ABSTRACT

Background: Stunted adults have higher risk for chronic diseases, but scarce information on its prevalence exists in Guatemala.

Objective: Our aim was to assess prevalence of stunting estimations using total vs. height adjusted with knee height (KH) in older (>60 y) Guatemalan adults. We also aimed at estimating body mass index (BMI, kg/m2) with both sets of height estimators.

Methods: We recruited 52 men and 72 women from Quetzaltenango City, Guatemala. We measured their total (TH) and KH in cm and weight in kg. T-tests and correlation models were tested to assess differences in stunting prevalence using TH or KH, plus BMI (kg/m2) estimates using either TH or KH. Adult stunting was defined as height below 150 cm and 145 cm in men and women, respectively.

Results: KH (cm) for men and women (M/W) were 48.7+2.3/44.4+2.1, p<0.001, and TH adjusted by KH were 157.4+4.3 / 144.4+4.2, p<0.001, as compared to measured TH of 156.3+6.6 /144.0+6.4, p<0.001. Weights (kg) were 58.7±10.7 /55.2±13.2, p>0.05. BMI (kg/m2) with TH as compared to the KH adjusted, were 23.8 vs. 23.5 for men and 26.4 vs. 26.3, with p>0.05 in both cases. Correlation coefficients for TH and KH were 0.90, p<0.01, and for BMI-TH vs. BMI-KH resulted in 0.96, p<0.001. Stunting prevalence was 52.8% for women and 13.7% for men. Stunted vs. non-stunted women, had a significantly higher torso:leg ratio, an indication of short legs. This was not replicated with men.

Conclusions: Estimates of stature and BMI with TH or KH were not significantly different. Women, as compared to men, had higher rates of stunting, and probably relatively shorter legs to their trunks. Average BMI in women was above normal. These findings are relevant and require correction at earlier life stages, as adult stunting and obesity are linked to adversities in survival, adult-health, learning- capacity and physical productivity.

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Older Adult Stunting in Guatemala, Assessed with Total vs. Knee Height Adjusted Stature

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INTRODUCTION

Stunted adults have higher risk for chronic diseases, but scarce information on its prevalence exists in Guatemala.

Nutritional and environmental factors, among others, contribute to growth of an individual. Early life affects leg growth more than trunk growth. Leg length has been shown to be a marker of the quality of early living conditions and good living conditions lead to relatively longer legs.

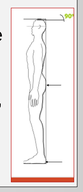
Survey evidence shows that a large proportion of the Guatemalan child population is stunted. However, few studies had examined the prevalence of stunting in adults and its implications in health and well-being. Estimations of adult stunting with measures of total height could lead to inaccurate estimations due to senescent changes in inter-vertebral space and curvature in the aging trunk.

Therefore, as alternative to estimate total height, body segment proportions such as armspan and knee height have been used to correct total height. In this study; we focused on measuring total and knee-height in a sample of Guatemalan adults. We then corrected total height with the measurements of knee height and examined the differences in prevalence of stunting with those two estimations. estimations.

OBJECTIVES

Our aim was to assess prevalence of stunting estimations using total vs. height adjusted with knee height (KH) in older (>60 y) Guatemalan adults.

We also aimed at estimating body mass index (BMI, kg/m2) with both sets of height estimators.



METHODS

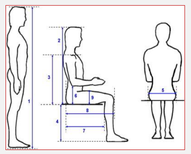
Study Sample:
52 men and 72 women (t=124) from Quetzaltenango City, were recruited for the study.
50 men and 64 women completed all measurements

Anthropometric Measures:
- Total Height, TH (cm)
- Knee Height, KH (cm) -- thigh/leg and leg/foot at 90º
- Weight (kg)

Anthropometric Estimates
- Body mass index – BMI= kg/m^2
- Estimated total height using knee height, with thigh/leg and leg/foot at 90^0

Equations for TH_e from KH (Ref= Bermudez 1999)
Males = 69.11+(1.86*knee height cm)-(0.03*age)
Females= 72.08+(1.84*knee height cm)-(0.131*age)

Adult stunting defined as:
Women: <145cm
Men: <150 cm



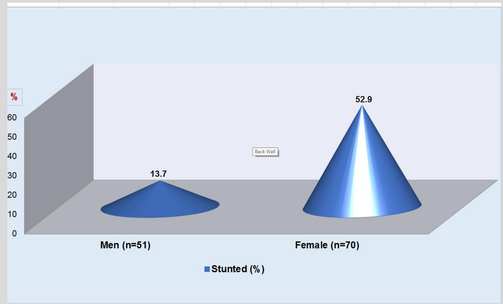
Analysis:
T-tests and correlation models to assess differences in:
- Stunting prevalence using TH or TH_e
- BMI (kg/m2) estimates using either TH or TH_e

