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ASSESSMENT OF NUTRITIONAL ANTHROPOMETRY OF POST-MENOPAUSAL WOMEN

Shamshad Begum S[1]*, Mushtari Begum J[2] and Muniswamappa M V[3]

*Corresponding Author: Shamshad Begum S, ✉ drshamshaduas@gmail.com

Menopause is the period, at which women stop ovulating. Most of the women experience this around the age of fifty and usually lasts upto fifty five years. Anthropometry is used to assess compromised health or nutrition well being. Anthropometric data from a single assessment provide a snapshot of current nutrition status within a community, and helps to identify groups at risk in terms of morbidity and mortality. In the present study, the association between anthropometric indices and different age groups of all the subjects indicated that the anthropometric measurements like weight mid-arm circumference, fat fold thickness, waist circumference and hip circumference were positively correlated with Brokas Index and only fat fold thickness was positively correlated with waist hip ratio. Similarly anthropometric measurements like height, weight, mid-arm circumference, waist circumference and hip circumference were negatively correlated with waist hip ratio of the subject. The correlation coefficient between anthropometric measurements with nutrient intake indicated weight, fatfold thickness and hip circumference were positively correlated with nutrients like fat. Hence, Nutritional anthropometry is relatively easy technique to determine the nutritional status of the individuals thereby providing a means for women to manage their existing problems like obesity by following good dietary pattern and lifestyle.

INTRODUCTION

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. Measures of subcutaneous adipose tissue are important because individuals with large values are reported to be at increased risks for hypertension, adult-onset diabetes mellitus, cardiovascular disease, gallstones, arthritis, and other disease, and forms of cancer. Combined with the dietary and related questionnaire data, and the biochemical determinations, anthropometry is essential and critical information needed to assist in describing the data collected from persons in the sample (Anonymous, 1988). Measurements of weight, height (or length) and, less frequently, subcutaneous fat and muscle, are the usual data collected. Nutritional anthropometry is relatively easy technique to employ as it is non-invasive in nature.

At the individual level, anthropometry is used to assess compromised health or nutrition well being, need for special services, or response to an intervention. A one-time assessment is used during emergency situations to screen for individuals requiring immediate intervention. Under nonemergency conditions, single assessments are used to screen for entry into health or nutrition intervention

[1]   Assistant Professor, Bakery and Value Addition Centre, UAS, Hebbal, Bangalore 560024, India.

[2]   Former Professor and Head, Division of Home Science, UAS, Hebbal, Bangalore 560024, India.

[3]   Associate Profesor (Statistics), Agricultural College, Hassan 573201.

programs either as an individual or as a marker for a household or community at risk.

At the population level, anthropometric data from a single assessment provide a snapshot of current nutrition status within a community, and should help to identify groups at risk of poor functional outcomes in terms of morbidity and mortality (Gorstein, *et al*., 1994). Under emergency conditions, these static measurements are used to identify priority areas for assistance. The advantages of anthropometry indicate-Anthropometric measurements to be non-invasive and relatively economical to obtain; objective; and comprehensible to communities at large. Data produced that can be graded numerically, used to compile international reference standards, and compared across populations. They can also supply information on malnutrition to families and health care workers prior to the onset of severe growth failure (or excessive weight gain).

Menopause is the stage at which women stop ovulating and it each women differently. However, most of the women experience this around the age of fifty and usually lasts upto fifty five years. The major endocrinal changes occur in women between 45 to 50 years of age with a decline in the ovarian function resulting in lower estrogen production responsible for menopausal changes. The acute symptoms experienced during menopause include dizziness, headache, difficulty in breathing and heart palpitations, vasomotor disturbances, perspiration, nightsweats, irregular bleeding , hot flushes, vaginal thinning and dryness, mood changes, changes in sexuality and insomnia. Further, the chronic changes that occur includes vascular diseases and skeletal osteoporosis. In addition, orthopaedic ailments like chronic back pain, stiffness and osteoporosis are commonly observed. Hence, the study was designed on nutritional and clinical evaluation of post-menopausal women with orthopaedic ailments with the sub objective of evaluation of nutritional Anthropometry of women.

MATERIAL AND METHODS

Locale of the study

The study was conducted at Bangalore district, Karnataka state, India. The subjects included for the study were from both rural and urban background.

Anthropometry

The Anthropometric measurements taken were height, weight, mid-arm circumference, waist circumference, hip circumference and fatfold thickness at triceps as per the guidelines specified by Jelliffe (1966).The anthropometric indices like body mass Index, waist hip ratio and arm muscle circumference were calculated from the above measurements. The cut off levels of the Body Mass Index as per Anonymous (2003) were used to classify subjects as malnourished, normal and obese.

