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Agreement between measured and estimated body weight and height in hospitalized adults and elderly

Concordância entre peso e altura corporais aferidos e estimados em adultos e idosos hospitalizados

Abstract

Objective: To compare measures of body weight and height measured and estimated by predictive equations in hospitalized adult and elderly patients. ***Methods:*** A cross-sectional study with 100 adults and 100 elderly hospitalized patients. Body height and weight, gender, skin color, waist circumference, calf and arm circumference, half-span, subscapular skinfold and knee height were obtained by a trained professional. Weight and height were estimated using the validated equations. The agreement between the measured and estimated measurements was evaluated through the Intraclass Correlation Coefficient, Paired T-Test, Bland & Altman Concordance and Receiver Operating Characteristic Curve. The level of statistical significance adopted was 5%. ***Results:*** According to the Intraclass Correlation Coefficient, the Chumlea equation showed higher agreement with weight (CCI = 0.95) and height measured in adults (CCI = 0.88). For the elderly, the Rabito equation presented higher agreement for both measures, weight (ICC = 0.92) and height (ICC = 0.80). The body mass index estimated by both equations showed good predictive capacity of overweight. The Bland & Altman method showed important differences between measured and estimated individual level, resulting in both overestimation and underestimation of body weight and height. *Conclusion:* Considering the average individual error, the height estimated by the Chumlea equation, and body weight, estimated by Rabito, were more adequate for adults. As for the elderly, the height estimated by Rabito and body weight, estimated by Chumlea, were more adequate. However, both methods showed low accuracy.

Keywords: Anthropometry. Body weight. Body height. Adult. Elderly. Estimative techniques.

Resumo

Objetivo: Comparar medidas de peso e altura corporais aferidos e estimados por equações preditivas em pacientes adultos e idosos hospitalizados. *Métodos:* Estudo transversal com 100 adultos e 100 idosos hospitalizados. Altura e peso corporais, sexo, cor da pele, circunferência da cintura, da panturrilha e do braço, semienvergadura, dobra cutânea subescapular e altura do joelho foram obtidos por um profissional treinado. Peso e altura foram estimados por meio das equações validadas. A concordância entre as medidas aferidas e estimadas foi avaliada por meio do coeficiente de correlação intraclasse, teste T pareado, Bland & Altman e curva *Receiver Operating Characteristic*. O nível de significância estatística adotado foi de 5%. *Resultados:* Segundo o coeficiente de correlação intraclasse, a equação de Chumlea mostrou melhor concordância com peso (CCI=0,95) e altura aferidos em adultos (CCI=0,88). Para idosos, a fórmula de Rabito apresentou melhor concordância para ambas as medidas, peso (CCI=0,92) e altura (CCI=0,80). O índice de massa corporal estimado por ambas equações mostrou boa capacidade preditiva de excesso de peso. O método Bland & Altman mostrou diferenças importantes entre medida aferida e estimada em nível individual, resultando em superestimação quanto subestimação do peso e da altura corporal. *Conclusão:* Considerando o erro individual médio, a altura estimada pela equação de Chumlea e o peso corporal, estimado por Rabito, foram mais adequados para adultos. Já para os idosos, a altura estimada por Rabito e peso corporal, estimado por Chumlea, se mostraram mais adequados. Porém, ambos os métodos mostraram baixa acurácia.

Palavras-chave: Antropometria. Peso corporal. Altura corporal. Adulto. Idoso. Técnicas de estimativa.

INTRODUCTION

Anthropometry consists of nutritional assessment coupled with clinical, biochemical and dietary assessment, and it measures body dimensions, such as body weight and height, circumferences, and skinfolds. Anthropometric measurements are of low cost, noninvasive, and can be performed by any properly trained health professional.[1]

Anthropometric indices are widely used in clinical nutrition for the screening, diagnosis and / or monitoring of nutritional status. Body mass index (BMI) is one of the most widely used index in clinical practice. Furthermore, it is related to morbidity and mortality rates.[2] Several studies show an association between BMI and mortality, where extremely low or extremely high BMI is associated with high death risk .[3]

In hospitals, weight and BMI are widely used in the screening and evaluation of nutritional status, as well as nutrition prescription. However, in the case of bedridden patients, the measurement of body weight and height is infeasible, thus mostly requires the use of predictive equations.[4] These predictive methods are important for the adequate calculation and prescription of nutritional needs of patients.[5] Weight and height formulas are based on recumbent measurements, being arm circumference (AC), waist circumference (WC) and calf (CC) circumference, subscapular skin fold (SSF), knee height (KH) and half arm span (HAS) 3 the most used in predictive equations.

