Cardiovascular Risk Profile in Women from Three Different Areas of the Province of Tucumán, Argentina

Perfil de riesgo cardiovascular en mujeres de tres entornos de la Provincia de Tucumán - Argentina

DAMIÁN HOLOWNIA[1], RICARDO S. GALDEANO[1,2], MARÍA S. ROJAS JORDÁN[1,2], PALAVECINO DARÍO OMAR[1,3], ABREGÚ JOSÉ DANIEL[1,4], MARIO O. MARTINENGUI[1], RODRIGO O. MARAÑÓN[1, 5], CLAUDIO M. JOO TURONI

ABSTRACT

Background: The role of the environment on female population health in Tucumán has been little studied. This study aimed to evaluate the cardiovascular risk profile in women from rural, peri-urban and urban areas in the province of Tucumán (Argentina) and to analyse their differences.
Methods: An analytical cross-sectional study was conducted in 3 groups of women from Tucumán: rural (n = 125), peri-urban (n = 50) and urban (n = 112).
Results: Blood pressure (BP) was lower in the rural group; the urban group showed higher heart rate and smaller neck circumference. Of the studied women, 29.7% were overweight and 42.4% obese, and no significant differences were found in the 3 groups. Increased neck circumference was observed in 62% of women in the rural group, 79% in the peri-urban group and 41% in the urban group (p <0.001). Smoking was more frequent in the urban group. In the urban and peri-urban groups, the proportion of women with higher education level was greater (p <0.001). Education level was positively correlated with heart rate.
Conclusion: Regardless of the environment, women from Tucumán are overweight or obese and have other risk factors for cardiovascular disease. This should be considered when planning policies and making decisions in order to improve their prognosis.

Keywords: Cardiovascular Disease - Women - Environment

RESUMEN

Introducción: El rol del entorno sobre la salud en la población femenina de Tucumán está poco estudiado. El objetivo del presente trabajo fue evaluar el perfil de riesgo cardiovascular de mujeres de los entornos rural, periurbano y urbano de la provincia de Tucumán (Argentina).
Material y métodos: Se efectuó un estudio analítico transversal en 3 grupos de mujeres de Tucumán: rural (n=125), periurbano (n= 50) y urbano (n=112).
Resultados: La presión arterial (PA) fue menor en el grupo rural; el grupo urbano presentó mayor frecuencia cardíaca y menor circunferencia de cuello. El 29,7% de las mujeres presentaron sobrepeso y el 42,4% obesidad, sin diferencia significativa entre los 3 grupos. La circunferencia de cuello estuvo aumentada en el 62% de las mujeres del grupo rural, 79% del periurbano y 41% del urbano (p<0,001). El grupo urbano presentó más frecuentemente tabaquismo. En los grupos urbano y periurbano fue mayor la proporción de mujeres con estudios superiores (p <0,001). El nivel educativo se correlacionó positivamente con la frecuencia cardíaca.
Conclusiones: Independientemente del entorno las mujeres de Tucumán presentan sobrepeso u obesidad asociados a otros factores de riesgo para enfermedad cardiovascular. Ello debe ser tenido en cuenta para la elaboración de políticas y la toma de conductas a fin de mejorar su pronóstico.

Palabras claves: Enfermedades Cardiovasculares - Mujeres - Entorno

[1] Tucumán District – Sociedad Argentina de Cardiología
[2] Sanatorio Racedo (Monteros) – Tucumán
[3] Provincial Health System (Sistema Provincial de Salud, SIPROSA) – Tucumán
[4] Municipality of Aguilares – Tucumán
[5] Biomedical Department, Institute of Physiology, School of Medicine, National University of Tucumán (Universidad Nacional de Tucumán, UNT); Higher Institute of Biological Research (Instituto Superior de Investigaciones Biológicas, INSIBIO)-National Scientific and Technical Research Council (Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET) – Tucumán

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality worldwide (1) and in Argentina. (2) The so-called "social gradient" (decrease in mortality and morbidity rates as social status increases) (3) has already been shown to occur in a wide range of conditions, including CVD. (4)

