# 93 - EVALUATION OF CORPORAL COMPOSITION THROUGH THE BIOIMPEDANCE AND ANTHROPOMETRY METHOD IN MILITARY POLICEMEN AND FIREMEN

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## INTRODUCTION

The evaluation of the corporal composition is an important tool that can be used in the defense against the no-transmissible chronic diseases, as well as in weigh loss programs and physical conditioning related to improvements of the conditions of health (BRASIL, 2005). The body fat percentage can be measured in several ways such as through the bioimpedance bioelectrical, quickly form and mainly used in clinical studies and field since the result is obtained by low-intensity electrical currents passing through the body of the patient, other form for the measurement of skinfolds that evaluates the fat percentage with precision, easy to access, not invasive, fast, easy to get the results, low cost, once, are used a special compass similar to a tweezers, that measures the fat in specific areas of the body (PITANGA, 2004).

It is known that Policemen and Firemen need to be prepared to accomplishment their functions, with the main objective of promoting safety the population. Fittest individuals have lower rates of bouts by illness, injury, have greater readiness effort and greater capacity for organic recovery post-exercise as well as the benefits reported for individuals with high levels of physical fitness, can be considered as desirable for military policemen, contributing to a better response in the performance of daily functions with physical demand (WEINECK, 1999).

In that way, the practice of regular physical activity is directly related to health benefits. While bad alimentary habits, sedentary and physical inactivity contribute to the individual presenting overweight and obesity, disease considered as one of the biggest health problems today, due to comorbidities (hypertension, diabetes and dyslipidemia) associated with it. It is also an injury which is associated with the progression of atherosclerosis, can cause the occurrence of the "metabolic syndrome" (CABRERA, JACOB FILHO, 2001).

In this sense, the physical fitness in the activity of policemen and firemen is of great relevance to the military can present satisfactory results.

In agreement with these premises, this study has as objective to verify the health conditions from the military policemen and firemen in respect with the anthropometric indicators of adiposity.

## METHODS

This is a descriptive and traverse study, that evaluated 50 military policemen and 52 military firemen male, belonging to the 4th Battalion of the Military Policemen (4ºBPM) and the 3rd Battalion military firemen of the city of Guarabira - PB, respectively.

Were included in this study the military that work in the operational service and that accepted voluntarily to participate in the research. All the participants signed the Consent Term. This project was approved by the Committee of Ethics in Research, of the Universidade Estadual da Paraíba (UEPB) - (with the Number: 0559.0.133.000-11).

The Military Policemen were submitted to individual interviews to knowledge of personal data such as age and anthropometric indicators of adiposity, which were: Body Mass Index and body fat percentage. The tests were proceeded in the Square Lima e Moura in the city-center of Guarabira where collection of data was accomplished in the schedule among 08:00h at 16:00h o'clock, in the month of September of 2011.

During the accomplishment of anthropometry, the individuals stayed in erect position, without shirt, without uniform, without shoes, with the relaxed abdomen, extended arms along the body and together feet. The verification of the corporal weight was made being used balances analogical model 31 of the mark Filizola®, with capacity for 150kg and 0,1kg variation. The scan height was performed by using an inelastic tape 150cm long, affixed to a flat wall, 50cm from the ground. From the verification of weight and height, we calculated the Body Mass Index (BMI kg/m2), by dividing body weight (kg) by height (m2).

For classification of BMI was used the criteria proposed by the World Health Organization (WHO, 1995) that establishes the following cut-off limits and their respective nutritional diagnoses: Normal 18.5 and 24.9 kg/m2 to 25.0 Overweight to 29.9 kg/m2, Obesity degree I 30.0 to 34.9 kg/m2, Obesity degree II from 35 to 39.9 kg/m2, and Obesity degree III ≥ 40.0 kg/m2.

The percentage of body fat was analyzed by Electrical Bioimpedance (BIA) with a frequency of 50kHz, following the previous recommendations of the manufacturer (OMRON HDS-300 BODY FAT- ANALYZER -). The risk of diseases associated with obesity was defined as the percentage of body fat was greater than or equal to 25% (LOHMAN; ROCHE; MARTORELL, 1991). 100% of the participants, made adequate preparation for this exam.

