Clinical Nutrition ESPEN xxx (2017) e1–e9

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Original article

# Malnutrition in the elderly and its effects on bone health – A review

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ARTICLE INFO

*Article history:*
Received 7 February 2017
Accepted 7 June 2017

*Keywords:*
Malnutrition
Osteoporosis
Bone health
Dietary protein
Sarcopenia
Osteopenia
Calcium and vitamin D deficiency

SUMMARY

This article aims to provide an overview of the prevalence, causes and risk factors associated with malnutrition in the elderly. It includes the clinical consequences and economic impact of malnutrition in the elderly and in particular the osteoporotic population. It encompasses the significance of dietary protein and its effects on bone health.



## 1. Introduction

A healthy balanced diet should provide all the necessary nutrients required for bone health.

However, this can be a challenge for the older population to achieve in practice particularly as their requirements for certain nutrients are higher than the general population. As a consequence the prevalence of malnutrition increases with advancing age and has an established detrimental impact on bone health.

## 2. Definition of malnutrition

Malnutrition can be defined as "a state resulting from lack of intake or uptake of nutrition that leads to altered body composition (decreased fat free mass) and body cell mass leading to diminished physical and mental function and impaired clinical outcome from disease" and it can result from a number of aetiologies [1] as seen in the figure below (Fig. 1). Identifying malnutrition risk is recommended using a validated screening tool such as the Malnutrition Universal Screening Tool (MUST) and malnutrition should be considered:

- If a person has a BMI of less than 18.5 kg/m$^2$
- If a person has had unintentional weight loss greater than 10% indefinite of time,
- If a person that has a BMI of less than 20 kg/m2 and has had unintentional weight loss greater than 5% within the last 3–6 months [2].

The most common forms of malnutrition seen in older adults in the hospital setting are:

- Chronic disease related malnutrition – nutrition inadequacy associated with chronic conditions such as chronic diseases in older patients
- Acute disease- or injury-related malnutrition: under nutrition associated with conditions that elicit marked inflammatory responses, such as orthopaedic fractures and surgery [3].

While malnutrition can encompass over and under nutrition; for the purpose of this article malnutrition will refer to the state of under-nutrition as this remains the most commonly used throughout published literature.

## 3. Prevalence of malnutrition in the elderly

While many changes associated with the process of ageing can promote malnutrition it is not an inevitable consequence of ageing [4] although research has shown that it is a widespread problem.

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http://dx.doi.org/10.1016/j.clnesp.2017.06.001
2405-4577/

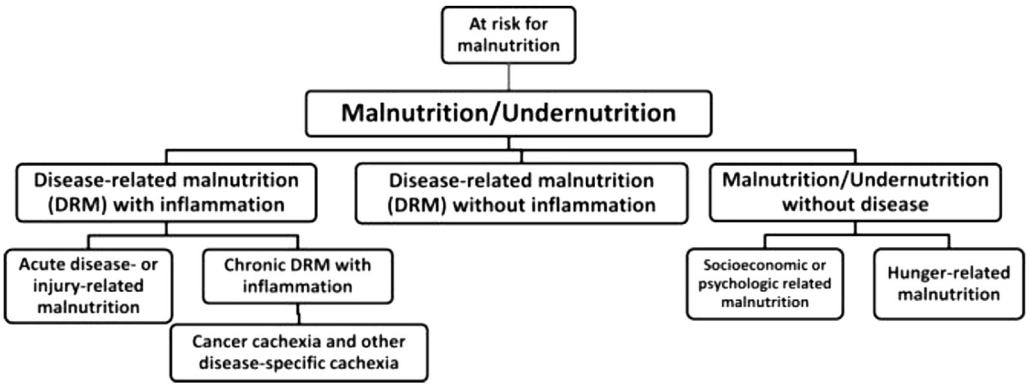


**Fig. 1.** Malnutrition diagnosis tree [1].

The prevalence of malnutrition in older adults is dependent upon the population studied, varying by geography, age distribution, and living situation.

