MEASUREMENT OF WAIST CIRCUMFERANCE AND WAIST-HIP RATIO AMONG ELDERLY MONGOLOID AND THARU POPULATION OF SUNSARI AND MORANG DISTRICTS OF EASTERN NEPAL

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ABSTRACT

Anthropometric standards derived from adult population may not be appropriate for elderly because of body composition change occur during ageing. The objective is to provide anthropometric characteristics of elderly Mongoloid and Tharu population & to describe gender differences of anthropometric characteristics in the elderly Mongoloid and Tharu population in Sunsari and Morang districts of eastern Nepal. Materials and Methods: Anthropometric data were collected from people at the age of 50 years and above of Tharu and Mongoloid races belonging to both genders. Total sample size was 600; 300 male and 300 female. In each gender of Mongoloid and Tharu 150 males and 150 females were equally represented. Waist & hip circumference were measured using plastic tape & waist-hip ratio was calculated. Results: Results showed that waist, hip circumference & waist hip ratio were higher in mongoloid in comparison to Tharu. Waist & hip circumference were highly significant among Tharu and mongoloid and difference in waist hip ratio was significant. Both Mongoloid males & Mongoloid females showed higher waist, hip circumference & waist hip ratio as compared to Tharu males & Tharu females respectively. Conclusion: Females of both races were at higher health risk whereas males of both races were not at health risk based on waist hip- ratio.

Keywords: Anthropometric Measurements; Elderly, Waist- hip ratio

INTRODUCTION

Anthropometry refers to measurement of living humans for the purpose of understanding human physical variations [1].Anthropometric evaluation provides detail information about different components of body structure, especially muscular and fat components, and can assist in assessing the nutritional status of a population thus provides a clear socio demographic profile that needs to be addressed in policy making and programming[2].

Anthropometric evaluation is an essential feature of geriatric nutritional evaluation for determining malnutrition, overweight, obesity, muscular mass loss, fat mass gain and adipose tissue redistribution. Anthropometric indicators are used for the evaluation of the prognosis of chronic and acute diseases, and to guide medical, surgical and dental intervention in the elderly[3-5].

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Ageing causes a lower metabolic basal expense, for which energy requirement is less. Therefore, the consumption of foods and nutrients may be reduced, increasing the risk of malnutrition and reducing the effectiveness of the immune response[6]. The other body compartment – fat mass – increases in proportion.

Senior citizens comprise 7.9% of the total global population. Every month 8,000,000 individuals reach 60 years of age in the world. By the year 2020, more than 1000 million will be over 60 years of age, out of which more than two-thirds will be living in the developing countries[7-8].Increasing elderly population would subsequently develop various health and nutritional problems requiring increasing health and social costs in resources of developing countries[9-10].

Political scientists Joshi and Rose broadly classify the Nepalese population into three major ethnic groups by their origin: Indo-Nepalese, Tibeto-Nepalese (Mongoloid), and Indigenous Nepalese.

Indigenous Nepalese comprise of number of tribal communities, such as the Tharus (Rajbansi, mandal, sardar, thandar, suthihar&chaudhary) and

the Dhimals of the Tarai. Sherpa, Tamang, Thakali, Rai, Limbu, Magar& Gurung are included under Mongoloid group

In Nepal, Birth rate is 22.17 births/1,000 populations; death rate is 6.81deaths/1000 population. . Life expectancy at birth of total population **is** 66.16 years**;** ofmales is64.94 years; offemales is 67.44 years.

UN refer to the elderly as those over 60 years of age[11], often based on the upper quintile of the population. The Senior Citizens Acts of Nepal (2063 BS), defines the senior citizens as 'people who are 60 years and above'. The retirement age for military in Nepal is 45 to 48 years for lower class, 58 years for general government service, and 63 years for university teachers and the judiciary services[12].

However, the equivalent upper quintile constituting the 'elderly' population in some developing country may include the people as young as 45 or 50. Moreover, given long-term malnutrition, disease exposure, physical work patterns and generally harsh life conditions common in many developing countries, the process of biological ageing occurs earlier and proceeds faster than in developed countries, so that an individual may be biologically 'old' at a chronological age of less than 60 years. Taking these factors into account, this study took the cut-off age of 50 years to define our 'elderly' population[13].

The ageing process involves physiological and nutritional changes manifested by height and weight loss, muscular mass loss with increased fat mass, thus resulting is adipose tissue redistribution, with fat accumulation in the trunk and viscera[14]. Body composition changes occur differently in men and women in various phases of ageing, influencing anthropometric parameters. Consequently, the anthropometric standard values derived from adult population may not be applicable to the elderly and values standardized by western study may not be similar for Nepalese population.

A clear understanding of the trends in the nutritional status of the elderly would help to develop community based preventive programs in public health[15-16]. Developed countries have formulated efficient health care system to meet the special needs of the elderly; however, such programs are presently lacking in Nepal and many other developing countries.

