測定身體組成的技術: 針對傳統的印尼老年人群

Technology in body composition: considerations for a traditional, elderly Indonesian population

Fadil Oenzil MD (Andalas), PhD (Deakin), Dip Nut (SEAMEO TropMed)

Department of Biochemistry, Faculty of Medicine, Andalas University, Padang, West Sumatra, Indonesia.

Body composition has been measured in a group of elderly people living in nursing home care in West Sumatra, Indonesia. Anthropometric techniques were used to measure height, weight, waist and hip circumference, and skinfolds at four sites (triceps, biceps, suprailiac and subscapula). Body fat was determined with the equations of Durnin and Womersley, although difficulties were encountered because of the age and leanness of some of the subjects. The average age of the subjects was 73.0±7.5 years (n=20) and 73.4±5.4 (n=15) for males and females respectively. The average body mass index (BMI) was 18.2 kg/m^2 for both groups. The mean total body fat and waist/hip ratio for the males was 8.8 kg and 0.86; corresponding results for the females were 12.3 kg and 0.77. The results demonstrate the limitations of these techniques, when they are applied to an elderly population for which appropriate standards are not available.

Introduction

The changes of body composition associated with aging are well documented[1,2] and they include decreased height (stooped posture secondary to increased kyphosis), decreased weight, increased fat-to-lean body mass ratio and decreased total body water. While information on these effects is readily available in many European and North American populations, there is very little information available on such populations in Indonesia.

Durnin[3] has recently argued that skinfold measurements are adequate for most purposes concerned with field studies. The most widely used method for converting skinfold measurements to % body fat is that of Durnin and Womersley[4]; however, their table does not show values for subjects over the age of 60 or for subjects whose sum of four skinfolds is less than 15mm.

Other methods are available for assessing body composition, but these also have their limitations, especially when applied to an elderly population. For example, weight-for-height tables are widely used when assessing subjects who are over-weight; the criteria generally depend on age and are generally limited to people up to the age of about 60 years. Roe[5] has adapted data from the Department of Health, Education and Welfare in the United States so that weight-for-height can be assessed in persons 65 years and older. Another technique for assessing fat has been demonstrated by McArdle[6] who used three girth measurements (abdomen, thigh and forearm) in their determination. Unfortunately, they have only applied it to two age groups, 18–26 and 27–50.

However, all of these techniques suffer from the disadvantage that they have been calibrated for ethnic groups in other countries and many authors have commented on the problems arising from this limitation[2]. In this work, anthropometric and skinfold data have been acquired on a group of elderly West Sumatran subjects and it was decided that the results would be interpreted according to the method of Durnin and Womersley. A major advantage in using the Durnin and Womersley table is that their work is the most widely accepted standard in the medical field. It is therefore easier to make comparisons with other work when the same conversions have been used by all authors.

Subjects and methods

The subjects for this study were 20 male and 15 female elderly people living in a nursing home in Sicincin, West Sumatra, Indonesia.

Body weight was measured to the nearest 0.1 kg using digital scales. Height was determined using a 'microtoise' with readings from a window device. Waist and hip circumference were taken with a non-stretch tape. The waist circumference was measured at the umbilicus and the hip was measured at the level of the maximum gluteal protuberance.

Skinfold thicknesses were measured at the triceps, biceps, supra-iliac and sub-scapular positions using a Harpenden caliper (John Bull, British Indicators Ltd). The sub-scapula skinfold was measured 5 cm below the scapula and at 45° to the vertical.

Results and discussion

The average age of the males was found to be 73.0±7.5 years (n=20) and for the females it was 73.4±5.4 years (n=15). The average BMI was found to be the same for both males and females, ie 18.2. See Table 1.

Table 1. Age, height, weight and body mass index (BMI) (mean±standard deviation).

	Males (n=20)	Females (n=15)
Age	73.0±7.5	73.4±5.4
Height (cm)	154.6±4.9	143.9±7.2
Weight (kg)	43.6±5.8	37.7±8.8
BMI (kg/m^2)	18.2±2.4	18.2±3.8

Averaged results of the skinfold measurements are shown in Table 2. The mean total body fat was 8.8 kg for males and almost 50% greater for females, 12.3 kg.

Table 2. Skinfolds, % fat and waist-to-hip ratio. Values are means ± sd: ( ) = n.

