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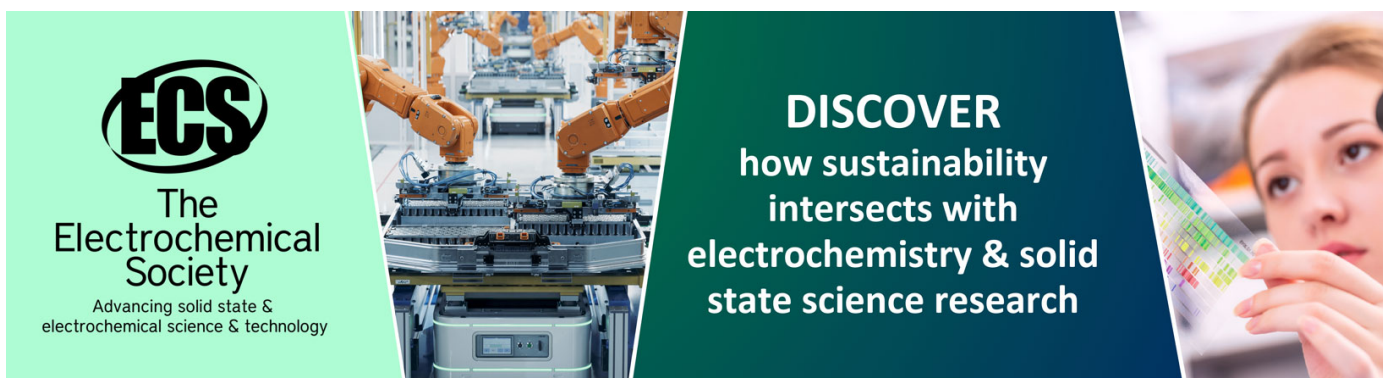
Correlation of handgrip strength with quality of life in elderly patients

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Correlation of handgrip strength with quality of life in elderly patients

A Wiraguna¹ and S Setiati^{1*}

¹Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia, Jakarta, 10430, Indonesia

*E-mail: s_setiati@yahoo.com

Abstract. The quality of life of elderly people decreases with age and is adversely affected by sarcopenia (decreased muscle mass, muscle strength, and physical activity) and chronic degenerative diseases. Assessment of handgrip strength is used for screening for sarcopenia. Handgrip strength is expected to predict the quality of life of elderly people. In this study, we aimed to assess the correlation of handgrip strength (measured using Jamar dynamometer) with the quality of life (measured using the EQ-5D and EQ-5D VAS questionnaires) of elderly patients. This cross-sectional study was conducted on 123 elderly patients at the Geriatric Outpatient Cipto Mangunkusumo Hospital. Findings of the Spearman test showed a significant correlation of handgrip strength with quality of life as measured using the EQ-5D questionnaire ($r = 0.219$; $p = 0.015$) and EQ-5D VAS questionnaire ($r = 0.266$; $p = 0.003$). In conclusion, a significant correlation was observed between handgrip strength and the quality of life of elderly patients.

1. Introduction

High life expectancy is an indicator of the successful development of the health sector of a country [1]. The life expectancy in a country is reflected in the number of elderly people and their quality of life. In 2012, elderly people (age > 60 years) accounted for 7.56% of Indonesia's total population of 237,641,326 people [1]. The number of elderly people in Indonesia is projected to increase yearly and is expected to reach 21.4% of the total population in 2050 [1,2].

The quality of life of individuals decreases with age. The elderly experience a decline in their health status both because of natural aging as well as chronic degenerative diseases [1-3]. According to the World Health Organization, quality of life is defined as an individual's perception of his/her position in life in accordance with the cultural system and values, the value of where the individual lives with respect to their interests, goals of life, expectations, and standards that they want to achieve. One aspect of the quality of life is health (health-related quality of life). Health-related quality of life is associated with the illness or health problems experienced by the patient [1-3]. The European Quality of Life 5 Dimension (EQ-5D) questionnaire is one of the instruments used for the assessment of health-related quality of life. The validity and reliability of this instrument for the measurement of health-related quality of life in the elderly are well-established [3].



