

Original Article

The prevalence of sarcopenia in fallers and those at risk of falls in a secondary care falls unit as measured by bio-impedance analysis

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Abstract

Objectives: Sarcopenia is characterised by loss of skeletal muscle mass and strength with adverse outcomes: physical disability, poor quality of life and death. Low muscle mass and strength are risk factors for falls, although there are few data available on the prevalence of sarcopenia in fallers. This study aimed to determine prevalence of sarcopenia in older people referred to a falls clinic. **Methods:** Consecutive patients referred to a secondary care falls unit were recruited. Sarcopenia was diagnosed using the European Working Group on Sarcopenia definition (low muscle mass and function) and cut-off points. Bio-impedance measured appendicular skeletal muscle mass. Gait speed and grip strength were functional measures. **Results:** Fifty-eight patients were recruited. Mean (SD) grip strength for women and men respectively were 17.9 (4.9) and 29.9(8.7) kg, mean (SD) gait speeds were 0.61(0.18) and 0.72 (0.4) m/s, mean (SD) appendicular skeletal muscle index in women and men were 6.98(1.0) and 7.85 (1.0) kg/m² (p=0.018). Prevalence of sarcopenia was 9.8% (95% CI=1.6%-18%). **Conclusions:** Sarcopenia, as measured by bio-impedance is not uncommon in older people accessing a secondary care falls clinic. Bio-impedance was simple to perform, although further validation against gold standard methods is needed. As nutritional and exercise interventions for sarcopenia are available, simple methods for diagnosing sarcopenia in fallers should be considered.

Keywords: Sarcopenia, Falls, Bio-impedance, Prevalence, Muscle

Introduction

Sarcopenia is the progressive loss of muscle mass and strength which leads to the risk of outcomes such as poor quality of life, disability or death¹. The prevalence of sarcopenia has been reported as 1-29% in community dwelling populations, 14-33% in long term care populations and 10% in one acute care population². There is little consensus on prevalence mainly due to the different populations studied and methods used to diagnose sarcopenia². The European Working Group on Sarcopenia in Older People (EWGSOP) have identified criteria for diagnosing sarcopenia: low muscle mass with low muscle strength or performance¹.

There are various methods that can be used to measure

muscle mass. Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) are very precise and are gold standard techniques for use in research¹. The EWGSOP

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states that dual x-ray absorptiometry (DXA) is the preferred alternative for both research and clinical use¹. DXA measurements have been validated against MRI and CT and the difference has been found to be less than 5 percent³. Bio impedance analysis (BIA) is another method which is easier to access and use in a clinic setting.

The diagnostic markers for sarcopenia: reduced strength, gait speed and muscle mass are also risk factors for falls⁴ however there are only a few data available on the prevalence of sarcopenia in fallers. Studies have shown that there is a strong link between sarcopenia and falls. The iSIRENTE study⁵ showed that 27.3% of participants diagnosed with sarcopenia during the study reported falls in the two year follow up of the study compared to only 9.8% of those without sarcopenia. Another study⁶ investigating older community dwelling participants in Japan also found that the prevalence of sarcopenia was higher in those who had fallen. Diagnosing sarcopenia in fallers is important as there are now interventions for sarcopenia available which may also help to reduce falls⁷⁻¹³.

This study aimed to determine the prevalence of sarcopenia in older people referred to a secondary care falls clinic.

Materials and methods

Ethical approval was gained prior to starting the study from NRES Committee East Midlands – Nottingham 2, reference 15/EM/O175. The population was taken from consecutive patients who had had falls or were at risk of falls and were receiving falls rehabilitation at the Nottingham University Hospitals Rehabilitation Unit (NUHRU) which is a secondary care falls rehabilitation unit. Recruitment was through provision of an information sheet about the study by the staff that usually see the patient at the unit. Participants were then approached by one of the research team if they had agreed to discuss the study and if consent was given they were recruited onto the study.

