Original Article

Frequency of Dyslipidemias and Cardiovascular Risk Determination in Patients with Systemic Arterial Hypertension

Frecuencia de dislipidemias y determinación del riesgo cardiovascular en pacientes con hipertensión arterial sistémica

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Summary

Objective: to determine the frequency of dyslipidemia and cardiovascular risk (CVR) in patients with systemic arterial hypertension (SAH) in a family medicine unit. **Methods:** analytical cross-sectional study conducted at the Family Medicine Unit No. 26 of the Mexican Institute of Social Security (IMSS) in Acapulco, Mexico, which included 150 patients with a confirmed diagnosis of systemic arterial hypertension in the electronic clinical record, obtained by non-probabilistic sampling by convenience, from November 2020 to May 2021. It was applied a questionnaire to obtain sociodemographic information, somatometry, laboratory tests, and the cardiovascular risk was assessed with the Globorisk estimation table. Descriptive statistics, bivariate and multivariate analysis were performed with the obtained data. **Results:** the frequency of dyslipidemia was 56.7% (n= 85), with a greater distribution in women 67% (n= 57), female to male ratio 2:1, 22.7% (n= 34) had mixed hyperlipidemia. 48% (72/150) presented moderate cardiovascular risk. Being a man and having a glomerular filtration rate <60 ml/min/1.27m^{2}SC increased the possibility of presenting high cardiovascular risk. **Conclusion:** moderate cardiovascular risk was observed in almost half of the patients. Being male and having a GFR <60 ml/min/1.27m^{2}SC increased the risk of presenting high CVR.

Keywords: Dyslipidemias, Heart Disease Risk Factors, Hypertension

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Resumen

Objetivo: determinar la frecuencia de dislipidemias y riesgo cardiovascular en pacientes con hipertensión arterial sistémica de una unidad de medicina familiar. **Métodos**: estudio transversal analítico realizado en la Unidad de Medicina Familiar No. 26 del IMSS en Acapulco, México; se incluyeron a 150 pacientes con diagnóstico confirmado de hipertensión arterial sistémica en el expediente clínico electrónico, obtenidos mediante muestreo no probabilístico por conveniencia, de noviembre 2020 a mayo 2021. Se aplicó un cuestionario para obtener información sociodemográfica, somatometría, estudios de laboratorio y se evaluó el riesgo cardiovascular con la tabla estimativa Globorisk. Con los datos obtenidos se realizó estadística descriptiva, análisis bivariado y multivariado. **Resultados:** la frecuencia de dislipidemia fue 56.7% (n= 85), se observó una mayor distribución en el sexo femenino 67% (n= 57), relación mujer-hombre 2:1, 22.7% (n= 34) cursó con hiperlipidemia mixta. 48% (72/150) presentó riesgo cardiovascular moderado. Ser del sexo masculino y tener una tasa de filtrado glomerular <60 ml/min/1.27m^{2}SC aumentó la posibilidad de presentar riesgo cardiovascular alto. **Conclusión**: el riesgo cardiovascular moderado se observó en casi la mitad de los pacientes. Ser hombre y tener una TFG <60 ml/min/m^{2}SC incrementó el riesgo de presentar riesgo cardiovascular alto.

Palabras clave: dislipidemias, factores de riesgo de enfermedades del corazón, hipertensión.

Introduction

The World Heart Federation, the World Health Organization (WHO), and the Pan American Health Organization (PAHO) have established that cardiovascular diseases (CVD) represent a public health problem, being the first place in morbidity and mortality in the world; in addition, they are the main cause of premature death and disability due to the long-term care they require, and the reduction in work capacity.[1-5] In 2015, approximately 17.5 million people died from this cause, which corresponds to 31% of the deaths registered in the world; of these, 7.4 million were due to coronary heart disease, and 6.7 million due to cerebrovascular accidents; 37% of these deaths occurred in people <70 years. The WHO projects a mortality of 22.2 million by 2030.[5] In Mexico, CVD has been the leading cause of death for more than 20 years.[6]

Cardiovascular risk (CVR) is defined as the probability of suffering a clinical event (cardiovascular or cerebrovascular death) that can occur in a person in a period of 5 to 10 years; its stratification is necessary to anticipate the level of intervention for each patient.[7,8] In individuals >40 years, systematic assessment of CVR is recommended using the Globorisk scale, which was validated in the Mexican population through the development of a CVR equation, recalibrated with other models such as Framingham Risk SCORE, which allowed an adequate 10-year risk correlation to be established in the Mexican population.[9]