Most health professionals use weight and height estimation methods validated for the American population, including black and white adults and older adults,[6-8] although there are proposed equations for the Brazilian population.[9] Knowledge on the precision of equations proposed for the American and Brazilian population is essential to test their applicability in clinical practice. Thus, the purpose of this study was to compare weight and height estimated by predictive equations with actual weight and height measured in hospitalized adults and older adults.

METHODS

This study is a cross-sectional observational study conducted in Hospital Geral Público de Palmas (General Public Hospital of Palmas), in the city of Palmas, Tocantins, from January to July 2015. The sample was obtained by non-probabilistic sampling and free demand. It constituted 200 hospitalized patients in the emergency room and surgical clinic, being 100 patients (50 men and 50 women) aged 20 to 59 years, and 100 patients (50 men and 50 women) aged 60 years or older. Inclusion criteria were: patients who ambulate; aged ≥ 20 years, signed Informed Consent Form (ICT). The exclusion criteria were pregnancy, breastfeeding, and presence of physical disability that prevents anthropometric measurements, anasarca, ascites, peripheral edema, amputation or limb paralysis.

Information regarding name, age, sex, skin color, main diagnosis and anthropometric characteristics was collected by a single evaluator, who is properly trained. The anthropometric data included weight, height, WC, SSF, CC, AC, HAS and KH. Weight and height were measured following the standards proposed by Jelliffe.[10] The patients were weighed barefooted and in hospital clothing using a digital scale with a maximum capacity of 150 kg and 100 g division; height was measured against a 2 meter stadiometer. BMI was calculated by the formula: BMI = weight (kg) / height (m)^2. Nutritional status of the adults was classified according to the cut-off points recommended by the World Health Organization (WHO).[11] In relation to older adults, the cut-off points recommended by the Pan American Health Organization (PAHO) were used.[12]

For the analysis of nutritional status, we grouped the data into class I, II and III obesity[11] according to WHO and all the classes were considered obese. In the construction of the Receiver Operating Characteristic (ROC) curve, both overweight and obesity proposed by WHO[11] and OPAS,[12] were evaluated as excess weight.

HAS was considered the distance between the sternal notch and the distal phalanx of the left middle finger. It was measured with a flexible inelastic tape parallel to the collarbone.[13] The measurement of KH was done in a supine position with the left leg forming a 90º angle between the ankle and knee.[14]

The circumferences were measured with flexible inelastic tape (200 cm) according to the techniques proposed by Callaway et al.[15] WC was measured with patient standing erect, facing forward and with arms extended parallel to the body and palms forward. The measurement was obtained at the midpoint between the last rib and the iliac crest, on the right and left side of the body, similar to the methodology of Rabito.[9] AC was measured in the non-dominant arm at the midpoint between the acromion and olecranon. CC was defined as the maximum perimeter of the calf muscle on the left leg forming a 90º angle between the knee and ankle in a sitting position with leg relaxed. SSF was obtained from the mean of three measurements using a Lange Skinfold Caliper scaled from 0 to 60 mm with a 1 mm precision and 10g / mm^2 spring constant pressure, on the right side obliquely to the longitudinal axis of the body, just below the lower angle of the scapula.[16] After obtaining the anthropometric measurements, the estimated weights and heights of the patients were calculated using the formulas of Chumlea et al.[6-8] and Rabito et al.[9] (Figure 1).

Figure 1. Description of the equations for estimating weight and height. Palmas-TO. Brazil. 2015.