Inclusion criteria were any person attending the NUHRU for rehabilitation due to falls or falls risk factors. Falls risk factors included reduced balance, muscle weakness, altered gait pattern, dizziness and visual deficit. Exclusion criteria were: Unable to complete the diagnostic tests; lacking capacity to consent to inclusion in the study; under 60 years of age.

This study used the EWGSOP method for diagnosing sarcopenia (low muscle mass and either reduced grip strength or low gait speed)¹ for diagnosing sarcopenia. Gait speed was measured by 10 metre timed walk with a stop watch, participants used their usual walking aid. Grip strength was measured with a grip dynamometer (Jamar) and muscle mass was measured through BIA (Tanita bc-147 machine¹⁴). As the Tanita machine measures and reports appendicular limb muscle mass, the Appendicular Skeletal Muscle Index (ASMI) was calculated by dividing appendicular skeletal muscle mass (sum of the muscle mass of the arms

Outcome measure	Cut off point
Grip strength:	
Men	30 kg
Women	20 kg
Gait speed:	
Men	0.8 m/s
Women	0.8 m/s
Muscle mass index:	
Men	7.26 kg/m ²
Women	5.45 kg/m ²

Table 1. Cut-off points for outcome measures.

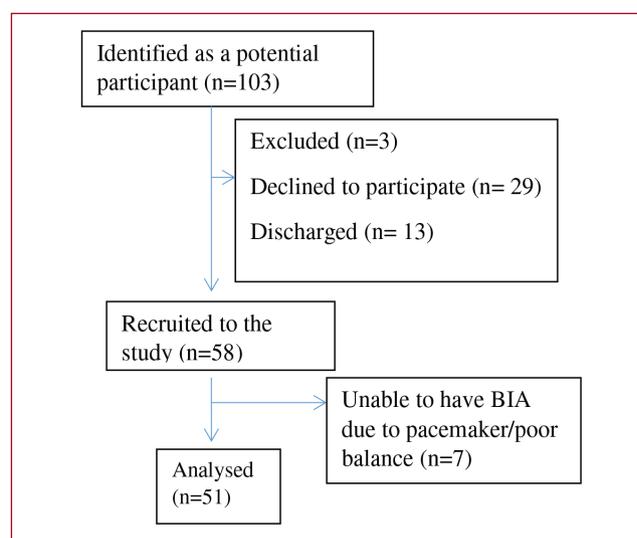


Diagram 1. Flow diagram showing the progress of participants through the study.

and legs) by height squared. The Rosetta study cut off points for muscle mass (7.26 kg/m² for men and 5.45 kg/m² for women) were employed³. The EWGSOP suggested cut-off points for gait speed and grip strength were used to diagnose reduced grip strength and low gait speed (Table 1).

Results

From a potential 103 participants the total sample size was 58, which included 22 males and 36 females (62.1%). Age range was 67-94 with the mean age (SD) being 80 (6.3) years old. Weight ranged from 45-110 kg with the mean weight (SD) being 71.9 (16.0) kg. Height ranged from 1.49-1.85 metres with the mean height (SD) being 1.66 (0.1) metres. Fifty-five participants were fallers and 3 were at risk

of falls. When a potential participant was not recruited it was either due to them declining, being excluded from the study or due to them being discharged from the falls unit before they could be approached by the research team (Diagram 1). Reasons for exclusion from the study were either lacking capacity to consent to inclusion in the study or being unable to complete the diagnostic tests due to poor mobility.

Mean grip strength (SD) for women was 17.9 kg (4.9) and for men 29.9 kg (8.7). Mean gait speed (SD) for women was 0.61 m/s (0.2) and for men 0.72 m/s (0.4).

Seven participants (12.0%) were unable to have BIA due to having a pacemaker or being unable to balance when standing on the machine. Mean ASMI (SD) was 6.98 kg/m² (1.0) for women and 7.85 kg/m² (1.0) for men.

Prevalence of sarcopenia in the total population was 9.8% (95% CI= 1.6%- 18%; n=5).