In urban areas, population has easier access to health services, but environmental factors, such as pollution, noise, and daily stress, affect the cardiovascular health. (5) The peri-urban areas have the disadvantage of being a transitional and unstable territory in terms of social networks, which is associated with increased cardiovascular risk. (6,7) In addition, it has been conventionally described that the prevalence of CVD is lower in rural areas. (8) However, this concept is changing, (9) since a high prevalence of overweight was observed in different indigenous communities. (10,11) In Argentina, a 38% prevalence of metabolic syndrome has been found in the Toba community (indigenous people living in central Chaco). (12) More recently, we have found that the Quilmes community (rural indigenous people living in the middle and high mountains who still preserves pre-Inca traditions) in Tucumán has a prevalence of risk factors for CVD similar to that in urban areas. (13)

The province of Tucumán, located in northwestern Argentina, with an area of 22 525 km², has rural areas with difficult access, densely populated urban areas (the capital city has 605 000 inhabitants in 91 km²) and strings of peri-urban areas surrounding the cities. In the urban and peri-urban areas of Tucumán, according to data from the National Institute of Statistics and Censuses (Instituto Nacional de Estadísticas y Censos, INDEC), the poverty rate was 42.7% in the second quarter of 2022. (14) However, the impact of the environment on CVD risk factors in women is still being studied. This view is consistent with the worldwide literature which indicates that there is a dichotomy between real and perceived CVD risk in women. (15,16)

This study aimed to evaluate the cardiovascular risk profile in adult women from rural, peri-urban and urban areas of the province of Tucumán (Argentina) and to analyse their differences.

METHODS

An analytical cross-sectional study conducted in 3 population groups of women from different areas of Tucumán.
- Rural group: Women from Quilmes, a middle and high mountain area where pre-Inca traditions are still preserved, who participated in the Sonqo Calchaquí 2018 study (13) (n = 125).
- Peri-urban group: Women from Villa Muñecas, a peripheral neighbourhood located 3 km away from the city, who participated in a cardiovascular health activity organized by the Argentine Society of Cardiology (Sociedad Argentina de Cardiología, SAC), Tucuman District, on Women's Day in March 2021 (n = 50).
- Urban group: Women living in the city of San Miguel de Tucumán and performing desk jobs at the Municipality, who underwent a cardiovascular health registry in September 2019 (n = 112).

In this study, the following variables were assessed:
- Age: Expressed in years.
- Education level: Expressed as completed level (illiterate, primary school, secondary school or higher education).
- Presence of the following CVD risk factors: Smoking, dyslipidemia, hypertension (HT) or diabetes. Women were asked about the presence of said risk factors. A semiquantitative score was made according to the number of risk factors mentioned (0 to 4).
- Salt added to cooked food.
- Weight (kg): It was measured with a digital scale.
- Height (cm): It was measured with a portable height rod.
- Neck circumference (cm): It was measured with a non-expandable measuring tape. It was considered increased when it was greater than 34 cm. (17)
- Waist circumference (cm): It was measured with a non-expandable measuring tape. It was considered increased when it was greater than 88 cm. (17)
- Body mass index (BMI): It was calculated as weight in kg/(height in m². Women were classified according to their nutritional status as follows: underweight (BMI <18.5); normal weight (BMI ≥18.5 and <25); overweight (BMI ≥25 and <30); obesity (BMI ≥30 and <35); severe obesity (BMI ≥35 and <40); and morbid obesity (BMI ≥40).
- Systolic blood pressure (SBP) and diastolic blood pressure (DBP) values were expressed in mmHg: It was measured with an Omron 7120® automatic digital sphygmomanometer according to the applicable guidelines. (18) Pulse pressure (PP) was calculated as SBP - DBP and mean blood pressure (MBP) as DBP + (PP/3).
- Heart rate and O2 saturation were measured with an An Mat® pulse oximeter.

Statistical Analysis

The results were compiled in a Microsoft Excel 2010 spreadsheet and expressed as percentage (%) or mean ± standard error, as required. The statistical analysis was performed with GraphPad Prism 5.02 software. Student's t-test, ANOVA with Newman-Keuls' post-test, Pearson's correlation (r) or chi-square test (2) were used, as required. Results were considered significant with a <5% probability (p <0.05).

Ethical Considerations

All participants granted the appropriate oral and written informed consent to participate in this study.