Chumlea et al.[10]
Women
[1.27 x CP (cm)] + [0.87 x KH (cm)] + [0.98 x AP (cm)] + [0.4 x Subst (mm)] - 62.35
Male
[0.98 x CP (cm)] + [1.16 x KH (cm)] + [1.73 x AP (cm)] + [0.37 x Subst (mm)] - 81.69
Rabito et al.[11]
[0.5759 x AP (cm)] + [0.5263 x WC (cm)] + [1.2452 x CP (cm)] – [4.8689 x (sex)] - 32.9241
Chumlea et al.[8]
Women
Elderly = [1.83 x KH (cm)] – [0.24 x age (years)] + 84.88
Male
Elderly = [2.02 x KH (cm)] – [0.04 x age (years)] + 64.19
Chumlea et al.[7]
Women
19-59 years (black ethnicity) = 68.1 + [1.86 x KH (cm)] – [0.06 x age (years)]
19-59 years (white ethnicity) = 70.25 + [1.87 x KH (cm)] – [0.06 x age (years)]
Male
19-59 years (black ethnicity) = 73.42 + [1.79 x KH (cm)]
19-59 years (white ethnicity) = 71.85 + [1.88 x KH (cm)]
Rabito et al.[11]
63.525 – (3.237 x (sex*)) – (0.06904 x age (years)) + (1.293 x HAS)
Being: * corresponds to multiplication factors: 1 for male and 2 for female

HAS: half-arm spans; KH: knee height; WC: waist circumference; Subst: subscapular skinfold thickness; CP: calf perimeter; AP: arm perimeter.

The data were entered into an excel spreadsheet and analyzed with the SPSS software for Windows, version 13.0 (SPSS Inc., Chicago, IL, USA). The normality of the continuous variables were tested by the Kolmogorov-Smirnov test. Paired t-test was used to verify differences between the means of the actual and estimated weight, height and BMI. The agreement between the actual and estimated weight and height measurements was verified by intraclass correlation coefficient (ICC). The Bland & Altman test[17] was used to analyze the agreement between the variability of the methods, the magnitude of the differences at the individual level, and whether the weight and height values obtained by the equations overestimated or underestimated the actual measurements. The Receiver Operating Characteristic (ROC) curve was used to calculate the area under the curve (AUC) and evaluate the capacity of the calculated BMI with weight and height estimated by the equations of Chumlea et al.[6-8] and Rabito et al.,[9] in predicting the nutritional status of adults and older adults. The performance of the curves was compared using the Z test. The level of statistical significance was set at α = 5%.

This study was approved, under protocol number 840.788, in 2014, by the Research Ethics Committee of Universidade Luterana do Brasil (Lutheran University of Brazil) (ULBRA) in Palmas, Tocantins, and followed all the norms established in Resolution 466/2012. All participants were informed about the data collection procedures before signing the ICF.

RESULTS

We studied 200 patients, of both sexes, being 100 adults and 100 older adults. The mean age of the adults was 39.6 ± 11.2 years, and of the older adults was 67.3 ± 7.7 years. The mean weight and height estimated by the formula of Rabito et al.,[9] for adult patients were equal to the real values. Also, height estimated by Chumlea et al.,[7] was equal to the real values. However, for older adults, we found that both the mean weight and height estimated differed significantly from the real values (Table 1).

Table 1. Characterization of hospitalized adults and elderly according to age and anthropometry. Palmas-TO. Brazil. 2015 (n = 200).

Variables	Adult (n=100)			Elderly (n=100)		
	Mean (SD)	Minimum	Maximum	Mean (SD)	Minimum	Maximum
Age (years)	39.6 (11.2)	20	58	67.3 (7.7)	60	93
Weight measured (kg)	66.9 (13.2)	47.6	127.6	64.9 (12.3)	37.4	110
Height measured (cm)	164.01 (9.7)	144	190	158.62 (8.6)	139	180
BMI measured (kg/m²)	24.8 (3.8)	18.1	38.1	25.8 (4.4)	14.2	39.2
WC (cm)	88.2 (10.2)	65	118.5	92.9 (11.0)	63	124
SSF (mm)	29.0 (10.9)	10	55	30.4 (12.5)	6	65
CP (cm)	35.1 (3.0)	30	47	34.1 (3.6)	26	46
AP (cm)	29.4 (3.6)	23	44	28.5 (3.7)	16.5	37
HAS (cm)	84.7 (5.3)	73	96	82.2 (5.0)	70	95
KH (cm)	51.1 (3.3)	45	61	49.6 (2.8)	43	59
Height Chumlea (cm)	164.30 (7.9)	148.56	184.65	161.09 (6.1)	147.73	180.05

SD: standard deviation; WC: waist circumference; SSF: subscapular skin fold; CP: calf perimeter; AP: arm perimeter; HAS: half-arm spans; KH: knee height; BMI: Body Mass Index.

