A Descriptive Analysis of Body Composition Among Forest Firefighters in Spain

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Objective: To determine the body composition profile of forest firefighters. Data were collected from 701 forest firefighters. **Methods:** We have carried out this analysis using a bioimpedance scale BC-601 of the brand Tanita® ISO 9001 Certified. **Results:** Obtained values of body mass index 24.85 in women and 27.83 in men. The visceral fat index was 5 in women and 9 in men. In both cases, taking as reference the values proposed by the WHO, women are within a low-moderate risk of cardiovascular or metabolic diseases. Men are at a moderate-high risk. **Conclusions:** The values obtained in the analysis show that forest firefighters have a moderate risk of cardiovascular and metabolic diseases in the future. It is effective to propose future works that elaborate specific physical activity plans to improve their health profile.

Keywords: body composition, firefighters, health, physical condition, technology

In recent decades, the problem of forest fires has increased substantially, causing serious impacts on all types of resources, ecosystems, human health, and safety. Despite all this, the number of fires increases each year in Spain (more than 20,000 fires per year). The European Forest Information Center defines the situation as critical and highlights that 50% of the hectares burned are in Spain. Forest workers or forest firefighters are a group of people who are responsible for the prevention and extinction of fires, as well as the integral management of waste and territorial development in a direct way aimed at the conservation and improvement of the quality of the environment and development in rural areas.

The promotion of health and the prevention of diseases and injuries in this group, there are two different lines on which to work in.

First, the prevention and/or treatment of diseases, such as cardiorespiratory diseases that are related to a continuous exposure to external agents.

Second, the prevention and/or treatment of those musculoskeletal injuries related to the job performance required by the same job.[1] Exposure to high temperatures, smoke inhalation, cleaning the woods with heavy machinery, the adoption of particular ergonomic positions, the lack of hydration during work in fires, adverse terrain conditions, stress, fireproof equipment that is not very breathable, and the transport of tools and equipment, among others, puts the health of these workers at great risk.[2]

One of the most important risks that can affect the health of firefighters is cardiovascular risks, where overweight and obesity favor the occurrence of this type of heart disease. In their respective investigations, Morioka and Brown,[3] Perroni et al,[4] and Tierney et al,[5] when they say that overweight and obesity are the main causes of mortality in firefighters. Even in the Morioka and Brown[3] study, it indicates a prevalence that 65% of firefighters were overweight and 5% of firefighters were obese. In another study conducted by Yoo and Franke,[6] they said that 86% of American firefighters did not know their lipid profile and 47% did not know their blood pressure, pathologies also related to cardiovascular problems.

Within the cardiorespiratory pathologies we find overweight and obesity, which are defined as an abnormal or excessive accumulation of fat that can be harmful to health.

Overweight is a pathology in which there is an excessive increase in body fat that can be harmful to health. Obesity derives from poor nutrition, high intake of carbohydrates, saturated fats, sugars, and physical inactivity.[7]

There are authors who already consider overweight and obesity as a public health problem and it is considered a pandemic that affects both industrialized and less industrialized countries, since it has consequences in the short, medium and long term, at the biological, physical, psychological level, and social.[8]

The fundamental cause of overweight and obesity, according to WHO in 2018, is an energy imbalance between calories consumed and spent. We can say that two things have happened worldwide:

- an increase in the intake of high-calorie foods that are high in fat.
- a decrease in physical activity due to the increasingly sedentary nature of many forms of work, new modes of transport, and increasing urbanization.

The consequences of being obese or overweight are as follows:

- cardiovascular diseases (mainly heart disease and strokes), which were the leading cause of deaths in 2012.
- diabetes.
- musculoskeletal system disorders (especially osteoarthritis, a degenerative disease of the joints that is very disabling).
- some cancers (endometrium, breast, ovaries, prostate, liver, gallbladder, kidneys, and colon).[9]

To measure body composition, there are different techniques such as electrical bioimpedance to calculate different variables. It is a method of obtaining cheap body composition, easy to use, with high precision and that can measure regional fat.[10] This technique is based on the resistance offered by the body components to the passage of an electric current, considering that the impedance is low in lean tissues, which are mainly composed of intracellular fluids and electrolytes, while it is high in fatty tissue, and is proportional to total body water.

