

Sri Lanka Elderly Study: Phase 1 (SLES:1) – A descriptive study of the health status and physiological parameters of institutionalized elderly in Colombo district: The protocol

SLES Research team

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Abstract

Objectives: Population ageing is a world phenomenon affecting many sectors including health. High prevalence of multiple co-morbidities, increased healthcare expenditure, psychological disease and social consequences are some major health problems of ageing. Study of physiology and health status among elders is an important component in geriatric care. This is a study protocol to describe overall health status and functional capacity among the elders in residential care facilities in Colombo district.

Methods: Eligible elders aged over 65 years, in all residential care facilities in Colombo district, registered under the National Secretariat for elders will be included in this cross-sectional study. Data on basic demography and medical co-morbidities will be collected. Nutritional status will be assessed by 24-hour dietary recall, mini nutritional assessment and anthropometric measurements. Five fried model indicators, Montreal cognitive assessment and geriatric depression scale will be used to assess frailty, depression and cognition respectively. Timed up and go test and five times sit to stand test will be performed to assess the risk of falls and the FRAX index for osteoporotic risk assessment. Spirometry

will be used to assess respiratory function. Descriptive and correlation analysis of data will be performed.

Discussion: This is a comprehensive health assessment of the elderly population living in residential care facilities for elders in Colombo. The study will contribute to establish better geriatric care in Sri Lanka and will serve as a model to design an island wide study on elderly.

Introduction

There is an increase in the ageing population globally. It was 48% in 2015 compared to year 2000, reaching 901 million from 607 million. The population over 60 years is expected to reach 2.1 billion by 2030(1). An increased elderly population leaning towards living in residential elderly care centres has become one of the most significant social transformations of the 21st century with implications for nearly all sectors of the society¹. The health sector is among the most important sectors catering to the needs of the elderly population due to the high burden of health issues with ageing.

Multiple co-morbidities are a common health related issue among the elderly population. The prevalence of heart disease has increased among the older population². The probability of having chronic co-morbid diseases such as arthritis, osteoporosis, diabetes and hypertension too has increased in the older population over the past few decades³. Co-morbidities and physiological changes have compromised the ability of the elderly population to

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cope with acute stressors thus making them frail^{4,5}. Between 25% to 50% people older than 85 years are estimated to be frail, and they have a substantially increased risk of falls, disability, need for long-term care, and death^{4,5}. The co morbidities, frailty and other changes with ageing population has resulted in several psychosocial problems. All these problems affect Sri Lanka too.

In Sri Lanka, the population over 60 years has increased from 6.6% in 1981 to 12.4% by 2012 and if the same rate of ageing continues, it is expected that the population aged over 60 years will reach 24.8% by 2041⁶. The prevalence of chronic disease in the population aged 60 and above was 45.3%⁷. The prevalence of obesity which is a feature of metabolic syndrome leading to non-communicable diseases such as diabetes is also high in the older age group in Sri Lanka⁸. Recurrent falls, depression, cognitive dysfunction and severe visual impairment were some of the unnoticed illnesses present in a substantial proportion of elders⁹. It has also been reported that over 50% of elderly in some elderly care institutes in Sri Lanka are malnourished¹⁰. The details on dietary diversity scoring and the serving sizes among the elderly are deficient¹¹. Despite the glimpses of these graver health and economic consequences of ageing population in the country, a comprehensive study of the elderly population has not been conducted.

This study would be a comprehensive health assessment to describe the overall health status and functional capacity of the elderly population living in the residential care facilities in the Colombo district in Sri Lanka.

Methods

This cross-sectional descriptive study will be conducted in the residential care facilities registered in the National Secretariat for Elderly in Colombo district. The ethical clearance for this study was obtained from the Ethics Review Committee of Faculty of Medicine, University of Colombo (EC 17-048). Elders over 65 years of age will be included in this study, and those who are unable to communicate due to hearing, speech and visual impairments will be excluded. Though some of the parameters may be checked in individuals with those parameters it was considered unethical to carry out tests without properly communicating the procedure.

Residents who are not able to mobilize, those with neurodegenerative disease (e.g: Alzheimer disease, Parkinson disease), stroke, elderly people who have moderate to significant impairment with

activities of daily living, as determined by interview will be excluded when assessing tendency to fall using timed up and go test and five time fit to stand test.

Residents with cognitive impairment that interferes with ability to comply with instructions and contraindication to spirometry [active respiratory infection, history of IHD, uncontrolled hypertension, history of haemoptysis, history of pneumothorax, history of pulmonary embolism, any patient discomfort, vomiting, diarrhoea, common cold, history of thoracoabdominal surgery] will be excluded from spirometry.