(cont.) **Table 1.** Characterization of hospitalized adults and elderly according to age and anthropometry. Palmas-TO. Brazil. 2015 (n = 200).

Variables	Adult (n=100)			Elderly (n=100)		
	Mean (SD)	Minimum	Maximum	Mean (SD)	Minimum	Maximum
Height Rabito (cm)	165.54 (8.2)	148.80	182.20	160.36 (7.5)	143.41	178.49
Weight Chumlea (kg)	70.9 (12.6)	49.9	127.6	67.3 (12.9)	34.8	105.5
Weight Rabito (kg)	66.9 (10.5)	45.8	107.8	67.7 (11.2)	33.6	98.1
BMI Chumlea (kg/m²)	26.2 (3.7)	19.7	39	25.8 (4.5)	13.7	37.2
BMI Rabito (kg/m²)	24.4 (3.6)	16.7	32.8	26.4 (4.6)	14.9	46.2

SD: standard deviation; WC: waist circumference; SSF: subscapular skin fold; CP: calf perimeter; AP: arm perimeter; HAS: half-arm spans; KH: knee height; BMI: Body Mass Index.

Regarding the classification of nutritional status, we observed a discrepancy in nutritional diagnosis as regards the actual and estimated weight and height values obtained by the two formulas studied, especially in the underweight range. BMI calculated using the estimated weight and height by the formula of Chumlea et al.[6,7] did not detect any underweight adult patients. On the other hand, the estimates obtained from the equations of Rabito et al.[9] overestimated the real frequency of underweight (4%). For older adults, the estimates of Rabito et al.[9] presented an inverse behavior, underestimating the frequency of underweight, which was 22%, while the BMI estimated by the equations of Chumlea et al. was equal to that actually observed (25%), according to table 2.

Table 2. Absolute frequency of hospitalized adults and elderly according to the actual nutritional status and estimated by Chumlea et al. and by Rabito et al. (n = 200). Palmas-TO. Brazil. 2015.

Nutritional Status	Adult (n=100)			Elderly (n=100)		
	Actual	Chumlea[7,10]	Rabito[11]	Actual	Chumlea[7,10]	Rabito[11]
Underweight	1	0	4	25	25	22
Eutrophic	54	40	47	45	41	40
Overweight	39	44	43	14	14	15
Obesity	6	16	6	16	20	23

The analysis of the ICC showed that the estimated weight, height and BMI were in good agreement with the measured values for both adults and elderly. For adult patients, the equation of Chumlea et al.[6] (ICC: 0.95, 95% CI: 0.93-0.97) showed the best agreement between the real and estimated weight. For older adults, the best agreement was found for Rabito et al.[9]

(ICC: 0.92, 95% CI: 0.89-0.95). As regards estimated height, the equation of Chumlea et al.[7] showed a better agreement with actual height for adults (ICC: 0.88, 95% CI: 0.83-0.92) while Rabito et al.[9] was better for older adults (ICC: 0.80, 95% CI: 0.71-0.86), as shown in Table 3.

Table 3. Intraclass correlation coefficient between actual weight and height and BMI estimated by Chumlea et al. and by Rabito et al. for hospitalized adults and elderly (n = 200). Palmas-TO. Brazil. 2015.