Having a good body composition profile could be considered as having good health. This is revealed as an integral and

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Clinical Significance: The study shows a high risk of suffering cardiometabolic diseases derived from high percentages of body and visceral fat, high body mass index combined with a deficit of lean and bone mass. There seems to be a greater probability of causing absenteeism among those participants who report a worse state of health.
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fundamental part of the human capital stock of a society, which although it does not ensure future economic development, it does seem to be postulated as a necessary condition to achieve it.[11,12]

There are several works that have estimated in monetary terms the losses of productivity, responsibility for diseases, and health problems in our environment.[13]

The fact that a person has a health problem affects their work performance from two points of view.

First, it can prevent the worker from carrying out his/her professional performance for a short period of time permanently (work absenteeism). The studies that have evaluated this impact in our country estimate the productivity losses that are the responsibility of diseases and health problems can represent between 0.7% and 0.9% of the Gross Domestic Product if we consider only the premature deaths that health problems cause.[14]

Second, not yet preventing workers from carrying out their professional activity, illnesses, and health problems can diminish the capabilities of the worker while he or she continues to carry out his or her professional activity (labor presenteeism). In this regard, the scientific evidence available to date has focused on the evaluation of certain mental illnesses[15] health problems,[16] or chronic diseases.[17]

In a study of urban firefighters in the United States, it was concluded that there is a 10/100 times higher risk of death from cardiovascular or coronary heart disease in firefighters, who are dedicated to extinguishing fires compared to those who do dedicate themselves to emergency tasks, such as responding to an alarm, returning from an alarm, engaging in physical training, responding to nonfire emergencies, and performing nonemergency duties.[18] There is also a high risk of developing multiple myelomas due to exposure to harmful substances at the fire scene as well as at the firehouse[19] and an increased risk of musculoskeletal injuries, due to the nature of work tasks, in which most firefighters and administrators indicated a high risk of several different types of injuries during the course of a firefighter's career. They also indicated concern about the impact of injuries on their jobs.

One of the reasons cited for this risk was the nature of the work, where firefighters have to respond to emergencies without prior notice and without the ability to prepare for what the incident may require. Although their departments provide instructions on the adequate lifespan, the technique, the nature of the incidents that often see the speed of action prevents them from using the proper lifting technique in practice.

The epidemic of obesity and the number of incidents that required the removal of very large individuals is another of the most frequent causes of musculoskeletal injury.

Fire organizations constantly recognize the risk of injury, as firefighters experience approximately 80,000 injuries per year at a cost of 2.7 to 7.8 billion dollars per year.[20]

We find in the scientific literature research aimed at improving the health and physical condition of the firefighters where they have analyzed their training, the physical aptitudes that the work itself entails, in addition to the determining variables that affect its performance. The ''CREIF Project'' developed in Spain in 2009 for forest firefighters analyzed the metabolic repercussions produced by exposing the human body to the process of extinguishing forest fires. The results concluded that an improvement of the aerobic threshold through specific physical exercise plans would allow the subjects to adopt higher work intensities during the extinction of the fires, being vital as the duration of the fire was greater.[21] From the needs in this population emerged physical exercise programs such as the ''FIT Firefighter,'' applicable to the profile of firefighters, which promotes a wellness initiative that consists on the evaluation of training, physical skills, and nutrition for the improvement of the general physical condition of the body. After the application of this program, positive results were obtained regarding the physical condition of firefighters.[22] Among the researches consulted, the work presented by Cos Morera[23] presented overweight as the variable that most affects the work performance of firefighters.

The objective of this study is to define the body composition profile of the group of forest firefighters, and that this serves to have a basis on which to act in the future and thus reduce the cardiovascular problems of this professional group, as well as musculoskeletal problems that can be related to the variables studied with the bioimpedance technique. We believe this study is important since in the consulted bibliography, we only found a study of these characteristics but it was done in 1970 by Morioka and Brown.[3]

The study hypothesis considers that the state of the body composition of forest firefighters is not adequate for the proper performance of their professional work in the forest, and may jeopardize both their physical integrity and their health.

MATERIALS AND METHODS

Participants and Method

All volunteer subjects ($N = 701$) were forest firefighters with at least 1 year of experience among the provinces of Cuenca, Guadalajara, Toledo, Ciudad Real, and Albacete from Community of Castilla La Mancha (Spain).

The forest firefighters belong to nine different departments of forest firefighters.

The study population consisted of 86.30% of men and 13.7% of women between ages 23 and 65 with a mean age of 43.43 years $\pm$ 8.91.

Firefighters were excluded if in addition to being unsuitable in the medical examination, they presented any of the contraindications indicated to us by the manufacturer of the Firstbeat analysis software.