Sarcopenia is one of the causes of decreased quality of life, especially in elderly patients. It is a chronic condition characterized by decrease in muscle mass, muscle strength, and physical performance that result in vulnerability or frailty. Frailty refers to a condition where individuals experience a vulnerability that can increase the risk of health problems when faced with a stressor. The frailty syndrome may be caused by various diseases suffered by the elderly, which typically include chronic and degenerative diseases, and especially cardiovascular diseases, such as hypertension, stroke, coronary heart disease, and heart failure [2,4].

In elderly patients, sarcopenia is liable to affect the muscle strength, including that of hand muscles [5]. The assessment of handgrip strength using the handgrip dynamometer comprises one of the methods for measuring the strength of the hand muscles [5,6]. It can also be used for screening for sarcopenia [6].

Several studies have demonstrated a relationship between handgrip strength and the quality of life of elderly patients. Poor handgrip strength is associated with mortality and disability rates and can be used as a predictor of death [6,7]. Till date, few studies have investigated the correlation of handgrip strength with health-related quality of life among elderly patients in Indonesia. In addition, the characteristics of elderly population in Indonesia differ from those of elderly population in other countries with respect to posture, body mass index, and nutritional status [7]. Therefore, in the present study, we investigated the correlation of handgrip strength with health-related quality of life among elderly population in Indonesia.

2. Methods

This study was designed as a cross-sectional study. While the target population of this study was all elderly patients (age ≥ 60 years), the study population comprised of elderly patients (age > 60 years) who received outpatient treatment at the Geriatric Outpatient Clinic Cipto Mangunkusumo Hospital between June and September 2016. The study protocol had been approved by the Health Research Ethics Committee of Faculty of Medicine, Universitas Indonesia-Cipto Mangunkusumo Hospital. Handgrip strength scores were directly measured using the handgrip dynamometer (Jamar type); quality of life scores using EQ-5D and EQ-5D VAS questionnaire were obtained by interviewing outpatients at the Geriatric Outpatient Clinic Cipto Mangunkusumo Hospital. Nutritional status was assessed using a Mini Nutritional Assessment (MNA) questionnaire.

The sampling method was consecutive sampling. The inclusion criteria were elderly patients aged ≥ 60 years who consented to participate in the research. The exclusion criteria were elderly patients with paralysis of one or both sides of the body; patients with joint disorders (especially the arms, wrists, and fingers); history of fracture of hand bones; patients with impaired cognitive function; and patients who refused to participate in the study. The minimum sample size was calculated as 62; however, by the end of this study a total of 123 patients were recruited.

Data processing and analysis were performed using SPSS version 20 program. Normally distributed variables are presented as mean, while non-normally distributed variables are presented as median. The distribution of normal data was analyzed using the Pearson correlation test, while non-normally distributed data were analyzed using the Spearman correlation test. Coefficient correlation value (r) was obtained from statistical test results (r) with values ranging from -1 to 1 . A correlation coefficient of $0-0.4$ indicates weak correlation, $0.4-0.6$ indicates moderate correlation, $0.6-0.8$ indicates strong correlation, and $0.8-1$ indicates very strong correlation.

3. Results

A total of 123 patients qualified the patient-selection criteria. Patients were grouped according to age, gender, and nutritional status. Table 1 shows that a majority of the patients were in the age-group of 60–74 years (65%), male (54.5%), and generally at risk of malnutrition (52%).

Table 1. Demographic characteristics of the study subjects on the basis of age, sex, and nutritional status

Characteristic	n (%)
Age	
60–74 years	80 (65%)
75–90 years	43 (35%)
Sex	
Male	67 (54.5%)
Female	56 (45.5%)
Nutritional Status	
Malnutrition	14 (11.4%)
Potential malnutrition	64 (52.0%)
Normal	45 (36.6%)

Table 2 shows the mean score of handgrip strength and median score of quality of life in elderly patients. The mean score of handgrip strength in all elderly patients was 18.82 kg. The mean score of handgrip strengths of male and female patients were 21.83 and 15.21 kg. Among both male and female patients, those in the age-group of 60–74 years had higher mean handgrip power as compared with patients in the age-group of 75–90 years. The median score of the quality of life of elderly patients was 0.750 (EQ-5D) and 70 (EQ-5D VAS). The median score quality of life of male was higher than female. The median score of quality life for elderly men was 0.768 (EQ-5D) and 70 (EQ-5D VAS), while for elderly women was 0.722 (EQ-5D) and 70 (EQ-5D VAS).