Group	Anthropometric measurements	Actual	Chumlea[7,8,10]	ICC [(a)] (CI95%)	Rabito[11]	ICC [(b)] (CI95%)
Adult	Weight (kg)	66.9	70.9	0.95 (0.93-0.97)	66.9	0.90 (0.86-0.93)
	Height (m)	1.64	1.64	0.88 (0.83-0.92)	1.65	0.85 (0.78-0.89)
	BMI (kg/m^2)	24.8	26.2	0.92 (0.88-0.94)	24.4	0.90 (0.86-0.93)
Elderly	Weight (kg)	64.9	67.3	0.92 (0.89-0.94)	67.7	0.92 (0.89-0.95)
	Height (m)	1.58	1.61	0.78 (0.69-0.85)	1.60	0.80 (0.71-0.86)
	BMI (kg/m^2)	25.8	25.8	0.90 (0.86-0.93)	26.4	0.92 (0.89-0.95)

[(a)] Correlation of the anthropometric measures measured and estimated by Chumlea et al. [(b)] Correlation of the anthropometric measures measured and estimated by Rabito et al.

In the present study, we assessed the capacity of predicting measured excess weight through estimated BMI, given the low frequency of underweight in the studied sample. This fact was already expected due to the profile of patients admitted to the emergency room and surgical clinic; in general, the clinical conditions of the patients have small to no effect on nutritional status.

The predictive capacity of estimated BMI for the diagnosis of excess weight was good, with significant AUC for both adults and older adults, regardless of the formula used. In adult patients, Chumlea et al.[6,7] (AUC: 0.868, 95% CI: 0.800-0.936) presented the highest absolute AUC while Rabito et al.[9] presented the highest AUC among older adults (AUC: 0.958, 95% CI: 0.924-0.993). There was, however, no significant difference between AUC obtained for adults and older adults (table 4).

Table 4. Area under the ROC curve and 95% confidence interval for overweight of adult and elderly patients estimated by Chumlea et al. and by Rabito et al. (n = 200). Palmas-TO. Brazil. 2015.

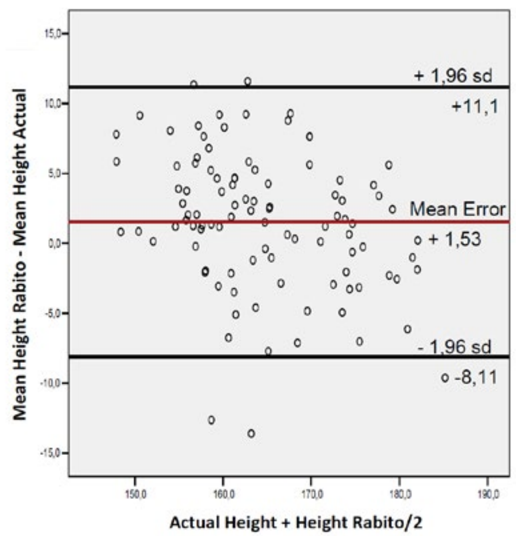
Group	Equations	Area under the curve	95%CI	p value[1]
Adult	Chumlea	0.868	0.800 – 0.936	0.3572
	Rabito	0.849	0.776 – 0.921	
Elderly	Chumlea	0.930	0.881 – 0.979	0.3251
	Rabito	0.958	0.924 – 0.993	

[1] Z Test

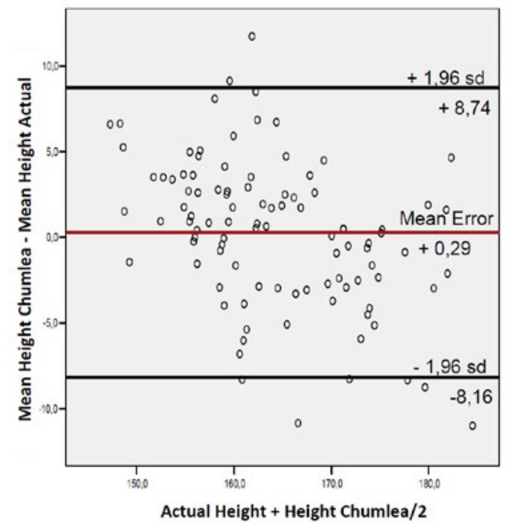
The comparison of Figures 2a and 2b using the Bland & Altman,[17] method showed that for the hospitalized adults, individual estimated height can be well below or above the actual height, interfering in the classification of nutritional status according to BMI. The difference between the means of the actual and estimated heights was statistically significant only for height estimated by Rabito et al.[9] (p = 0.002). For body weight estimated by the formula of Chumlea et al.[6] (fig.2d), the individual differences were mostly concentrated above zero, clearly showing an overestimation of body weight, and statistically significant (p <0.001) difference between the means of the real and estimated values.

