

# Prevalence of Multimorbidity and Cardiovascular Risk Factors in a Romanian Occupational Medicine Private Facility

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## ABSTRACT

**Background:** The past decades have witnessed an increasing interest in the field of multimorbidity, as common risk factors such as obesity, arterial hypertension or diabetes have surged worldwide, thus posing a burden on public health systems all over the world. Defined as the presence of two or more conditions in the same individual, multimorbidity and its prevalence have shown large heterogeneity among countries and age groups. This cross-sectional study aimed to assess the presence of cardiovascular risk factors and multimorbidity in a cohort of 4200 patients of a Romanian private occupational medicine facility in order to provide a better outlook on this domain, adapted to patients in the active population group.

**Methods:** The cohort selected by us for the present study comprised all 4200 patients who visited our facility over the course of three months. Upon clinical examination of all patients, data were collected via on-paper registration and included into each individual's medical file, afterwards being digitally registered. Finally, the prevalence of each risk factor and multimorbidity was analyzed using Microsoft Excel 2019 version data analysis software.

**Results:** Among all members of the cohort, 815 individuals (19.4%) had arterial hypertension, 614 patients (14.61%) were registered with obesity, 110 people (2.61%) had diabetes, and finally, 754 subjects (17.95%) had multimorbidity. Analysis of multimorbidity patterns showed a higher prevalence of multimorbidity among women (56.89%) and urban residents (68.03%).

**Conclusion:** The present study found a lower prevalence of multimorbidity and cardiovascular risk factors than other similar data in the literature. While this can be explained by multiple factors, such as the general addressability of private occupational medicine services, we also raise awareness about the fact that further populational studies regarding this topic need to address larger and more heterogeneous cohorts in order to provide data of utmost accuracy.

**Keywords:** multimorbidity, risk factors, populational study, public health, active population.

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## INTRODUCTION

Cardiovascular disease currently stands as the leading cause of death worldwide, a phenomenon posing a grand burden on public health systems. While cardiovascular disease development is a multifactorial process, several risk factors are well known to account for a high number of cases (1). Arterial hypertension, diabetes, dyslipidemia and smoking behaviours should be commonly investigated in order to identify individuals who are at higher risk for cardiovascular pathologies. In Romania, a country that has only recently emerged from the developing countries' group, according to the World Bank, prevention guidelines report a very high risk for cardiovascular disease as well as a 30.7% general prevalence of smoking as of 2018 available data (2, 3). Moreover, a 2010 study reported that the prevalence of hypertension in the general adult population in Romania was 44.92% (4). Our study was meant to assess the prevalence of common cardiovascular risk factors, including obesity, arterial hypertension and diabetes, in a statistically significant proportion of patients, while also correlating these risk factors with the presence of multimorbidity, defined as the occurrence of two or more conditions in the same individual. □

## MATERIALS AND METHODS

This cross-sectional study comprised a statistically significant cohort of patients who visited a private occupational medicine facility in Oradea, Romania, over the course of three months, between January and March 2022. Upon their visit, all patients underwent a complete clinical examination as well as arterial blood pressure and glucose level measurements, and 12-lead electrocardiogram assessment, with all data being collected via on-paper registration and integrated within each patient's medical file. Informed consent was obtained from all patients. In total, we have analysed 4200 medical files and digitally registered all data into a digital database. In order to provide accurate information, the following parameters have been defined: obesity as a body mass index (BMI) of 30.0 or above, arterial hypertension as systolic blood pressure  $\geq 140$  mm Hg and diastolic blood pressure

$\geq 90$  mm Hg and diabetes as *à jeun* glycemia levels of  $\geq 126$  mg/dL or random glycemia levels of  $\geq 200$  mg/dL, as well as based on each individual's medical history. Data analysis was performed using the Microsoft Excel 2019 version software package. All statistical analysis have been performed using a 95% confidence interval (CI). This study was performed in accordance with the guidelines of the Declaration of Helsinki as well as COPE guidelines on publication ethics and STROBE guidelines for cross-sectional studies. □

## RESULTS

In order to present the results of our study appropriately, we have divided the results section into three subsections to assess cohort demographics, prevalence of risk factors and multimorbidity.