These contraindications were such as: chronic heart rhythm disturbance, pacemaker or heart transplant, left bundle branch block, severe heart disease (eg, symptomatic coronary heart disease, heart failure), very high blood pressure ($\geq$180/100 mm Hg), type 1 or 2 diabetes with autonomic neuropathy, hyperthyroidism, or other abnormalities of the thyroid gland that lead to resting HR greater than 80 bpm, severe neurological disease (eg, advanced multiple sclerosis or Parkinson disease), fever or other acute disease and body mass index (BMI) greater than 40 kg/m^2. Cases of earlier/earlier stages of the disease and some medications can affect R-R intervals or physical activity levels. The inclusion/exclusion of these participants from the R-R interval recordings was assessed on a case-by-case basis in occupational health programs.[24]

The number of subjects with a BMI greater than 40 is three with the following results 40.70, 42.70, and 48.30. These subjects were excluded from the analysis of results, because as the manufacturer of the software with which we measure physical activity tells us, it can give erroneous data.

Freedom and Flow Company (Spain) contacted the company to which the subjects of the measurement belonged. Participation in the study was totally voluntary. In all cases, acceptance and voluntary, informed signing of participation in the study was essential. It is certified that during the course of the investigation, all the regulations marked on the ethical use of the human volunteers marked in the Declaration of Helsinki were fulfilled. In addition, in the data collection of the subjects included in the study no data were included that could accurately identify any worker according to the requirements of the General Data Protection Regulation (EU) 2016/679. The protocol was approved by the ethical research committee of the integrated health management area of Talavera de la Reina (Código CElm: 22/18).

The population studied were forest firefighters from the autonomous community of Castilla La Mancha. The sample

represents 44.03% of the total forest firefighters. If we speak by sex, there is a representation of 42.21% of men and 60.37% of women.

The protocol to collect the data was: pass the physical tests and the annual medical examination performed by the company.

Once obtained the suitable to be able to carry out the work of forest firefighter, it was evaluated if it did not present any of the characteristics that the manufacturer of the Firstbeat software marked us as exclusive. This software was used to know the physical activity data through a device.

Then he agreed to take the set of measures completely voluntarily and signing the informed consent, in which he was informed of the set of Healthy Box measures that were to be performed.

This set of Healthy Box® measures was made available to the group as a complement to the physical tests and the annual medical examination for a full month.

The Healthy Box® consists in measuring the corporal composition of the subjects, the physical condition of the subjects by means of a dynamometry test, another vertical jump and ankle dorsiflexion test, as well as a measurement of the stress level, carried out through the variability, cardiac, but physical fitness and stress level tests are not part of this study.

The Excel program of the Microsoft Office 2018 package was used to collect the data.

It is important to note that the research team conducted a previous training 1 month before starting with the data collection, to minimize the margin of error that could be incurred.

Body weight and height, variables necessary to record the analysis of body composition, were measured with an accuracy of 0.1 kg and 0.01 m, respectively. The percentage of relative body fat, kilograms of lean mass, bone mass index, body mass index, water percentage, and visceral fat level were determined with the bioelectrical impedance analysis (BC-601 bioimpedance scale). Tanita brand with ISO 9001 certification, Japan). The level of hydration they brought when they came to perform the test was not considered.

In order to perform the bioimpedance, all the subjects had to go barefoot, without rings, bracelets, chains, or watches so as not to interfere in the measurement. Nor could they wear a belt or objects in their pants pockets. In this way, we made sure that the result was going to be more reliable.

Subsequently, the participant placed the heels on the sensors of the lower part of the machine, waiting until the sound signal that determined the weight measurement, and with it the grip of the sensors located in the upper part for the grip with the hands.

From the Healthy Box measurement set, we analyze the following variables:

- *Body composition*:
  1. *Percentage body fat*: It is the amount of fatty tissue that we store in the body in relation to our total body weight. We measure it in percentage. The healthy ranges for men are 21% to 23.9% and for women are 25% to 27.9%
  2. *Kilogram of lean mass*: It is the amount of body tissue formed by the muscles, organs, and viscera. The healthy ranges for men are 44 to 69 kg and for women are 45 to 68 kg.
  3. *Bone mass index*: It is the index corresponding to bone mineral density. The healthy ranges for men are 3.69 or more, and for women are 2.4 or more.
  4. *Body mass index*: It is the global indicator of health in which height and body weight are related. The healthy ranges for men and women are 19 to 24.9.
  5. *Percentage body water*: It is the percentage relative to the weight corresponding to water. The healthy ranges for men are 50% to 65% and for women are 45% to 60%.
  6. *Visceral fat*: It is the fat that accumulates in the abdomen and between the internal organs. The healthy ranges for men and for women are 1 to 12.