Among the older adults group, the paired t-test showed statistically significant differences between the real and estimated mean weight (p = 0.000) and height (p = 0.000) for both formulas. From the graphical analysis of Bland & Altman,[17] it was observed that the individual differences between the actual and estimated weight and height values for older adults group were very low. Both the height values obtained by the formula of Chumlea et al.[6] (fig.2f) and body weight obtained by the formula of Rabito et al.[9] (fig.2g) resulted in an important overestimation of the actual values.

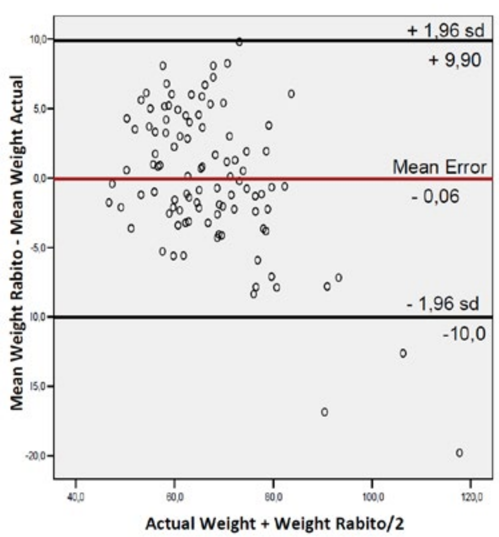
Figure 2. Analysis by Bland & Altman of actual and estimated weight and height by Chumlea et al. and Rabito et al. of adult (n = 100) and elderly (n = 100) hospitalized patients. Palmas-TO. Brazil. 2015.



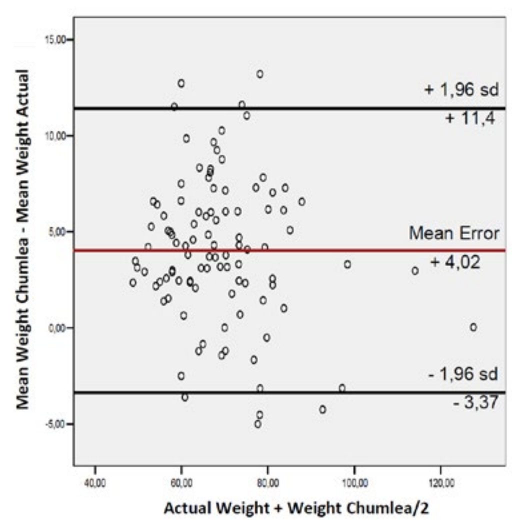
a) Actual Height x Rabito et al. (adult)



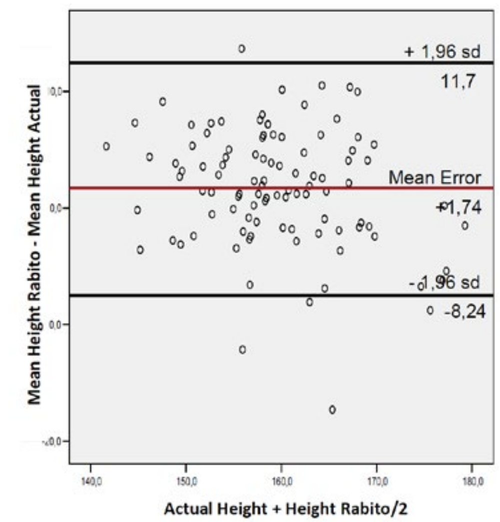
b) Actual Height x Chumlea et al. (adult)



