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Revista de cercetare și intervenție socială

ISSN: 1583-3410 (print), ISSN: 1584-5397 (electronic)
Selected by coverage in Social Sciences Citation Index, ISI databases

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Revista de cercetare și intervenție socială, 2017, vol. 59, pp. 62-74

The online version of this article can be found at:
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expert projects publishing

On behalf of:
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Department of Sociology and Social Work
and
Holt Romania Foundation
REVISTA DE CERCETARE SI INTERVENTIE SOCIALA
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Arterial Hypertension Prevalence in a Romanian Rural Community: Correlations with Social and Economic Status, Age and Gender

Irina Iuliana COSTACHE[1], Egidia MIFTODE[2], Ovidiu MITU[3], Alexandru Dan COSTACHE[4], Viviana AURSULESEI[5]

Abstract

Throughout the world, cardiovascular diseases (CVD) have become a major public health problem and have been recognized as a leading cause of death and disability in most developed and developing countries. Hypertension is the most important risk factor for cardiovascular diseases such as stroke, coronary artery disease, end-stage renal disease and heart failure. It is estimated that about 25% of the world's adult population have hypertension, and it will be likely to increase to 29% by 2025. In Europe, an estimated 37% - 55% of the adult population is affected by hypertension. The primary aim of this cross-sectional study was to estimate the prevalence of arterial hypertension among adults (n = 2659) in a rural community of the North Romanian Region. A secondary aim was to identify the risk factors involved in hypertension. The study gathered information on socio-demographic conditions, history of diseases, habits and anthropometric parameters. The number of inhabitants in the records of the general practitioner (GP) who conducted the collaboration is 2659 people, of whom 1244 males (46.78%) and 1415 females (53.21%). The patients fulfilled defined diagnostic criteria for hypertension: systolic pressure $\geq$ 140 mmHg and/or diastolic pressure $\geq$ 90 mmHg, or have been diagnosed with hypertension or have taken antihypertensive

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drugs within two weeks. Patients with secondary hypertension were excluded. The mean age of the study group was 65.96 ± 11.93 years, the age varying between 26 and 92 years. Among these, 9.13% had increased blood pressure values, most of them having 1st or 2nd degree arterial hypertension. By diving the persons into 6 age categories, according to decades, normal blood pressure values were more frequently seen in age extremities (< 50 or > 80 years old). A positive relationship was obtained between arterial hypertension and obesity and a direct correlation between arterial hypertension and type 2 diabetes mellitus. Stress was more pronounced in the active population where 38.6% of persons declared that they were stressed compared to only 18.3% in the retired population (p = 0.0001). The findings can contribute to strategies for improving health services to monitor and prevent cardiovascular events.

Keywords: arterial hypertension, cardiovascular risk factors, cardiovascular diseases.

Introduction

According to the World Health Organisation, cardiovascular diseases are the leading cause of mortality in the world. Throughout the world, cardiovascular diseases (CVD) have become a major public health problem and have been recognized as a leading cause of death and disability in most developed and some developing countries (Lopez, *et al*., 2001; He, *et al*., 2005). Hypertension is the most important risk factor for cardiovascular diseases such as stroke (Lopez *et al.*, 2001), coronary artery disease (Van der Hoogen *et al.*, 2000; Flack *et al*., 1995), end-stage renal disease (Klag *et al*., 1996; Tozawa *et al*., 2003) and heart failure (Levy *et al*., 1996). It is estimated that about 25% of the world's adult population have hypertension, and it will be likely to increase to 29% by 2025 (Mittal & Singh, 2010). In Europe, an estimated 37%–55% of the adult population is affected by hypertension (Wolf-Maier *et al*., 2003; Firmann *et al*., 2008). The prevalence of hypertension is even higher in some developing countries. These observations indicate the high burden of hypertension in the general population.

