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A Pilot Study of Malnutrition among Elderly in a Malaysia Elderly Care Centre – Part I : Assessment of Handgrip Strength Measurement

Nurul Aini Bani^{a*}, Mohamad Zaki Hassan^a, Hazilah Mad Kaidi^a, Nor Fazilah Mohd Hashim^a, Rudzidatul Akmam Dziyauddin^a, Rafizah Musa^a, Mohamed Azlan Suhot^a, Sahnus Usman^b, Firdaus Muhammad-Sukki^c, Siti Hawa Abu-Bakar^d, Abdullahi Abubakar Mas'ud^e

^a UTM Razak School of Engineering and Advanced Technology, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia

^b UTM School of Professional and Continuing Education, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia

^c School of Engineering, Robert Gordon University, Scotland, United Kingdom

^d Universiti Kuala Lumpur British Malaysian Institute, Selangor, Malaysia

^e Department of Electrical and Electronic Engineering Technology, Jubail Industrial College, Saudi Arabia

*e-mail: nurulaini.kl@utm.my

Abstract— The number of elderly population in Malaysia of aged 60 years and above is expected to increase every year. Apart from that, the life expectancy of the elderly population is also estimated to rise up with female tend to live longer than male. These uncontrollable factors can lead to a declining healthy lifestyle if the current health care system is inadequate and inappropriate in providing services to the elderly population especially to those that require rehabilitation program to return to their premorbid function. In some cases, these frail elderly were sent to Elderly Care Centre by their primary care taker due to limited nursing ability, time and space. In this pilot study, handgrip strength among elderly and pre-elderly community residing at an Elderly Care Center in Branang, Malaysia is measured using a cross-sectional study design. In overall, 12 male occupants (8 elderly, 4 pre-elderly people) aged 50 years and above were interviewed to obtain data on their sociodemographic characteristics, medical history, hand functionality and hand strength measurements. The overall sample mean (standard deviation) age are 63 (8) years. The mean (standard deviation) of handgrip measurements is 12.47 (6.69) kg.

Keywords—malnutrition; handgrip strength measurement; elderly; sociodemographic; ANOVA; pre-elderly, elderly care centre

I. INTRODUCTION

Based on United Nations (UN) projections, Malaysia is expected to become an ageing country in 2030 when Malaysian population aged 60 years and above reaches 15 per cent of the nation's total population [ref]. In Malaysia, elderly citizens are defined by those aged 60 years and over [1-3]. The Department of Statistics Malaysia [4] estimated an increase of 1.3% in total population of Malaysia in 2017, amounted to 32 million population. Subsequently, the elderly population of aged 65 years and above is estimated to be 2 million elderly people, an increase of 0.2% from the estimated population in 2016. As a result, Malaysia is projected to experience ageing population by 2020 as the percentage of elderly population rise up and exceeds 7% of the total population [5]. The longevity of the

elderly population is expected to increase to 0.2 years for both male and female in 2017. This indicates that the elderly people are expected to live longer every year. Thus, those in their pre-elderly age will in a few years also contribute to the statistics of the elderly population.

Collectively, the high number of elderly and pre-elderly population every year and the increased life expectancy can have major impact on the country's health care system if not geared with advanced technologies and good health management. There are a number of chronic diseases associated with ageing population such as Alzheimer, arthritis, lung disease, stroke, osteoporosis and malnutrition. Malnutrition in elderly population can be caused by medical, social and psychological factors. Typical risk factors for malnutrition are poor appetite, physical disability that affected the ability to feed or reach food, endocrine disorders such as diabetes thus limited the choice of food, oral problems that affected the ability to swallow the food and other disease states or nursing support quality that may contribute to under-nutrition as well as over-nutrition [6].

Several studies [7-14] have been conducted to investigate the relationship between malnutrition and muscle condition. Muscle wasting and muscle loss have been associated with elderly population in many studies [7]. The conditions of our muscle can be an indicator of morbidity and mortality in patients and it can be predicted using nutritional status assessment [8]. There are a number of nutrition assessment tools are available to recognize patients who are under-nutrition and over-nutrition such as Malnutrition Universal Screening Tool (MUST), Scored Patient-Generated Subjective Global Assessment (PG-SGA), Mini Nutritional Assessment (MNSA), hand grip strength (HGS) and many more. Several studies on HGS as a general indicator of multiple chronic diseases such as chronic kidney disease [9-10], arthritis [11-12], coronary artery disease [13] and De Quervain Tenosynovitis [14] have been conducted and the results are conclusive; there is a close correlation in predicting chronic

disease of a patient using HGS. In addition, HGS can also predict a decline in function of elderly population [15] as well as an indicator for nutritional status in individuals with chronic malnutrition [16-19]. Moreover, physical activities i.e. training and exercise, have become an important element in promoting active and healthy aging, increase the rate of longevity, improve physical functionality and quality of life especially for those in ageing population [20].

