Anthropometric Parameters for Height Estimation in Egyptian Elderly Females

Thesis

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List of Abbreviations

ADRs	Adverse drug reactions
AF	Atrial fibrillation
AS	Arm span
BMD	Bone mineral density
BMI	Body mass index
CHI	Creatinine height index
CKD	Chronic kidney disease
CVS	Cerebrovascular stroke
DLCO	Diffusion capacity of the lung for Carbon Monoxide
DM	Diabetes mellitus
DS	Demi-span
EULAR	The European league against rheumatism
FEV1	Forced expiratory volume in 1 second
FL	Fibular length
FVC	Forced vital capacity
GFR	Glomerular filtration rate
HDL	High-density lipoprotein
HSE	The Health Survey for England
HTN	Hypertension
ICU	Intensive care unit
ISHD	Ischemic heart disease
KH	Knee height
LDL	Low-density lipoprotein
MAC	Mid-arm circumference
MNA	Mini nutritional assessment
MUST	The Malnutrition Universal Screening Tool
OA	Osteoarthritis
OP	Osteoporosis
P Cr	Plasma creatinine
REE	Resting energy expenditure
RI	Renal impairment

RV	Residual volume
SHeS	The Scottish Health Survey
TLC	Total lung capacity
UL	Ulnar length
WHO	World health organization

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Introduction

Population ageing is taking place in nearly all the countries of the world. Ageing results from decreasing mortality, and, most importantly, declining fertility. This process leads to a relative reduction in the proportion of children and to an increase in the share of people in the main working ages and of older persons in the population ***(Chawla and Amonthep, 2008)***.

Globally, the number of older persons (aged 60 years or over) is expected to more than double, from 841 million people in 2013 to more than 2 billion in 2050. Older persons are projected to exceed the number of children for the first time in 2047***(WHO, 2013)***.

As elderly population increases in size, the focus should be given for research on geriatric nutritional status and methods of assessment. Anthropometry is an essential tool in geriatric nutritional assessment used to evaluate underweight and obesity conditions, which are both important risk factors for severe diseases and disability among the elderly ***(Jensen & Rogers, 1998; Visser et al., 1998).***

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue ***(Ulajaszek, 1994; Ulajaszek & Kerr, 1999).***

It is often heavily relied on to determine nutritional status of older adults as it is considered to be the most portable,

inexpensive, simple and least invasive technique used to assess nutritional status ***(Dey et al, 1999; Kuczmarski et al, 2000; Shils et al, 2006).***

Height, one of the anthropometric measurements, is indeed a very important indicator of body size for use in the clinical setting and also for nutrition and health research. It is an important determinant of several clinical parameters related to patient care, most of which rely on accurate recording of body weight and height ***(Shahar & Pooy, 2003).***

Together with body weight, height is used in calculation of body mass index (BMI) in nutritional assessment , creatinine height index which shows protein nutrition , resting energy expenditure from the Harris-Benedict's equation, basal metabolic rate ***(McPherson et al; 1978)***, estimation of nutrient requirements and calculation of body composition such as fat free mass ***(Kyle et al., 2004)***.

Height is also necessary for calculation of body surface area for drug dosage adjustment ***(Sawyer & Ratain, 2001)*** and estimation of renal clearance ***(Peters et al, 2000)***.

Height is used in predicting lung volumes, which are used in pulmonary function tests, such as forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), residual volume (RV), total lung capacity (TLC) and diffusion capacity of the lung for Carbon Monoxide (DLCO) ***(Singh et al, 1993)***.

However, there are difficulties in obtaining an accurate measurement of height in elderly subjects. Ageing is associated with several physiological, psychological and biological changes, including body composition, such as an increase in body fat and a decrease in lean body mass and also bone mass ***(Kuchmarski, 1989)***

This can lead to changes in body posture and thinning of vertebrae and discs which can contribute to a reduction in height ***(Prothro & Rosenbloom, 1993)*** or even kyphosis in elderly people with osteoporosis ***(Roubenoff & Wilson, 1993).***

Standing height is also rather difficult to measure in elderly subjects due to several conditions such as infectious diseases, arthritis, paralysis and amputation ***(Cockram & Baumgartner, 1990; Bermudez et al, 1999)***.