Atherosclerosis is a multifactorial process that promotes chronic endothelial injury. Among the main factors that contribute to its etiopathogenesis are lipoprotein alterations, heredity, age, smoking, sedentary lifestyle, unhealthy diet, arterial hypertension, hyperglycemia, and overweight or obesity.[5,10]

Systemic arterial hypertension (SAH) may be associated with dyslipidemias, defined as a group of diseases characterized by abnormal concentrations of cholesterol, high-density lipoproteins (HDL-C), low-density lipoproteins (LDL-C), and triglycerides (TG) in the blood, which have a synergistic effect on CVR.[7,8,11]

Dyslipidemias are one of the main modifiable CVR factors, which is why screening and treatment is cost-effective in the population ≥20 years of age, since it prevents complications such as acute myocardial infarction and cerebrovascular disease.[5,11]

There is evidence that a system of periodic evaluations represents a unique opportunity in the prevention, early diagnosis, and timely treatment of CVD; with the premise that the greater the risk, the greater the therapeutic intensity.[12]

The objective of this study was to determine the frequency of dyslipidemia and cardiovascular risk in patients with systemic arterial hypertension in a family medicine unit.

Methods

An analytical cross-sectional study conducted in the outpatient clinic of the Family Medicine Unit (FMU) No. 26 of the Mexican Institute of Social Security (IMSS) in Acapulco, Mexico, from November 2020 to May 2021. The sampling was non-probabilistic by convenience. A total of 150 people with a confirmed diagnosis of SAH in the electronic clinical record participated. Patients were selected with the following criteria: assigned to the FMU, both genders, aged 40 to 86 years, with complete lipid profile ≤6 months, and who agreed to participate in the study by signing the informed consent form. Patients with a history of congenital and/or dilated heart disease, hypothyroidism, diabetes mellitus, human immunodeficiency virus, and pregnant women were excluded. Patients

with incomplete questionnaires that did not contain the basic and sufficient study variables for the investigation were eliminated.

A questionnaire designed by the researchers was used to record patient information; the format included four sections: sociodemographic information, clinical information, anthropometric parameters, and laboratory tests. The first section included age, gender, marital status, level of schooling, and profession. The second section collected time of evolution of SAH, smoking, and comorbidities. The third section recorded weight, height, body mass index (BMI), waist circumference, and blood pressure. Finally, the fourth section collected biochemical parameters such as total cholesterol, LDL-C, LDL-C, HDL-C, triglycerides, fasting glucose, creatinine, and the glomerular filtration rate (GFR) was calculated using the Cockcroft-Gault formula.

The frequency of dyslipidemia was determined according to the criteria defined by the third report of the National Cholesterol Education Program Expert Panel (NCEP-ATPIII).[13] Ten-year cardiovascular risk was categorized using the Globorisk tables, classified as very high risk (10%), high risk (5-10%), moderate (1-5%), and low risk (<1%).[14]

Univariate analysis was performed to obtain simple frequencies and percentages. Association factors were measured by bivariate analysis using the Mantel-Haenszel procedure, 95% confidence intervals (95% CI) were calculated using the Miettinen procedure, and logistic regression was used for multivariate analysis. The obtained data were analyzed in the CIETmap 2.1.[15] statistical package.

The research project was approved by the local Research Committee and complies with current IMSS regulations.

Table 1. Sociodemographic and Clinical Characteristics in Patients with Arterial Hypertension

	Characteristic	Frequency (n=150)	Percentage
Age	40-50 years	27	18.0
	51-60 years	35	23.3
	61-70 years	45	30.0
	70-86 years	43	28.7
Gender	Male	54	36.0
	Female	96	64.0
Job	Household	91	60.7
	Student	1	0.7
	Employee	31	20.7
	Merchant	22	14.7
	Professional worker	5	3.2
Civil Status	Single	8	5.3
	Married	111	74.0
	Common-law marriage	8	5.3
	Widow /Widower	14	9.4
	Divorced or separated	9	6.0
Level of Studies	Illiterate	23	15.3
	Elementary	66	44.0
	Junior High-School	31	20.7
	High-School	21	14.0
	Bachelor's degree	9	6.0
Comorbidities	Nephrotic syndrome	1	0.7
	Chronic kidney disease	7	4.7
	Rheumatologic disease	11	7.3
	Other disease	76	50.7
	None	55	36.6
Smoking	Yes	4	2.7
	No	146	97.3
Body Mass Index	Normal	22	14.7
	Overweight	61	40.7
	Obesity grade I	36	24.0
	Obesity grade 2	21	14.0
	Obesity grade 3	10	6.6
Waist circumference	Normal	71	47.3
	HIGH CVR	79	52.7