In this study, a structured questionnaire on sociodemographic characteristics, medical history and hand functionality was conducted on elderly and pre-elderly community residing at Pusat Jagaan Nur Hasanah (Nur Hasanah Care Centre), Branang, Malaysia. A handgrip strength measurement was also conducted to investigate the relationship between handgrip strength and chronic diseases. This study is part of a rehabilitation program conducted at the care centre towards imposing positive impact on the quality of life of the Elderly Care Centre occupants.

II. METHODOLOGY

A. Data Collection

This is a cross-sectional study conducted in Pusat Jagaan Orang Tua Nur Hasanah, Branang, Malaysia. This elderly care centre take care of elderly people who are childless, have no surviving spouse or unfortunately disregarded by their family when they were discharged from government hospital but requires further medical follow-up care in terms of hospital appointments and physiotherapy treatments. There are also those who came to the centre without being persuaded by anyone, not wanting to become a burden to their family and care-givers. The care centre is located in a remote rubber estate area and most of the days, the surrounding is quiet and gloomy. This mundane atmosphere can cause high depression and stress among the population. Moreover, the centre is not designed to stimulate physical movements and encourage thinking thus contribute to the mental, emotional and health problems of the occupants.

All subjects aged from 50 years old and above were invited to participate in this study. The exclusion criteria for participation were those without limb and limb deformation. Subjects with upper limb injury, dysfunction of the elbow joint, had undergone surgery related to hand within the last three months were invited to participate and their physical condition were acknowledged.

Before the start of the study, subjects were interviewer-administered to provide information on background history, demographic data, health status, hand functionality and lifestyle routine. The interview is conducted in Bahasa Malaysia throughout the interview session. To calculate the body mass index (BMI), height and weight must be measured. Since most of the elderly were unable to stand properly and tend to hunch forward, the height is estimated using the ulna length. Based on [21], the ulna length must be measured between the point of the elbow and the midpoint of the prominent bone of the wrist. The height of the subject is by comparing the ulna length value and the subject's age [21]. The BMI can be determined by dividing the body weight measured in

kilogram (kg) by the square of the estimated body height in meters (m).

For handgrip strength, a Digital Pinch / Grip Analyser from MIE Ltd will be used throughout the data collection [22]. This analyser is a precision instrument specifically designed to ensure maximum accuracy and resolution. This instrument is chosen because of its lightweight handle construction thus allowing patients with very poor strength especially the elderly to perform the strength test efficiently. The handle is also insensitive of grip placement as it incorporates a unique sensor to generate correct readings at all times. The handle width is set to a common scale value so that the tests are comparable. The digital analyzer provides force values in Newtons force, kilograms or pounds with the values shown at the digital display of the multi-analyzer. The force values are then captured by a CAS Software incorporated in the analyser and relevant analysis can be conducted by the software [22].

For handgrip strength measurement, due to the poor health of the elderly, the measurement was taken with participants seated on the chair following the standard position by American Society of Hand Therapy (ASHT) [23]. Subjects are instructed to be in seating position with the elbow flexed at 90 degrees, wrist and forearm in a neutral position with the forearm lying on an armrest. This is to ensure that their hand is free to squeeze the handles but neither the hand nor the handle should touch the body or any other object during the test. Their feet were ensured to be flat on the floor and they did not leave the ground during the test. Prior to the commencement of data collection, subject will be allowed to do a practice trial to familiarize the handles. Before testing, the examiner will demonstrate how to hold the handles properly. Subjects will be asked to hold the grip analyser handles 2 cm down from the red indicator line without support. Three handgrip measurements are taken on seated position on dominant or functional hand only with 5 seconds of maximal hand gripping. Subjects are given a 10-second rest between the measurements to minimize fatigue. Subjects received no feedback but were given consistent verbal encouragement for each test to ensure maximal effort. All tests are conducted by the same examiner to control inter-tester variability. All data are saved under the condensed format and subsequently converted to required format of the pre-processing techniques.

B. Data Analysis

All statistical analysis are performed using SPSS. Descriptive statistics e.g. frequencies, percentages, means and standard deviations (SD) were used to analyse the characteristics of the participants. A paired t-test was used to determine the relationship of handgrip between elderly and pre-elderly populations. A $p \leq 0.05$ probability level was used to indicate significance in all of the statistical analyses.

III. RESULTS AND DISCUSSIONS

The results of this study are discussed based on the questionnaire categories.