This study aimed to assess the anthropometric profile of the senior citizens of Tharu and Mongoloid race with respect to age and gender in Sunsari and Morang districts of eastern Nepal with a view to help in formulating appropriate intervention measures to address their health needs.

MATERIALS & METHODS

The cross-sectional study was conducted in association with Department of Community Medicine & School of Public Health. Anthropometric data were collected from people at the age of 50 years and above of Tharu and Mongoloid races belonging to both genders. Total sample size was 600; 300 males and 300 females. In each gender, distribution of subjects from Mongoloid and Tharu race was equal i.e. 150 Mongoloid and Tharu males each and 150 Mongoloid and Tharu females each. Purpose of study was explained and informed consent was taken from the individual participants before collecting the data from the respective communities by door-to-door visit using snowball sampling technique at different places of Sunsari& Morang districts.

Subjects of pure ethnic races of were only included in study whereas Subjects with any physical deformity or injury, chronic/systemic diseases & those who had history of hospital admission in the last two months were excluded.

Waist Circumference was measured by asking the subjects to stand comfortably with arm hanging by side and head in Frankfurt plane. The pants and underclothing of the participant were lowered slightly for the examiner to palpate directly on the hip area for the iliac crest. The examiner stood behind the participant and palpated the hip area for the right iliac crest . The examiner marked a horizontal line at the high point of the iliac crest and then crossed the line to indicate the midaxillary line of the body. The examiner then stood on the participant's right side and placed the measuring tape around the trunk in a horizontal plane at this level marked on the right side of the trunk. The tape was parallel to the floor and was snug, but does not compressed the skin. The measurement was made at minimal respiration to the nearest 0.1 cm.

Waist circumference is used to identify individuals with possible health risks based upon threshold values of ≥ 88cm for women and ≥ 102 cm for men[17].

Hip circumference was measured by asking the participant to stand erect with feet together and weight evenly distributed on both feet. The examiner squated on the right side of the participant and placed the measuring tape around the buttocks. The tape was placed at the maximum extension of the buttocks. The tape was checked in the front and sides so that the plane of the tape was horizontal. The zero end of the tape was held under the measurement value. The tape was held snug but not tight. The examiner took the measurement from the right side and was recorded.

The waist-hip ratio (WHR) was calculated by dividing the values of the waist circumferences by hip circumferance. Threshhold value of WHR is taken as ≥ 0.85 for women and ≥ 1.00 for men, above which superior distribution of adipose tissue will be considered[18].

Plastic tape used in this study was manufactured by the Perfect Measuring Tape Company, 1116 Summit Street, Toledo, Ohio 43604, USA.

RESULT & DISCUSSION:

Collected data were entered in Microsoft Excel 2010. Data were tabulated and then analyzed using Statistical Package for Social Science (SPSS) 20.0 version software. The Inferential statistic t-test was applied to find out differences between the groups at 95% confidence interval where P=0.05. P value of <0.05 was considered statistically significant, p<0.001 was considered statistically highly significant and p>0.05 was considered statistically not significant (NS).

The elderly people of Mongoloid race were older than the Tharu. Waist circumference (WC), Hip Circumference (HC) & Waist Hip Ratio (WHR) of the Mongoloid were found to have higher value when compared to Tharu. This difference of all the variables between the two races was statistically significant (Table 1).

A study done by Rosnah M.Y. in Malaysia to compare differences in the anthropometric data of the elderly population between Malyan and Non-Malayan elderly revealed that some anthropometric dimensions were influenced by age, gender and ethnicity. The differences in anthropometric dimensions were found between these two groups[19].

Comparison between Chinese (Beijing) and Japanese elderly also showed that the anthropometric dimensions differences were found between these two groups. The significant differences in many of the measurements clearly indicate that ethnicity should be taken into consideration when designing within the Malaysian population.

Table 1: Comparison of anthropometric characteristics of elderly Tharu and Mongoloid population

Variables	Race		P value #
	Tharu (mean±SD)	Mongoloid (mean±SD)	
Age	59.63±8.11	62.94±9.78	0.000***
WC	74.84±10.78	85.44±11.32	0.000***
HC	84.39±7.07	91.34±9.89	0.000***
WHR	0.88±0.07	0.97±0.61	0.011**

Table 2: Difference of anthropometric character among male of Tharu and Mongoloid population

Variables	Race		P value #
	Tharu (mean±SD)	Mongoloid (mean±SD)	
Age	59.89±8.36	63.00±9.18	0.002**
WC	78.10±10.23	87.06±10.00	0.000***
HC	85.31±7.00	89.95±10.00	0.000***
WHR	0.91±0.07	0.99±0.30	0.003**

Table 3: Difference of anthropometric character among Female of Tharu and Mongoloid population

Variables	Race		P value #
	Tharu (mean±SD)	Mongoloid (mean±SD)	
Age	59.37±7.87	62.88±10.41	0.001**
WC	71.58±10.35	83.83±12.37	0.000***
HC	83.46±7.08	92.73±9.64	0.010**
WHR	0.85±0.73	0.96±0.81	0.114 NS

Difference of anthropometric characteristics between male & female of Tharu and Mongoloid population are shown in table 2 and 3 respectively. All the variables of Mangoloid male and female were found to have higher reading as compared to their counterparts of tharu race with statistically significant difference except for WHR between mongoloid and Tharu female.

