our country, cardiovascular diseases are the leading cause of death among women.
Objectives: To identify early atherosclerotic signs in middle-aged women with a history of pre-eclampsia.
Methods: A An observational descriptive study was carried out with 108 women aged 45-59 years old, at the Policlínico Docente Chiqui Gómez Lubián, in Santa Clara (Cuba), over the years 2017 and 2018. The study group was made up of 54 women who had a history of pre-eclampsia in the last decade while the control group comprised the same number of women with no history of pre-eclampsia.
Results: The most prevalent risk factor in the total number of women studied was the combination of overweight and obesity (75%); this subgroup comprised 98.1% of those with a history of pre-eclampsia. It was followed in frequency by hypercholesterolemia (71.3%), high blood pressure (54.6%), smoking (51.8%) and diabetes mellitus (38.9%). The 92.6% of women with a history of pre-eclampsia were hypertensive and all had an abdominal circumference ≥ 88 cm. Furthermore, all those with moderate, high or very high cardiovascular risk had a history of preeclampsia, and of the total number of women with low cardiovascular risk, only 22 (28.9%) had such a background; as the rest (71.1%) accounted for the total number of women without pre-eclampsia.
Conclusions: Early atherosclerotic signs: obesity, abdominal circumference greater than 88 cm and high blood pressure, as well as atherogenic risk factors associated with moderate, high and very high cardiovascular risk predominated in women with pre-eclampsia
Keywords: Women, Middle aged, Pre-eclampsia, High blood pressure, Obesity, Cardiovascular risk

Señales ateroscleróticas tempranas en mujeres de edad mediana con antecedentes de preeclampsia

RESUMEN

Introducción: Las enfermedades cardiovasculares son la principal causa de muerte en el país, en el sexo femenino.
Objetivo: Identificar señales ateroscleróticas tempranas en mujeres de edad mediana con antecedentes de preeclampsia.
Método: Estudio observacional descriptivo de corte transversal con 108 mujeres entre 45-59 años de edad, en el Policlínico Docente Chiqui Gómez Lubián, de Santa Clara (Cuba), en los años 2017 y 2018. El grupo estudio estuvo constituido por 54 mujeres que tuvieron antecedentes de preeclampsia en la última década; la misma cantidad de ellas, sin este antecedente, conformaron el grupo control.

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Authors' contribution

JASG and MGM were equally involved in the idea and design of the research, obtaining, analyzing and interpreting the data, as well as in writing the manuscript. Both authors critically reviewed the manuscript and approved the final report.

Resultados: El factor de riesgo con mayor prevalencia en el total de mujeres estudiadas fue el combinado de sobrepeso y obesidad (75%), subgrupo donde se ubicó el 98,1% de aquellas con antecedentes de preeclampsia. Le siguieron en orden de frecuencia la hipercolesterolemia (71,3 %), la hipertensión arterial (54,6%), el hábito de fumar (51,8%) y la diabetes mellitus (38,9%). El 92,6% de las mujeres con antecedentes de preeclampsia eran hipertensas y todas tenían una circunferencia abdominal ≥ 88 cm. Además, todas aquellas con riesgo cardiovascular moderado, alto o muy alto tenían antecedentes de preeclampsia, y del total de mujeres con bajo riesgo cardiovascular, solo 22 (28,9%) tenían este antecedente; pues el resto (71,1%) representa el total de mujeres sin preeclampsia.

Conclusiones: En las mujeres con preeclampsia predominaron las señales ateroscleróticas tempranas, como la obesidad, la circunferencia abdominal mayor de 88 cm y la hipertensión arterial; así como los factores de riesgo aterogénico asociados a un riesgo cardiovascular moderado, alto y muy alto.

Palabras clave: Mujeres, Mediana edad, Preeclampsia, Hipertensión arterial, Obesidad, Riesgo cardiovascular

INTRODUCTION

The first cause of death in Cuba corresponds to the group of non-communicable chronic diseases and, according to the 2018 Statistical Yearbook of Health[1], heart diseases are the main cause of death in women in the country with 12,814 deaths in 2017 (rate of 227.0 per 100,000 inhabitants), and in 2018, 11,892 women died from this cause with a rate of 210.5 per 100,000 inhabitants. But the problem becomes more profound when analyzing cerebrovascular diseases in females in the same period, 2017 and 2018, which was in third place among the leading causes of death in Cuba, and in the province of Villa Clara, in 2018, they had a gross rate of 238.1 deaths per 100,000 inhabitants. These conditions currently represent the largest health burden in the world, with a death toll over 17 million every year[2,3].