A. Demographic Characteristics

Table 1 shows the sociodemographic characteristics and occupation history of the occupants from Nur Hasanah Care Centre. There were a total of 12 male participants with mean (SD) age of 63 (8) years. The age range between 50 to 79 years old with 4 subjects fall in pre-elderly category and the other 8 subjects are in elderly category. Majority (83.33%) of the care centre occupants are from Malays ethnic and the rest (16.67%) are from Indian ethnic. A total of 6 (50.00%) occupants have been married, 3 (25.00%) are still single while 3 (25.00%) have been divorced before living at the care centre. Mostly all of the occupants (n (%) = 11 (91.67%) people) had attended school during their school year. The lowest education level is reported to be in elementary Year 2 while the highest education level is achieved by one of the occupants (9.10%) who attended tertiary education level at local university. However, he did not manage to complete his tertiary education. All occupants (100%) have worked before to support their daily lives such as rubber tappers, village work and security officials. About 7 (58.33%) occupant used to live in urban areas in different states while the remaining 5 (41.47) occupants lived in suburban.

TABLE I. SOCIODEMOGRAPHIC CHARACTERISTICS AND OCCUPATION HISTORY OF THE STUDY SAMPLE

Variables	Total		
	n	%	Mean (SD)
Sample size	12	100	
Age:			
< 60 years old	4	33.33	54.50 (3.42)
> 60 years old	8	66.67	67.25 (5.80)
Overall	12	100.00	63 (8)
Gender:			
Male:	12	100.00	-
Female:	0		
Races:			
Malay:	10	83.33	
Chinese:	0	0	-
Indian:	2	16.67	
Others:	0	0	
Marital Status:			
Married:	6	50.00	-
Single:	3	25.00	
Others:	3	25.00	
Education Status:			
Attended school:	11	91.67	-
Never attended school:	1	8.33	
Working experience:			
Working:	12	100.00	-
Never work:	0	0	
Residential area:			
Urban:	7	58.33	
Suburban:	5	41.67	-
Remote:	0	0	

B. Hand Grip and Pinch Strength Measurement

Table II shows the anthropometry and handgrip strength measurements for all subjects. The mean (SD) of the study sample is 65.24 (7.49). As mentioned in Methodology section, the estimated height was calculated using ulna measurement and age (in years) of the participants since most of the elderly

were unable to stand properly and tend to hunch forward. The mean (SD) of the study sample is 1.80 (0.05) m. The mean (SD) BMI falls in the normal and healthy weight category (BMI > 18.5 kg/m²) at 20.26 (2.73).

Hand dominance is important in measuring performance of motor skills in daily activities. Medical conditions such as stroke and arthritis can cause impairment to both dominant and non-dominant hand thus affected the physical movement in many situations. Initially, majority of the participants (n (%) = 6 (50.00%)) were right-hand dominant with 3 (25.00%) participants were left-hand dominant and the other 3 (25.00%) participants can use both hand equally well (ambidextrous). However, due to stroke and arthritis, there were 4 (57.14%) participants who have right hand dysfunction and two participants (28.57%) have left hand dysfunction. It was reported that one participant (14.29%) has a dysfunction problem in both hands due to a relatively chronic stroke. A few participants who are having dysfunctional problem with their dominant hand have to train their non-dominant hand to perform daily activities such as holding spoon and feeding themselves as well as taking a bath. This motivation has allow them to continue living their lives sufficiently if not smoothly.

The overall mean (SD) of hand grip measurement is 12.47 (6.69) kg. Those below 60 years old have higher mean (SD) handgrip at 16.47 (8.69) kg than those in elderly category with mean (SD) of 10.46 (5.77) kg. Although the mean value is low, the decreased in mean handgrip as the age increased is consistent with a study in Korean elderly community [24].

TABLE II. ANTHROPOMETRY, HAND GRIP MEASUREMENT OF THE STUDY SAMPLE

Variables	Total		
	n	(%)	Mean (SD)
Current weight in kg:	-	-	65.24 (7.49)
Estimated height in m:	-	-	1.80 (0.05)
Estimated BMI in kg/m ² :	-	-	20.26 (2.73)
Dominant hand:			
Right	6	50.00	
Left	3	25.00	-
Both	3	25.00	
Dysfunctional hand:			
Right	4	57.14	
Left	2	28.57	-
Both	1	14.29	
Hand grip strength in kg			
< 60 years old	-	-	16.47 (8.69)
> 60 years old			10.46 (5.77)
Overall			12.47 (6.69)

IV. CONCLUSION

This study has been conducted on the pre-elderly and elderly people at Nur Hasanah Care Centre in Branang, Malaysia. For this study, the sociodemographic data, anthropometric data and handgrip strength measurement were recorded for all occupants. Overall, the mean BMI of the elderly falls in the normal and healthy weight category.

However, this is not reflected in their handgrip strength measurements that are quite low due to age factor. By having this handgrip value, physical therapist can help to design physical activities and rehabilitation exercises that are suitable for the elderly people. On top of that, the caretaker at the care centre can be trained to monitor the usage of rehabilitation equipment by the elderly people to avoid unnecessary incidents due to over exercising.

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