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Evaluation of the body composition of soldiers from the Kinshasa garrison: Descriptive cross sectional study

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Abstract

Excess body fat among military personnel, one of the major public health issues according to the recommendations of the World Health Organization. This abnormal increase in fat mass is responsible for numerous chronic non-transmissible pathologies among soldiers to which they are victims. The objective of the study was to evaluate the body composition of Congolese FARDC soldiers using AMAZON brand body composition monitors. This is a descriptive cross-sectional study by a body composition monitor carried out in the Kinshasa Garrison between October 1, 2020 and February 27, 2021 where the cardiovascular exploration center of the military health corps served as a setting. Data collection was carried out by an AMAZON brand impedemeter including the percentage of water, muscles, body fat and BMI. Corporals, privates, non-commissioned officers and senior officers took part. A total of 487 voluntarily enlisted soldiers, made up of 415 men and 72 women, 85.2% versus 14.8% participated in the study. The mean age was 45.4 ± 11.9 years. BMI, waist circumference, hip circumference, fat, lean mass and water had an average of 29.3 kg/m^2, 78.3 cm, 36.6 cm, 14.5 %, and 54.3%, respectively (p = 0.001). These means were significantly different depending on age and grade (p = 0.001). The age group over 60 is more exposed with a high rate of fat mass 38.1% and a reduction in lean mass 16.1% (p = 0.002). This had a significantly higher frequency among military officers of developing metabolic risk factors (p = 0.001). This is the first Congolese study which was interested in evaluating the body composition of soldiers from the Kinshasa garrison and which determined the morphological state of these combatants. This reveals that the majority of the study population had a high fat mass and a high BMI in the entire group. This abnormal increase exposes them to developing a chronic pathology. It is suggested that a military PA program be offered to them so that they can improve their physical health.

Introduction

Today, excess body fat among military personnel has become a real public health problem. This excess fat is correlated with the severity of the disease associated with an increase in mortality (Connor et al., 2007). Although measuring body mass index (BMI) is the tool most often used to measure the nutritional status of military personnel (Dalal et al., 2011). The aim of this study is to measure, by a Body Monitor composition of the AMAZON brand of the military.

The term "body composition" generally describes the percentage of fat, bone, muscle mass, and water in the body (Feachem et al., 1992). It is an appropriate measure to assess certain parameters of overall health in adults and children.

In the human body, fat is stored in priority depending on the sex of the individuals. In men, fat tends to accumulate more in the upper body (mainly abdomen and secondarily in the buttocks), producing an "apple" shaped silhouette. In women, on the other hand, the accumulation is noticed more in the breasts, hips, waist

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and buttocks, creating a "pear" shaped silhouette (Gaylin & Kates, 1997).

It has been shown that excess fat does not allow men and women in uniform to be in good physical shape, as well as to wear military uniform correctly (Jordan et al., 2008).

Each time we address the problem of excess fat mass, the body mass index (BMI) adopted by the WHO defines it as an element harmful to health (Law et al., 2009). BMI remains the most used index among anthropometric measurements. It is well correlated with fat mass at the collective level but very insufficient to take care of body composition at the collective level individual level (Maire et al., 2002).

However, the professions of arms require flexibility, endurance and physical aptitude necessary to accomplish missions of securing borders, people and their property in times of peace and war. To address this problem, it is necessary to find a way to get rid of it and maintain normal body fat because body fat plays a vital role in the human body (Manton, 1988).

Furthermore, among the military it is a pure engineering gem that needs fuel to maintain its integrity. In other words, we need the energy to breathe, speak, laugh, walk, and run to actively live well. This energy comes from the foods that make up the diet (Pobee et al., 1977).

In the body, nutrients are transformed into glucose to serve as fuel. This fuel is then carried through the bloodstream to every cell in the body. Conversely, these are then found stored in large quantities creating an imbalance in the energy balance, an increased consequence of the increase in fat mass, not allowing the military to have the physical fitness necessary for service (Psaty et al., 2003).

The objective of our study was to evaluate the body composition of Congolese soldiers using an AMAZON brand body monitor composition device, precisely in the Kinshasa garrison, as well as to establish reference values for the percentage of fat mass, indices of lean mass, fat mass and water (Dalal et al., 2011).

Methods

This is a descriptive cross-sectional study with an AMAZON brand impedance meter which allowed us to evaluate the body composition of soldiers from the Democratic Republic of Congo. The study took place in the Kinshasa garrison, between October 5, 2020 and February 27, 2021. The cardiovascular exploration center served as a setting for the clinical evaluations.