Results

The age range of the patients was 40 to 86 years, mean 62.9 ±11.7 and median 64 years. Regarding the clinical history of the respondents, 63.3% (n= 95) mentioned having at least other comorbidity, 70% (n= 105) referred having ≥6 years with the diagnosis of arterial hypertension. According to European guidelines, 97.3% (n= 146) presented SAH grade I, with a mean systolic blood pressure of 124.9 ±13.6 mm Hg and diastolic blood pressure of 75.6 ±7.4 mm Hg. The sociodemographic and clinical characteristics can be seen in Table 1.

The means of biochemical results were distributed as follows: glucose 101.4 ± 12.3 mg/dL; creatinine 0.95 ± 1.03, mg/dL cholesterol 189.5 ± 38.3 mg/dL, C-HDL 45.3 ± 10.7 mg/dL, C-LDL 113.8 ± 29.8 mg/dL, triglycerides 162.1 ± 89.7 mg/dL, Cockcroft-Gault GFR 90.2 ±37.39 ml/min /1.73m^{2}SC). 51.3% (n= 77) presented GFR grade 1, 28.7% (n= 43) grade 2, 16% (n= 24) grade 3, 3.3% (n= 5) grade 4, and 0.7% (n= 1) grade 5.

The frequency of dyslipidemia was found to be 56.7% (n= 85), with a female predominance of 67% (n= 57), female to male ratio 2:1. In relation to the type of hyperlipoproteinemia, mixed hyperlipidemia prevailed in 40% (n= 34), hypercholesterolemia in 25.9% (n= 22), hypertriglyceridemia/hypoalphalipoproteinemia 22.3% (n=19) and hypertriglyceridemia 11.8% (n= 10).

The cardiovascular risk of each respondent was calculated to determine the probability of presenting CVD at 10 years, according to the risk factors present when using the Globorisk tool; a moderate CVR was observed in 48% (72/150), low 30.7% (46/150), very high 14% (21/150), and high 7.3% (11/150).

Table 2. Bivariate analysis of Associated Factors with High Cardiovascular Risk in Patients with Arterial Hypertension

	Categories	Cardiovascular Risk		Orna*	CI 95%**	p***
		High	Low			
Dyslipidemia	Yes	15	70	0.61	0.28-1.33	0.20
	No	17	48			
Hypercholesterolemia	Yes	10	45	0.74	0.32-1.70	0.47
	No	22	73			
Hypertriglyceridemia	Yes	12	51	0.79	0.35-1.76	0.56
	No	20	67			
Time of evolution with arterial hypertension	1 a 10 years	12	46	0.94	0.42-2.11	0.87
	≥11 years	20	72			
Comorbidities	Yes	24	71	1.99	0.83-4.76	0.12
	No	8	47			
Glomerular filtration rate	<60 ml/min/1.73m^2 SC	15	15	6.06	2.65-13.85	0.000019
	≥60 ml/min/1.73m^2 SC	17	103			
Body Mass Index	≥25 Kg/m^2	23	105	0.32	0.12-0.80	0.015
	<25 Kg/m^2	9	13			
Waist circumference	Woman >88 cm Man >102 cm	8	71	0.22	0.10-0.51	0.0004
	Woman ≤88 cm Man ≤102 cm	24	47			
Gender	Male	19	35	3.47	1.58-7.61	0.001
	Female	13	83			

*ORna: Odds ratio unadjusted, *IC 95 %: Confidence Interval of 95 % of Miettinen, *** p Value

Table 3. Multivariate Analysis Model of Factors Associated with High Cardiovascular Risk in Patients with Arterial Hypertension

High Cardiovascular Risk	ORna	ORa	CI 95 %	MH χ^2	Interaction Test	P
Gender: male	3.47	3.32	1.42-7.73	7.71	0.62	0.43
IFG <60 ml/min/1.73m^{2}SC	6.06	5.99	2.47-14.54	15.68	0.62	0.43

ORna: Odds ratio unadjusted; ORa: Odds ratio adjusted; CI 95 %: Confidence Interval of 95 %; Mantel-Haenszel χ^2 for two of more strata, p Value.