For more than two decades, in multiple clinical and epidemiological trials, the set of symptoms and signs that take place during the climacteric stage are described, where there are changes in the physiology of women associated with the loss of reproductive function of the ovary that include: amenorrhea and infertility, vasomotor symptoms (hot flashes and sweats), changes in body composition, urogenital atrophy, psychological symptoms (decreased memory and concentration capacity, changes in thinking and ability analysis, depressive-like symptoms and sleep disorders), which have an unfavorable influence on their health. In addition, it favors the development of chronic diseases such as: high blood pressure, diabetes mellitus, cardiovascular disease and osteoporosis, among others[2-10].

During the middle age in the life of women, as well as the climacteric, the influence of social determinants linked to overload must be considered in their health status (paid and at home work, family care), which gender issues fall on women, together with their active participation in the community life, which allow to raise the need to identify the impact of both processes on the quality of life of women in the climacteric stage[2,8,10].

Early atherosclerotic signs are those manifestations of atherosclerosis and known atherogenic risk factors, which can be detected by the health personnel, even when their symptoms or signs are not evident to the patient[8]. Their early detection in middle-aged women, and their combination with other risk factors or damage to health, helps to identify risk at stages of life where women can modify risk factors and lifestyles to ensure a menopause with less cardiovascular risk, and that would be those who would be more likely to get sick of athero-consequences, compared to others in the same time lapse.

The purpose of this study was to identify early atherosclerotic signals in middle-aged women with a history of pre-eclampsia in the last decade.

METHOD

A descriptive cross-sectional study was conducted, in the years 2017 and 2018, at the *Policlínico Docente Chiqui Gómez Lubián*, of Santa Clara, Villa Clara (Cuba), with the objective previously described. The

sample consisted of 54 middle-aged women with a history of pre-eclampsia in the last decade (study group) and the same number of women, of the same age, who do not have this history (comparison or control group), for a total of 108 women between 45 and 59 years of age, considered as middle age.

An instrument in the form of survey was carried out, where the general data of women studied, their personal pathological history and associated diseases, as well as anthropometric measurements and complementary studies were conducted, previous to the signing of the informed consent's model. Traditional atherogenic risk factors (overweight, obesity, high blood pressure [HBP], and smoking) were searched and early atherosclerotic signs (overweight, obesity, abdominal circumference, and HBP) were screened in both groups.

In addition, the Cuban national survey on intensity of the climacteric syndrome was carried out, according to the questionnaire of Pérez Piñero[11], in order to determine the association of cardiovascular risk. According to its results, the classification is: asymptomatic or very mild (0-24 points), mild (25-50 points), moderate (51-80 points) and critical (more than 80 points).

The instructions for the use of tables predicting the risk of the World Health Organization (WHO)[12] were taken into account. These tables indicate the risk of suffering a serious cardiovascular event, fatal or not (myocardial infarction or stroke), in a period of ten years according to age, sex, systolic blood pressure, tobacco consumption, total blood cholesterol and presence or absence of diabetes mellitus in 14 epidemiological subregions of the WHO. The AMR A tables were used, designed for the epidemiological subregion for Canada, Cuba and the United States[12].

It was accepted that a person was a smoker when she/he consumed one or more cigarettes on a daily basis, or those who reported quitting the addiction six months before their inclusion in this study. For the classification of the diabetes mellitus, the criteria proposed by the Expert Committee (WHO/ADA)[13] were used. There were considered as isolated systolic HBP levels ≥ 140 mmHg and cholesterol levels ≥ 5.2 mmol/L (200 mg/dL) were considered elevated.

The overall cardiovascular risk was determined according to the models proposed by the WHO for our country[12], that classifies it as: low risk (< 10%), moderate (10-19.9%), high (20-29, 9%) and very high (≥ 30%).

Once all the information had been obtained, the cardiovascular risk was estimated for ten years as follows:
- Step 1. The appropriate table was chosen according to the presence or absence of diabetes mellitus.
- Step 2. The female box was selected.
- Step 3. The smoker or nonsmoker box was selected.
- Step 4. The corresponding box according to the cholesterol value was selected.
- Step 5. The age group box was chosen (we chose 40 if the age was between 40 and 49 years, and 50 if the age was between 50 and 59 years).
- Step 6. In the box chosen at the end, the cell closest to the intersection of the systolic blood pressure levels (mm/Hg) was located. In the intermediate values, the lower value was taken.

Anthropometry

The abdominal circumference was measured using the technique described by Lohman[14.] For this, women were in a standing position with the abdomen relaxed, arms at the sides of the body and feet together, and the tape was placed on a horizontal plane at the level of the natural waist, i.e. in the torso's minimum circumference. The measurement was obtained without compressing the skin and at the end of a normal expiration. A flexible measuring tape was used and the measurement was registered to the nearest 0.1 centimeter.