Materials

For the analysis of the data, demographic data such as gender, age, height, weight, and BMI were collected. The measurement set was adapted to the characteristics of the population analyzed following the Healthy Box® methodology (Freedom and Flow Company, Spain). The measurement set chosen to carry out the analysis of the body composition profile of the forest firefighter's collective was composed of a bioimpedance scale BC-601 of the brand Tanita® ISO 9001 certified.

We have carried out this analysis using the bioimpedance technique, which is based on the behavior of the organism when an alternating current pass, at a frequency (usually 50 kHz is chosen) or at several, knowing that fat has a high resistance to current flow, as well as bone and lung, while muscle mass offers very little resistance.[25]

Statistical Analysis

All statistical analyses were performed with SPSS® V.23 (SPSS Inc., Chicago, IL). For Windows, the first thing we did was the Kolgomorov-Smirnof test to verify the normal distribution of the sample. The level of significance was set for $P < 0.05$. Subsequently, the descriptive statistics of the sample (mean, standard deviation, minimum, and maximum) were analyzed, both in the total composition of the sample and segregating the sample by sex. The *t* test for independent samples with two-tailed analysis, with a confidence interval of 0.95% was used to compare the means by sex and see if there were significant differences or not between men and women.

We also analyze with respect to the healthy values of the total fat and BMI variables of men and women who are overweight or obese, with respect to lean mass men and women who are below healthy ranges, with respect to BMI men and women who are below healthy ranges and regarding visceral fat for those men and women who would have a moderate risk to their health and those who would have a high risk to their health.

RESULTS

The results that we have found after the analysis correspond to a response rate of 701 subjects with respect to a total of 1592 forest firefighters from the Community of Castilla-La Mancha (Spain) (44.03% response rate).

When segregating by sex, men have a response rate of 605/1433 (42.21%) and women 96/159 (60.37%).

The reasons why there was no greater participation could be because participation in the study was completely voluntary.

The characteristics of men participating in this study had a mean age of 43.54 ± 9.04 years, the youngest being 23 years old and the oldest 65 years old. In women, their average age was 43.64 ± 8.14 years, with the youngest being 29 years and the oldest being 63 years.

Regarding weight, men had an average weight of 81.82 ± 12.53 kg, where the lowest weight was 47.6 kg and the heaviest weight 142.7 kg. In women, their average weight was 65.24 ± 11.67 kg, where the lowest weight was 46.3 kg and the heaviest weight was 117.8 kg.

Regarding the height, the average of men was of 1.73 ± 0.07 m, being the minimum of 1.51 m and the maximum of 1.95 m. In women, their average height was 1.61 ± 0.05 m, with a minimum of 1.47 m and a maximum of 1.81 m.

Health Profile—Body Composition

Table 1 presents data of all the variables analyzed related to body composition.

When comparing firefighters according to gender, it can be observed that, the mean of the variables is significantly higher in men with respect to women in all variables except % body fat.

TABLE 1. Characterization of Body Composition of the Sample ($N = 701$), $P < 0.01$

	Men				Women					
	Average	SD	Minimum	Maximum	Average	SD	Minimum	Maximum	Statistical Test	Significant Differences
Body fat (%)	20.74	6.38	5	55.7	29.00	7.67	8.4	52.2	*t* test for independent samples	0.00*
Lean mass (kg)	60.60	8.44	2.8	82.4	43.10	5.36	23.1	55.6	*t* test for independent samples	0.00*
Bone mass index	3.20	0.34	2.2	4.2	2.32	0.25	1.70	3	*t* test for independent samples	0.00*
Body mass index	27.34	3.91	19.50	48.30	24.85	4.20	16.20	42.2	*t* test for independent samples	0.00*
Body water (%)	57.56	4.96	40	72.7	52.84	5.60	36.3	68	*t* test for independent samples	0.00*
Visceral fat	8.60	4.09	1	40	5.18	2.90	1	15	*t* test for independent samples	0.00*

*These variables are significant differences between men and women.