The data will be collected through a questionnaire administered by well-trained data collectors and a series of internationally accepted tests conducted by trained technical officers using calibrated equipment.

Basic demography, nutritional assessment, physical activity will be assessed using the interviewer administered questionnaire. The basic facilities available in the residential elderly care facilities will be collected from the heads of the institutes.

Basic demography details such as age, marital status, past occupations and support systems will be gathered. The details related to existing co-morbidities and the medications they are currently on will be gathered from the participants and by their existing medical records.

The diet of the residents will be assessed using a 24-hour dietary recall. Food portion sizes will be obtained using standard household measures such as plate, bowl, cup, glass and different spoons. The mini nutritional assessment which is a widely used tool to assess malnutrition in the elderly will also be used to describe the nutritional status of the elders¹².

Assessment of physical activity will be done using the physical activity scale for elderly (PASE); which is validated as a suitable tool to assess physical activity of elderly in community studies¹³ and the short version of the International physical activity questionnaire (IPAQ); a validated tool to measure physical activity levels of adults in community studies, which has been used in previous studies in Sri Lankan population^{14,15}.

Anthropometric measurements

All anthropometric measurements will be performed following the standard protocols of the International Society for the Advancement of Kinanthropometry (ISAK)¹⁶. All anthropometric measurements will be performed under direct supervision of an ISAK level 1 anthropometrist.

Table 1. Tools that will be used in the assessment of different components in SLES 1

<i>Component</i>	<i>Tool that will be used for assessment</i>
Nutritional status	24-hour dietary recall Mini nutritional assessment (MNA)
Physical activity	Physical activity scale for elderly (PASE) International physical activity questionnaire (IPAQ)
Body composition	Height, Weight, Circumference: waist, hip, mid upper arm, calf skinfold thickness. Sites: biceps, triceps, subscapular, medial calf
Frailty	Five fried model
Osteoporotic and fracture risk	FRAX index
Tendency to fall	Timed up and go (TUG) test Five times sit to stand test (FTSST)
Cognitive assessment	Montreal cognitive assessment (MoCA)
Risk of depression	Geriatric depression score – short form (GDS-S)
Cardio respiratory function	Blood pressure (seated and standing) Spirometry

Height will be taken to the nearest 0.1 cm, as the maximum distance to the uppermost position on the head from heels, with the individual standing barefoot and in full inspiration using a stadiometer.

Body weight will be measured to the nearest 0.1 kg using a digital weighing scale with the participants wearing indoor light clothing.

Waist circumference will be measured midway between the iliac crest and the lower rib margin at the end of normal expiration using a plastic flexible tape to the nearest 0.1 cm.

Hip circumference will be measured at the widest level over the greater trochanters using a plastic flexible tape to the nearest 0.1 cm.

The measuring point of mid upper arm circumference (MUAC) will be marked at the midpoint between the acromion and the olecranon process in the right upper arm when the right elbow is 90° flexed placing the forearm palm down across the trunk. The measurement at the marked site will be taken using a plastic flexible tape to the nearest 0.1 cm when the right arm is extended alongside the body with the palm facing upwards.

The largest circumference of the calf will be measured as the calf circumference using a plastic flexible tape to the nearest 0.1cm in seated/supine position when the knee and hip are 90° flexed in the two lower limbs.

Skinfold thickness

Each skin fold measurement will be taken in duplicate on the non-dominant side, and the average of the two readings will be recorded using a consistent technique and by a calibrated Harpenden skinfold calliper.

a) Biceps skinfold site: The skinfold measurement will be taken parallel to the long axis of the arm at the biceps skinfold site at the point on the anterior surface of the arm in the mid-line at the level of the mid-acromial-radial landmark. This point will be located by projecting the mid-acromial-radial site perpendicularly to the long axis of the arm around to the front of the arm, and intersecting the projected line with a vertical line in the middle of the arm when viewed from the front. The participant will stand with the right arm relaxed, the shoulder externally rotated, and the elbow extended by the side of the body.

b) Triceps skinfold site: The skinfold measurement will be taken parallel to the long axis of the arm at the triceps skinfold site, the point on the posterior surface of the arm, in the mid-line, at the level of the marked mid-acromial-radial landmark. This point is located by projecting the mid-acromial-radial site perpendicularly to the long axis of the arm around to the back of the arm, and intersecting the projected line with a vertical line in the middle of the arm when viewed from behind. The participant will stand with the arm hanging by the side in the mid-prone position and the elbow extended by the side of the body.

c) Subscapular skinfold site: The skinfold will be measured at the site 2 cm along a line running laterally and obliquely downward from the subscapular landmark, the under most tip of the inferior angle of the scapula, at a 45° angle. The line of the skinfold is determined by following the natural fold lines of the skin. The participant will be with the arms hanging by the sides.

d) Medial calf skinfold site: The skinfold measurement will be taken vertically at the medial calf skinfold site at the maximum girth level. The participant will stand with their right foot placed on a box and the calf relaxed. The fold was parallel to the long axis of the leg. The right knee will be bent at about 90° angle.

