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Evaluation of body composition and its relationship with cardiovascular risk factors in workers

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ABSTRACT

Introduction. Body composition is a critical indicator of overall health and the risk of developing chronic non-communicable diseases, particularly within the working population. Objetive: This study assessed body composition and its association with cardiovascular risk factors in a sample of 98 employees from a multinational corporation.

Methods. Cross-sectional observational study in which we have collected variables that include: BMI, visceral fat, skeletal muscle percentage, body fat percentage, blood pressure, cholesterol, glucose levels, and health-related behaviors. Correlation analysis has been performed between these factors and the SCORE risk.

Results. Findings revealed a high prevalence of overweight (41.8%) and obesity (14.3%). The most notable correlations were age and SCORE risk ($r = 0.646$), BMI and visceral fat ($r = 0.860$), visceral fat and systolic blood pressure ($r = 0.564$), and skeletal muscle percentage and body fat percentage ($r = -0.948$), all with $p < 0.000001$. Other significant associations included BMI and systolic blood pressure ($r = 0.49$), and age and glucose levels ($r = 0.36$). Excess body fat—particularly visceral adiposity—has been strongly linked to increased risk of hypertension, dyslipidemia, insulin resistance, and cardiovascular disease (1,2). In occupational settings, these factors adversely affect not only employee health but also productivity, absenteeism, and organizational healthcare costs (3).

Conclusions. These findings highlight the vital role of occupational health nursing in health surveillance and the implementation of preventive strategies in the workplace. Periodic assessments of parameters such as BMI, visceral fat, and muscle mass can facilitate early risk detection and support the development of targeted interventions adapted to occupational contexts.

Keywords: Obesity; occupational health; prevention; visceral fat; worker health surveillance.

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Introduction

Body composition is a key indicator of overall health status and the risk of developing chronic non-communicable diseases, especially in working-age populations. Excess body fat, particularly visceral fat, has been associated with an increased risk of hypertension, dyslipidemia, insulin resistance, and cardiovascular disease (1,2). In the workplace, these factors not only affect workers' health but also productivity, absenteeism, and healthcare costs for companies (3).

Occupational nursing plays a fundamental role in health monitoring, promoting healthy habits, and preventing occupational risks. Regular assessment of parameters such as body mass index (BMI), visceral fat, and muscle mass allows for early identification of risk situations and the design of interventions tailored to the work environment (4).

Recent studies have shown that regular physical activity and a balanced diet can significantly improve body composition and reduce cardiovascular risk factors (5,6). However, implementing effective strategies in the business world requires detailed knowledge of the health profile of workers.

The objective of the study was to explore the relationship between body composition and cardiovascular risk in workers, as a basis for preventive interventions from occupational nursing.

Moreover, other secondary objectives were established: to describe body composition in a sample of workers; to assess cardiovascular risk using the SCORE scale; and to identify statistically significant associations between body variables and cardiovascular risk.

Methods

Study Design

A cross-sectional observational study with a quantitative design was conducted in 2024 to describe body composition and its association with cardiovascular risk factors in a working population.

The sample comprised 98 employees from a multinational company. Inclusion criteria were: the study was offered to all adult workers of both sexes in the company, of which 98 decided to participate voluntarily.

Variables and measurements

Outcome variable: Cardiovascular rik calculated with SCORE.

Explanatory variable:

- Sociodemographic: age, sex.
- Body composition: body mass index (BMI), visceral fat index, skeletal muscle percentage, body fat percentage (%).
- Clinical parameters: systolic blood pressure (mmHg), total cholesterol (mg/dl), venous glucose (mg/dl).
- Health behaviors: alcohol consumption (g/week), tobacco use (yes/no/ex-smoker), physical activity (days/week).

Instruments and Procedures

Data collection involved the use of:

- A bioimpedance scale to assess BMI, visceral fat, muscle percentage, and body fat percentage
- A digital sphygmomanometer to measure blood pressure.
- Venous blood sampling for glucose analysis
- A structured questionnaire for assessing health-related behaviors

All assessments were conducted by occupational nursing staff at the company's medical department, adhering to standardized protocols and ensuring confidentiality.