Table 2. Mean score of handgrip strengths and median score of the quality of life in elderly patients

	n	Mean $\pm$ SD (kg)	Median Quality of Life scores	
			EQ-5D	EQ-5D VAS
Hand Grip Strength	123	18.82 $\pm$ 6.62	-	-
Male	67	21.83 $\pm$ 6.49	-	-
60–74 years	39	22.08 $\pm$ 7.41	-	-
75–90 years	28	21.50 $\pm$ 5.05	-	-
Female	56	15.21 $\pm$ 4.74	-	-
60–74 years	41	16.19 $\pm$ 4.51	-	-
75–90 years	15	12.53 $\pm$ 4.42	-	-
Quality of Life	123	-	0.750 (0.423–1)	70 (0–100)
Male	67	-	0.768 (0.47–1)	70 (25–100)
Female	56	-	0.722 (0.423–1)	70 (0–100)

Findings of the Spearman correlation analysis revealed a significant correlation of handgrip strength score with EQ-5D score ($p = 0.015$) (Figure 1). The correlation coefficient (r) was 0.219, which indicated a weak correlation.

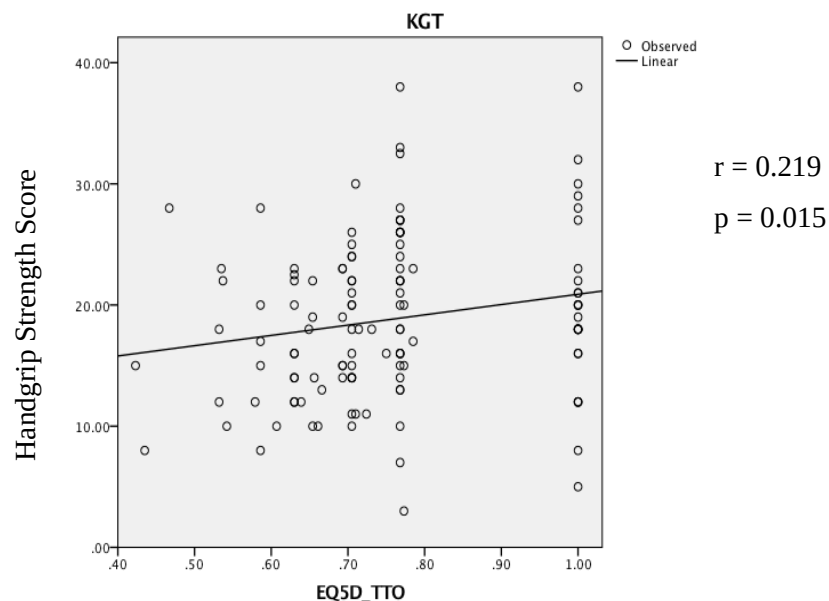


Figure 1. Results of the Spearman analysis showing correlation of Handgrip Strength with EQ-5D score

Spearman correlation analysis also revealed a significant correlation of handgrip strength score with EQ-5D VAS score ($p = 0.003$) (Figure 2). The correlation coefficient value (r) was 0.266, which indicated a weak correlation.