Of those diagnosed with sarcopenia 60% were male and 80% were over the age of 80 years.

Eleven participants had either Parkinson's disease or a previous stroke but only one of these participants was sarcopenic.

According to the BMI categories 2 participants (3.9%) were underweight (one of these was sarcopenic), 20 (39.2%) were normal in weight (with 15% being sarcopenic), 21 (41.2%) were overweight (with 4.8% being sarcopenic), and 8 (15.7%) were obese (none being sarcopenic).

Thirty-four participants used a walking aid and 14.7% of these were diagnosed with sarcopenia, conversely 17 walked unaided and none of these were sarcopenic.

Discussion

The results show that prevalence of sarcopenia, as measured by BIA, is not uncommon and accounts for around one tenth of older people referred to a secondary care falls clinic. This is important as sarcopenia is a risk factor for further falls and potential interventions for this condition are available.

The most appropriate skeletal muscle index cut off points for this study were carefully considered. The EWGSOP paper suggests using 8.87 kg/m² for men and 6.42 kg/m² for women¹. However, these cut off points were derived from the Taiwanese study by Chien et al. (2008)¹⁵ in which they specifically used the BIA Janssen equation which was developed for estimating total skeletal muscle mass (SMM)¹⁶. Usually, 73-75% of total SMM is found within the limbs¹⁷. Therefore, it was felt that these cut off points were not appropriate for our study as the Tanita BIA device¹⁴ estimated appendicular limb skeletal muscle mass (ASMM). This ASMM compartment can be estimated when a BIA equation is derived from a validation study where ASMM has been assessed using DXA. An example of this is the recent study by Sergi et al. where a new BIA equation was developed for older people using DXA as a reference¹⁸. In their paper, they discuss the prevalence of sarcopenia in the study population specifically using the Rosetta study cut off

points (7.26 kg/m² for men and 5.45 kg/m² for women³). The Rosetta study cut off points have also been suggested as suitable cut off points using DXA estimation of ASMM by EWGSOP¹. Therefore we chose the Rosetta Study cut off points as the most appropriate for the current study using Tanita BIA. The application of BIA and utilisation of specific cut off points for estimating sarcopenia is currently a 'grey area', which needs to be urgently addressed, as discussed in a recent editorial¹⁷.

A higher proportion of those with sarcopenia were male and over the age of 80 years. Prevalence of sarcopenia was lower with increasing BMI. Similar results have also been found in previous studies and it has been suggested that in older people over the age of 80 years, being underweight is an independent risk factor for sarcopenia^{19,20}. However it is difficult to assess patterns of body composition from BMI²¹ as this method does not discriminate between body fat and lean mass²². An overweight or obese BMI may be due to increased lean mass rather than body fat and therefore a sarcopenia diagnosis would be less likely in this case. In those of low BMI however, nutritional interventions may be promising in treating sarcopenia^{7,9}.

A limitation of this study was that although consecutive patients referred to the falls unit were approached, recruitment was difficult in this population as many declined to take part. Poor health and having too many hospital appointments were the main reasons cited for declining. The prevalence of sarcopenia therefore may have been underestimated in this population.

Another limitation is that 11 participants had either Parkinson's disease or a previous stroke which may have affected the results as these conditions can also cause muscle weakness and gait abnormalities. However this is representative of a falls clinic population and only one of these participants was sarcopenic.

Using BIA to measure muscle mass was simple to perform in this setting and the majority of participants were able to use the machine, however further validation against gold standard methods of measuring muscle mass is needed in this population as accuracy has not been adequately established.

Conclusion

Sarcopenia, as measured by BIA is not uncommon in older people referred to a secondary care falls clinic. BIA was simple, relatively cheap and quick to perform in this busy falls clinic setting and shows promise in diagnosing sarcopenia, although further validation against gold standard methods is required in this population. As resistance exercise and nutritional interventions for treating sarcopenia are now being developed, simple methods for diagnosing sarcopenia in fallers such as BIA should be considered.

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