It is also difficult to measure height in bed-bound elderly persons. Even in adult subjects with the above conditions, measuring height is impossible ***(Muncie et al, 1987).***

Therefore height measurements in some older people can be impossible or inaccurate and may not necessarily reflect their maximum attained height.

So measurements of other body segments such as knee height, arm span, demi-span and ulnar length have been proposed as alternative methods for predicting height in elderly people because the length of long bones is less affected by ageing ***(Mitchell & Lipschitz, 1982)***.

Efforts have been carried out to develop equations to estimate stature from long bones, such as knee height ***(Chumlea et al, 1985; Chumlea and Guo, 1992; Roubenoff et al, 1993; Chumlea et al, 1998),*** arm span ***(Cockram and Baumgartner, 1990; Reeves et al, 1996; Aggarwal et al, 1999; Brown et al, 2000)*** and demi span ***(Bassey, 1986)***.

However, many Studies have shown that all these anthropometric parameters are being influenced by many genetic, environmental and biological factors ***(Food and Nutrition Research Institute – Philippines 1998; Mohanty et al, 2001; Nunez et al, 2002).***

So the accuracy of the equations is reduced if used to estimate stature in populations in which the equation has not been derived from ***(Cockram & Baumgartner, 1990)***. For example, a systematic error occurred when the equation developed for Caucasians ***(Chumlea et al, 1985)*** was used to estimate stature in Japanese Americans ***(Myers et al, 1994).***

Aim of the Study

The aim of this study is to assess the most accurate method for estimation of height in Egyptian elderly females from the 3 anthropometric parameters; demi-span, ulnar length and knee height, and to use it to develop sex-specific equation for height estimation among Egyptian elderly females.

Height as an Anthropometric Parameter

Older adults are the fastest growing segment of the world's population and they are quite heterogeneous **(Gibson, 2005)**. As we age, there are many biological changes in body composition, although rate and consequences of changes vary greatly ***(Kuczmarski et al, 2000)***.

Because of these changes, older adults have an increased susceptibility to several chronic diseases that may be prevented or delayed through the provision of nutrition interventions ***(Pirlich & Lochs, 2001).***

However, appropriate interventions are dependent on comprehensive assessment of nutritional status which includes diet, biochemical, clinical and anthropometric information.

Nutritional status is difficult to measure in any population, but is especially difficult in older adults because dietary recalls may be inaccurate due to cognitive impairment, biochemical lab values may be skewed due to the presence of chronic disease states and clinical symptoms may be difficult to detect due to normal aging processes ***(Pirlich & Lochs, 2001).***

Thus, anthropometry is often heavily relied on to determine nutritional status of older adults as it is considered to be the most portable, inexpensive, simple and least invasive technique used to assess nutritional status ***(Dey et al, 1999; Kuczmarski et al, 2000; Shils et al, 2006).***

The purpose of nutritional anthropometry is to estimate or predict body composition (with a focus on the major nutritionally relevant components of body weight) based on weight, stature, body circumference and subcutaneous fat thickness measurements ***(Pirlich & Lochs, 2001; Menezes & Marrcui, 2005).***

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. The word "anthropometry" is derived from the Greek word "anthropo" meaning "human" and the Greek word "metron" meaning "measure" ***(Ulajaszek, 1994; Ulajaszek & Kerr, 1999).***

Main advantages of these measurements include: the ability to reflect past, present and future events or processes, to predict functional impairment, morbidity and mortality and sensitivity to the aging process ***(Kuczmarski et al, 2001; Chernoff, 2003; Gibson, 2005).***

Due to age associated changes in physical function and body composition, collecting, interpreting and using anthropometric data from the elderly population are very different from that of younger adults, that's why techniques, estimation equations and standards for interpretation need to be specific to this group ***(Kuczmarski et al, 2000).***

Anthropometry is an essential tool in geriatric nutritional assessment used to evaluate underweight and obesity conditions, which are both important risk factors for severe diseases and disability among the elderly ***(Jensen & Rogers, 1998; Visser et al., 1998).***