Statistical Analysis

Descriptive statistics were used for quantitative variables (means, standard deviations) and qualitative variables (frequencies and percentages). Pearson's correlation coefficients were calculated to explore associations between variables. Statistical significance was set at $p < 0.05$. Analyses were performed using SPSS version 15.

Results

Characteristics of the sample

Table 1 shows the mean values, standard deviations, and ranges for the quantitative variables assessed, including age, BMI, visceral fat, skeletal muscle percentage, body fat percentage, systolic blood pressure, cholesterol, fasting glucose, and frequency of physical activity.

Table 1. Mean Values of Quantitative Health Variables by Sex

Variable	Total	Females	Males
Age (years)	48.88	49.6	48.0
Body Mass Index (kg/m²)	25.99	25.1	27.2
Visceral Fat Index	7.98	6.4	10.1
Skeletal Muscle Mass (%)	30.39	27.1	34.8
Body Fat Percentage (%)	30.74	35.5	24.4
Alcohol Consumption (g/week)	19.97	15.57	25.8
Systolic Blood Pressure (mmHg)	117.31	111	126
Total Cholesterol (mg/dL)	203.90	205	203
Fasting Blood Glucose (mg/dL)	80.67	79.5	82.2
Physical Activity (days/week)	2.69	2.5	3.0
Estimated Cardiovascular Risk (SCORE, %)	2.59	2.0	3.3

Table 2 shows the prevalence of cardiovascular risk factors in the sample of the study.

Table 2. Prevalence of Risk Factors

Risk Factor	Prevalence
Overweight	41.8%
Obesity	14.3%
High or Very High Visceral Fat	25.8%
Low Skeletal Muscle Mass Percentage	23.5%
Body Fat Percentage in Obesity Range (>40%)	>40%

Bivariate Correlations

An bivariate correlation analysis was developed to know the association between the study variables (Figure 1).