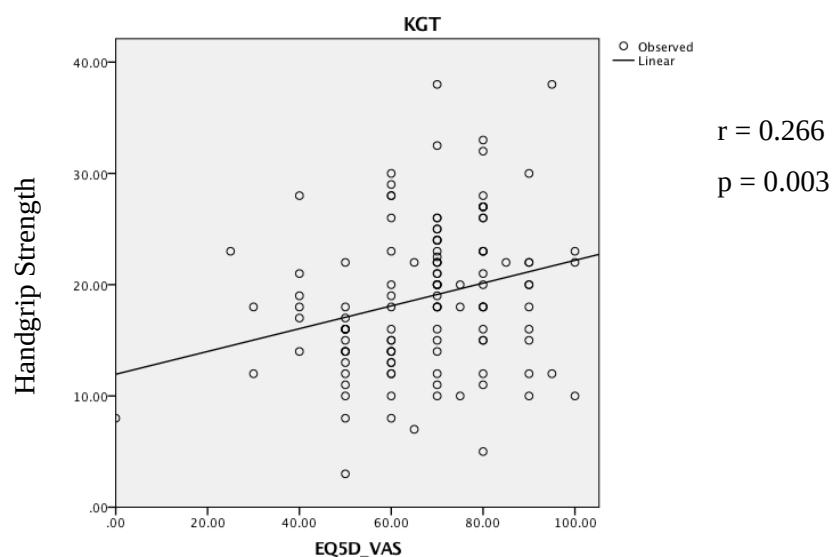


Figure 2. Results of the Spearman analysis showing correlation of handgrip strength with EQ-5D VAS score

4. Discussion

4.1. Demographic characteristics of subjects by age, sex, and nutritional status

There has been a progressive increase in the elderly population in Indonesia. In 2015, the elderly people accounted for 8.49% of the total population of Indonesia. The figure is projected to increase to 15.77% by 2035. In the present study, the proportion of male patients (54.5%) was greater than that of

female patients (45.5%). The sex distribution in the present sample is consistent with the projected sex-distribution in the general population of Indonesia issued by the Central Bureau of Statistics for 2016. However, on the basis of the age category, the number of elderly women (11,908,700) was more than that of elderly men (10,722,300) in the general population of Indonesia [8].

Based on age, the results showed that a majority of the subjects were in the age-group of 60–74 years (65%). This is consistent with the total population of the elderly population projected by the Central Bureau of Statistics, which showed that the proportion of people in the age-group of 60–74 years was more than that in the age group of ≥ 75 years [8]. This likely reflects the average life expectancy of the Indonesian population (70.1 years) [1,8].

Aging is associated with an increased risk of malnutrition. The elderly population is susceptible to malnutrition [9]. This is consistent with the results of our study wherein 52% of the study subjects were at risk of malnutrition and 11.4% of patients were malnourished. Rasheed et al. [9] reported that old age is one of the risk factors for malnutrition. This is caused by chewing and swallowing disorders, decreased sense of taste, inadequate food intake, anorexia, and acute or chronic illness that can reduce the appetite [9].

4.2. Mean value of handgrip strength of elderly patients

In clinical practice, handgrip strength is one of the easiest methods for assessing the function and strength of upper extremity muscles. Studies have shown that handgrip strength decreases after mid-life and is accompanied with a decrease in muscle mass. Low handgrip strength is associated with fall frequency, disability, quality of life, length of hospital stay, and mortality. Jamar type dynamometer is the gold standard for the measurement of the strength of hand muscles [10].

In this study, the average score of handgrip strength of men was higher than that of women. This result is in accordance with that of a study conducted by Bohannon et al. [11], which showed that handgrip strength differs between men and women. This is likely attributable to the fact that women generally have lower muscle mass than men. This also contributes to the differences between men and women with respect to body weight, height, and arm size [11].

Findings of this study revealed that the handgrip power of elderly patients in Indonesia is lower than that of their counterparts in other countries. In a study conducted by Massy-Westropp et al. [7] in Australia, the mean handgrip strengths of male subjects in the age-groups of 60–69 years and ≥ 70 years were 40 and 33 kg, respectively; the corresponding handgrip strengths of women were 24 and 20 kg, respectively. This suggests that the average handgrip strength of the elderly in Indonesia is lower than elderly in Australia [7]. This difference may be because of racial differences between Australians (Caucasian race) and Indonesians (Mongoloid race). Studies have shown that the handgrip strength of Caucasians is greater than that of the races that inhabit the Asian region. This is likely influenced by several factors such as body weight, height, body mass index, and nutritional status [7,12,13].

