

Ageing and Sarcopenia

Key Messages

- ※ Sarcopenia is recognised as a geriatric syndrome characterised by progressive loss of skeletal muscle mass as well as muscle function with a risk of adverse outcomes.
- ※ Various factors over the life-course can contribute to the loss of skeletal muscle mass and function. Other than age-related biological and physiological changes and certain chronic diseases, onset and progression of sarcopenia is also affected by lifestyle factors which are modifiable.
- ※ In Hong Kong, the prevalence of sarcopenia among community-dwelling people aged 65 and above was 9.0%.
- ※ The impact of sarcopenia in elders is far reaching. It is associated with falls, physical disability and loss of independence.
- ※ Some degree of skeletal muscle mass and strength loss is an inevitable part of ageing. However, adoption of a healthier lifestyle can help keeping skeletal muscle stronger for longer and reducing the risk of sarcopenia.

Ageing and Sarcopenia

The ageing process is responsible for many changes in our body. One of the most significant age-related changes is a reduction in skeletal muscle mass. In fact, human body contains over 400 skeletal muscles which account for about 40% to 50% of total body weight.¹ They function primarily to produce body movement and maintain postures. Contraction of the major muscle groups also aids venous blood return to the heart and generates heat to help maintain body temperature. Peak skeletal muscle mass and strength is generally attained in the 20s and 30s and gradually declines into middle age. The loss progresses faster and becomes more pronounced during old age.^{2,3} While many elders could retain enough muscle mass and strength for all necessary tasks, some suffer from sarcopenia which is now recognised as a geriatric syndrome.^{4,5}

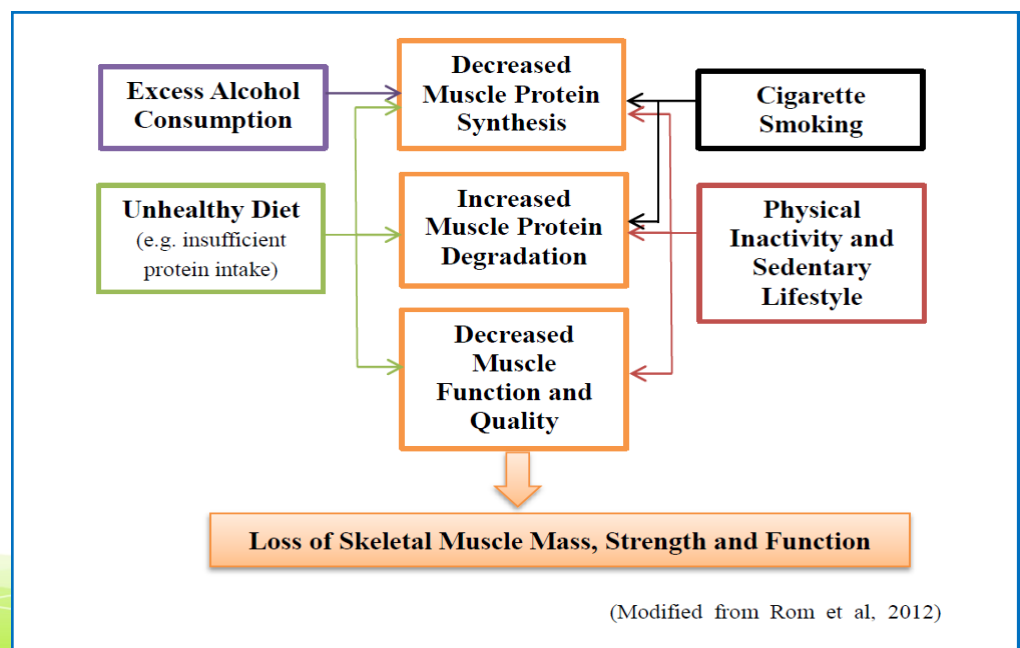
Sarcopenia is a condition characterised by progressive and generalised loss of skeletal muscle mass as well as muscle function (defined by muscle strength or physical performance) with a risk of adverse outcomes, such as physical disability, poor quality of life and death.^{4,7} As the European Working Group of Sarcopenia in Older People (EWGSOP) suggests, diagnosis of sarcopenia requires documentation of low muscle mass plus documentation of either low muscle strength or low physical performance.⁵

However, diagnostic cut-off values for measurements of muscle mass, muscle strength and physical performance may differ across the world for sarcopenia.⁴⁻⁷