In the acute setting it has been shown that the prevalence of malnutrition can be between 20% and 50% [5]. This rises to 29%–61% in the elderly population [4] and it has been shown that the prevalence of malnutrition is greater in patients over 60 years than in those less than 60 years [6]. Subsequent research has also shown that 60% of hospitalised older adults (aged 65 years and above) and 35%–85% of patients in long term care facilities experience malnutrition [7]. An acute hospital survey undertaken in 27 Irish hospitals revealed a malnutrition prevalence of 33% [8] and similar results were seen in a Belgian study which subsequently also reported that 43% of those included were at risk of malnutrition [9]. In addition to those admitted to hospital malnourished, it has been shown that 33% of patients become malnourished while in hospital [10]. The British Association for Parenteral and Enteral Nutrition – Nutritional Screening Week in 2007 found a high prevalence of malnutrition in the older population – 35% in adults over 80 years and 25–35% in adults from 60 to 80 years compared to 25% in adults less than 60 years. This high prevalence of malnutrition in hospitalised elderly patients was also shown by Kaiser et al. [11].

The hospital setting is not the only area where malnutrition is an issue. It is estimated that at any one time 75,000 of those aged over 65 years in Ireland are malnourished with the majority community dwelling with a further one in three nursing home residents reported to be malnourished [12]. Malnutrition risk was detected in 28% of community dwelling patients assessed in a Geriatric outpatient clinic [13] and another study also showed that 40% of the community living elderly participants were either malnourished or at risk of malnutrition [14]. The UK National Diet and Nutrition Survey on the over 65 age group found that one in six in residential homes were malnourished (16% of men and 15% of women). This was more prevalent when compared with those of a similar age living at home in the community (3% of men and 6% of women). This was re-iterated by Donini et al. [15] who reported that the prevalence of malnutrition was higher in nursing home residents when compared to free living individuals.

Malnutrition prevalence has been reported in many elderly subgroups in particular those with fractures and osteoporosis. Drevet et al. [16] confirmed a high prevalence of malnutrition in elderly hip fracture patients. A study by van Bokhorst-de van der Schueren et al. [17] found that there was a higher rate of osteoporosis in malnourished patients attending a geriatric outpatient clinic while it was shown that frail elderly women with severe osteoporosis were more underweight [18].

In summary, it is well established that malnutrition is very common in the older population with higher rates of osteoporosis being seen within this group and therefore requires attention [19]. There are considerable differences in the rates of malnutrition between the settings [11] and it is recommended that screening for malnutrition using a validated tool should become an integral part of the comprehensive geriatric assessment [20].

## 4. Risk factors and causes of malnutrition in elderly

There are several factors that can contribute to malnutrition in the elderly and these can be complex and multifactorial. They include poor appetite, poor dentition [21], loss of taste and smell, difficulties accessing and preparing food and cognitive impairment [4]. These are divided into three main types here: medical, social, and psychological (Table 1).

A decline in sensory function as we age has been well documented [22] and this can be due to progressive loss in the number of taste buds per papilla on the tongue. A recent study found the 74% of its elderly participants had taste impairment [23] and this effect on sensory function can have clinical consequences such as increasing the risk of malnutrition [24]. It has been reported in the older population that an impaired appetite has been associated with a reduction in taste and smell in up to 50% [22] and those with swallowing difficulties have been found to be five times more malnourished while those with taste difficulties had two and a half times more risk of being malnourished. It has also been found that older adults with digestion problems have an 85% more chance of being malnourished [9].

Poor intake in older adults, in particular, during hospitalisation may worsen malnutrition. It has been shown that elderly patients in hospital do not meet their protein requirements which are consistent with older studies despite awareness and screening for malnutrition [25]. Profound malnutrition and serious illnesses often present concurrently and each can accelerate the progression of the other. Multiple co morbidities i.e. Cardiovascular, pulmonary, and neurological diseases, as well as osteoarthritis and osteoporosis, in the older population mostly contribute to overall nutritional compromise.

## 5. Consequences of malnutrition

Both animal and human based studies have established that malnutrition can adversely affect virtually every organ system. The

Please cite this article in press as: Siddique N, et al., Malnutrition in the elderly and its effects on bone health – A review, Clinical Nutrition ESPEN (2017), http://dx.doi.org/10.1016/j.clnesp.2017.06.001