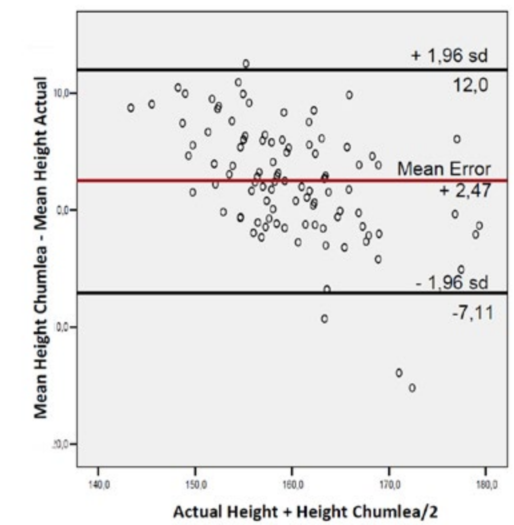
c) Actual Weight x Rabito et al. (adult)



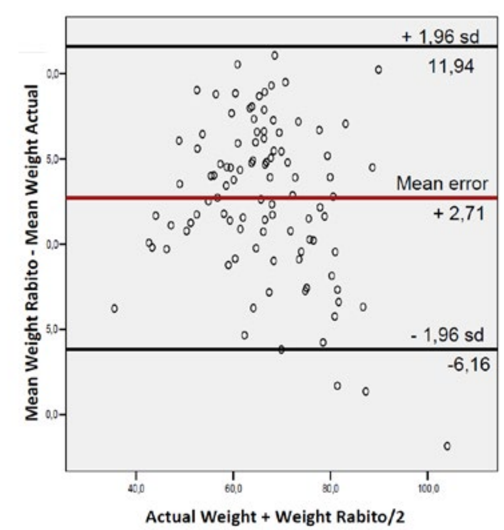
d) Actual Weight x Chumlea et al. (adult)



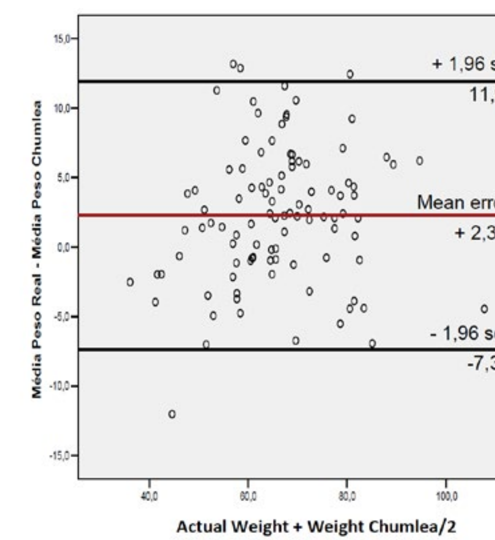
e) Height actual x Rabito et al. (elderly)



f) Height actual x Chumlea et al. (elderly)



g) Weight actual x Rabito et al. (elderly)



h) Weight actual x Chumlea et al. (elderly)

DISCUSSION

In the hospital, outpatient and home setting, equations for the estimation of weight and height of bedridden patients are frequently used for screening and nutritional assessment. Malnutrition is the most investigated alteration in nutritional status since it can affect clinical progression, prolong hospital stay and increase hospital costs,[18] especially in older adults, who are generally more inept, fragile and have a greater burden of morbidities.[2]

The verification of body weight is a routine procedure during hospitalization, not only for assessing the nutritional risk of patients, but also serves as a guide in procedures dependent on body weight such as dosage of medication, water balance, flow and dialysis time and nutritional needs.[19] Erroneous estimates of body weight may contribute to wrong diagnosis and therapeutic management, and may underestimate or overestimate the needs of patients.[20]

In the present study, the ICC test showed a good correlation between actual body weight and weight estimated by Chumlea et al.[6] and Rabito et al.[9] for adult and older adult patients. Other studies[4,5] in hospitalized adults and older adults reported a good correlation between actual and estimated body weight by the equation of Chumlea et al.,[6] however, they did not use the equation of Rabito et al.[9] In contrast, studies that evaluated body weight estimated by the equation of Chumlea et al.[6] and Rabito et al.[9] for adults and older adults showed that the values did not differ significantly from the real values[20] and the difference between both formulas was significant when compared with actual weight.[2]

It should be noted that most studies make comparisons considering mean estimates without considering the possible problems when the magnitude of the individual differences is high. The Bland & Altman analysis,[17] used in this study demonstrates individual estimates with very important errors resulting in both overestimation and underestimation of actual body weight values. In terms of nutritional behavior, for example, these estimation errors have a significant impact on the calculation of energy and protein requirements, which may result in hypo- or hyperalimentation of patients, which can be severe for those with hemodynamic and respiratory instability.[21]

From the Bland & Altman analysis[17] considering the individuality of the adult patients, we found that the formula of Chumlea et al.[6] presents a very clear error of overestimation of body weight, contrary to the results found by Yugue et al.,[22] which were underestimated possibly due to the different methodology used for the data analysis.

