Profile of Handgrip Strength, Anthropometry, Nutritional Status and Activities of Daily Living Among Geriatrics at Karitas Nursing Home, Bandung

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Abstract

Background: Reduced handgrip strength is an aging process that influences the activities of daily living among elderly people. Handgrip strength varies greatly with age, gender, anthropometric measurement and nutritional status. This study aimed to determine the profile of handgrip muscle strength, physical characteristic, nutritional assessment and activities of daily living among elderly
Methods: This study was conducted at Karitas nursing home, Bandung on September 2012. This is a descriptive study by collecting primary data from 28 elderly people. Data were collected in 2 days within 2 weeks. The first data collection included details of anthropometric measurement and handgrip measurement. The second data collection included face to face interview using standardized questionnaire for mini nutritional assessment and Barthel index.
Result: The mean age of the respondents was 74.14 ± 8.5189 years. The average reading on handgrip muscle strength was 30.84 ± 12.0175 lbs for right hand and 27.77 ± 11.3778 lbs for left hand. For anthropometric measurement, most of the respondents had normal weight body mass index status (39.3%). Nutritional status of respondents evaluated by mini nutritional assessment showed that most of the respondents were at risk of malnutrition (64.3%). The activities of daily living assessment based Barthel Index showed that half of the respondents were dependent in activities of daily living (50%).
Conclusions: From this study, it can be concluded that the grip strength of all the respondents are weaker. Majority have normal body weight, malnutrition risk, and half of the subjects are depend on others in doing their daily activities.

Key words: Activities of daily living, anthropometry, elderly, handgrip strength, nutritional status

Introduction

In 2012, 810 million people who were 60 years old or over accounted for 11.5% of the global population.[1] In Indonesia, population ageing has started to emerge as a distinct demographic feature and the proportion of elderly people, which remained around 6 percent during the period of 1950 to 1990, has now exceeded 8% and is projected to rise to 13 percent by 2025, and to 25 percent by 2050. This means that by 2050, one in four Indonesians would be classified as an elderly, compared to the current one in twelve.[2]

The increase of elderly people in Indonesia is due to the rise of life expectancy for Indonesian, leading to the increase of the elderly population size. Elderly people are also referred to as geriatrics in medical dictionaries.[2]

There are five classic geriatrics problems, with fall as the main problem. In normal physiology, there is a strong relationship between falls and muscle strength. In the aging process, the decline in muscle strength with age is a well-known phenomenon. It causes an overall muscle mass decrease. With this decline, an increased risk of untoward outcomes such as disability in activities of daily living (ADL), functional limitations, falls, and mortality is seen.[3]

However, the awareness towards the importance of muscle strength among elderly people or geriatrics is still low. Physiologically, muscle strength is influenced by certain factors such as age, gender, and anthropometric traits such as fat percentage, body mass index,

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nutritional status, depression level and ADL.[4]

There are various ways to measure muscle strength in human body. Handgrip strength is one of the most reliable clinical measures of human muscle strength and it is widely used as a clinical observation to test the hand function in people with disease. To measure the handgrip muscle strength, handgrip dynamometer is normally used.[5] Earlier studies have established that age, gender and anthropometric traits are the influencing factors of handgrip strength.[6]

Poor nutrition is not a natural concomitant of aging, older adults are at risk for malnutrition due to physiological, psychological, social, dietary, and environmental risk factors. Weight loss in elderly people is often associated with a loss of muscle mass and can ultimately impact the functional status. The progression to malnutrition is often insidious and undetected. It is influenced by adequate food intake both in terms of quantity and quality and also by the physical health of the individual. The nutritional status of elderly people has been related to functional ability to perform basic daily activities without assistance.[7]

Activity of daily living is commonly used as predictors for health condition and muscle strength. Ten studies provides information about the predictive value of muscle strength or hand grip strength on ADL. Out of ten, seven studies concludes that grip strength is a significant predictor of ADL disability.[8]

Handgrip muscle strength is a surrogate measurement of overall muscular strength. The handgrip strength is an important indicator to predict ADL disability, which can be clinically useful in identifying elderly people who might benefit from an intervention that prevents disability or increases physical functioning in daily life. Apart from that, handgrip strength is also a predictor of all mortality causes in elderly population and may serve as a convenient tool for prognostication of mortality risk among elderly people.

According to the description above, this study aimed to determine the profile of handgrip muscle strength, physical characteristic, body mass index, nutritional status and activities of daily living among elderly people at Karitas nursing home, Bandung.

Methods

This was descriptive study conducted in Karitas nursing home, Bandung . The inclusion criteria for the subjects are elderly people who live in Karitas nursing home, Bandung. Subjects aged more than 60 years old can understand verbal instructions, subjects who did not suffer from neuromusculoskeletal disease and the subjects who did not suffer physical injury. The exclusion criteria are subject chosen in the selected sample refuses or reject the study.