According to the analyzed results of 86% of the subjects enrolled into the SEPHAR III study, initiated by the Romanian Hypertension Society, 49.5% of the Romanians aged between 18 and 80 suffer from hypertension (Dorobantu *et al*., 2008). The same study showed that the hypertension prevalence in the Romanian adult population was on the rise, compared to the 40.4% incidence recorded following a 2012 SEPHAR study. In Bucharest, preliminary data showed arterial hypertension prevalence beyond the national average of 50.6 %. Regionally, prevalence over the national coverage have been recorded in the Western (58.3%), South-Western (53.2%), Bucharest-Ilfov (51.9%) and North-Westerns (50.7%) areas, according to SEPHAR III preliminary results. On the other hand, areas with

lower prevalence are the Central (47.4%), Southern (46.7%), North-Eastern (46.6%) and South-Eastern (44.3%).

The importance of these data is connected to the fact that high blood pressure (HBP) is the main risk factor of cardiovascular diseases, the cause of most deaths, not only in Romania, but also world-wide. Regarding its impact on CVD, high blood pressure is linked to 62% of the deaths recorded in our country, which in the year 2014 reached 2.547.912. The onset of arterial hypertension is determined, mostly, by factors which depend on the patient's lifestyle (Dima-Cozma & Cozma, 2012), which could be changed. In Romania, HBP prevalence varies between 8 - 16% at the average age, reaching 40% at people of 60 years of age (Dorobantu *et al*., 2008). It is higher in the rural environment. In women who took oral contraceptives for more than 5 years, the risk is 2-3 times higher. The cardiovascular risk is higher in men under the age of 55, while suffering a moderate growth in women as they reach the age of 55, so that it may rise significantly as the latter reach the age of 75. HBP control reduces the cardiovascular risk by 15%, considering as important smoking quitting, weight loss, reduction of sodium intake and physical activity performed regularly. Overweight and obesity are also important risk factors of hypertension, the pooled results showing that the prevalence increases with the growing rate of both.

Hypertension is one of the leading causes of disease burden across the world. More information about hypertension prevalence could help to improve overall antihypertensive health care (Chen *et al*., 2014).

Among the factors associated with HBP onset, it is estimated that half of cases are connected with an unhealthy diet, while 30% are correlated with high salt intake, and almost 20% with a low potassium intake, generated a small amount of fruits and vegetables in alimentation, according to the World Hypertension League (Frohlich, *et al*., 1993). Compared tot the European countries, in Asia the data regarding the HBP prevalence in rural communities is somewhat different. So, the prevalence of hypertension in rural areas of China is 22.8% ($\geq$ 18 years old) in the last decade, which is well-above the level in 2002 (18.0%) concluded by a national investigation and even 1.3% higher than the prevalence (21.5%) in the urban environment (Chen *et al*, 2014). In India, the prevalence of hypertension was 19.0% in a rural community (Kokiwar *et al*., 2012). Hypertension is a major risk factor for CVDs, including stroke and myocardial infarction, and its burden is increasing disproportionately in developing countries as they undergo demographic transition (Sushil *et al.*, 2012). In 2008, a cross-sectional study of rural community health status among 1078 adults (aged > or =18 years) shown that the crude prevalence of hypertension was 18.3% in Nigeria while a total of 30 peer-reviewed publications were identified that reported the prevalence of hypertension in 33 143 patients was 32.6% in rural Ibero-America (Diaz & Tringler, 2014).

A study suggested that the prevalence of hypertension in young men is higher than in young women but the situation was opposite before the age of 40, and after that the prevalence of hypertension did not differ between males and females in rural areas (Wu *et al*., 1995).