Were used three skinfolds (triceps, suprailiac and abdomen) to evaluted the body composition by skinfold method, whit according to the protocol proposed by Guedes (1985). For this, we used a a plicometer (Sanny ®), accurately of 0,5mm and variation from 0 to 55mm.

Initially the data were stored in Excel® (Microsoft Office 2007). The descriptive statistical analysis of the data will be accomplished being used the programs Epi-Info, in the version 3.4 and SPSS version 14, applying the paired Student t test. For all statistical tests will be considered the interval of trust of 95% and significance level of 5% ($p \leq .05$).

## RESULTS

50 Military Policemen and 52 Firemen were analyzed, all of the masculine gender, whose statistical information with relationship the analyzed variables are showed in the Table 1.

Table 1 – Average Values, standard deviation and statistical "t" of the variables analyzed in the study.

| | Military Policemen (n=50) | Firemen (n=52) | P |
|---|---|---|---|
| Age (years) | 30,40 ± 8,96 | 34,18 ± 7,27 | 0,030 |
| Body Weight (kg) | 76,29 ± 9,92 | 77,85 ± 9,48 | 0.403 |
| Stature (cm) | 1,72 ± 0,05 | 1,72 ± 0,06 | 0,676 |
| BMI (kg/m2) | 25,87 ± 2,97 | 26,34 ± 3,42 | 0,491 |
| Skin folds | | | |
| Triciptal (mm) | 14,05 ± 5,57 | 17,01 ± 9,62 | 0,057 |
| Iliac supra (mm) | 15, 36 ± 6,91 | 15, 84 ± 7,51 | 0,699 |
| Abdominal (mm) | 29,22 ± 14,27 | 29,66 ± 11,44 | 0,854 |
| BIA | 17,34 ± 6,36 | 19,12 ± 5,97 | 0,225 |

p≤0,05= significant difference

The subjects gathered in the study presented averages of age between 30 and 34 years and, when of the comparison among the values observed in both, the found differences are significant. However, verified when of the comparison among medium values studied regarding the corporal weight, BMI, measures of skinfold thickness measurements and BIA, that the found differences are not pointed in statistical language. As the average of those values, the results show higher measures for firemen.

The averages obtained by the two methods in the military policemen and in the firemen, showed percentile of fat above the normality strip. Statistical indicators as the comparison among % Fat by skinfold methods and bioimpedance was significant in both (table 2 and 3).

Table 2 - Comparison between measurements of skinfolds and bioimpedance (Average and Standard Deviation) of the military policemen.

| Variable | Skinfolds | | BIA | | |
|---|---|---|---|---|---|
| | Average | Standard Deviation | Average | Standard Deviation | p |
| % Fat | 19,39 | 4,85 | 17,34 | 6,36 | 0,018 |

p≤0,05= significant difference

Table 3 - Comparison between measurements of skinfolds and bioimpedance (Average and Standard Deviation) of the firemen.

| Variable | Skinfolds | | BIA | | |
|---|---|---|---|---|---|
| | Average | Standard Deviation | Average | Standard Deviation | p |
| % Fat | 20,56 | 4,06 | 19,12 | 5,97 | 0,017 |

p≤0,05= significant difference

It is observed in Table 4 that among groups there was a high proportion of overweight in both groups. The sum of military policemen with a diagnosis of overweight and obesity was 32 (64%) and only 18 (36%) are within the normal range, being eutrophic. The sum of Firemen with diagnosis of overweight and obesity was 33 (63.4%) and only 19 (36.5%) are within the normal range, being eutrophic.

Table 4 - Nutritional status of military policemen and firemen, according to the Body Mass Index (BMI).

| Nutritional status based on BMI | Military Policemen | | Firemen | |
|---|---|---|---|---|
| | n | % | N | % |
| Eutrophic | 18 | 36 | 19 | 36,5 |
| Overweight | 28 | 56 | 27 | 51,9 |
| Obesity | 4 | 8 | 6 | 11,5 |
| Total | 50 | 100 | 52 | 100 |

It was verified that around 10-16% of the policemen and firemen studied, showed risk of diseases associated with obesity due to the high percentage of corporal fat.