In the bivariate analysis, four factors associated with high CVR were identified: GFR <60 mL/min/1.73 m^{2}SC, BMI ≥25 kg/m^2, waist circumference in women >88 cm and men >102 cm, and male gender (Table 2).

In the multivariate logistic regression analysis, the variables found to be associated with high cardiovascular risk were men and GFR <60 mL/min/1.73m^{2}SC. (Table 3).

It can be seen that the two independent variables included in the multivariate model maintained the same direction as in the bivariate model, with a minimal reduction in the adjusted model. This suggests that the estimated effect is consistent in both direction and magnitude.

Discussion

Atheromatous disease and arterial hypertension are closely linked. In this relationship, the renin-angiotensin system is involved in the progression of vascular disease, through angiotensin II, by affecting various components such as endothelial function, monocyte activation, and binding, vascular smooth muscle cell proliferation and migration, LDL-C oxidation and free radical formation.[16,17]

According to the biochemical parameters defined by NCEP-ATPIII, 13 in this study it was found that more than half of the population presented some type of dyslipidemia, which was higher than that observed by various authors, who reported an overall prevalence of 50.5%, 48.8%, and 41%, respectively;[18-20] and lower than that reported by other studies;[21,22] the latter two were performed in health care workers. These differences can be explained by the characteristics of the study population, lifestyle, sample size, as well as the type of sampling.[23]

The most frequent lipid phenotype in this study was mixed hyperlipidemia, which differs from that found in Mexico by the 2012 ENSANUT, which reported hypoalphalipoproteinemia in 55.2%,[24] while in Mérida, Yucatán, the main alteration observed was hypercholesterolemia with 31.6%.[25]

Four out of five individuals presented some degree of obesity or overweight, higher than that found by the 2016 and 2018 ENSANUT,[7,26] such condition constitutes a major risk factor for CVD, which is increasing, and has a direct impact on the life expectancy and quality of life of those who suffer the disease.[27]

Almost half of the participants presented moderate cardiovascular risk, similar to that found by Rodriguez et al.,[18] who used the Framingham criteria, differing from other authors, with scales such as Framingham, Framingham Colombia, Procam (Quality in Medical Health Care Program) and Procam Colombia in which the most frequent CVR was low and moderate.[28,29] There are no studies in the international and national literature that allow us to determine CVR with the Globorisk estimation scale in the general population, so it is not possible to compare with our results.

In the multivariate analysis by logistic regression, it was observed that having a GFR <60 mL/min/m^2SC and being male were significantly associated with having a high CVR. Our results coincide with those reported by other authors.18,30 During the study, the history of previous infection by COVID-19 was not evaluated, opening an opportunity for future research with this and other risk factors that may influence CVR.

One of the limitations of the study was the design, as it is a cross-sectional study, temporality interferes with the association between exposure factors and effect. The differences observed in our study differ from other similar studies due to the number of participants due to the low demand in the family medicine office, in relation to the confinement caused by the COVID-19 pandemic, in addition to the geographic region where the study was conducted, which means that it is not representative of the population and limits the extrapolation of our results.

One strength of this study is that it is the first research work carried out in the FMU No. 26, and the application of the Globorisk tool to calculate CVR. It is important to continue with studies on this topic to establish causality, since despite the measures and changes in public health, a high frequency of cardiovascular risk factors has been identified.

Conclusion

Moderate CVR was observed in almost half of the patients. Being a man and having a GFR <60 mL/min/m^2SC were significantly associated with high CVR. It is important that Family physicians detect cardiovascular risk factors in the population in a timely manner, and an early request of laboratory tests. This will allow comprehensive management that will have an impact on the prevention of these pathologies, since the latter generate clinical complications, work absenteeism, and alterations in family dynamics.