If we focus on the specific analysis by variables for each gender, we can observe how women present significantly higher percentages of body fat than men, combined with lower significant values of lean fat and bone mass. In this sense, the female gender also presents a BMI within the upper limit of the healthy ranges, although significantly lower the BMI of men. The BMI of men is in the range of overweight.

The men presented significantly higher values of visceral fat with respect to women, obtaining values of average within the upper limit of the ranges described as healthy, showing a strong positive correlation between BMI and visceral fat ($r = 0, 77$) ($P < 0.01$) in this group (Table 1).

If we analyze men and women who are overweight, considering the variable percentage of total fat, we obtain that 181/605 (29.91%) of men and 48/96 (50%) of women in an overweight situation, which corresponds to 229/701 (32.66%) of the total sample.

When analyzing men and women who are in an obesity situation, considering the variable percentage of total fat, we obtain that 95/605 (15.70%) of men and 28/96 (29.16%) of women in an obesity situation, which corresponds to 123/701 (17.54%) of the total sample.

If we analyze the same parameters considering the BMI variable, we obtain that 291/605 (48.09%) of men and 31/96 (32.29%) of women would be overweight. In obesity, we obtain 146/605 (24.13%) of men and 10/96 (10.41%) of women. This corresponds to 322/701 (45.93%) in an overweight situation and 156/701 (22.25%) in obesity of the total sample.

If we compare them with the results obtained by Morioka and Brown,[3] our sample has a lower percentage of 19.07% in overweight, but in obesity is higher in 17.25%.

If we analyze men and women who find lean mass below healthy values, we obtain that there are 11/605 (1.81%) of men and 43/96 (44.79%) of women, which corresponds with 54/701 (7.70%) of the total sample.

If we analyze men and women who are below the healthy bone mass index, we obtain that 543/605 (89.75%) of men and 68/96 (70.83%) of women, which corresponds to 611 / 701 (87.16%) of the total sample.

If we analyze men and women who have a moderate visceral fat index, we obtain 208/605 (34.38%) of men and 16/96 (16.66%) of women, which corresponds to 224 /701 (31.95%) of the total sample. If we analyze those that have a high visceral fat index, we obtain that there are 135/605 (22.31%) of men and 2/96 (2.08%) of women, which corresponds to 137/701 (19.54%) of the total of the sample (Table 2).

If we compare the results with those obtained by Camacho et al[26] that analyzed the body composition of a sample of Spanish population ($N = 579$), we see how our sample has a lower percentage of fat in both men and women, a lower lean mass in men, although higher in women and higher percentages of water.

DISCUSSION

After analyzing the results and given the importance of the health status of the forest firefighter, both in his daily life and in the performance of his work, the study meets the objective of determining the health profile through body composition.

The research hypothesis that we have raised at the beginning of the investigation, which is whether the physical health status of firefighters is not adequate for the performance of their professional work in the forest, and after the analysis of the data, is met by obtaining results with high percentages of people with different health risks; thanks to the data compared to the different comparison tables of the instrument for measuring the compositional composition (Tanita BC-601). These data indicate that your physical integrity can be jeopardized; thus justifying the need for specific physical preparation and health promotion programs at both times of the year.

TABLE 2. Percentage of People At Risk for Their Health According to the Different Body Composition Variables ($N = 701$)

	Men	Women	General
	% People in Risk for Health, %	% People in Risk for Health, %	% People in Risk for Health, %
Overweight according to % total fat	29.91	50	32.665
Obesity according to % total fat	15.70	29.16	17.54
Overweight according to BMI	48.09	32.29	45.93
Obesity according to BMI	24.13	10.41	22.25
Low lean mass according to kilogram of lean mass	1.81	44.79	7.70
Low bone mass according to bone mass index	89.75	70.83	87.16
Moderate risk according to visceral fat index	34.38	16.66	31.95
High risk according to visceral fat index	22.31	2.08	19.54

BMI, body mass index.

In this sense, the results indicate high BMI values in both men and women, may be due to poor diet planning and poor specific physical preparation plans during the prevention period that compensate stress values, exposure to high temperatures, inhalation of smoke, and high physical demand that demands the time of extinction.[2]

However, the health profile described in this population indicates high percentages of fat combined with low percentages of lean mass, especially in women, which in a population with an average age of 43.43 ± 8.91 years. It poses a high risk of developing cardiovascular and metabolic problems,[27,28] especially in the time of extinction where demand and physiological stress is triggered by the increase number of forest fires of recent times.