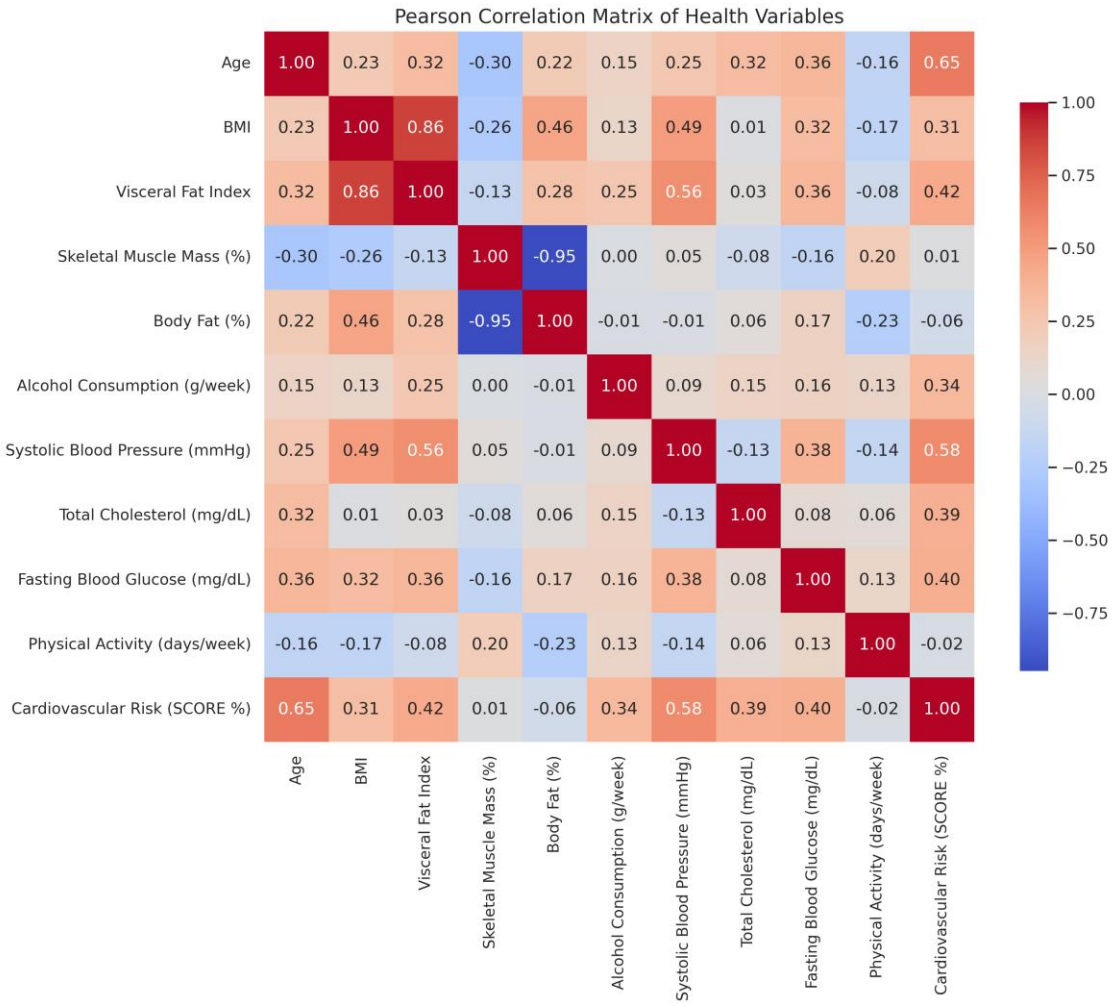

Figure 1. Pearson correlation matrix of health variables.

Although several statistically significant relationships were observed, the most relevant correlations, both clinically and statistically, are highlighted below:

- Age and SCORE risk: r = 0.646
- BMI and visceral fat: r = 0.860

- Visceral fat and systolic blood pressure: r = 0.564
- Skeletal muscle percentage and body fat percentage: r= -0.948 (All with $p < 0.000001$)

Additional relevant associations include:

- BMI and systolic blood pressure: r = 0.49
- Age and glucose levels: r = 0.36

The most notable results are the high prevalence of overweight (41.8%) and obesity (14.3%) among the study participants. The high and very high percentage of visceral fat (25.8%), the low percentage of muscle mass (23.5%), and the presence of a high percentage of body fat in obese individuals (>40%). Among the most significant correlations are BMI and visceral fat, visceral fat and systolic blood pressure, and the percentage of skeletal muscle and body fat.

Discussion

This study reveals a high prevalence of overweight (41.8%) and obesity (14.3%) in the analyzed workforce. These results are consistent with findings from other European studies highlighting the rising trend of overweight in working-age populations (1). Such patterns present a significant challenge to public and occupational health systems, as excess weight is closely linked to increased risk of cardiovascular, metabolic, and musculoskeletal conditions (2).

From the occupational nursing perspective, these findings underscore the necessity of adopting a comprehensive preventive approach in the workplace, prioritizing the promotion of healthy behaviors and early detection of risk factors.

The strong correlation between BMI and visceral fat (r = 0.86) confirms the clinical value of BMI as a screening metric in occupational health, despite its limitations—most notably, its inability to distinguish between fat and lean mass (3). Visceral adiposity, in particular, is of clinical concern due to its established links to chronic systemic inflammation and heightened risk of insulin resistance, hypertension, and dyslipidemia (4). This explains why individuals with similar BMI values may exhibit markedly different metabolic risk

profiles, reinforcing the importance of integrating body composition analysis into occupational health assessments.

Additionally, the metabolic heterogeneity of obesity, as described by Neeland et al. (3), calls for individualized cardiovascular risk stratification. Not all individuals with obesity display the same metabolic dysfunction, and some remain metabolically healthy despite elevated BMI. This reinforces the relevance of combining anthropometric, biochemical, and compositional data in occupational risk evaluations.