Risk Factors Underlying Sarcopenia

Various factors over the life-course can individually or collectively contribute to the loss of skeletal muscle mass and function. Other than age-related biological and physiological changes (including reductions in size and number of skeletal muscle fibers; decline in the number of neuromuscular junctions; decrease in production of hormones that are important for maintaining muscle mass, such as growth hormone and testosterone; and increase in inflammation and oxidative stress that contribute to muscle breakdown and hamper muscle regeneration) and certain chronic diseases (such as cancer, diabetes and endocrine disease) that drive sarcopenia, its onset and progression is also affected by lifestyle factors which are far more modifiable.^{3,8,9} As shown in Figure 1, unhealthy lifestyle (such as physical inactivity, impaired nutrition, smoking and alcohol consumption) can decrease muscle protein synthesis, aggravate muscle protein degradation or weaken muscle function and quality, thereby upsetting the muscle-protein balance and increasing the risk of sarcopenia.¹⁰

Figure 1:
Unhealthy lifestyle factors affecting sarcopenia



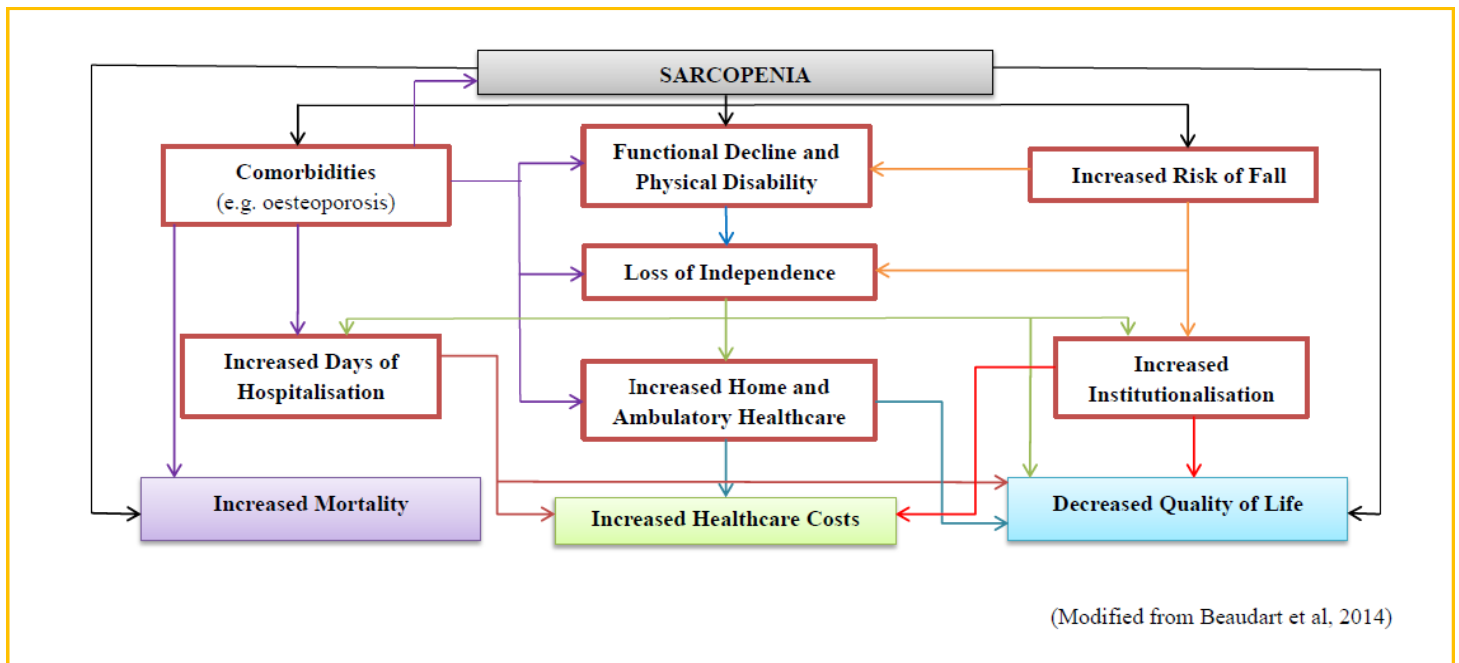
A cross-sectional study of 162 community-dwelling people aged 60 to 86 years in Australia found a 33% increased risk of sarcopenia for every 1-hour increase in overall daily sitting time.¹¹ Protein intake has a major influence of skeletal muscle metabolism. In the United States (U.S.), a 3-year prospective study examined the relationship between protein intake and lean mass change among 2 066 community-dwelling people aged 70 to 79. Results showed that those in the highest category of protein intake had about 40% less lean mass loss than those in the lowest category of protein intake.¹² For smoking, one meta-analysis of 12 studies found that cigarette smoking was associated with 12% increase in the risk of sarcopenia.¹³ In alcoholic myopathy, the entire muscle mass may be reduced by up to 30%.^{10, 14} Furthermore, a study of over 500 community-dwelling Chinese