Specifically, the male gender presents mean values in the BMI above 27 which, when positively correlated with the visceral fat index, indicates a predisposition of the organism to accumulate more visceral fat in the coming years if the BMI continues to increase in the male gender. The results agree with other studies where a strong tendency to accumulate fat in the abdominal area and its relationship with cardiometabolic pathologies is described.[29] It is important to take into account these data in the prevention of cardiometabolic pathologies of the group, not only as a preventive measure, but also because of the high risk of death that exists, due to cardiovascular or coronary diseases that may have firefighters who are dedicated to the fire extinction compared to those who do not engage in emergency tasks described in other studies such as, for example, responding to an alarm, returning from an alarm, engaging in physical training, responding to nonfire emergencies, and performing nonemergency duties.[18]

In the case of females, female forest firefighters have a BMI within the upper limit of healthy ranges, but significantly higher percentages of body fat than men, combined with lower significant values of lean fat and bone mass. In this regard, the risk of suffering cardiometabolic diseases is also high for the feminine gender, combined with a high risk of suffering sarcopenia, as defined by Cruz-Jentoft et al[29] would be the progressive and generalized loss of skeletal muscle mass and strength, which would increase the risk of physical weakness, reduced physical function and poor quality of life.[30,31]

Regarding the general physical condition, the group of forest firefighters analyzed also presents positive values of physical activity of 8.15 ± 10.22 h/wk, which correspond to an average of 480 minutes per week (approximately 68.6 min/d). These data were collected through the device that quantified physical activity in 24 hours.

In this regard, WHO recommends that adults 18 to 64 years of age devote at least 150 minutes a week to the practice of aerobic physical activity, of moderate intensity, or 75 minutes of vigorous aerobic physical activity each week, or an equivalent combination of occupations. Moderate and vigorous, to obtain even greater health benefits, adults of this age group should perform at least 300 minutes per week the practice of moderate aerobic physical activity, or up to 150 minutes per week of intense aerobic physical activity, or an equivalent combination of moderate and vigorous activity.

In this sense, the forest firefighter corps would be complying with the recommendations of physical activity prescribed by the World Health Organization, although this has no impact on the values recorded in body composition.

In this regard, according to a report by the Institute for European Policy on the Environment, people living near green spaces have a better state of physical and mental health, and say they feel happier. The study analyzed the relationships between well-being and nature, based on around 200 studies on these topics. As a result, positive links between environment, health, and well-being were found. For example, they discovered that in places with more trees, doctors usually prescribe less antidepressants. Moreover, for example, in countries like Denmark, those who live less than 300 meters from green spaces are less likely to suffer from obesity and more from exercising frequently. Another study prepared by EUROPARC-Spain, ''Health and Protected Areas in Spain,'' shows how contact with nature helps to reduce heart rate and speeds up the recovery of hospitalized patients.

Even so, despite having an adequate and positive physical condition profile, probably associated with a higher level of physical activity in nature associated with the characteristics of their job position, the health profile metabolic of the group is worrisome, which justifies the need to adapt physical preparation plans specifically to improve body composition in a specific way, completing these strategies with adequate feeding plans that can compensate for high levels of body fat, visceral fat and BMI found in the collective.

This study can be the starting point for the study of a group such as forest firefighters and establish policies so that they have a better body composition profile and this will have an impact on health improvement.

Among the strengths of the study, we have a large sample ($N = 701$), in a population where the health profile obtained through a bioimpedance, there are not many studies, with a solid design and updated information.

One of the limitations of the study would be that not all subjects came to perform the test under the same conditions of feeding and hydration, because of the organization of the company itself. This made it difficult to follow the same methodology in each of the provinces.

For future studies, you should try to perform bioimpedance under similar conditions.

CONCLUSIONS

The group of forest firefighters analyzed presents physical condition values higher than the population average.

However, the health profile analyzed through body composition shows a high risk of suffering cardiometabolic diseases derived from high percentages of body fat, visceral fat, and high BMI, combined with a deficit of lean mass and bone mass.

The risk of suffering from diseases related to bone mass such as osteopenia and/or osteoporosis is higher in women than in men.

The type of physical activity carried out by the group of forest firefighters during their workday is not specific to deal with the problem of their health profile by itself, so it is advisable to establish plans of physical preparation intended to improve body composition in a specific way during prevention. This should be combined with plans and strategies that promote healthy eating in the collective.

Plans for healthy food should be aimed at the reduction of fats and processed foods.

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