The prevalence of hypertension was substantially different in regions. The prevalence was higher in north China than in south China (25.7% vs. 19.3%), and differences still exist between the urban and rural population (25.8% vs. 20.4%), which may be attributed to the discrepancy in eating habits (Kokiwar *et al*, 2012). The proportion of salt intake among the local residents in Hainan and the long-term living from the north is 7.2% and 8.4%, while in the short-term residents from the north is more than16.9% (Lin *et al*, 2014). High blood pressure is also an important public health burden in both urban and rural settings in African population, but risk factors associated with high BP are different in women and men which require different prevention methods (Agyemang, 2006).

Material and method

The main aim of this cross-sectional study was to estimate the prevalence of hypertension among adults (n = 2659) in a rural community of the North Romanian Region. A secondary aim was to identify the risk factors involved in hypertension. The study gathered information on sociodemographic conditions, history of diseases, habits, and anthropometric parameters in order to establish the influence of lifestyle on the incidence of risk factors in the studied population and their comorbidities. The results will be used to design prevention programs that have already proven to be absolutely necessary to promote a healthy lifestyle in order to increase the life expectancy of the population and the quality of life. The findings can contribute to strategies for state and municipal health services to monitor and prevent cardiovascular events.

The studied population and data collection

The research was conducted in a rural community of Suceava County, being chosen as representative in terms of number of inhabitants, population stability, and uniformity in educational, religious and ethnic features. An important element was the ongoing collaboration with local healthcare professionals and their willingness to actively participate in data collection. The study was conducted in collaboration with a General Practitioner (GP) from Suceava County, in Patrauti, who provided all necessary data on the basis of existing medical records. The exclusion criteria in this study were: previous personal history of cerebrovascular diseases (stroke, acute coronary syndrome), patients younger than 18 years of age, patient refusal, and the presence of psychiatric, cognitive or other diseases

that might alter the understanding of the study objectives or the ability to provide accurate information (Dima-Cozma *et al.*, 2014). Those who did not complete the interview were recorded as having refused to participate and were taken into account when calculating the refusal rate, but excluded from the final analysis.

The rural community where the research was conducted has a population of 4,567 inhabitants, with relatively equal distribution on the two genders (2,262 males and 2,305 females). The distribution by age groups is as follows: between 18 - 65 years – 2,344 people (51.32%), of whom 1,203 males (26.34%) and 1,141 females (24.98%); over 65 years = 833 inhabitants (18.23%), 527 males (11.53%), 306 females (6.7%).

The number of inhabitants in the records of the family doctor who conducted collaboration is 2659 people, of whom 1244 males (46.78%) and 1415 females (53.21%), with the following distribution by age: between 18-65 years = 1457 (54.79%) , 826 females (31.06%), 631 males (23.73%), between 65-90 years = 304 (11.43%), 153 females (5.75%), 151 males (5.67%) and over 90 years = 8 (0.30%), 6 females (0.22%), 2 males (0.08%).

The patients fulfilled the defined diagnostic criteria for hypertension: systolic pressure≥140 mmHg and/or diastolic pressure≥90 mmHg, or have been diagnosed with hypertension or have taken antihypertensive drugs within two weeks. Patients with secondary hypertension were excluded.

Blood pressure (BP) was recorded in a sitting and orthostatic position using the same device. Every measurement was taken after five minutes of resting quietly. If this reading did not indicate hypertension then it was accepted, however, if it did indicate hypertension then a second reading was taken and this reading was reported for the purpose of the study. Hypertension was defined as BP≥140 mmHg systolic or ≥ 90 mmHg diastolic BP, or a known hypertensive on medication. This is in accordance with the Joint National Committee (JNC) V criteria (Frohlich, 1993). A higher cut-off of BP ≥160 mmHg systolic or 100 mmHg diastolic BP was used to identify those with severe hypertension. The study group consisted of 285 patients aged between 26 - 92 years.

The contribution of stress in cardiovascular disease is controvertial, due to the improper definition of stress itself. The diagnosis of stress was established through case history investigation, out of which the existence of stressful situations was concluded, together with subjects' personality and lifestyle traits favorable for psychiatric stress. With the aid of the Family Doctor a self-evaluation questionnaire was composed, in order to evaluate stressful situations (existential situations which act as stressors), as well as subjects' personality traits.