A convenience sample was used to constitute the population of 487 military subjects, aged 19 to 69 years, of both sexes including: 215 corporals and soldiers, 345 non-commissioned officers and 339 officers. The sample was constituted on the basis of a letter of free and informed consent duly signed by the soldiers of the Kinshasa garrison, voluntarily agreeing to participate in our study.

We used the body composition monitor which allowed us to assess body composition, an essential tool for nutritional description. The study of body composition not only allows us to better understand the functioning of much pathology, but also in certain cases to follow their evolution to maintain good physical health (Seedat et., 1981).

Description of the device, It also makes it possible to measure the resistance of an organism to an electric current determining the automatic acoustic pressure of the human body, Integrating computer software incorporated on the device where the gender (Male/Female) of the soldier, Height, weight, BMI and age were previously introduced to finally determine the percentage of fat mass, lean mass and water percentage (Shaper et al., 1999).

Anthropometric Data

BMI (kg/m^2) is a marker for measuring body composition, adopted by the WHO and has been calculated to determine nutritional status. It now remains the most used index among anthropometric measurements. The percentage of body fat (% FM), muscular mass (% MM) were also measured by the same procedure. Were also measured by the same procedure.

Ethical Considerations

The soldiers willingly agreed to participate in the study according to the Helsinki declarations and approved by the Ethics Committee of the School of Public Health of the Faculty of Medicine of the University of Kinshasa Under numbers ESP/CE/151/2020.

Statistical Analysis

The statistical analysis was carried out using SPSS version 21.0 Software by age group (18-39 years, 40-59 years and over 60 years). The descriptive analyzes represented the quantitative variables by their mean and their deviation. The recruited population was also studied by category of military rank defined according to BMI (less than 25 kg/m^2, 25-30 kg/m2, 30-40 kg/m^2 and more than 40 kg/m^2. The threshold of significance was used at $p<0.05$, the correlations were used to study the reciprocal links between the different body composition parameters.

Table 1

Comparison of averages of parameters composition of the military depending on the age group.

Variables	Whole Group (n= 487)	Age Range			
		18-39 (n=48)	40-59 (n=153)	≥ 60 (n=286)	P
Age (year)	45.4 ± 11	28.7 ± 6	51.3 ± 4	61.3 ± 7	0.001*
Weight (kg)	78.0 ± 07	77.0 ± 03	78.01 ± 1	72.2 ± 4	0.002*
Height (cm)	166.1 ± 3	165.3 ± 4	168.2 ± 2	169.1 ± 3	0.001*
Body Mass Index (kg/m^2)	29.3 ± 01	28.1 ± 7	30.2 ± 6	29.1 ± 4	0.006*
Waist Circumference (cm)	78.3 ± 7	78.1 ± 4	78.2 ± 9	80.1 ± 3	0.007*
Hip Circumference (cm)	82.2 ± 1	80.3 ± 6	82.1 ± 2	84.2 ± 6	0.002*
Waist-to-Hip Ratio (%)	0.9 ± 3	0.8 ± 6	0.9 ± 7	1.00 ± 3	0.001*
Body fat (%)	36.6 ± 1	35.3 ± 1	37.2 ± 1	38.1 ± 4	0.001*
Muscular Mass (%)	14.5 ± 3	11.6 ± 2	16.1 ± 7	16.0 ± 1	0.001*
Water (%)	54.3 ± 1	52.3 ± 1	56 ± 3	55.1 ± 3	0.001*

** p<0.05*

Table 2

Comparison of the averages of the parameters of the body composition of the caporals and soldiers as a function of the genus.

Variables	Whole Group (n=48)	Gender		P
		Man (n=35)	Women (n=13)	
Age (year)	28.7 ± 6	28.7 ± 6	29.4 ± 2	0.001*
Weight (kg)	77.0 ± 03	77.0 ± 03	80.1 ± 4	0.001
Height (cm)	165.3 ± 4	165.3 ± 4	166.2 ± 1	0.002*
Body Mass Index (kg/m^2)	28.1 ± 7	26.6 ± 4	30.1 ± 6	0.001*
Waist Circumference (cm)	78.1 ± 4	77.1 ± 2	80.6 ± 1	0.002*
Hip Circumference (cm)	80.3 ± 6	79.3 ± 7	81.1 ± 3	0.001*
Waist-to-Hip Ratio (%)	0.8 ± 7	0.8 ± 4	0.9 ± 1	0.001*
Body fat (%)	35.3 ± 1	32.3 ± 7	38.2 ± 8	0.001*
Muscular Mass (%)	11.6 ± 2	10.4 ± 3	13.1 ± 2	0.001*
Water (%)	52.3 ± 1	50.4 ± 7	56.2 ± 9	0.001*

** p<0.05*

Table 3
Comparison of the averages of the parameters of the body composition of the military sub officers according to the genus.