Statistical Analysis

The data was classified, tabulated using SPSS office package windows 2003, expressed as percentage, mean. The results were analysed statistically using Correlation test to determine whether there was any correlation between the parameters (Kothari, 2004).

RESULTS AND DISCUSSION

Anthropometric Measurements

The mean anthropometric measurements are presented in Table 1. The mean height and weight of the subjects was found to be 152 cms and 58 Kg respectively which was more than the average weight of a reference women. The mean waist and hip circumference of the subjects was 82.7 and 98.9 cms respectively.

Table 2 indicated the anthropometric measurements of the menopausal women at different age groups. The mean height was highest among the subjects in the age group of 51-55 years with 154.8 cms followed by 56-60 years age group with 153.7 cms and lowest being in subjects belonging to 60-65 years with 146.8 cms. However, there was no significant difference in mean height between the age groups.

The mean weight was highest among the subjects from the age group of 51-55 years with mean weight of 61.2 kgs followed by 56-60 years age group with 59.5 kgs. Lowest being in subjects belonging to 60-65 years with 53.8 kgs. However, there was significant difference in the mean weight between the age groups. On an average, irrespective of the age, the weight was higher than the reference weight for indian adult female.

The mean Mid Upper Arm Circumference (MUAC) was highest of 30.45cms in the age group of 51-55 years and lowest of 28.79 cms among subjects of 46-50 years of age group. However, the standards for adult females (Jelliffe, 1966) being 28.5 cms that was lesser than the values of the present study. Statistically, there was no significant difference in mid upper-arm circumference between different

Table 1: Mean Anthropometric Measurements of the Subjects (n = 200)

Anthropometric Measurements	Mean ± SD	Z- Score
Height (cms)	152.0 ± 8.2	1.76
Weight (Kgs)	57.9 ± 10.0	0.39
Mid-upper arm circumference (cms)	29.4 ± 2.9	-1.04
Fat fold thickness at Triceps (mm)	29.2 ± 7.7	-1.04
Waist circumference (cms)	82.7 ± 8.9	0.17
Hip circumference (cms)	98.9 ± 10.0	0.54

Table 2: Anthropometric Measurements of Menopausal Women at Different Age Groups

Parameters	46-50 yrs (n = 60)	51-55 yrs (n = 56)	56-60 yrs (n = 54)	60-65 yrs (n = 30)	F-test
Height (cms)	150.53 (±8.57)	154.86 (±7.29)	153.73 (±5.71)	146.8 (±9.70)	8.69[*]
Weight (kgs)	55.58 (±8.85)	61.17 (±7.72)	59.49 (±12.51)	53.87 (±8.90)	5.47[*]
Mid-arm circumference (cms)	28.79 (±2.8)	30.45 (±2.8)	28.99 (±3.10)	29.4 (±2.64)	3.77[*]
Fat Fold thickness (mm)	27.95 (±7.68)	30.52 (±6.98)	29.56 (±8.06)	28.7 (±8.38)	0.94[NS]
Waist circumference (cms)	81.73 (±9.61)	81.63 (±7.97)	85.5 (±7.20)	81.61 (±10.87)	2.50*
Hip circumference (cms)	98.28 (±9.45)	101.27 (±6.70)	100.62 (±9.97)	92.95 (±13.57)	5.55*

Note: ** Significant at 1% level. NS - Non-significant. Within the parenthesis standard deviation values are indicated.

age groups. The Mean fat fold at triceps was found to be highest among 51-55 years of age, the value being 30.52 mm while lowest of 27.9 mm was among subjects in the age group of 46-50 years. However, there was no significant difference in fat fold at triceps between the age groups. The mean waist circumference was highest in subjects of 56-60 years age group with 85.5 cms lowest of 81.61 cms among 60-65 years age group. The mean hip circumference was 101.27 cms in the age group of 51-55 years which was highest among all age groups. However, the lowest was found to be in the age group 60-65 years with value of 92.9 cms. There

was significant difference at five percent level for waist and hip circumference between different age groups.

Anthropometric Indices

The mean anthropometric indices calculated based on anthropometric measurements is indicated in the Table 3. It was observed that the body mass index was found to be 25.2 and the brokas index was 113.31. However, the Lean body mass index was 409.9. The waist hip ratio and the arm muscle circumference of the subjects were 0.83 and 6.81, respectively. As per the Z-distribution, there was no statistical significance among all anthropometric indices.

The anthropometric indices of the menopausal women at different age groups is indicated in Table 4. It was observed that the anthropometric indices like Brokas index, Lean body mass index, Waist hip ratio and arm muscle circumference was found to be highest in the age group of 61-65 years and the values being 115.65, 416.83, 0.87 and 22.26 cms, respectively. The lowest values of Brokas index and arm muscle circumference was observed in the age group of 46-50 yrs with values being 112.23 and 19.99 cms respectively. The anthropometric indices like Lean body mass index and Waist hip ratio was found to be lowest in the age group of 51-55 years with 397.31 and 0.8 respectively. On the whole, there was no significant difference between the anthropometric indices and age groups but it was known that there was significant difference at five percent level for arm muscle circumference among all the age groups of post-menopausal women.