elders aged 70 and above in Hong Kong found that being underweight (body mass index <18.5) was a significant risk factor of sarcopenia.¹⁵

Consequences of Sarcopenia

The impact of sarcopenia is far reaching at both individual and societal levels. In elders, it is associated with falls, physical disability and loss of independence. These not only affect the quality of life and mortality of sarcopenic elders, but also increase healthcare costs for society (Figure 2).¹⁶ Using the Foundation for the National Institutes of Health (FNIH)'s criteria to define sarcopenia, an Australian study found significant associations between severity of sarcopenia and disability in activities of daily living, institutionalisation, and all-cause mortality among community-dwelling men aged 70 and above.¹⁷

Figure 2: Health consequences of sarcopenia



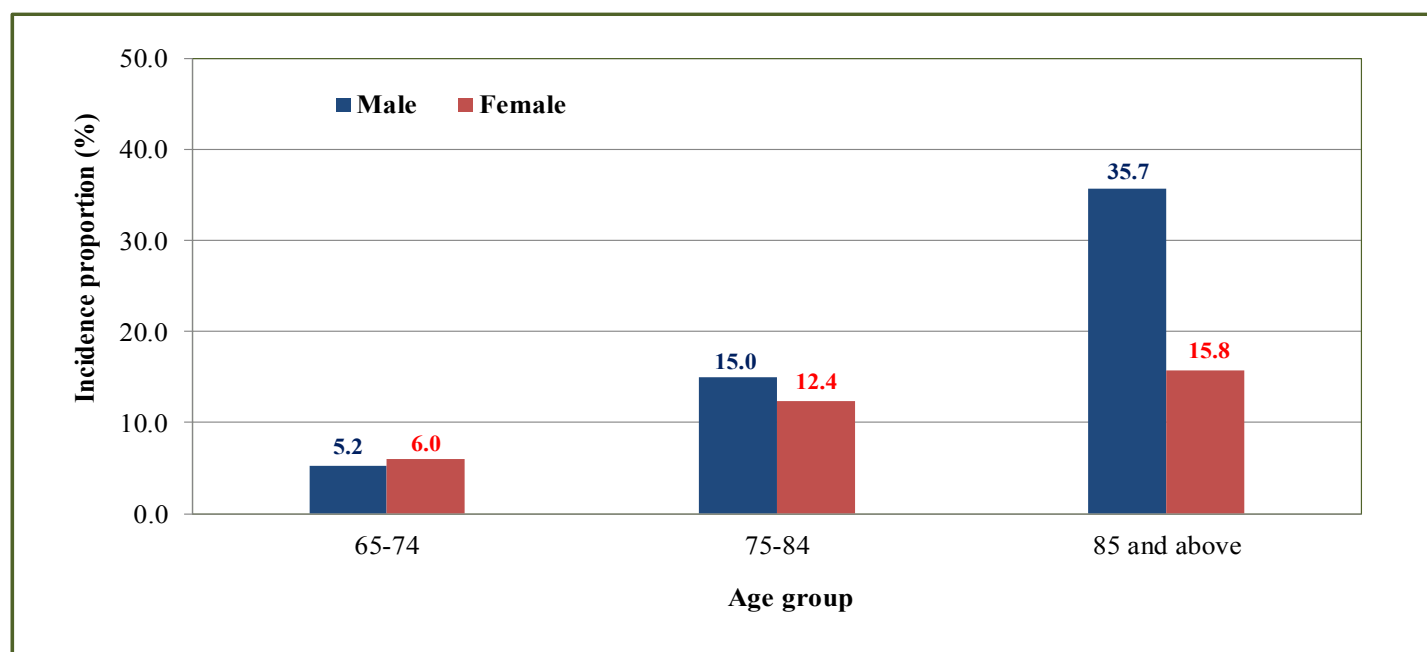
Prevalence of Sarcopenia

Depending on the definitions used, assessment methods or cut-off values chosen for diagnosis and populations studied, prevalence of sarcopenia varied substantially across different countries. Using the consensus definition of and diagnostic criteria for sarcopenia developed by the EWGSOP, a systematic review of studies indicated that the prevalence of sarcopenia among people aged 50 and older varied from 1% (Finland) to 29% (Italy) for those living in community; 10% (United Kingdom) for those in acute hospital-care setting; and 14% (Netherlands) to 33% (Italy) for those in long-term care institutions.¹⁸ Among community-dwelling people aged 65 and above, a pooled analysis of 9 studies in the U.S. found that 5.3% men