Table 5 - Nutritional status of military policemen and firemen, according to the percentage of corporal fat.

| Percentile of corporal fat | Military policemen | | | | Firemen | | | |
|---|---|---|---|---|---|---|---|---|
| | DC | | BIA | | DC | | BIA | |
| | n | % | n | % | N | % | n | % |
| Equal or below the average ≤ 15% | 9 | 18 | 22 | 44 | 6 | 11,5 | 14 | 26,9 |
| Above the average 15,1-24,9% | 35 | 70 | 20 | 40 | 41 | 78,8 | 32 | 61,5 |
| Equal or above of 25% - Risk of diseases associated to the obesity | 6 | 12 | 8 | 16 | 5 | 9,6 | 6 | 11,5 |
| Total | 50 | 100 | 50 | 100 | 52 | 100 | 52 | 100 |

**DISCUSSION**

Of the policemen and firemen evaluated, was observed that more than 50% were with overweight and 4 (8%) and 6 (11,5%), respectively, were obese. According to the data of Donadussi et al. (2009), in Cascavel (PR), the overweight prevalence in policemen of the 6th Military Police Battalion was of 45,4% and of obesity, 18,5%. Observed that the obesity proportion presented by the military policemen of Cascavel is above the average of the policemen of the present study while the overweight presented smaller values.

Study accomplished by Canabarro and Rombaldi (2010) evaluated the risk of overweight and obesity in soldiers of the Fire Department in Pelotas-RG showed that 21 subjects were overweight / obese, in other words, (85.5%) of his sample that the more than five years in the military, taking risks related to the excess of corporal fat. The present study showed a percentile one smaller of 63,4% of overweight / obesity, but fact this preoccupying, tends in view the attributions and functions of the same ones in the institution where they work once these indicators are associated in the predisposition of risks related to the health.

The repercussion of this draws attention, since subjects with BMI less than 30 kg / m² may be exhibiting symptoms of hypertension, a dangerous disease. The results of the present study were similar to other (KALES et al., 1999; LALIC; BUKMIR; FERHATOVIC, 2007; CARVALHO et al., 2007). One factor that could account for the high values of BMI would be advantaged muscle mass proportion, which has a higher density than fat mass, which could l take these individuals be classified as overweight or obesity when in fact would present tax proportionally larger of muscle than of fat. But this was not the case in this study, since the values of percent fat gave nonstandard corroborating BMI values found.

The studied group showed médium values for the percentage of fat in both methods used above the normal range established by the World Health Organization (WHO) that is 15% (PETROSKI, 2003). Similarly male officers belonging to the Special Operations Battalion of the Municipality of Aracaju-SE also had anthropometric fat percentage above the normal range recommended by WHO (FREITAS, PRADO; SAXNTOS SILVA, 2007).

The studied literature points relative risks the health as regards an increase in the percentage of fat above the limits set by the WHO, since, with increasing corporal fat also increases the amount of circulating triglycerides, cholesterol, causing hyperlipidemia (LIMA; GLANNER, 2006).

The evaluation percentile of corporal fat analyzed by the method of bioimpedance related to the risk of diseases associated to the obesity in the studied population was shown smaller than in the military of Cascavel (PR) that was 21,3%. Although these values related to the risk of cardiovascular diseases, diabetes, dislipidemia, metabolic syndrome has been minor cannot leave of focusing that most of the military studied are in risk with percentile of fat above the average (15,1-24,9%).

This way a concern should be existed, because as it is known, the military should have the honorable mission of defending the society, even with the risk of the own life. Being like this, evident that those militate possess, besides a special technical formation, an excellent physical fitness for the good execution of their works and that includes great levels of fat percentile.

Differences were observed enter the methods of evaluation of the % Fat in the policemen and in the firemen, although the skinfold method estimated a higher fat% when compared with the bioimpedância method.

Our results corroborated with Rios et al. (2010) also found differences between the methods of skinfold thickness and bioimpedance. Rodrigues (2007) indicated in his results significant differences in the estimates of % fat provided by the two methods in a sample of males. Unlike, Conterato and Vieira (2001) found no significant difference corporal composition assessed by bioelectrical impedance and skinfold second Petroski (1995).

Buscariolo et al. (2008) observed differences in % fat estimated by skinfold thickness and bioimpedance in women athletes with different aspect in this study a lower % Fat in the skinfold method, so as Glaner (2005) who observed a higher % Fat in bioimpedance compared to results found in the skinfold method. However, the present study found a lower % fat in the subjects studied by the method of bioimpedance.