All women were measured in centimeters (without obstacles on the head) and weighed in kilograms in the office's weight (after calibration), as lightly dressed as possible and barefoot, to calculate the body mass index (weight in kilograms divided by the square of the height in meters [BMI = weight (kg) / height $(m)^2$])[15]. The Quetelec index (kg/m^2) was applied for the determination of overweight and obesity (**Box**), according the criteria of the Cuban

Box. Criteria for the interpretation of the nutritional state according to the BMI (kg/m^2).

Normal	18.5 – 25.0
Overweight	25.1 – 29.9
Obesity	≥ 30
Obesity grade I	30.0 – 34.9
Obesity grade II	35.0 – 39.9
Morbid obesity	≥ 40

consensus on climacteric and menopause, and the procedures manual for care of priority groups of the Cuban Ministry of the Public Health, available in all Family Doctor offices.

Blood pressure
An aneroid sphygmomanometer with a cuff was used to measure blood pressure figures. The technique was performed with a previous rest of approximately five minutes, in a sitting position, with the back resting on the back of the chair, the feet resting on the floor, and with the right arm bare and resting on a surface that allowed to maintain the cuff at the heart's level. The cuff was insufflated, the radial artery was palpated, and insufflation was continued until 20 or 30 mmHg above the disappearance of the pulse. Subsequently, the diaphragm of the stethoscope was placed over the brachial artery in the antecubital fossa and the cuff was deflated, descending the needle at a speed of 2 mmHg per second. Systolic blood pressure was considered at the first auscultated sound (Korotkoff 1) and diastolic, at the disappearance of the last sound (Korotkoff 5). The reading of the figures was set at the 2 mmHg or divisions closest to the appearance or disappearance of the noises. For the diagnosis of high blood pressure were used the criteria established by the Cuban guide of diagnosis, evaluation and treatment of high blood pressure[16].

Processing of information
Data were collected on a model developed for this purpose, where variables of interest were gathered, complying with all the principles of medical ethics.

The software Microsoft Excel 2010 for Windows was used. The results are summed up in tables and graphs.

RESULTS

As can be observed in **table 1**, atherogenic risk factors are present in all patients, but always predominated in the subgroup with a history of pre-eclampsia. The most prevalent risk factor in all of the women studied was the combination of overweight and obesity (75%), evaluated through the body mass index, subgroup which stood 98.1% of those with a history of pre-eclampsia. Followed in order of frequency by hypercholesterolemia (71.3 %), high blood pressure (54.6%), smoking (51.8%) and diabetes mellitus (38,9%).

Regarding the early atherosclerotic signals (**Table 2**), 92.6% of women with a history of pre-eclampsia were hypertensive, against 16.6% of the control group, and all had an abdominal circumference ≥ 88 cm; furthermore, more than half (57.4%) had obesity established by body mass index, compared to only 16.6% of obese women in the group who did not have pre-eclampsia. On the other hand, overweight was similar in both groups (38.9 *vs.* 37.1%) and in the total study population (37.9%).

According to the information gathered in the applied survey, only some circulatory and psychological symptoms (insomnia) are referred by the studied population (**Table 3**). Among the circulatory symptoms referred to are hot flashes, night sweats, and headache. All were referred by the three women

Table 1. Distribution of middle-aged women according to atherogenic risk factors and history of pre-eclampsia.

Atherogenic risk factors	History of pre-eclampsia				Total (n=108)	
	Yes (n=54)		No (n=54)			
	Nº	%	Nº	%	Nº	%
Hypercholesterolemia ≥ 5.2 mmol/L	40	74.0	37	68.5	77	71.3
High blood pressure	50	92.5	9	16.6	59	54.6
Smoking habit	45	83.3	11	20.4	56	51.8
Diabetes mellitus	25	46.3	17	31.4	42	38.9
Overweight or obesity (BMI ≥ 25.5 kg/m^2)	53	98.1	28	51.4	81	75.0

(100%) with very high cardiovascular risk. Moreover, all the high-risk women (100%) had night sweats; 75%, hot flashes and 50%, headache. Insomnia was reported by seven of the eight women with high cardiovascular risk (87.5 %) and one with very high risk (33.3%).

In addition, all those with moderate (19.4%), high (7.4%) or very high (2.8%) cardiovascular risk had a history of pre-eclampsia (**Table 4**), and of the total number of women with low cardiovascular risk, only 22 (28.9%) had this history, since the rest (71.1%) represents the total number of women without pre-eclampsia (p=0.01). If only those with a history of pre-eclampsia are analyzed, it is striking that these 22 women with low risk represent 40.7% (**Figure**); therefore, the remaining 59.3% is distributed in moderate (38.9 %), high (14.8 %) and very high (5.6 %) risk.

Table 2. Early atherosclerotic signs in middle-aged women depending on the presence or absence of a history of pre-eclampsia.