### Demographic characteristics of the cohort

The median age of the cohort was 39.23 years, with a standard deviation of  $\pm 11.91$ ; 50.04% (n=2102) of all patients were males and 49.95% (n=2098) females. Regarding the place of residence, 61.97% (n=2603) of patients reported they were living in urban areas, with 38.02% (n=1597) coming from rural backgrounds.

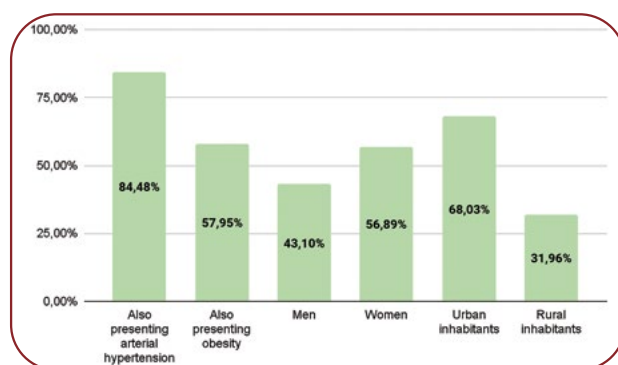
### Prevalence of cardiovascular risk factors

Arterial hypertension was found in 815 members of our cohort, placing its prevalence at 19.4%, with no statistically significant variation among genders (19.5% in men and 19.3% among women,  $p > 0.005$ ). The prevalence of obesity was 14.61% (n=614) and that of diabetes 2.61% (n=110). Upon division of the cohort into rural versus urban populations, the prevalence of all risk factors has shown no statistically significant differences ( $p > 0.005$ ). The prevalence of arterial hypertension was 19.28% (n=502) in the urban population and 19.59% (n=313) in the rural one. Obesity was reported among 21.74% (n=457) of urban residents and only 9.83% (n=157) of rural ones. Lastly, the prevalence of diabetes was 3.94% (n=83) in the urban population and only 1.69% (n=27) in the rural one.

### Multimorbidity assessment

Multimorbidity was found in 17.95% (n=754) of study participants, and in a vast majority of them (84.48%, n=637) it consisted of arterial hyper-

**FIGURE 1.** Characteristics of the subpopulation with multimorbidity in our cohort



tension associated with another factor. The prevalence of multimorbidity among patients with obesity was 71.17% ( $n=437$ ). Moreover, multimorbidity showed higher levels of gender-based variation, with this phenomenon being more prevalent among women (20.44%,  $n=429$ ) than men (15.46%,  $n=325$ ),  $p<0.001$ . Nonetheless, there were no statistically significant differences between urban and rural populations, with multimorbidity occurring among 19.7% ( $n=513$ ) of urban residents and 15.09% ( $n=241$ ) of rural residents ( $p>0.005$ ). Upon assessment of the multimorbid subpopulation in our cohort, several patterns have emerged, which are highlighted in Figure 1.  $\square$

## DISCUSSION

Our study showcases lower overall prevalence of cardiovascular risk factors than other studies available in the literature (4-10). However, our findings on patterns of multimorbidity occurrence and risk factors align with commonly endorsed ideas in the current reports concerning public health, showing that patients in whom arterial hypertension and obesity are associated with other comorbidities are everyday encounters, putting them in exceptionally

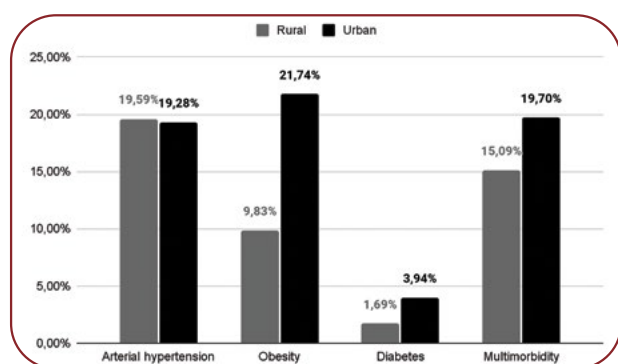
high risk categories for multiple diseases, especially those implying the cardiovascular system (11).