As the method of bioimpedance relies on a electric principle some care should be considered preliminary. Therefore should be avoided situations that cause variations in the water status of the individual, such as edema, dehydration, caffeine and alcohol ingestion, physical activity, besides operational cares as the positioning of the evaluated. In turn, the use of skinfold requires a trained and familiarized with those techniques. Deminice and Rose (2009) verified that skinfold method has a higher reliability compared to the method of bioelectrical impedance in estimating body composition in athletes due to the great interference of the trainings in the individuals' organism.

According to the collected data, was verified that there is need to maintain a level of physical activity and, maybe, of constant nutritional evaluation for such servants, tends in view that the same ones depend on the physical condition for best perform of their functions, in order to benefit as much the soldiers and firemen as the population for them assisted.

Considering these results it is important to reinforce the importance of the combination of anthropometric measurements in the evaluation of nutritional status, as well as the need for regular physical activity in the contingent of policemen and firemen, to identify and even prevent disease risk and / or metabolic changes in these individuals and improve the physical condition required in the work that they realized.

**CONCLUSIONS**

It was concluded that the policemen and firemen studied, showed high risk for obesity, considered of risk for the development of chronic-degenerative diseases. These factors reveal the exposure of first responders to health-related risks which may hinder the fulfillment of the various missions in the presence of situations involving helped.

Future studies should consider interventions with practice of physical activity and alimentary cares, in order to modify the overweight and obesity picture of this population.

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**EVALUATION OF CORPORAL COMPOSITION THROUGH THE BIOIMPEDANCE AND ANTHROPOMETRY METHOD IN MILITARY POLICEMEN AND FIREMEN**

**ABSTRACT**

Objective: Compare body composition by bioelectrical impedance analysis and anthropometric methods applied to military policemen and firemen in the city of Guarabira-PB, working in the operational service of the 4th Military Police Battalion and 3rd Battalion Fire Brigade. Methods: The research dealt with is a cross-sectional descriptive study consisting of 50 military policemen and 52 firemen male soldiers, consisting of a sample of the non-probabilistic convenience. For this study, we surveyed about age, gender, body mass, height, Body Mass Index (BMI) and body fat percentage. Results: The nutritional diagnosis more frequent in the population studied was overweight and obesity, being 32 (64%) in the policemen and 33 (63.4%) in the firemen. The group analyzed showed values for the percentage of fat in both the methods used above the normal range established by the World Health Organization (WHO) is 15% and thus at high risk for metabolic complications. Conclusion: This study showed the prevalence of overweight in military policemen and firemen, thus suggesting that there is need for greater physical activity and dietary reeducation groups evaluated. The implementation of health policies aimed at preventing obesity certainly will have a

major impact on primary prevention of chronic diseases in these individuals, improving the physical condition required in the work that they realized.

**KEYWORD:** Obesity, Body Composition, Military

**ÉVALUATION DE LA COMPOSITION CORPORALLE PAR ANTHROPOMÉTRIE ET IMPÉDANCE BIOÉLECTIQUE DANS LA POLICE MILITAIRE ET LES POMPIERS**

**RESÚMÉ**

Objectif: Comparer la composition des corps humains par des méthodes anthropométriques et l' impédance bioélectrique dans la police militaire et les pompiers de la ville de Guarabira-Paraiba, travaillant en service opérationnel dans le 4ème bataillon de la police militaire et dans le 3e bataillon des sapeurs-pompiers militaires. Méthodes: La recherche a traité une étude transversale descriptive composé par 50 policiers et 52 pompiers de sexe masculin, qui etait un échantillon non probabiliste par convenance. Pour cette étude l'information a été soulevée sur: âge, sexe, poids, taille, indice de masse corporelle (IMC) et le pourcentage de graisse corporelle. Résultats: Le diagnostic nutritionnel le plus fréquent dans la population de l'étude était de surpoids et obésité: 32 (64%) dans la police et 33 (63,4%) chez les pompiers. Le groupe analysé a montré valeurs moyennes pour le pourcentage de graisse dans les deux méthodes utilisées, au-dessus de la norme normale établie par l'Organisation mondiale de la Santé (OMS) qui est de 15% et donc présentent haut risque de complications métaboliques. Conclusion: Cette étude a montré une prévalence de poids en excess parmi les policiers et les pompiers et ce suggère qu'il est nécessaire plus d' activité physique et d' éducation nutritionnelle dans les groupes évalués. La mise en œuvre des politiques de santé visant à prévenir l'obésité aura certainement un impact important sur la prévention primaire des maladies chroniques chez ces personnes, améliorant la condition physique requisé dans le travail qu'ils accomplissent.