RESULTS

The average age of the studied women was 48.9 ± 0.9 years, with no differences among the 3 groups: (rural: 50.2 ± 1.8 years, peri-urban: 47.7 ± 1.9 years, urban: 48.1 ± 1.0 years, p = NS).

Education level of the studied women is shown in Figure 1. Illiterate women were reported only in the rural group. The percentage of women with higher education level was greater in the urban and peri-urban groups than in the rural group (p <0.001).

Anthropometric and hemodynamic values are shown in Table 1. Weight and height values were lower in the rural group than in the other two groups, but the average BMI was elevated in all the studied population, with no differences among the 3 groups.
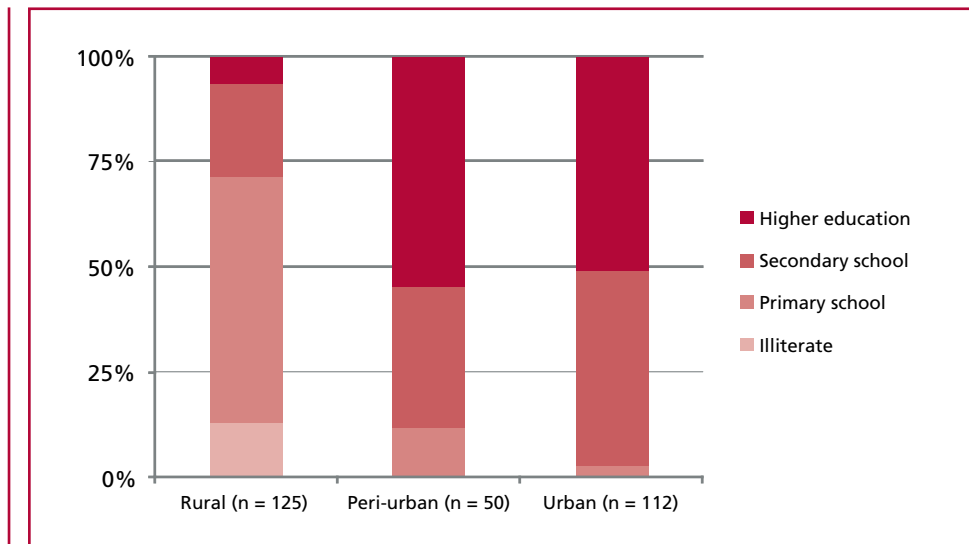
Fig. 1. Education level in the studied population.

Table 1. Anthropometric values in the studied population

	Rural (n = 125)	Peri-urban (n = 50)	Urban (n = 112)	Total (n = 287)
Weight (kg)	68 ± 1	73 ± 2+	78 ± 2***	72.6 ± 1.0
Height (cm)	154 ± 1	160 ± 1***	160 ± 1***	1.6 ± 0.1
BMI	28.5 ± 0.5	28.5 ± 0.8	30.3 ± 0.6	29.3 ± 0.4
Neck circumference (cm)	36.9 ± 0.8	36.1 ± 0.4	34.3 ± 0.4**	35.7 ± 0.4
Waist circumference (cm)	95.6 ± 1.3	97.9 ± 2.0	95.0 ± 1.8	95.8 ± 1.0
BP (mmHg) SBP	123.7 ± 1.9	131.5 ± 2.4**	131.2 ± 1.8***	128.0 ± 1.2
DBP	75.6 ± 0.9	82.8 ± 1.9**	80.7 ± 1.0**	79.1 ± 0.7
PP	44.9 ± 1.4	48.7 ± 2.0	50.5 ± 1.2**	49.0 ± 0.8
MBP	90.5 ± 1.2	99.0 ± 1.9***	97.6 ± 1.2***	94.7 ± 0.8
Heart rate (bpm)	76.4 ± 1.2	78.4 ± 1.1	79.0 ± 1.1*	77.6 ± 0.7
O2 saturation (%)	94.9 ± 0.3	97.0 ± 0.2***	97.3 ± 0.2***	96.7 ± 0.2

BMI: body mass index; DBP: diastolic blood pressure;
MBP: mean blood pressure; PP: pulse pressure; SBP: systolic blood pressure.
Values are expressed as mean ± standard error.
*: p <0.05 vs. rural; **: p <0.01 vs. rural; ***: p <0.001 vs. rural; +: p <0.05 vs. urban.