Authors' contribution

MJ S-M: conceptualization, development, writing, data analysis, discussion of results, and preparation of the paper for submission for publication, IJ L-L: conceptualization, development, writing, data collection, data analysis, discussion of results, preparation of the paper for submission for publication, Y G-J: conceptualization, development, writing, discussion of results, and preparation of the paper for submission for publication, B G-O: conceptualization, development, writing, discussion of results, and preparation of the paper for submission for publication, AJ L-M: conceptualization, development, writing, discussion of results, and preparation of the paper for submission for publication, G J-M: conceptualization, development, writing, data analysis, discussion of results, and preparation of the paper for submission for publication. All authors critically reviewed the document and approved its publication.

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Conflicts of Interest

The authors declare not having conflicts of interest.

References

1. McDermott MM. The international pandemic of chronic cardiovascular disease. JAMA. 2007;297(11):1253-5.
2. Organización Panamericana de la Salud. Prevención de las enfermedades cardiovasculares, directrices para la evaluación y el manejo del riesgo cardiovascular. Washington, D.C. OPS, 2010. [Internet]. [Citado 2021 Jun 20]. Disponible en: https://www.paho.org/hq/dmdocuments/2011/Directrices-para-evaluacion-y-manejo-del-riego-CV-de-OMS.pdf
3. Jardim TV, Sousa AL, Povoa TI, Barroso WK, Chinem B, Jardim L, et al. The natural history of cardiovascular risk factors in Health professionals: 20-year follow-up. BMC Public Health. 2015;15:1111.
4. Hernández PYZ. Aterosclerosis y sistema ateométrico. Rev Cub Med Mil. 2016;45(2):183-194.
5. Organización Mundial de la Salud. Enfermedades Cardiovasculares. Ginebra: centro de prensa OMS; 2017. [Internet]. [Citado 2022 abril 8]. Disponible en: https://www.who.int/es/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)
6. Fanghanel SG, Velázquez MO, Lara EA, Sánchez RL, Ledesma OY, Berber A, et al. Epidemiología cardiovascular en México. Estudio comparativo entre datos nacionales y una población cautiva de trabajadores en el Distrito Federal. Diabet Hoy Med Sal. 2004; 5(4): 1252-1261.
7. Encuesta Nacional de Salud y Nutrición de medio camino 2016. Instituto Nacional de Salud Pública y Secretaría de Salud. [Internet]. [Citado 2020 May 15]. Disponible en: https://www.insp.mx/resources/images/stories/2017/Avisos/docs/180315_encuesta_nacional_de_salud_y_nutricion_de_medio_Ca.pdf
8. Manton KG, Woodbury MA, Stallard E. Analysis of the components of CHD risk in the Framingham study: new multivariate procedures for the analysis of chronic disease development. Comput Biomed Res. 1979;12(2):109-23.
9. Guía de Práctica Clínica. Diagnóstico y tratamiento de hipertensión arterial en el adulto mayor. Guía de Evidencias y Recomendaciones: Guía de Práctica Clínica. México, IMSS; 2017. [Internet]. [Citado 2020 Julio 2]. Disponible en: http://www.imss.gob.mx/sites/all/statics/guiasclinicas/238GER.pdf
10. Factores de riesgo cardiovascular-Instituto del Corazón de Texas (Texas Heart Institute). Texasheart.org. 2016. [Internet]. [Citado 2021 Ene 5]. Disponible en: https://www.texasheart.org/heart-health/heart-information-center/topics/factores-de-riesgo-cardiovascular/
11. Secretaría de Salud. Programa Nacional de Salud 2007-2012. [Internet]. [Citado 2021 Ene 7]. Disponible en: https://www1.paho.org/hq/dmdocuments/2010/politicas_nacionales_salud-mexico_2007-2012.pdf
12. Blood Pressure Lowering Treatment Trialists' Collaboration. Blood pressure lowering treatment based on cardiovascular risk: a meta-analysis of individual patient data. Lancet. 2014;384(9943):591-598.
13. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation. 2002;106(25):3143-3421. Disponible en: https://pubmed.ncbi.nlm.nih.gov/12485966/
14. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, et al. European Guidelines on cardiovascular disease prevention in clinical practice: The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts): Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). Eur Heart J. 2016;37(29):2315-2381.
15. Andersson N, Mitchell S. CIETmap: Free GIS and epidemiology software from the CIETgroup, helping to build the community voice into planning. In World Congress of Epidemiology. Montreal, Canada, August 2002.
16. Díaz AA, Fernández BCL, Enciso MJL, Ceballos RG, Gutiérrez SG, León HFJ, et al. Posicionamiento en torno al diagnóstico y tratamiento de las dislipidemias. Rev Mex Cardiol. 2018;29(Suppl: 3):S148-S168.
17. Ponte-Negretti CI, Isea-Pérez J, Lanas F, Medina J, Gómez-Mancebo J, Morales E, et al. Atherogenic dyslipidemia in Latin America: prevalence, causes and treatment. Consensus. Rev Mex Cardiol. 2017;28(2):54-85.
18. Rodríguez Rueda BY, Ramírez Bautista L, Alvarado Gutiérrez T, Cruz López M, Peralta Romero JJ. Prevalencia de dislipidemia y riesgo cardiovascular en pacientes con diabetes mellitus tipo 2. Aten Fam. 2019;26(3):81-84.
19. Vyssoulis GP, Karpanou EA, Liakos CI, Kyvelou SM, Tzamou VE, Michaelides AP, et al. Cardiovascular risk factor(s) prevalence in Greek hypertensives. Effect of gender and age. J Hum Hypertens. 2012;26(7):443-51.
20. Escobedo-de la Peña J, De Jesús-Pérez R, Schargrodsky H, Champagne B. Prevalencia de dislipidemias en la ciudad de México y su asociación con otros factores de riesgo cardiovascular. Resultados del estudio CARMELA. Gac Med Mex. 2014;150(2):128-36.
21. Gómez-Avellaneda G, Tarqui-Mamani C. Prevalencia de sobrepeso, obesidad y dislipidemia en trabajadores de salud del nivel primario. Duazary. 2017;14(2):141-148.
22. Orozco-González CN, Córtes-Sanabria L, Viera-Franco JJ, Ramírez-Márquez JJ, Cueto-Manzano AM. Prevalencia de factores de riesgo cardiovascular en trabajadores de la salud. Rev Med Ins Mex Seguro Soc. 2016;54(5):594-601.
23. Secretaría de Salud. Norma Oficial Mexicana NOM-037-SSA2-2012, para la prevención, tratamiento y control de las Dislipidemias. 13/07/2012. [Internet]. [Citado 2020 May 8]. Disponible en: https://www.dof.gob.mx/nota_detalle.php?codigo=5259329&fecha=13/07/2012
24. Hernández-Alcaraz C, Aguilar-Salinas CA, Mendoza-Herrera K, Pedroza-Tobías A, Villalpando S, Shamah-Levy T, et al. Dyslipidemia prevalence, awareness, treatment and control in Mexico: results of the Ensanut 2012. Salud Publica Mex. 2020;62(2):137-146..
25. García-González I, Novelo-Ceh A, López-Novelo ME, Ceballos-López A, Góngora-Bianchi RA. Prevalencia de dislipidemias en población urbana aparentemente sana de Yucatán. Rev Latinoam Patol Clin Med Lab. 2015;62(3):150-156.
26. Encuesta Nacional de Salud y Nutrición 2018. Instituto Nacional de Salud Pública y Secretaría de Salud. [Internet]. [Citado 2020 Agos 28]. Disponible en: https://ensanut.insp.mx/encuestas/ensanut2018/doctos/informes/ensanut_2018_presentacion_resultados.pdf
27. Catenacci VA, Hill JO, Wyatt HR. The obesity epidemic. Clin Chest Med. 2009;30(3):415-444.
28. Wadhera RK, Steen DL, Khan I, Giugliano RP, Foody JM. A review of low-density lipoprotein cholesterol, treatment strategies, and its impact on cardiovascular disease morbidity and mortality. J Clin Lipidol. 2016;10(3):472-89.
29. Zavala Rubio JD, Rivera Montellano ML, Sánchez Martínez S, De la Mata Márquez MJ, Torres Rodríguez MM. Prevalencia de factores y estratificación de riesgo cardiovascular en personal que labora en una unidad de medicina familiar. Aten Fam. 2019;26(4):129-133.
30. Castelli WP, Anderson K. A population at risk. Prevalence of high cholesterol levels in hypertensive patients in the Framingham study. Am J Med. 1986;80:23-32.