**MOTS-CLES:** obésité, composition corporelle, militaire.

**EVALUACIÓN DE LA COMPOSICIÓN CORPORAL A TRAVÉS DE LA BIOIMPEDANCIA Y LA ANTROPOMETRÍA EN LOS POLICÍAS MILITARES Y BOMBEROS**

**RESUMEN**

Objetivo: Comparar la composición corporal por antropometría y métodos de análisis de impedancia bioeléctrica aplicadas a los agentes de policía y bomberos, in la ciudad del Guarabira-PB, que trabajan en el servicio operacional del 4 º Batallón de la Policía Militar y el 3 º Batallón de Bomberos Militar. Métodos: La investigación se trató de un estudio descriptivo transversal que consta de 50 policías y 52 bomberos de sexo masculino, que consiste en una muestra de conveniencia no probabilística. Para este estudio, la información fue planteada en: edad, sexo, peso, talla, índice de masa corporal (IMC) y porcentaje de grasa corporal. Resultados: El diagnóstico nutricional más frecuente en la población del estudio tenía sobrepeso y obesidad, 32 (64%) en la policía y 33 (63,4%) en los bomberos. El grupo analizado tenían valores medios del porcentaje de grasa, tanto en los métodos empleados por encima del rango normal establecido por la Organización Mundial de la Salud (OMS) es del 15%, por lo tanto un alto riesgo de complicaciones metabólicas. Conclusión: Este estudio mostró prevalencia de sobrepeso en la policía y los bomberos y, por tanto, lo que sugiere que existe la necesidad de una mayor actividad física y la educación nutricional en los grupos evaluados. La implementación de políticas de salud destinadas a prevenir la obesidad sin duda tendrá un gran impacto en la prevención primaria de las enfermedades crónicas en estos individuos, la mejora de la condición física necesaria en el trabajo que realizan.

**PALABRAS CLAVE**: La obesidad, la composición corporal, Militar.

**AVALIAÇÃO DA COMPOSIÇÃO CORPORAL ATRAVÉS DOS MÉTODOS DE BIOIMPEDÂNCIA E ANTROPOMETRIA EM POLICIAIS MILITARES E BOMBEIROS**

**RESUMO**

Objetivo: Comparar a composição corporal por métodos antropométricos e bioimpedância elétrica aplicados em policiais militares e bombeiros, da cidade de Guarabira-PB, que trabalham no serviço operacional do 4º Batalhão de Polícia Militar e do 3° Batalhão de Bombeiros Militares. Métodos: O universo da pesquisa tratou-se de um estudo descritivo e transversal, constituído por 50 policiais militares e 52 bombeiros militares do sexo masculino, composta por uma amostragem do tipo não-probabilística por conveniência. Para esse estudo, foram levantadas informações sobre: idade, gênero, massa corporal, altura, Índice de Massa Corporal (IMC) e percentual de gordura corporal. Resultados: O diagnóstico nutricional mais freqüente na população estudada foi de sobrepeso e obesidade; sendo de 32 (64%) nos policias e 33 (63,4%) nos bombeiros. O grupo analisado apresentou valores médios para o percentual de gordura em ambos os métodos utilizados acima da faixa de normalidade estabelecida pela Organização Mundial de Saúde (OMS) que é de 15% e desta forma apresentam risco elevado para complicações metabólicas. Conclusão: Este estudo mostrou prevalência de excesso de peso nos policiais e bombeiros militares e, portanto, sugerindo que há necessidade de maior prática de atividades físicas e reeducação alimentar nos grupos avaliados. A implantação de políticas de saúde voltadas para a prevenção da obesidade certamente terá um impacto importante na prevenção primária de doenças crônicas nesses indivíduos, melhorando a condição física exigida no trabalho que os mesmos desempenham.

**PALAVRAS-CHAVE:** Obesidade, Composição corporal, Militares.