Neck circumference was smaller in the urban group, but waist circumference was similar in the 3 groups. Although SBP and DBP values, on average, remained within the normal rank, they were higher in the peri-urban and urban groups than in the rural group, and PP values were higher in the urban group than in the peri-urban group. Heart rate values were also higher in the urban group, and O2 saturation was lower in the rural group.

When nutritional status was evaluated, 27.9% of women showed normal weight; 29.7% was overweight and the remaining 42.4% had some level of obesity (26.5% obesity; 10.6% severe obesity and 5.3% morbid obesity). No underweight women were found. The nutritional status distribution was similar in the 3 groups (p = NS).

Increased neck circumference was observed in 62% of the women in the rural group, in 79% in the peri-urban group and in 41% in the urban group (p <0.001) and increased waist circumference was observed in 69% of the studied women, with no significant differences among the 3 groups.

The number of risk factors for CVD, according to the semiquantitative score, was higher in the urban group (Figure 2A). The proportion of women with no risk factor was higher in the rural group (53%) than in the peri-urban (44%) and urban (33%) groups (p <0.001). When each risk factor was analysed separately, HT was the most prevalent (30%), followed by dyslipidemia (25%), smoking (23%) and diabetes (6%). The urban group reported a higher percentage of smoker women (p <0.001). Similar percentages for

the other risk factors were found in the 3 groups (Figure 2B).

Addition of salt to cooked meals was observed in 47% of women. There were no significant differences regarding this in the 3 groups.

A positive correlation was found between neck and waist circumferences (r 0.65; 95% CI: 0.57-0.71; p <0.001). At the same time, neck and waist circumferences were positively correlated with BMI, the number of CVD risk factors and blood pressure (BP) (Table 2).

Education level was positively correlated with heart rate (r 0.21; 95% CI 0.09-0.31; p <0.001) and O2 saturation (r 0.38; 95% CI 0.27-0.47; p <0.001) and negatively correlated with neck circumference (Figure 3) and PP (r -0.1470; 95% CI: -0.26 to -0.03; p <0.05). Age was positively but poorly correlated with neck circumference, waist circumference, the number of risk factors, SBP and DBP, but was not correlated with BMI (r: 0.06; 95% CI: -0.05-0.18; p = NS).

DISCUSSION

The main result of this study is that, regardless of the area where the studied women live (rural, peri-urban or urban), they had increased BMI, large waist circumference and high percentage of obesity. When observing the anthropometric values in the 3 populations, women in the rural group showed lower weight;
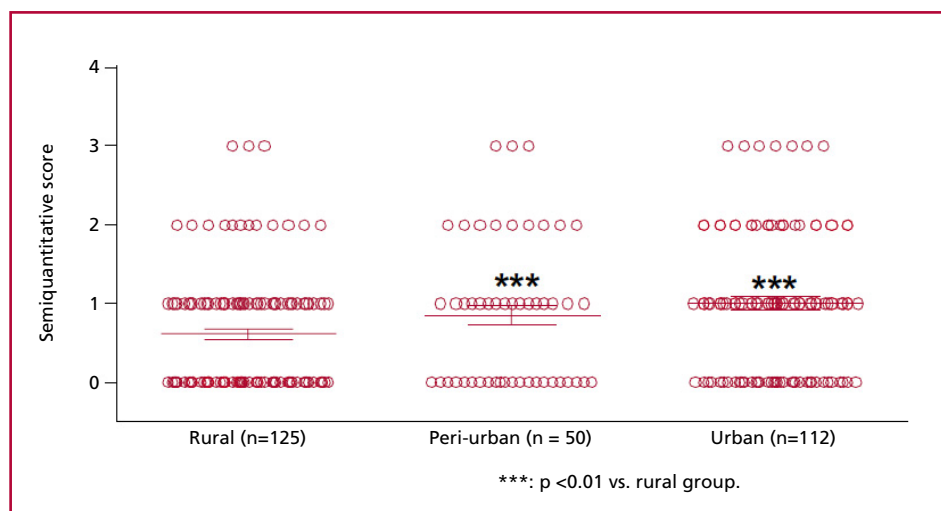

Fig. 2A. Number of risk factors for CVD in the studied groups.