While rural-urban discrepancies in our cohort are not statistically significant, we attribute this to the sample size limitation. Literature-wise, there have been a number of studies with contradictory conclusions on the topic; however, most of the statistically significant results suggest that risk factors are indeed more prevalent among people who live in urban areas (12, 13). This could be explained by a number of both environmental and socioeconomic factors, such as exposure to pollution or a more competitive working environment, combined with personal behaviours which put each individual at risk. On the other hand, rural populations exhibit certain characteristics that may be linked to the occurrence of risk factors mentioned by us, with patterns regarding smoking behaviours, ethanol consumption or absence of preventive medical behaviours due to resource availability. A summary of the rural-urban differences concerning the prevalence of risk factors and multimorbidity in our cohort is shown in Figure 2.

While our findings suggest that the prevalence rates of cardiovascular risk factors and multimorbidity are lower than those suggested by most literature references, we believe that the rather low addressability of private occupational medicine services to the general population play a pivotal role. Because these services are available to some extent in public healthcare facilities, they are used by some patients, especially those with a lower income.

There are, however, several limitations that need to be taken into account. Firstly, while the cohort is significant, it represents less than 30% of the total number of patients who came to this facility over the course of 2022. Also, while the factors investigated by us are extremely relevant to cardiovascular multimorbidity, other parameters which are arguably involved in the occurrence of cardiovascular diseases, such as behavioural characteristics (sedentarism, smoking behaviours or traits linked to type A personality, for instance), have not been included into our analysis. Moreover, we believe that the barriers to patients' access to occupational healthcare facilities in the private sector play a significant role in a 'pre-study' selection of a potentially healthier cohort.

**FIGURE 2.** Prevalence of cardiovascular risk factors and multimorbidity among rural versus urban residents in our study cohort



Nonetheless, we reiterate the incremental role that occupational medicine plays in the prevention of non-communicable diseases, especially in countries like Romania, where primary care through family medicine professionals is accessed at rather low rates, thus enabling the regular examinations in context of employment to be a useful weapon when tackling non-communicable diseases in terms of both primary and secondary prevention.

Finally, further research should assess multimorbidity and cardiovascular risk factors in the Romanian population, with focus on multimorbidity patterns, especially among different age groups and socioeconomic contexts, as this would be the key to creating more efficient public health policies, thus improving healthcare professionals' response in a world where multimorbidity has an ascending trend. ▣

## CONCLUSION

In an attempt to characterize the economically active population in terms of cardiovascular risk factors and multimorbidity, our study manages to identify several patterns of distribution in the prevalence of these phenomena. Taking into account the growing public health burden cardio-

vascular diseases account for, the scientific community needs to develop viable tools and efficiently maneuver all available resources concerning both treatment and prevention in order to minimize the effects of these pathologies in the future. ▣

*Authors' contributions: conceptualization – M.O.D.; data collection – R.M.D.; data analysis – R.M.D. and M.O.D.; writing of the original draft – M.O.D.; review and editing – M.O.D., R.M.D. Both authors have read and approved the submitted manuscript.*

*Institutional review board statement: The present study has been conducted in accordance with the Declaration of Helsinki. As this research was a non-interventional study, an ethics committee approval was not necessary. However, data extraction was approved by the administrative board of the 'Medimun' private occupational medicine center.*

*Informed consent: obtained from all subjects involved in the present study.*

*Data availability: The data reported by this study are available on request from the corresponding author.*

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