Atherosclerotic signs	History of pre-eclampsia				Total (n=108)	
	Yes (n=54)		No (n=54)			
	Nº	%	Nº	%	Nº	%
Overweight	21	38.9	20	37.1	41	37.9
Obesity	31	57.4	9	16.6	40	37.1
Abdominal circumference ≥ 88 cm	54	100	49	90.7	103	95.4
High blood pressure	50	92.6	9	16.6	59	54.6

Table 3. Atherogenic risk according to symptoms of climacteric syndrome.

Symptoms	Atherogenic risk							
	Low (N=76)		Low (N=76)		Low (N=76)		Low (N=76)	
	No	%	No	%	No	%	No	%
Circulatory								
Hot flashes	22	28.9	10	47.6	6	75.0	3	100
Night sweats	30	39.4	18	85.7	8	100	3	100
Headaches	12	15.7	9	42.8	4	50.0	3	100
Psychological								
Insomnia	19	25.0	6	28.5	7	87.5	1	33.3

Table 4. Distribution of the women studied according to their cardiovascular risk and history of pre-eclampsia.

Cardiovascular risk	History of pre-eclampsia				Total (n=108)	
	Yes		No			
	Nº	%	Nº	%	Nº	%
Low	22	28.9	54*	71.1	76	70.4
Moderate	21	100	0	0.0	21	19.4
High	8	100	0	0.0	8	7.4
Very high	3	100	0	0.0	3	2.8
Total	54	50.0	54	50.0	108	100

* p=0.01

DISCUSSION

Cardio and cerebrovascular diseases represent the leading causes of morbidity and mortality for all ages in developed countries as well as in Cuba[2-5]. Several studies have shown the strong relationship between the different risk factors and these diseases, thus, the knowledge and treatment of high blood pressure, overweight, obesity and other factors are of great importance due to the early stage in which the complications' development begins.[17,18].

The importance of the early atherogenic signals is that it was thought that certain diseases and risk factors were typical of certain adult population[19-23], however, in the last ten years it has been found an increase in type 2 diabetes mellitus in more young women every day[24].

Obesity is recognized as one of the biggest public health problems in the world. The WHO estimated that, globally, 52% of adults and 30% of children are overweight[22,24]. This disease is characterized by excessive body fat, associated with the development of multiple metabolic disorders and these, in turn, cause other health problems[25].

Researchers at the Biomedical Research Centre in Physiopathology of Obesity and Nutrition (CIBEROBN, after its abbreviation in Spanish)[26] point out that more than 80% of obese young people continue to be so for life, which implies a growing trend towards an obese society. Awareness will be the key in preventing this disease, which is increased by the lack of healthy habits.

The metabolic syndrome, a health problem that has been the subject of intense scientific debate due to its long-term clinical implications, is of particular interest in women, and, because of its importance, it is worthy of further studies. It is a set of cardiovascular risk factors represented by central obesity, dyslipidemia, abnormalities in glucose metabolism and HBP, associated with insulin resistance. This syndrome increases the risk of cardiovascular disease and type 2 diabetes mellitus[25,27].

Another great importance of identifying atherogenic signals early is that they are present in people apparently healthy, even the relatives do not perceive them[5]. All of these risks are present in the female population studied, but evidently, a history of having had pre-eclampsia in pregnancies that took place in the last decade of these women represents another risk factor to consider. Identifying atherogenic signals present early in middle-aged women apparently healthy is of vital importance for the
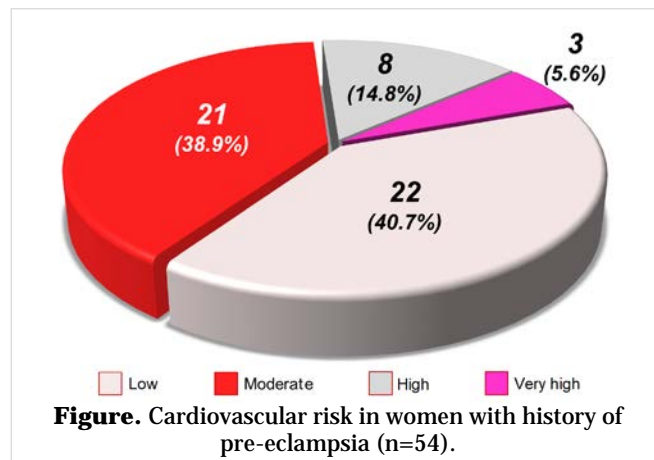

Figure. Cardiovascular risk in women with history of pre-eclampsia (n=54).

identification of the atherogenic risk and the establishment of a health approach to follow.

CONCLUSIONS

In middle-aged women with a history of pre-eclampsia, early atherosclerotic signs such as abdominal obesity −according to a waist circumference greater than 88 cm− and high blood pressure predominate; as well as atherogenic risk factors associated with high and very high cardiovascular risk.

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