Regarding body height in this study, for both adult and older adult patients, height estimates based on the formulas of Chumlea et al.[7,8] and Rabito et al.[9] did not present a significant difference in terms of mean real body height. Other studies also did not obtain signifi-

cant differences when comparing the actual value with that estimated by Chumlea et al.[7] for adults[3,20,23] and Rabito et al.,[9] for older adults.[2]

Closs et al.[24] obtained reliable results using the Bland & Altman analysis,[17] as regards the formula of Chumlea et al.[8] for the estimation of body height of older adults, contrary to our study, which found a better result for the formula of Rabito et al.,[9] using Bland & Altman analysis, due to the fact that the cited study used a population of different ethnicity.

Incorrect values of estimated height may contribute to errors in nutritional diagnosis. Screening or evaluation of nutritional status based on BMI methods can underestimate or overestimate actual BMI, resulting in ambiguous clinical diagnosis,[20] which has clinical impacts since patients with real nutritional risk are not identified.

In the study of Santos et al.,[20] the formulas of Chumlea et al.[6,7] and Rabito et al.[9] underestimated the actual proportion of overweight adult patients, and only Chumlea et al.[6,7] overestimated underweight, unlike the results obtained in the present study. This discrepancy can be explained by the pathologies in the mentioned study, which, due to their severity, significantly interfered in nutritional status.

It is important to take into account the difficulties in conducting the recumbent measures required for each formula, such as the estimation of body weight by the Chumlea et al.[6] formula which requires the availability of an adipometer and training of the professional to measure SSF. In contrast, the body weight estimation formula of Rabito et al.[9] is easier to apply because it uses anthropometric parameters attainable with a tape measure, such as AC, WC and CC. The limitations associated with the measurement of WC include difficulties in the case of excess central adiposity. Also, WC measurements are not recommended for patients with ascites or edema, complicating the use of the formula.[20]

The nutritional status of hospitalized patients interferes directly in their clinical progression, requiring reliable nutritional evaluation. In a hospital environment, the prevalence of malnutrition varies between 20 and 60%, and is therefore a risk factor for poor clinical prognosis since it impairs immunity, interfering with susceptibility to infections, wound healing and inflammatory response.[25]

Considering that hospital malnutrition is a problem of great magnitude with direct and positive relation with mortality, it is essential that professionals choose estimation formulas with greater sensitivity for the diagnosis of nutritional risk or underweight, reducing the number of false-negative patients and neglected patients. On the other hand, the use of methods that overestimate underweight or malnutrition can result in energy overload and losses, especially for patients with hyperglycemia, hepatic steatosis, cardiac arrhythmias, edema, respiratory failure and hemolysis.[3] Thus, the professional must exercise good judgement and complement anthropometric evaluations with other methods to obtain a more reliable nutritional diagnosis, adopting a greater caution for patients in critical conditions.

CONCLUSION

The estimates from the Rabito and Chumlea equations are in good agreement with the actual body weight and height measurements. Based on mean individual error, the estimation of height and weight of adults using the Chumlea and Rabito equations, respectively, was more adequate. On the contrary, the estimation of height and body weight of older adults by Rabito and Chumlea, respectively was the most adequate.

Although there were no significant discrepancies between the mean global estimates and actual measures, it is emphasized that both the Chumlea and Rabito equations resulted in individual estimates of body weight and height with many errors, both in adults and older adults, which should be considered during their application in clinical practice. Therefore, nutritional professionals should also be alerted of other parameters when using the estimation formulas, such as biochemical tests and clinical signs that patients present during hospitalization.

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Contributors

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