and 13.3% women had sarcopenia.¹⁹ In Japan, a population-based cross-sectional survey also reported that the prevalence of sarcopenia among adults aged over 65 was 8.2% and 6.8% in men and women respectively.²⁰

In Hong Kong, a 4-year longitudinal study of about 4 000 community-dwelling people aged 65 and above found that 9.0% of subjects had EWGSOP-defined sarcopenia at baseline. The average annual incidence of sarcopenia over 4-year follow-up was 3.1%. The incidence proportion of sarcopenia increased with age for both genders (Figure 3).²¹

Figure 3: Incidence proportion of sarcopenia from baseline to 4-year follow-up by sex and age group



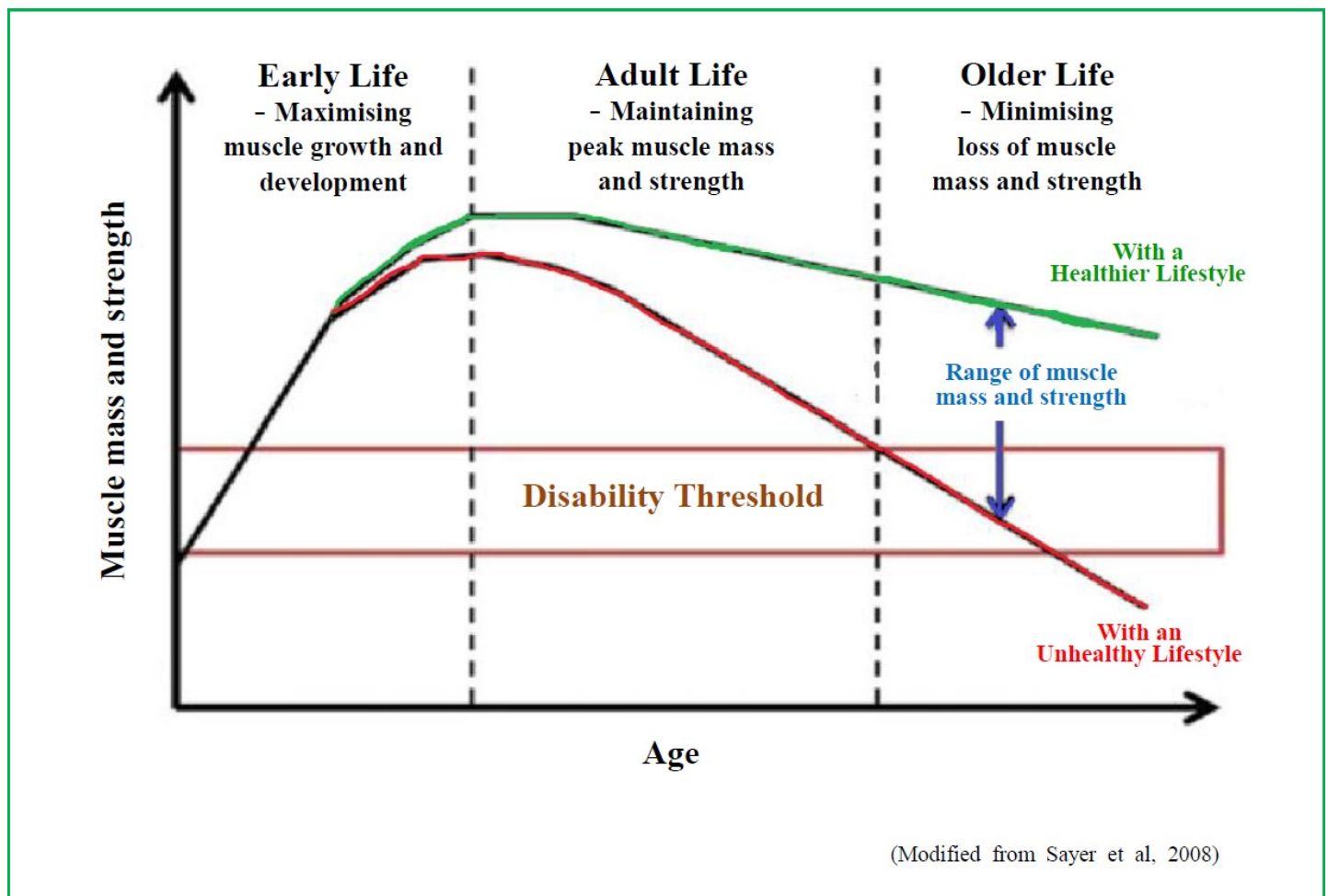
Source: Yu et al, 2014.