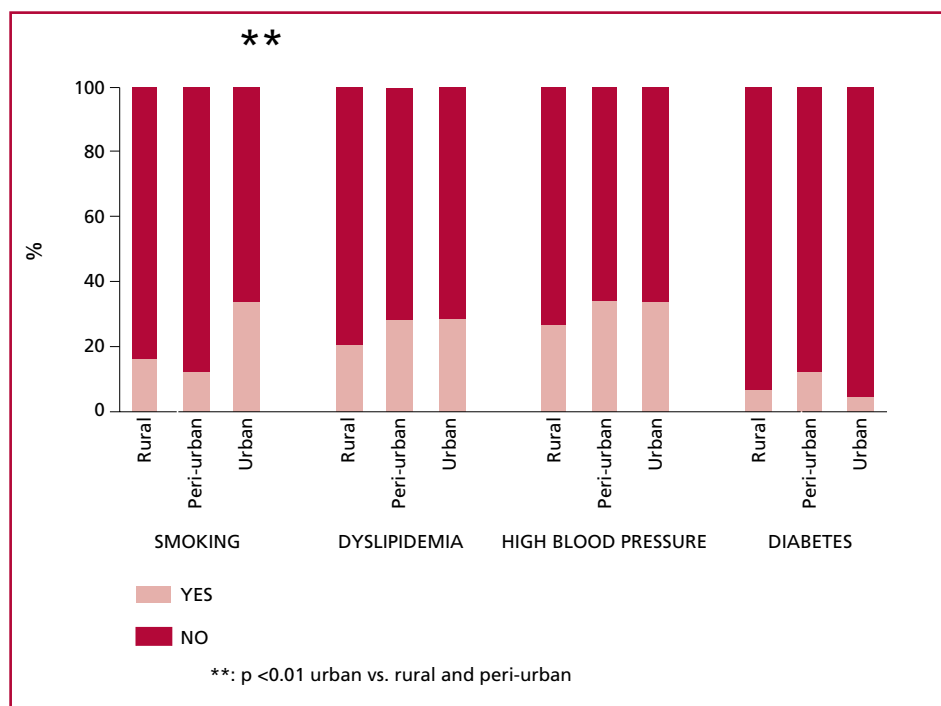Red dots represent each patient. Blue lines represent the mean ± standard error of each group.

**Fig. 2B.** Presence of the studied risk factors in each group.

Table 2. Predictors of major cardiovascular events (cardiac surgery/death/acute aortic syndrome)

	Neck circumference	Waist circumference
BMI	r: 0.62	r: 0.76
	95% CI: 0.54-0.69	95% CI: 0.71-0.81
Number of risk factors	r: 0.21	r: 0.22
	95% CI: 0.09-0.32	95% CI: 0.11-0.33
SBP	r: 0.31	r: 0.34
	95% CI: 0.19-0.41	95% CI: 0.23-0.44
DBP	r: 0.31	r: 0.34
	95% CI: 0.20-0.41	95% CI: 0.23-0.44
PP	r: 0.19	r: 0.21
	95% CI: 0.07-0.30	95% CI: 0.09-0.32
MBP	r: 0.33	r: 0.36
	95% CI: 0.22-0.43	95% CI: 0.26-0.46

BMI: body mass index; DBP: diastolic blood pressure; MBP: mean blood pressure; PP: pulse pressure; SBP: systolic blood pressure.
r: Pearson's r coefficient; 95% CI: 95% confidence interval.
In all cases, p <0.001.