Statistical analysis

Statistical analysis was performed using SPSS 20.0 software (Statistical Package for the Social Sciences, Chicago, Illinois). Data were expressed as mean ± standard deviation (SD) or number of cases with percentage, for continuous and ordinal variables. T-test was used for comparing the continuous variables and chi-square test for categorical comparisons. For all data, a two-sided p value < 0.05 was considered statistically significant.

Results and discussion

285 persons have been included in the final analysis. The mean age of the study group was 65.96 ± 11.93 years, the age varying between 26 and 92 years. 98 persons (34.4%) were males. 42.8% of the persons were overweight or obese according to the WHO classification of obesity. 13.7% were smokers (6.7% active smokers and 7.0% former smokers) while 14.7% had type 2 diabetes mellitus. 21.4% presented family history of CVD and 27.7% reported increased levels of psychosomatic stress. 85.6% had increased blood pressure values, most of them having grade 1 or grade 2 of arterial hypertension (38.2% - grade 1, 37.5% - grade 2, respectively 9.8% - grade 3 arterial hypertension). Related to the total number of population, this represents 9.13%. Regarding biochemical values, the average values are above the superior reference values especially for total cholesterol (208.62 ± 42.17 mg %), LDL cholesterol (123.01 ± 36.48 mg %) and triglycerides (156.54 ± 99.27 mg %).

By diving the persons into 6 age categories, according to decades, normal blood pressure values were more frequently seen in age extremities (< 50 or > 80 years old) (*Figure 1*). On the other hand, most of the persons aged 50-69 had arterial hypertension grade 2 or 3 while those with age 70 – 79 presented rather similar percentages covering all classes of arterial hypertension and normal blood pressure (31.7%). However, after diving the blood pressure and decades by sex categories, the statistical significance has been lost (for women: $p = 0.191$; for men: $p = 0.293$). Nonetheless, in the group 50 – 69 years, women had increased levels of arterial hypertension grade 2 and 3, while in the elderly (above 70 years) the blood pressure was rather normal in men's category ($p = 0.013$ between sex groups).

A positive relationship was obtained between arterial hypertension and obesity (*Figure 2*). As the grade of arterial hypertension was increasing, the proportion of obese patients was higher ($p < 0.0001$). As well, more than 55% of patients with 3rd degree obesity had the most increased blood pressure values, confirming the direct link between obesity and arterial hypertension.