Keeping Skeletal Muscles Stronger for Longer

While some degree of skeletal muscle mass and strength loss is an inevitable part of ageing, there are ways to delay the onset or slow down the progression. As Figure 4 shows, achieving a higher muscle mass and strength at earlier age, maintaining the peak during adulthood, and

minimising the loss in old age by leading a healthier lifestyle can keep skeletal muscle stronger for longer (green line). In contrast, having an unhealthy lifestyle will have a greater risk of developing sarcopenia and entering the 'disability zone' at an earlier age (red line).²²

Figure 4: Changes in muscle mass and strength throughout life



Physical activity is a primary strategy in the prevention and treatment of sarcopenia.¹⁰ Generally, adults should do at least 150 minutes of aerobic moderate-intensity physical activities (such as brisk walking), or 75 minutes of aerobic vigorous-intensity physical activities (such as fast swimming), or equivalent combinations of both throughout the week, in bouts of at least 10 minutes in duration. In comparison with aerobic exercise, resistance training has greater effect on increasing skeletal muscle mass and strength and attenuates the development of sarcopenia.¹⁰ A meta-analysis found that after an average of 20.5 weeks of resistance exercise could elicit an approximate 1 kilogram increase in lean body mass among people aged 50 and above.²³ Apart from aerobic physical activity, healthy elders are recommended to perform resistance exercise (such as progressive weight bearing training programmes) at least 2 days (non-consecutive) per week. For sarcopenic elders and those who are frail or living with a chronic disease, they may consult their family doctor and obtain a customised exercise prescription.

Balanced diet with an adequate amount of protein intake is also essential for stimulating muscle protein synthesis.^{24, 25} Vitamin D is important for normal skeletal muscle development and in optimising muscle strength and performances.²⁶

Studies showed that poor vitamin D status in elders is associated with weaker muscle strength, poorer physical performance, and higher sarcopenic risk.²⁷⁻²⁹ Apart from having optimal sunlight exposure to stimulate vitamin D synthesis in the skin, elders can strive to increase vitamin D intake from food sources (such as salmon, mackerel and egg yolk).

To keep skeletal muscles stronger for longer, no smoking and refrain from consuming alcoholic beverages are also of great importance. For many people, the ageing process is often paralleled by decreases in lean muscle mass and increases in body adiposity. Studies showed that elders with sarcopenic obesity (i.e. co-presence of sarcopenia and obesity) would have a greater risk of metabolic syndrome and all-cause mortality than those with sarcopenia or obesity in isolation.^{30, 31} Therefore, maintaining a healthy weight is important for overall health. Chinese adults living in Hong Kong should aim for a body mass index between 18.5 and 22.9 kg/m². Irrespective of the body mass index, men should keep their waist circumference below 90 cm (~36 inches) and women should keep theirs below 80 cm (~32 inches).

For more information about healthy ageing and elderly health, please visit Department of Health's Elderly Health Service website at <http://www.info.gov.hk/elderly>.



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25th International Day of Older Persons: Sustainability and Age Inclusiveness in the Urban Environment

On 14 December 1990, the United Nations General Assembly designated **1 October** the International Day of Older Persons to recognise the contributions of older persons.

It also aims to raise awareness of the impact of an ageing population and the need to ensure that people can grow old with dignity and continue to participate in society as citizens with full rights.

For 2015, the theme is

“Sustainability and Age Inclusiveness in the Urban Environment”.

It seeks to demonstrate that an age inclusive agenda is crucial for sustainable urban environments to promote equity, welfare and shared prosperity for all.

For details about the International Day of Older Persons and past observances, please visit <http://undesadspd.org/Ageing/InternationalDayofOlderPersons.aspx>.

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