Fig. 3. Correlation between the patients' education level and the neck circumference.
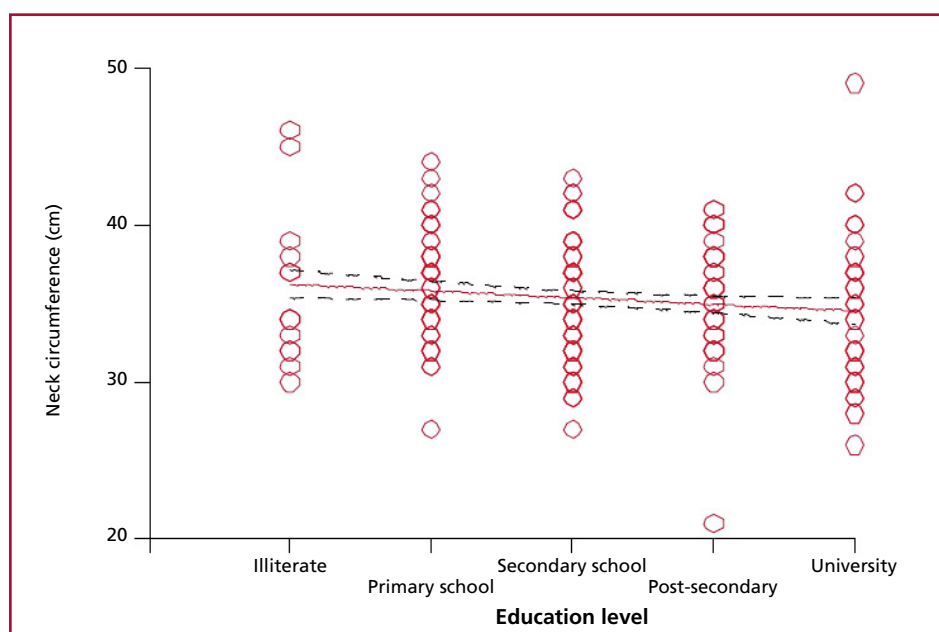
Education level: fully completed education level. Pearson's r: -0.13; 95% CI: -0.25 to -0,01; p <0.05.

however, as they also were smaller in height, they had a BMI similar to that of the other two groups, suggesting that these differences could be racial rather than nutritional.

It should be noted that 42.4% of the studied women had some level of obesity. According to the 4th National Risk Factor Survey (Encuesta Nacional de Factores de Riesgo, ENFR), (2) the prevalence of obesity in Argentina was 33.4%, and 26.9% in Tucumán, without discriminating by sex. The level of obesity observed in this study, which is higher than that reported by the ENFR, (2) could be due to the fact that in the rural and peri-urban groups, we studied women who attended health services (which could be biased, since women with a lower BMI may not have attended

health services), and in the urban group, we studied women who worked in offices –and therefore had a higher degree of sedentary lifestyle. The high prevalence of obesity is worsened by the fact that 5.3% of women are morbid obese. In addition, the increased waist circumference values indicate central (abdominal) fat distribution. Central obesity is associated with a poor quality diet and lack of physical activity. (19) Furthermore, there is a direct relation between central fat distribution and CVD onset. (20) The presence of central obesity indicates risk for CVD in the studied women, regardless of the area where they live. This view is supported by the fact that neck circumference –although, on average, had not increased– had changed in more than half of the women, and its value

was positively correlated with BMI, waist circumference, BP and a number of CVD risk factors. In this regard, it has been indicated that an increased neck circumference is associated with metabolic alterations (21) and higher mortality, even with normal BMI. (22) Based on the negative correlation between education level and neck circumference, we could assume that higher education level is associated with better diet choice or access to a healthier diet. In this regard, no differences were observed in the addition of salt to food, so the diet of the 3 groups should be investigated in future studies.

Women in urban areas have higher prevalence of smoking, a fact that could dilute the protection suggested by lower values of the neck circumference. In contrast to our findings, in a study conducted in the USA it was found that in urban areas, where the education level is higher, the prevalence of smoking is lower than in rural areas, (23) and in a study conducted in China it was observed that education level was inversely related to smoking. (24) The positive association between heart rate and education level suggests greater stress in women with a higher level of education, a fact that may be associated with increased smoking in this population. In a population of recycling workers, it was shown that elevated heart rate is associated with a higher degree of stress, (25) and under laboratory conditions it was shown that stress increases cigarette consumption in both men and women. (26)

Historically, regarding CVD risk factors, the prevalence of CVD and diabetes has been higher in urban than in rural populations. (8) Nowadays, this difference is controversial. Decreased survival and increased CVD have been reported in indigenous communities in several areas, including Australia, New Zealand, and the United States. (9) More recently, our working group found that in the Quilmes community, both men and women have a prevalence of CVD risk factors similar to that in urban areas. (13) Interestingly, this trend is replicated in the studied women of this population, which supports the hypothesis raised in the previous paragraphs: regardless of the environment, the levels of obesity and the cardiovascular risk profiles in women are similar.