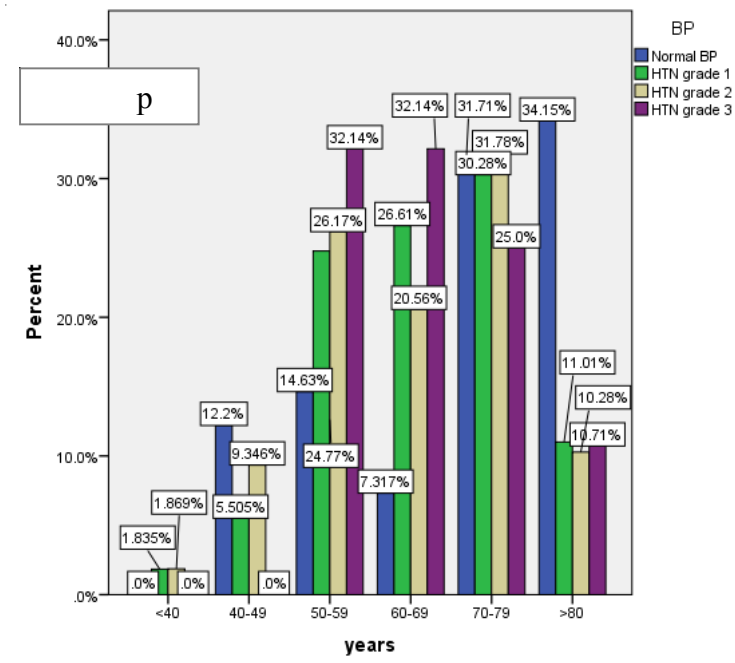

Figure 1. Arterial hypertension grades according to decades of age

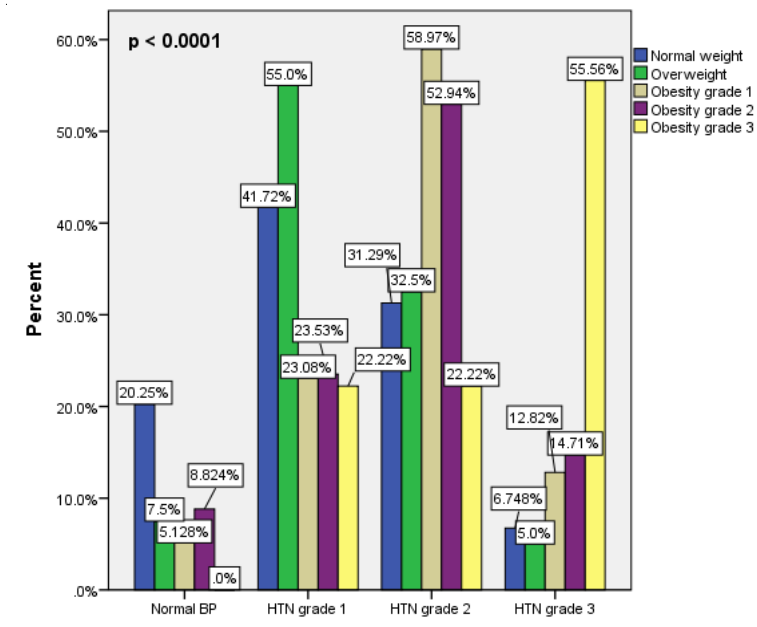

Figure 2. Relationship between arterial hypertension and obesity

There was a direct correlation between arterial hypertension and type 2 diabetes mellitus (*Figure 3*). More than 71% of persons with diabetes had 2nd or 3rd degree arterial hypertension (p = 0.002) suggesting the powerful association between these two pathologies. As well, most hypertensive patients had increased levels of stress, especially in final stages of the arterial hypertension compared to normal blood pressure values where only 8.8% of persons presented stress (p = 0.025) (*Figure 4*). In our study group, there was no significant difference between arterial hypertension and smoking (p = 0.673) or family history of CVD (p = 0.094).

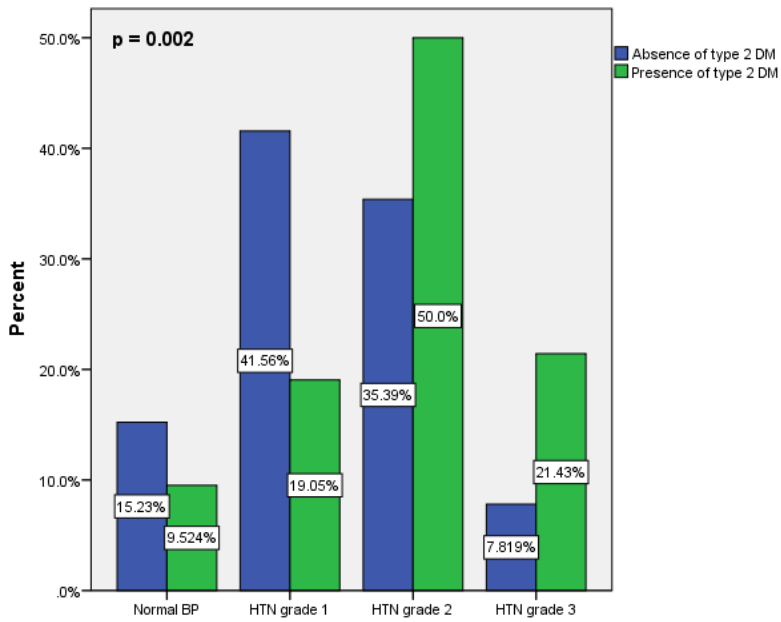

Figure 3. Relationship between arterial hypertension and type 2 diabetes mellitus