Based on the consensus statement of the Asian Working Group for Sarcopenia (AWGS), handgrip strength of 26 kg for older men and 18 kg for older women falls in the low category [14]. This suggests that the elderly population in Indonesia has lower handgrip strength compared with that of their counterparts in other Asian countries. However, the criteria for categorization of handgrip strength values in different countries are often adjusted to the characteristics of their respective populations.

Kamide et al. [6] investigated the handgrip strength of the elderly in Japan; the average handgrip strength of the male and female elderly population aged 65–74 years was 35.7 and 22.6 kg [6]. This result shows that the handgrip strength of the elderly population in Indonesia is lower than elderly population in Japanese even though Indonesian and Japanese populations belong to the same race. This is likely attributable to the higher level of welfare and health of Japanese population, which is reflected in the higher mean life expectancy in Japan (83.5 years) compared with that in Indonesia (70.1 years) [1,6].

In a study conducted by Keevil et al. [12], the mean handgrip strengths of elderly men and women in Malaysia were 18.4 and 12.6 kg. This suggests that the average handgrip strength of the elderly population in Indonesia is greater than elderly population in Malaysia [12]. In a recent study by

Malhotra et al. [15], the handgrip strength of elderly men and women in Singapore was greater than elderly population in Indonesia. This may reflect the differences between the two countries with respect to socioeconomic status, welfare and health of Singapore population [15].

4.3. Median score of quality life of elderly patients

The EQ-5D questionnaire is one of the most standardized and widely used instruments for the assessment of quality of life. The EQ-5D questionnaire is a user-friendly, self-completed instrument that can be completed in a few minutes [16]. Various studies have shown the validity and reliability of EQ-5D for the assessment of the quality of life of elderly population in Indonesia [17,18].

In the present study, elderly women had a lower average quality of life compared with that of elderly men. This suggests that women are at a higher risk of impaired quality of life compared with men. This result is consistent with that of the research conducted by Merryn et al. [19], in which the female sex was associated with lower SF-36 score (an instrument for quality of life assessment). However, Yessim et al. found no significant difference between men and women with respect to health-related quality of life [20]. Orfila et al. reported that the quality of life of elderly women worsened in the presence of disability and chronic diseases [21].

Dai et al. [3] reported that the average quality of life in the elderly population in Jinzhou, China was 73.55. However, they used the instrument SF-36 for the measurement of quality of life. SF-36 consists of 36 questions which are used for assessing the quality of life in eight dimensions (physical functioning; role limitations due to physical health; role limitations due to emotional problems; energy/fatigue; emotional well-being; social functioning; pain; general health). SF-36 has a score range of 0 to 100 where a higher SF-36 score indicates better quality of life [3].

4.4. Correlation of handgrip strength with the quality of life of elderly patients

Jakobsen et al. showed a significant positive correlation of handgrip strength with the quality of life. Individuals who had a higher handgrip strength score had a better quality of life [22]. The study also found a negative correlation of handgrip strength with mobility. Mobility is one of the items in the EQ-5D questionnaire. Mobility level was measured using the Timed Get Up and Go Test (TGUG Test). Individuals who had higher/longer TGUG test scores had lower handgrip strength [22].

Bohannon et al. reported a significant positive correlation of the maximum handgrip strength score (measured using a Jamar-type dynamometer) with the self-care capability of patients undergoing rehabilitation ($r = 0.382$) [23]. The ability of self-care is one of the indicators used for quality of life assessment. The results showed that the higher the handgrip strength score the better was the capacity of the individual for self-care. Worsening of the quality of life of elderly patients has been linked with mortality. Vecchiarino et al. reported a significant correlation of handgrip strength with mortality rates in hospitalized patients with pneumonia ($r = 0.285$, $p < 0.001$) [24].

Based on the present study, it can be concluded that there is a significant correlation of handgrip strength with the quality of life of elderly patients as measured using the EQ-5D and EQ-5D VAS questionnaires.

5. Conclusion

The average value of the handgrip strength of elderly patients was 18.82 kg. The median quality of life score of elderly patients was 0.750 as assessed using EQ-5D and 70 as assessed using EQ-5D VAS. The strength of handgrip showed a significant correlation with the quality of life of elderly patients.

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