The positive correlation between BMI and systolic blood pressure ($r = 0.49$) aligns with existing literature linking elevated body mass to hypertension (5), a relationship influenced by sympathetic nervous system activation, renal dysfunction, and hormonal alterations. In occupational settings, chronic psychosocial stress may amplify these physiological mechanisms. Given that hypertension is one of the most modifiable cardiovascular risk factors, its early detection in the workplace is essential.

The age–glucose association ($r = 0.36$) observed here is consistent with data indicating a progressive decline in insulin sensitivity with aging, increasing the risk of glucose intolerance and type 2 diabetes (6). In workplaces with aging staff, this emphasizes the need for long-term preventive monitoring.

Moreover, the strong inverse relationship between skeletal muscle mass and body fat ($r = -0.95$) highlights the protective role of muscle tissue. Muscle mass loss—particularly in older individuals—not only impairs function but also increases vulnerability to insulin resistance and metabolic syndrome. Regular physical activity, especially resistance training, has proven effective in reducing visceral fat, improving body composition, and attenuating cardiovascular risk (7).

These findings reinforce the strategic role of occupational nurses in health surveillance and preventive program implementation. Interventions promoting healthy habits should be structurally embedded within occupational health programs, especially in settings with high sedentary behavior or aging demographics. Key pillars of cardiovascular prevention include regular physical activity, adherence to the Mediterranean diet, and smoking cessation (8).

Physical activity promotion in the workplace is a crucial strategy for preventing cardiovascular disease, particularly in response to rising sedentary lifestyles among working

adults. Inactivity has been identified as a major contributor not only to cardiovascular disease but also to over 30 chronic conditions, including diabetes, cancer, and neurodegenerative disorders (9).

Understanding the determinants of physical activity is essential for designing effective interventions. Factors such as age, sex, and self-efficacy, alongside environmental influences such as urban design and accessibility to recreational facilities, play a pivotal role (10). In occupational nursing, addressing these determinants supports a multidimensional strategy that includes workplace redesign, lifestyle promotion, and institutional policy support. Environmental modifications—such as standing desks, walking meetings, and active breaks—can help reduce structural barriers and support sustained behavioral change.

As part of this study, in addition to assessing the body composition and cardiovascular risk of our workforce, our primary objective is to promote targeted interventions aimed at improving employee health and well-being.

To this end, the Occupational Health Service at Robert Bosch España, located in Madrid, has implemented the Befit Comprehensive Health Program, which includes, among other initiatives, a dedicated Cardiovascular Health Program.

Within the framework of this program, we have established a facility known as the Befit Wellness Center, composed of three specialized areas designed to address various aspects of physical health and preventive care:

1. Cardiovascular Exercise Room: Equipped with state-of-the-art machines including stationary spinning bikes, treadmills, rowing machines, and elliptical trainers. This space is intended to promote aerobic capacity, support cardiovascular function, and encourage regular physical activity among employees.
2. Strength Training Room: This room features a range of resistance training equipment, including weight machines, free weights, and dumbbells, designed to enhance muscular strength, improve posture, and contribute to overall physical resilience.
3. Group Activities and Education Room: Dedicated to instructor-led sessions such as yoga, Pilates, and pelvic floor training. This space also serves as a venue for educational workshops aimed at fostering healthy lifestyle choices. Topics covered

include nutrition, smoking cessation, cardiopulmonary resuscitation (CPR), and other preventive health practices.

Access to these facilities is provided free of charge to all employees, in order to facilitate the adoption and implementation of healthy lifestyle habits and to promote a culture of well-being within the workplace.

Limitations of the study

The number of participants relative to the total population could be higher. We are considering broader dissemination measures for the study.

Conclusions

There is a relationship between body composition and cardiovascular risk in workers, as a basis for preventive interventions from occupational nursing.

In conclusion, fostering physical activity within occupational settings offers a powerful means to reduce the burden of cardiovascular disease, improve quality of life, and support the broader goal of non-communicable disease prevention at the population level.

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