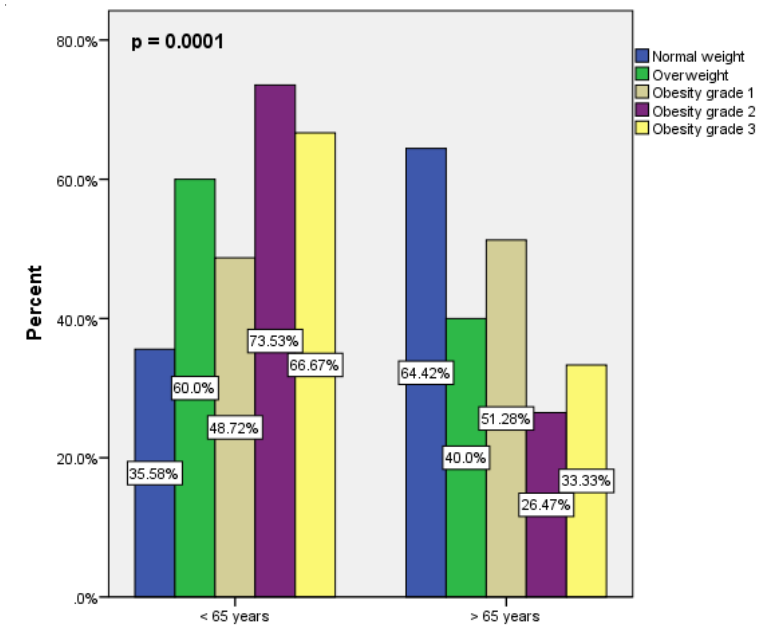

Figure 4. Relationship between arterial hypertension and stress

Though the values of lipid profile were higher as the grade of arterial hypertension was increasing, none of these reached the statistical significance, HDL cholesterol and total cholesterol having the best associations (*Table 1*).

We continued to evaluate the study group referring to the working status and dividing the population into 2 subgroups: active – under the age of 65, respectively retired – over the age of 65. Obesity was more frequently observed in persons younger than 65, especially 2nd and 3rd degree obesity, while more than 64% of normal weight subjects were retired (p = 0.0001) (*Figure 5*). Stress was more pronounced in the active population where 38.6% of persons declared that they were stressed compared to only 18.3% in the retired population (p = 0.0001). There were no significant associations between age and type 2 diabetes mellitus (p = 0.154) or smoking (p = 0.135).

Regarding biochemical values, total cholesterol and LDL cholesterol levels did not differ significantly between the two groups (*Table 2*). However, the value of triglycerides was significantly increased in the active population (p = 0.0001) while HDL cholesterol was significantly decreased in the same group (p = 0.0001) showing marked dyslipidemia as the persons were active.