Variables	Whole Group (n=153)	Gender		P
		Man (n=130)	Women (n=23)	
Age (year)	51.3 ± 4	50.1 ± 2	53.2 ± 4	0.001*
Weight (kg)	78.1 ± 1	75.6 ± 1	81.1 ±2	0.001*
Height (cm)	168.2 ± 2	169.2 ± 2	167.3 ± 7	0.001*
Body Mass Index (kg/m^2)	30.2 ± 6	28.4 ± 9	32.2 ± 1	0.001*
Waist Circumference (cm)	78.1 ± 9	78.2 ± 9	79.1 ± 9	0.001*
Hip Circumference (cm)	82.3 ± 2	81.1 ± 9	84.0 ± 1	0.001*
Waist-to-Hip Ratio (%)	0.9 ± 7	019.4 ± 7	1.00 ± 1	0.001*
Body fat Mass (%)	37.2 ± 1	35.1 ± 4	39.3 ± 1	0.001*
Muscular Mass (%)	16.1 ± 7	14.1 ± 6	19.0 ± 7	0.001*
Water (%)	56.2 ± 3	52.1 ± 7	60.0 ± 1	0.001*

** p<0.05*

Table 4
Comparison of average of the parameters of the body composition of military officers according to the genus.

Variables	Whole group (n=286)	Gender		P
		Man (n=250)	Women (n=36)	
Age (year)	61.3 ± 7	61.4 ± 2	62.2 ± 4	0.001*
Weight (kg)	79.2 ± 4	78.1 ± 7	80.4 ± 1	0.001*
Height (cm)	169.1 ± 3	167.0 ± 1	172.0 ± 4	0.001*
Body Mass Index (kg/m^2)	29.1 ± 3	29.3 ± 14	30.2 ± 0	0.001*
Waist Circumference (cm)	80.1 ± 4	79.2 ± 0	82.2 ± 7	0.001*
Hip Circumference (cm)	84.2 ± 6	80.0 ± 6	89.0 ± 2	0.001*
Waist-to-Hip Ratio (%)	1.00 ± 3	0.9 ± 2	1.2 ± 2	0.001*
Body fat (%)	38.1 ± 4	37.0 ± 6	40.2 ± 0	0.00
Muscular Mass (%)	16.0 ± 1	14.0 ± 4	19.0 ± 2	0.001*
Water (%)	55.1 ± 3	50.4 ± 2	60.1 ± 1	0.001*

** p<0.05*

Results

Excess fat mass increased with age and with military rank; a statistically significant difference between the 20-39 year old category and the 2 other categories was observed (Table 1). Age is a factor influencing the body parameters of military rank categories (Table 1). BMI increased with age and with a statistically significant difference between age categories; said analysis revealed a difference between the ages group of 20-39 years and the 2 other categories of military ranks (Table 1). BMI is an independent factor influencing body composition parameters (Table 2). By classifying women according to BMI and military rank category (Table 3), we see that the BMI was high among female military officers with a statistically significant difference between the 3 groups. A high BMI would result not only from an increase in BMI but also from a decrease in lean body mass and water percentage.

Discussion

Genuine discussion Public health problem, excess fat in military reached the proportions of a global epidemic. It is defined according to the World Health Organization (WHO) as an abnormal or excessive accumulation of body fat that may harm health. It results in increased risk of metabolic diseases (diabetes), cardiac, respiratory and joint. Coise grease is determined by the body mass index

(BMI), calculated according to weight and size, defines standard intervals (normal, overweight, obesity). It can evaluate the risks associated with overweight among military thanks to its correlation with the percentage of fat mass. However, these different parameters allow indicating variations the nutritional state of the Kinois military. In addition, they are influenced by the reduced proportions of lean mass and the percentage of water; this varies according to age, weight and size. The skinny skin and gray mass indices eliminate differences due to size. They are cited in many scientific works done in small samples of healthy or sick subjects (United Nations, 2008).

Conclusion

This study reveals that the majority of Kinshasa soldiers have a low level of physical activity. This low level of physical activity exposes them to develop an exaggerated oily mass allowing them to carry out military spots with any peace. She described the bodily composition of Kinshasa's garrison military using a good body composition of the WHO. Women's participation was low in both groups, 11.3% versus 88.7% (gender report: 8m / 1F). The study focused on 487 military answered questions, consisting of 48 Corporals and soldiers, 153 of the sub-officers and 286 military officers. We suggest that a military physical activity program is to regularly propose them to improve their physical health.

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Conflicts of Interest

The authors declare do not have conflict of interest.

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