RESULTS

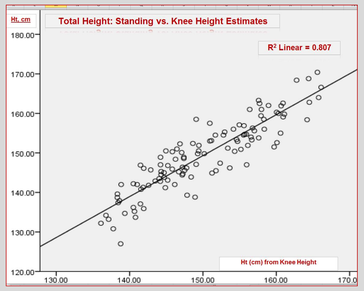
DEMOGRAPHICS

Measurements	Males (N=50) Mean ± SD	Females (N=64) Mean ± SD	p-value
Total Height (cm)	156.33 ± 6.55	143.99 ± 6.43	<0.001
Weight (kg)	58.37 ± 10.72	55.17 ± 13.15	0.165
Knee Height, (cm)	48.70 ± 2.30	44.40 ± 2.10	<0.001
Total Height from Knee Height (cm)	157.37 ± 4.33	144.40 ± 4.20	<0.001
BMI from Total Height (kg/m2)	23.79 ± 3.51	26.43 ± 5.01	<0.005
BMI from Knee Height (kg/m2)	23.48 ± 3.66	26.29 ± 5.24	<0.005

PREVALENCE OF STUNTING



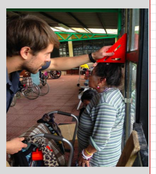
Association between Standing Height and Total Height estimated with Knee Height

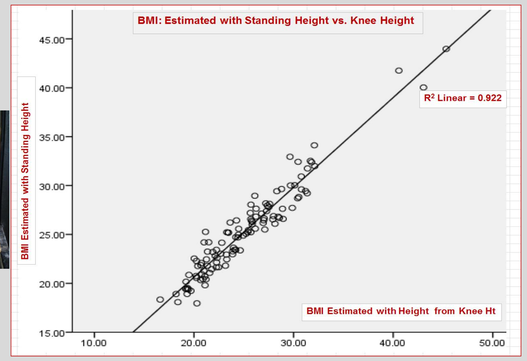


Correlations

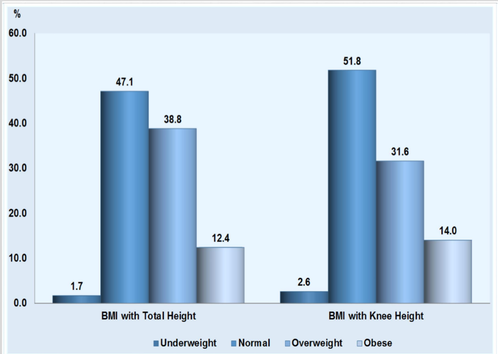
	Correlation Coeficient	p-value
Height to Knee-Height	0.898	p<0.001
BMI Height to BMI Knee-Height	0.960	p<0.001

Association between BMI Calculated with Total Height vs. Height estimated with Knee Height

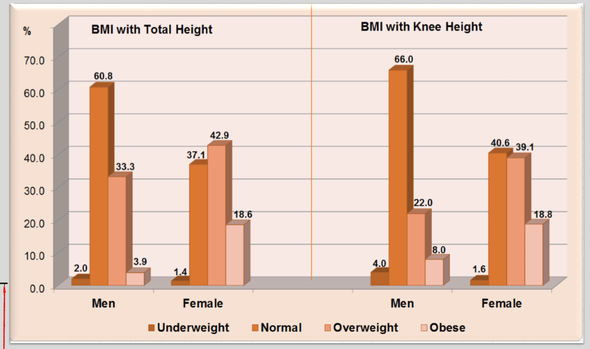




BMI Categories estimated with standing height vs. knee height estimates



BMI Categories, by Sex, estimated with standing height vs. knee height estimates



CONCLUSIONS

DISCUSSION

- Estimates of stature with standing height and from knee height estimates were not significantly different.
- Women, as compared to men, had higher rates of stunting, and probably relatively shorter legs to their trunks.
- BMI from standing height and from knee height estimates were all significantly correlated with each other
- Average BMI in women was above normal.
- These findings are relevant and require correction at earlier life stages, as adult stunting and obesity are linked to adversities in survival, adult-health, learning-capacity and physical productivity.
- Stunted adults have higher risk for chronic diseases, but scarce information on its prevalence exists for Guatemala

FINAL COMMENTS

•The degree of height loss found in our study would account for an **artificial increase in BMI** of approximately 0.7 kg/m2 for men and 1.6 kg/m2 for women by age 70 years, which increases to 1.4 and 2.6 kg/m2, respectively, by age 80 years.

•True height loss with aging must be taken into account when height (or indexes based on height) is used in epidemiological or clinical studies.

•In poorer, less nourished populations where manual labor is very common with heavy weight-bearing, one might hypothesize resistance to a decrease in height and therefore less overestimation of BMI.

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