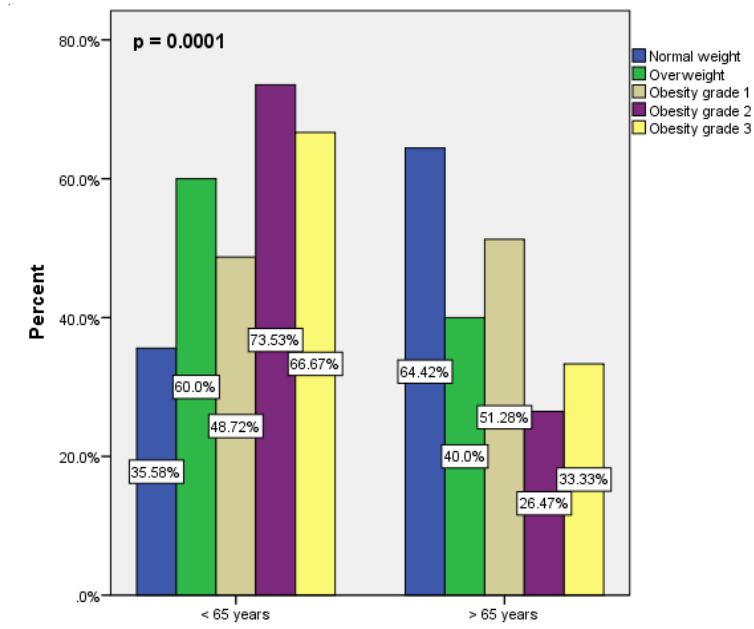

Figure 5. Relationship between obesity and age

Table 1. Association between lipid profile markers and arterial hypertension

Marker	Normal BP	HTN grade 1	HTN grade 2	HTN grade 3	p value
Total cholesterol (mg/dl)	194.59 ± 31.63	213.96 ± 41.27	207.94 ± 44.36	211.00 ± 47.82	0.093
Triglycerides (mg/dl)	138.02 ± 98.50	161.19 ± 105.48	157.57 ± 96.01	161.89 ± 88.41	0.627
HDL cholesterol (mg/dl)	60.07 ± 18.58	53.60 ± 15.01	52.56 ± 16.76	47.81 ± 13.70	0.056
LDL cholesterol (mg/dl)	110.71 ± 34.86	127.53 ± 34.97	121.47 ± 36.68	130.37 ± 41.30	0.156

BP=blood pressure; HTN= arterial hypertension

Table 2. Association between lipid profile markers and working status

Marker	Active persons (< 65 years)	Retired persons (> 65 years)	p value
Total cholesterol (mg/dl)	211.28 ± 44.36	206.33 ± 40.21	0.325
Triglycerides (mg/dl)	180.69 ± 120.86	135.89 ± 70.20	0.0001
HDL cholesterol (mg/dl)	48.71 ± 15.16	57.15 ± 16.30	0.0001
LDL cholesterol (mg/dl)	124.39 ± 35.82	122.03 ± 37.07	0.651

Urban rural differences may be, in part, due to diet and the stress of urban living. In our study in both males and females, age and high BMI were significant predictors of hypertension; which suggests that the main modifiable risk factor is obesity. Interestingly, stress was an independent predictor of hypertension in males. Although psychosocial stress has been implicated as a risk factor for hypertension in urban populations it has not been thought to be a major predictor of hypertension in those living rurally. Females were significantly more likely to be overweight and have abdominal obesity than males, although this did not translate into a higher prevalence of hypertension. It seems likely that, in females, factors relating to obesity may be the main modifiable risk factor for hypertension, whilst in males' alcohol consumption and stress are also important risk factors.

Conclusions

HBP values in an analyzed rural community were 9.13%, lower than the national data. Most of the persons aged 50 – 69 had 2nd or 3rd degree arterial hypertension while those between the ages 70 – 79 presented rather similar percentages covering all classes of arterial hypertension and normal blood pressure. In the group 50 – 69 years, women had increased levels of 2nd or 3rd degree arterial hypertension, while in the elderly (above 70 years of age) the blood pressure was rather normal in men's category. A positive relationship was obtained between arterial hypertension and obesity. There was a direct correlation between arterial hypertension and type 2 diabetes mellitus. Most hypertensive patients had increased levels of stress, especially in final stages of arterial hypertension compared to normal blood pressure values where only 8.8% of persons presented stress ($p = 0.025$). In our study group, there was no significant difference between arterial hypertension and smoking ($p = 0.673$) or family history of CVD ($p = 0.094$). Marked dyslipidemia was associated with the working status.

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