It should be highlighted, among other points, that the BMI is within the overweight rank in the rural and peri-urban groups and within the obesity rank in the urban group;

neck circumference is higher in the rural and peri-urban groups; the percentage of women without risk factors is higher in the rural group; and smoking is higher in the urban group. However, the fact that the distribution of body fat is similar (central type) in the 3 groups would indicate a high risk for CVD in the entire studied population and a different impact of the risk factors in the 3 groups, which suggests that the preventive approach should also be differentiated.

Furthermore, although BMI did not change with increasing age, we observed a correlation between age and waist and neck circumferences, SBP, DBP, and the number of risk factors. It has been shown that fat body mass increases and lean body mass decreases with aging, (27) which could explain why BMI is maintained over time.

CONCLUSIONS

Regardless of the environment (urban, peri-urban or rural), women in Tucumán are overweight or obese and have other risk factors for CVD, which could significantly affect their cardiovascular health in the future. Although in all cases women should be made aware of the benefits of a healthy diet and preventive lifestyle including weight control, physical activity and stress reduction, in rural and peri-urban areas more emphasis should be given to improve the level of education and access to healthcare systems, while in urban areas the priority is to work on other aspects, such as smoking cessation.

Conflicts of interest
None declared.

(See authors' conflict of interests forms on the web/Additional material).

REFERENCES

1. GBD 2016 Mortality and Causes of Death Collaborators. Global, regional, and national age-sex specifc mortality for 264 causes of death 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet 2016;390:1151–210. https://doi.org/10.1016/S0140-6736(17)32152-9
2. 4ta Encuesta Nacional de Factores de Riesgo. Ministerio de Salud y Desarrollo Social. Presidencia de la Nación. Argentina. 2019
3. Wilkinson RG, Marmot M. Social Determinants of Health: the Solid Facts. 2nd ed. Copenhagen, Denmark: World Health Organization; 2003
4. Marmot M. Social determinants of health inequalities. Lancet 2005;365:1099-104. https://doi.org/10.1016/S0140-6736(05)71146-6
5. Nieuwenhuijsen, MJ. Influence of urban and transport planning and the city environment on cardiovascular disease. Nat Rev Cardiol 2018;15:432–8. https://doi.org/10.1038/s41569-018-0003-2
6. Dhungana R, Thapa P, Devkota S, Chandra Banik P, Gurung Y Jahan Mumu S, et al. Prevalence of cardiovascular disease risk factors: A community-based cross-sectional study in a peri-urban community of Kathmandu, Nepal. Indian Heart Journal 2018;70(Supp 3):S20-S27. https://doi.org/10.1016/j.ihj.2018.03.003
7. Abbs ES, Viñoles J, Alarcón JO, Johnson H, Zunt J. High prevalence of cardiovascular risk factors in Peruvian adolescents living in a peri-urban shantytown: a cross-sectional study. J Health Popul Nutr 2017;36:19. https://doi.org/10.1186/s41043- 17-0093-1
8. Barceló A. La diabetes en las Américas. Boletín Epidemiológico OPS 2001;22:1-3.
9. Lucero A, Lambrick D, Faulkner J, Fryer S, Tarrant M, Poudevigne M, et al. Modifiable Cardiovascular Disease Risk Factors among Indigenous Populations. Adv Prev Med 2014;2014:547018. https://doi.org/10.1155/2014/547018
10. Pinto Garcia J, Lobo Cerna F, Andrade Romero J, Soriano EM. Caracterización de los Factores de Riesgo Cardiovascular para Infarto Agudo de Miocardio en Población Garífuna. Rev Cient Cienc Med 2015;18:16-9. https://doi.org/10.51581/rccm.v20i1.152
11. Cataño Bedoya J, Duque Botero J, Naranjo González C, Rúa Molina D, Rosique Gracia J, García Pineda A, et al. Prevalencia de factores de riesgo cardiovascular en indígenas embera-chamí de Cristianía (Jardín), Antioquia. IATREIA 2015;28:5-16. https://doi.org/10.17533/udea.iatreia.18535
12. Lagranja E, Phojanakong P, Navarro A, Valeggia C. Indigenous

populations in transition: An evaluation of metabolic syndrome and its associated factors among the Toba of northern Argentina. Ann Hum Biol 2015;42:84-90. https://doi.org/10.3109/03014460.2014.93 2008