Blood pressure measurement

Seated blood pressure will be measured after at least a 10-minutes rest using Riester digital blood pressure monitor (Rudolf Riester, Germany). Blood pressure in standing position after 3 minutes of standing will also be measured to assess orthostatic hypotension, which is defined as a fall in systolic blood pressure greater than 20 mm hg or a fall in diastolic blood pressure greater than 10 mm hg within 3 minutes of standing¹⁷.

Assessment of frailty

As per the five fried model indicator, presence of 3 positive indicators of the 5 indicators; weight loss, exhaustion, low energy expenditure, slowness and weakness will be considered as frail⁴.

Weight loss: Unintentional weight loss of 4.5kg or more in the past 6 months⁴ and/or BMI of less than 18.5 kg/m² at the time of measurement¹⁸.

Exhaustion: 'a little' or 'none of the time' responses for the Short Form 12-item Survey (SF-12) question, "how much of the time during the past 4 weeks did you have a lot of energy?"⁴.

Low energy expenditure: A score < 73 on the Physical Activity Score for Elderly (PASE) questionnaire¹⁹.

Slowness: The average of two readings in the 6m fast gait speed test and a gait speed of < 0.65m/s; the lowest quintile values stratified for gender and height will be used to classify the participants as 'Slow'⁴.

Weakness: Hand grip strength stratified for sex and BMI will be measured using Jamar Hand Dynamometer. A measurement <25kg would be considered 'Weak'^{14,18}.

Fracture risk

FRAX is a globally accepted tool to assess the risk fractures. The FRAX index without bone mineral density predicts the similar risk as the FRAX with BMD²⁰. FRAX indices specific for Sri Lanka will be calculated using the FRAX index calculator available.

Tendency to fall

Inability to walk and mobilize is an exclusion criterion for this component of the research.

The presence/absence of neurodegenerative disease, stroke and other diseases like deforming arthritis that will have a significant impact on activities of daily living will be gathered before continuing this component of research, as the analysis of cognitive deficit and tendency to fall may be affected by the presence of these conditions.

a) Timed up and go (TUG) test

Timed up and go (TUG) test will be used to assess the tendency to fall. The participants will be observed and timed as they stand up from a chair at the beginning of the walkway, walk 3m, turn around, walk back to the chair and sit down²¹. Regular footwear and customary walking aids would be used while the participant may walk at a comfortable and safe speed. A TUG time is the time in seconds a participant needed to complete the test. ≤13.5 seconds will be considered normal (non-fallers) and >13.5 seconds will be considered those with high prediction for falls (fallers)²².

b) Five Times Sit to Stand Test (FTSST)

FTSST will be used to determine functional lower extremity strength and balance of each participant. This test measures in seconds, the time it takes an individual to stand up and sit down five times from a chair. No physical assistance is given. Subject starts with the back against the chair, arms crossed in front of the chest. Each stand will be counted aloud so that the patient remains oriented. The test will be stopped when the patient achieves the standing position on the 5th repetition. ≤15 seconds – normal; indicates functional level of lower extremity strength²².

Cognitive assessment

The Montreal Cognitive Assessment (MoCA) is an internationally accepted, widely used instrument used for assessment for mild cognitive impairment, which is validated for the Sri Lankan population and it takes about 10-15 minutes for the assessment²³. Cognitive domains such as attention, concentration,

memory, executive functions, visuo-constructional skills, calculations, orientation and conceptual thinking can be assessed separately using MoCA. The MoCA score ranges between 0-30 and a score of 24 or above will be considered normal and a score below 24 will be categorized as mild cognitive impairment²³.

Assessment for the risk of depression

The geriatric depression score-short form (GDS-S) which is validated for Sri Lankan population will be used to screen the population for depression. 10 or more points in GDS will be considered as "moderate depression", 8-10 points as "mild depression" warranting further assessment and a score below 8 as normal (non-depressed)²⁴.