Body Mass Index (BMI) and Waist Hip Ratio (WHR)

The classification of subjects as per the anthropometric indices is shown in Table 5. The results revealed that 49% of the subjects in the study were found to be over weight by BMI classification, 47% were normal and 4% were undernourished. The finding of the present study with respect to subjects being normal by BMI classification was higher compared with finding of Visweswara Rao et al. (1993), Yadav and Padam Singh (1999) and Gopalan (2002). The high percentage of obese postmenopausal women as per WHR was found to be 77%. This was found to be in par with the investigation of Deepti et al. (2004). The results indicated the higher percentage of post menopausal women were obese as per Body Mass Index (BMI) and Waist Hip Ratio (WHR) comparison to pre-menopausal women. Also similar trend was observed by Deepa et al. (2008), with

Table 3: Mean Anthropometric Indices of the Subjects

Anthropometric Indices	Mean ± SD	Z- Score
Body Mass Index	25.2 ± 4.23	-0.57
Brokas Index	113.3 ± 20.57	-0.01
Lean Body Mass Index	409.9 ± 65.51	1.89
Waist Hip Ratio	0.83 ± 0.06	-0.73
Arm Muscle Circumference	6.81 ± 24.71	-0.56

Table 4: Anthropometric Indices of the Menopausal Women at Different Age Groups

Anthropometric Indices	46-50 yrs (n = 60)	51-55 yrs (n = 56)	56-60 yrs (n = 54)	61-65 yrs (n = 30)	F-test
Body Mass Index	25.1 (±5.03)	25.54 (±2.961)	25.16 (±4.429)	24.8 (±4.34)	0.2187[NS]
Brokas Index	112.23 (±23.67)	112.26 (±14.17)	113.13 (±20.36)	115.65 (±24.84)	0.2188[NS]
Lean Body Mass Index	415.37 (±65.27)	397.31 (±46.73)	413 (±72.83)	416.83 (±81.52)	0.9813[NS]
Waist Hip Ratio	0.82 (±0.050)	0.8 (±0.068)	0.84 (±0.069)	0.87 (±0.071)	0.9813[NS]
Arm Muscle Circumference	19.99 (±2.47)	20.2 (±3.20)	19.97 (±2.73)	22.26 (±3.31)	3.799*

Note: * Significant at 5% level. NS - Non-significant. Within the parenthesis standard deviation values are indicated.

higher BMI in post-menopausal women (29.15) followed by peri-menopausal women (26.8) and pre-menopausal women. However, difference between mean values of BMI were found to be significant (P <0.01).

Brokas Index and Lean Body Mass Index

Seventy percent of subjects were classified as normal where as 21% were found to be obese and 9% were found to be overweight. According to Lean body mass Index 91% were classified as normal and 8% were found to suffer from chronic energy deficiency. However, only 1% of the women were found to be overweight.

Waist-Hip Ratio

Waist Hip Ratio (WHR) classification indicated 23% of the subjects to be normal while remaining 77% to be obese.

Table 5: Classification of Subjects According to Anthropometric Indices

Anthropometric Indices	n	Percentage
Body Mass Index		
Undernutrition (≤18.5)	8	4
Normal (18.5-25)	94	47
Overweight (≥25)	98	49
Broka's Index		
Normal (80-120)	140	70
Overweight (120-130)	18	9
Obese (130-140)	42	21
Lean Body Mass Index		
Chronic energy deficiency (>500)	16	8
Normal (300-500)	182	91
Overweight (<300)	2	1
Waist Hip Ratio		
Normal (≤0.8)	46	23
Obese (>0.8)	154	77
Mid arm Circumference		
Standard 100% (>28.5)	119	59.5
Standard 90% (25.7-28.5)	73	36.5
Standard 80% (22.8-25.7)	7	3.5
Standard 70% (20-22.8)	1	0.5
Standard 60% (17.1-20)	0	0
Arm Muscle Circumference		
Standard 100% (>23.2)	24	12
Standard 90% (20.9-23.2)	74	37
Standard 80% (18.6-20.9)	41	20.5
Standard 70% (16.2-18.6)	53	26.5
Standard 60% (14-16.2)	8	4

Percent of normal subjects judged by WHR were lower compared with Gopalan (2002). However, higher percent of females were in the category of obesity. However, it was observed by Deepa *et al.* (2008) in a study conducted on nutritional status of 100 menopausal women that the mean