13. Galdeano R, Holownia D, Palavecino D, Abregú J, Rivas Jordan M, Frías Silva M, et al. Evaluación de variables cardiovasculares en una población calchaquí de media y alta montaña de Tucumán. Rev Argent Cardiol 2021;89:20-6. https://doi.org/10.7775/rac.v89.i1.19095

14. Informes técnicos / Vol. 6, n° 60 ISSN 2545-6636. Publicaciones del INDEC.

15. Kling J, Miller V, Mankad R, Wilansky S, Wu Q, Zais T, et al. Go red for women cardiovascular health–screening evaluation: The dichotomy between awareness and perception of cardiovascular risk in the community. Womens Health 2013;22:210-8. https://doi.org/10.1089/jwh.2012.3744

16. Dearborn J; McCullough L. Perception of risk and knowledge of risk factors in women at high risk for stroke. Stroke 2009;40:1181-6. https://doi.org/10.1161/STROKEAHA.108.543272

17. Ben-Noun L; Arie LaorNeck E. Circumference as a Simple Screening Measure for Identifying Overweight and Obese Patients. Obes Res 2001;9:470-7. https://doi.org/10.1038/oby.2001.61

18. Sociedad Argentina de Cardiología. Consenso Argentino de Hipertensión Arterial; Rev Argent Cardiol 2018;86 (Suppl 2):4-53. https://doi.org/10.7775/rac.v86.i4.13736

19. Xu F, Earp J, LoBuono D, Greene G. The relationship of physical activity and dietary quality with android fat composition and distribution in US adults. Nutrients 2022;14:2804. https://doi.org/10.3390/nu14142804

20. Barroso T, Marins L, Alves R, Souza Gonçalves A, Barroso S, de Souza Rocha G. Association of central obesity with the incidence of cardiovascular diseases and risk factors. Int J Cardiovasc Sci 2017;30:416-24. https://doi.org/10.5935/2359-4802.20170073

21. Ataie-Jafari A, Namazi N, Djalalinia S, Chaghamirzayi P, Abdar M, Zadehe SS, et al. Neck circumference and its association with cardiometabolic risk factors: a systematic review and meta-analysis. Diabetol Metab Syndr. 2018;10:72. https://doi.org/10.1186/s13098-018-0373-y

22. Sahakyan KR, Somers VK, Rodriguez-Escudero JP, Hodge DO, Carter RE, Sochor O, et al. Normal-Weight Central Obesity: Implications for total and cardiovascular mortality. Ann Intern Med 2015;163:827-35. https://doi.org/10.7326/M14-2525

23. Doogan N, Roberts M, Wewers M, Stanton C, Keith D, Gaalema D, et al. A growing geographic disparity: Rural and urban cigarette smoking trends in the United States. Preventive Medicine 2017;104:79-85. https://doi.org/10.1016/j.ypmed.2017.03.011

24. Wang Q, Shen J, Sotero M, Li C, Hou Z. Income, occupation and education: Are they related to smoking behaviors in China?. Plos One 2018;13: e0192571. https://doi.org/10.1371/journal.pone.0192571

25. Burns K, Sun K, Fobil J, Neitzel R. Heart Rate, Stress, and Occupational Noise Exposure among Electronic Waste Recycling Workers. Int. J. Environ Res Public Health 2016;13:140. https://doi.org/10.3390/ijerph13010140

26. Siegel A, Korbman M, Erblich J. Direct and indirect effects of psychological distress on stress-induced smoking. Journal of Studies on Alcohol and Drugs 2017;78:930-7. https://doi.org/10.15288/jsad.2017.78.930

27. Holmes C, Racette S. The Utility of Body Composition Assessment in Nutrition and Clinical Practice: An Overview of Current Methodology. Nutrients 2021;22;13(8):2493. https://doi.org/10.3390/nu13082493