Respiratory functions

The inability to comprehend the instructions due to cognitive impairment and other contraindications for spirometry such as active respiratory infection, uncontrolled hypertension, history of ischemic heart disease, hemoptysis, pneumothorax, thoraco-abdominal surgery or pulmonary embolism will be considered as additional exclusion criteria for this component of research.

Respiratory functions will be assessed using BioPonys 3 spirometer quark PC KIT with USB. The same instrument will be used to perform measurements in all subjects. The subjects will be tested in the seated position. A nose clip will be applied to prevent air escaping through the nose during exhalation. Disposable mouth pieces will be utilized per individual to prevent cross-infection. The subjects will be asked to take a deep breath to maximal inspiration and exhale maximally in a slow expiration. The maneuver will be then be repeated with a forced exhalation. Each measurement will be repeated until three reproducible recordings are obtained. The measurement with highest reading will be taken as the test reading.

Slow vital capacity, forced vital capacity, forced expiratory volume in first second (FEV1), Peak expiratory flow rate (PEFR), MEF 75, MEF 50, MEF 25 will be obtained.

Plan for data analysis

Demographic distribution and comorbidities

The population demography according to sex, age, ethnicity, religion and marital status will be described in percentages. The prevalence of co-morbidities like diabetes, hypertension, dyslipidaemia, asthma and arthritis will be described.

Nutritional and dietary assessment

Anthropometric measurements will be used to classify the population according to WHO classification for South Asian population and the prevalence of each group; underweight, normal, overweight, obese and morbidly obese²⁵. The body composition will be described using the anthropometric measurements height, weight, waist circumference, thigh circumference, calf circumference, mid-upper arm circumference and the skin fold thickness measured as biceps, triceps, subscapular and medial calf sites.

The portion sizes obtained by the 24-hour dietary recall will be described under five food categories: starch, proteins (legumes and animal products), fat, dairy products, fruits and vegetables^{26,27}. The portion sizes consumed will be compared with the recommended portion sizes for the population^{28,29}. The dietary intake will also be described in terms of energy calculated by the Nutrisurvey 2000 software. The energy content of each food component will be calculated using standard energy values for the portion sizes and compared with the recommended intake of energy according to their age, body composition and physical activity.

Assessment of frailty among the population

The prevalence of frail, pre frail and no frail groups among the study population will be studied as the presence of ≥ 3 components among the five frail components as "frail", 1-2 components present as "pre frail", no component present as "not frail"⁴.

Cognitive assessment and depression screening

Prevalence of mild cognitive impairment according to MoCA will be described. The population screened for depression will be described in terms of "mild depression" and "moderate depression" categories according to GDS²⁴.

Risk of falls and osteoporosis

The percentages of fallers and non-fallers in TUG (Timed Up and Go Test) test and those with good lower extremity strength and those without as to FTSSST will be described. The association between cognitive functions and the risk of falling will be identified. The risk of fracture due to osteoporosis will be described by the FRAX index.

Respiratory functions

The spirometry findings among the population will be described using means. Restriction will be

described as a SVC or FVC less than 80% of predicted. Airway obstruction will be categorized as FEV1/FVC \leq 70%.

Correlation analysis will be conducted to assess the relationship between the components of the research. All data will be analysed using the SPSS 22 version.

Discussion

This study will be conducted to evaluate the health of the elders living in elderly homes in Colombo with a holistic approach. Individual studies have been conducted to assess different components like nutritional status in residents of elderly homes¹⁰, relationship between risk of falls and cognitive functions²², assessment of dependency in primary care using Barthel index³⁰. There is paucity of data regarding lung function in elders in Sri Lanka. However, with the set of comprehensive tools to assess several components of health, this study will provide a holistic approach to health assessment in the residents. Many of the tools used in the study are already validated for Sri Lanka, like the GDS-S²⁴ and the MoCA²³ which improves precision of the data. However, some internationally accepted and widely used tools like the PASE, IPAQ used in this study have not yet been validated for the Sri Lankan population, which is a limitation. As the focus of this phase is on the residents of elders' homes, the planning and execution of the interventions for the deficits identified by this study would be relatively easy. However, the needs and the health care deficiencies of the elders in the community will have to be assessed separately, since this holistic approach may not be applicable for the community level due to high demand of resources and the time constraints in assessing community level elders using the same method.

Outcome

The findings of this phase will be used to develop health interventions to improve health status in the elderly population and the effectiveness of such interventions will be studied in the subsequent phases of the study. The data gathered in the first phase of this study shall be used to plan out an island wide study to assess the health status and the functional capacity of the elders living in Sri Lanka.

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