Ethics approval was obtained from the Health Research Ethics Committee of Faculty of Medicine Universitas Padjadjaran and informed consent was obtained from all respondents. Data were collected in 2 days within 2 weeks. In the first time, data collection included details of physical characteristics/anthropometric measurement and handgrip measurement. The second time, data collection included face to face interview using standardized questionnaire for mini nutritional assessment (MNA) and Barthel index.

Inform consent was given to each subject. All subjects signed a personal consent form, after identified their name, Id number and age. Explanation and instruction were given to all subjects. Examination is conducted in a quiet room where the subject and examiner are free from distraction of noise. The room was setting in normal temperature. The subjects were placed in a position that provided overall support to the body, so that the subjects can concentrate on their test. Ensure that the part proximal to the tested part is stabilized.[9]

Handgrip muscle strength generated by maximum muscle contraction is the ability to generate tension against a resistance. It measures using handgrip dynamometer. Grip strength measurements were taken in standing position with the elbow joint held in full extension, the shoulder joint adducted and neutrally rotated and the forearm and wrist joint held in neutral position. Hold the grip dynamometer with one hand; grip the dynamometer between fingers and palm at the base of the thumb. Arm positioning was demonstrated by the operator. Each subject was instructed to breathe in through the nose and blow out through pursed lips as a maximum grip effort was made. Next step, the subjects were instructed to squeeze the handle of the dynamometer as hard as possible and to hold for about 5 seconds. The dynamometer output that reflects the highest force exerted during gripping Verbal encouragement was offered during the test by commanding the subjects to “Pull! Pull!” and “Pull!” The measurements were obtained for both extremities, and about 2 to 5 minutes of resting interval were allowed between testing. Two trials were allowed but

the higher reading was used for data analysis. The unit of the reading is in kilogram (kg).[9]

Weight was taken by a portable human weighing machine with an accuracy of 0.5 kg. The machine was placed on the plane surface and then the subjects were asked to stand straight on the machine wearing minimum clothing. Height was measured with the help of a measuring tape. The subjects were asked to stand straight and then vertical distance from the ground to the vertex of the subject. The body mass index (BMI) was calculated from the collected height (meter) and weight (kg). The following formula was used to measure BMI.BMI= weight (kg)/ (meter).[4]

The nutritional status of the subjects was evaluated by questionnaire method. The MNA was used to evaluate the subjects. The MNA is an assessment tool used to identify elderly people aged more than 60 years old who were malnourished or at risk of malnutrition. Mini nutritional assessment consists of 18 questions on food intake, weight loss, mobility, psychological stress or acute disease, presence of dementia or depression, BMI and etc. After taking data from the individual, the total score was calculated. Scores of 24-30 were considered normal nutritional status, 17-23.5 indicate at risk of malnutrition, and less than 17 indicate malnutrition.[10]

Barthel Index is used to measure the ADL. The Barthel Index belongs to the activities of daily living assessment field and measures the functional independence at personal care, mobility, locomotion and excretion. Each item is scored according to the patient's ability to perform activities either independently, with some help, or completely depending on help. The version used assesses the functional independence in ten activities such as feeding, bathing, grooming, dressing, bowl and bladder care, toilet use, transfers, ambulation, and stair climbing. Patient's performance established using the best available evidence by asking the patient, friends or relatives, and nurses would be the usual source. Direct observation and common sense are also important total of the patient's scores for each item. Total possible scores range from 0–20, with lower scores indicating increased mild disability, 10-14 moderate disability, 5-9 severe disability, and 0-4 indicate very severe disability.[11]

Results

Overall there were 28 respondents who lived in Karitas nursing home, which consists of 21 female and 7 male. Table 1 showed

Table 1 Profile Handgrip Strength by Age and Sex

Age (years)	Gender	N	Hand	Mean ± SD	Status
60–64	Male	2	Right	37.35 ± 6.7175	Weak
			Left	38.80 ± 9.3338	Weak
	Female	2	Right	21.90 ± 1.4142	Weak
			Left	23.70 ± 1.4142	Weak
65–69	Male	0	Right	-	-
			Left	-	-
	Female	3	Right	31.37 ± 4.14015	Weak
			Left	25.80 ± 3.0643	Weak
70–74	Male	2	Right	46.40 ± 18.5262	Weak
			Left	43.55 ± 19.4454	Weak
	Female	9	Right	27.82 ± 10.0713	Weak
			Left	23.79 ± 8.8578	Weak
75+	Male	3	Right	49.67 ± 7.7106	Weak
			Left	43.57 ± 8.3291	Weak
		7	Right	22.66 ± 5.7183	Weak
			Left	20.46 ± 5.6435	Weak