Experts in obesity assessment, management and epidemiology research from the University of Laval, Canada, reviewed 120 studies and found that the

association exists between WC and CVD/diabetes morbidities[20].

In our study, the WC of both Tharu& Mongoloid males & females was found to be less than threshold value, i.e., < 88 cm for females and <102 for males, suggesting that the study population were not at health risk.

In cross-sectional analytical study done among adult patient aged 40-69 by Michelle V. Lemoncito et al., it was noted that mean WC of male subjects was 92.90±11.54 and of female subjects was 93.83±10.43. Compared to male, female were at more health risk as waist circumference was above the threshold value. The study was in accordance to present study for male subjects but contrary for female subjects[21].

In study done by N. K. Mungreiphy et al., they found that WC of female subjects form Delhi, Manipur & Kerala was 67.30±8.00, 69.7±7.27 & 62.5±6.40 respectively and WC of male subjects was 76.30±8.51, 72.2±8.70 & 68.00±7.02 respectively. The study result was similar to present study[22].

WC correlates well with abdominal obesity as assessed by different imaging methods and is associated with increased risk for adiposity-related morbidity and mortality[23].

Significant differences between healthy young and older men were noted on computed tomography by Schwartz RS et al. with a twofold greater Intra-abdominal fat area and a twofold lesser thigh subcutaneous fat area in the older subjects. They concluded that there was an age-related central and intra-abdominal redistribution of adipose mass, even in healthy older subjects[24].

Price et al. described how a high WHR is associated, more closely than BMI and especially WC, with a greater mortality risk in the elderly[25].

In study done by N.K. Mungreiphy et al., they found that WHR of female subjects form Delhi, Manipur & Kerala to be 0.74±0.05, 0.78±0.07 & 0.74±0.06 respectively and WHR of male subjects to be 0.84±0.05, 0.80±0.07 & 0.79±0.06 respectively. The study was similar to present study for male subjects and contrary to female subjects[22].

In another study by Lujain Anwar Al-khazrajy et al., it was noted that WHR of female was 1.12±0.09 and of males was 1.09±0.08 which was contrary to male subjects of both Tharu and mongoloid but was in agreement with both Tharu and Mongoloid females[26].

In this study, the WHR of males & females of both races was < 1 &> 0.85 respectively which suggests that females had more accumulation of adipose tissue compared to male and they were also associated with health risk like CVD, hypertension, gallstones.

These variations between ethnic groups could be due to different dietary preferences, lifestyle, physiological differences as well as differences in genetic backgrounds[27].

Waist circumference and waist-hip ratio (WHR) are regarded as alternatives to BMI. As fat in the abdominal region is associated with increased health risks, the National Institute for Health and Clinical Excellence (NICE) and National Institute of Health (NIH) recommends these measures as a practical tool to measure risk factors for diseases like diabetes and hypertension, especially in persons with a BMI range under 35 kg/m^2 [7-8].

LIMITATION

Limitation of the study is that the study was related to Tharu and Mongoloid ofSunsari and Morang districts only; it is not generalized population of Tharu and Mongoloid & it does not represent whole population of Nepal. Snowball sampling method was used for sample collection so study may have sampling bias and sample may have represented only a small portion of entire population.

RECOMMENDATION

Since there is an age-related central and intra-abdominal redistribution of adipose mass, even in healthy older subjects. The associations between metabolic abnormalities and redistribution of adipose mass in the elderly must be investigated further.

A larger study including elderly population of all ethnic groups should be conducted to know the anthropometric characteristics of generalized population of Nepal.

CONCLUSION

Waist circumference of both study groups was found to have less than threshold which indicated that both study groups were not associated with any chronic or acute health risk.

Mongoloid and Tharu females are at health risk like CVD, hypertension, type 2 diabetes as the study found that waist-hip ratio of females was more than threshold value (≥0.85) in both races. Mongoloid &Tharumale population was not associated with any chronic disease or acute illness as their waist-hip ratio was found to be less than threshold value (≥1.00) in both races.

Finally this study could be very useful for measurements of anthropometric parameters to identify the problems of elderly Mongoloid &Tharu population.

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