	Males	Females
Triceps skinfolds (mm)	7.5±2.8 (20)	10.3±4.9 (15)
Biceps skinfolds (mm)	5.8±1.5 (20)	7.1±2.9 (15)
Suprailiac skinfolds (mm)	9.7±5.4 (20)	1.9.5±11.8 (15)
Subscapular skinfolds (mm)	8.2±3.0 (20)	7.7±3.4(15)
Total skinfolds (mm)	31.1±11.3 (20)	44.5±20.5 (15)
% Body fat	19.8±4.0 (18)	31.3±5.8 (14)
Total body fat (kg)	8.8±2.8 (18)	12.3±4.8 (14)
Waist circumference (cm)	70.2±6.6(18)	63.2±8.7 (15)
Hip circumference (cm)	81.6±5.4 (18)	81.9±7.4 (15)
Waist-to-hip ratio	0.86±0.06 (18)	0.77±0.06 (15)

Table 3. Comparative data.

	Oenzil[7]		Prijatmoko et al[8]	
	Urban (n=52)	Rural (n=50)	Males (n=71)	Females (n=51)
Age	25-39	25-39	40.2±8.7	36.5±7.2
Height (cm)	161.8±7.7	157.4±2.3	163.6±5.5	152.6±5.2
Weight (kg)	56.4±10.8	53.2±7.3	61.3±5.5	53.4±9.1
BMI (kg/m^2)	21.2±3.4	20.4±2.9	22.6±4.4	22.3±4.8
% body fat	–	–	18.5±6.8	27.2±9.6
Total body fat	13.4±5.3	9.1±3.5	–	–
Waist-to-hip ratio	0.90±0.06	0.88±0.04	0.84±0.1	0.75±0.1

Difficulties arise with the tables of Durnin and Womersley[4] because they do not show values of percent fat for subjects whose sum of four skinfolds is less than 15 mm. As indicated by the reduced numbers at the bottom of Table 2, two males and one female were omitted because their skinfolds summed to less than 15 mm. A further difficulty arises because Durnin and Womersley show their oldest age group to be for 50 to 70 years. Eleven of the males and ten of the females in the study were over 70 years of age, but their skinfolds were still interpreted with the figures given for 50–70-year-olds.

The mean waist-to-hip ratio was determined to be 0.86 for males and 0.77 for females. (Table 2).

Comparative data on Indonesian adults is available in two recent papers[7,8]. Oenzil[7] studied 102 West Sumatran adult rural and urban Indonesian males as two separate groups. Prijatmoko and Strauss[8] have presented data on 122 adults from Jember, 71 males and 51 females. The data from both papers are summarized in Table 3.

Conclusion

The subjects included in this study were all residents of a nursing home. This is unusual for Indonesia because most elderly Indonesians live with their children. The comparative data shown in Table 3 show that the elderly are shorter, have a lower weight, a lower BMI and less fat than their younger countrymen. Steen[2] has recently emphasized the need for body fat equations to be created and validated from skinfolds of the same age group, but in this group there is the added complication that the equations have been derived on a very different ethnic group. Another short coming of the present study is the techniques were not available for the measurement of total body water. This measurement is very important in the elderly because of their reduced total body water and their correspondingly greater susceptibility to dehydration.

Despite the limitations of the equipment, the present study demonstrates that the measurement of anthropometry and skinfolds can be usefully applied in survey work and the results are indicative of the changes normally observed in an ageing population.

References

1 Kane RL, Ouslander JG, Abrass IB. Essentials of Clinical Geriatrics. 2nd Edn. New York: McGraw-Hill, Inc, 1989:4–15.

2 Steen B, Gause-Nilsson I, Bosaeus I. Body composition and the aged – what needs to be measured? Asia Pacific Nutr 1994;3:

3 Durnin JVGA. Appropriate technology in body composition. Asia Pacific Clin Nutr 1994; 3:

4 Durnin JVGA, Womersley J. Body fat assessed from total body density and its estimation from skinfold thickness: measurements on 481 men and women aged from 16 to 72 years. Br J Nutr 1974: 32, 77–97.

5 Roe DA. Geriatric Nutrition. 3rd Edn. New York: Prentice Hall, 1991: 130–135.

6 McArdle WD, Katch FI, Katch VI. Exercise Physiology: Energy, Nutrition and Human Performance. 2nd Edn. Philadelphia; Lea Febiger, 1968:651–658.

7 Oenzil F. Coronary risk in West Sumatran men. Asia Pacific J of Clin Nutr 1994; 2:97–99.

8 Prijatmoko D, Strauss BJG. Health surveillance using body composition: low cost technology. Asia Pacific J Clin Nutr 1995; 15–17.