Table 2 Frequency Distribution of Respondents by Body Mass Index (BMI), Malnutrition Indicator Score (MIS), and Barthel Index Score (BIS)

BMI	n=28	MIS	n=28	BIS	n=28
Underweight	4	Normal	8	Very Disability	1
Normal weight	11	At risk	18	Severe Disability	1
Overweight	4	Malnourished	2	Moderate Disability	3
Obese	9			Mild Disability	9
				Indipendent in ADL	14

that all the subjects had weak handgrip strength with female subjects as majority. Table 2 showed that mostly subjects had normal weight status (11/28) but majority were (18/28) at risk for being malnourished based on Malnutrition Indicator Score meanwhile based BIS most of them had independent ADL (14/28)

Discussions

The majority of respondents who lived in Karitas nursing home, Bandung, were female respondents and the highest number of respondents were aged in range of 70-74 years old. The frequency of female respondents was higher than male respondents after age of 64 years old. From the total number of respondents, female elderlies were older than males. Life expectancy for female is higher than male due to three main factors; genetic, hormones and cardiovascular risk.[12] Women constitute a majority of the elderly population and even in most countries, the oldest people population have a greater majority . At present, nearly 60 percent of Indonesian oldest people are women and this proportion is expected to increase to 64 percent by 2030.[2, 12]

Grip strength of right and left hand were not similar. The results show that the right hand had greater grip strength than left hand in both sexes. The right hand was the dominant hand of the subjects. A general rule is often used to suggest that dominant hand is about 10% stronger than non dominant hand.[6] One explanation for difference might due to use of more muscle and muscular hypertrophy in dominant hand which leads to increased strength. The difference in grip strength between two hands in the present study shows right grip strength more or less 10% higher than left grip strength for both males and females.[13]

However these findings are much lower compared to data from Mathiowetz V.[9] In western population, the mean handgrip strength can be as much as 1.5 times greater than people in the Karitas nursing home, Bandung. This suggests that grip strength norms from the western population may not accurately represent the local population and reference values are needed. Genetic variation, health status and different lifestyle could also be the reasons for the difference observed between our findings with the western elderly's.[9]

In this present study, men have greater handgrip strength than women, (Table 2). The gender difference in grip strength variation might due to the variation of the activity level in two sexes. From the everyday life, it was observed that male performed more physical activity with greater work load or may be due to lower strength per arm muscle area.[14]

Handgrip strength was found to increase until the thirties and decrease with accelerated speed after forties.[6] With aging, muscle mass was lost due to motor neuron death and muscle cell shrinking due to inactivity. Apart from that nutritional deficit, lower body weight, diminished use of muscle, reduced physical activity or sedentary lifestyle and poor health in the elderly also may cause the handgrip strength to decline progressively. Hormonal changes, particularly decreases in testosterone and growth hormone levels, may be associated with decreased muscle mass. Disease may cause decrease in strength through inactivity or they may have a direct effect in muscle. The older people in the present study, (Table 1) also showed a decline in grip strength which might be due to the same reason mentioned above.[14]

Elderly who had higher weight and height were found to have higher handgrip

measurements. Similar results were shown by kamarul et al.[15] studies. Elderly who had low weight may have low muscle mass, hence, weaker physical strength resulted in poor handgrip measurement.[14] The results of this present study, (Table 2) showed most number of subjects remained in normal weight range. The results of previous study conducted by Patterson proved that BMI has poor correlation with strength.[16]

Studies by Chilima et al. have proven that the association of elderly poor nutritional status has poor functional ability and strength.[17] Lower muscle mass could be related to under nutrition. The studies showed that most of the subjects with weak grip strength are at risk for malnutrition indicator score. Studies conducted in Asian countries showed that average intakes among population of older people often fall below the official dietary recommendations.[7] Among 240 communities, living Indonesian elderly the median energy intake was below the assessed requirement while iron, thiamin and folate intakes were below the recommended values. The relationship between nutrition status and handgrip strength was not really understood. Further study is required in this direction.[17]

The ADL is commonly used as predictors for health conditions and muscle strength among elderly.8 The study showed that most of the subjects were still independent in ADL. Elderly who had higher Barthel index had higher measurement in handgrip strength as found in previous studies.[16]

As a conclusion, the profile of overall handgrip muscle strength among elderly people at Karitas nursing home, Bandung are weak. The profile of physical characteristic showed that the higher the age the weaker the grip strength. Most of the respondents have normal weight for BMI status. Most of the respondents are at risk of malnutrition and the profile of activities of daily living showed half of the respondents are dependent in activities of daily living.

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