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# Nutritional impact symptoms evoking unintended weight loss among elderly patients in general practice

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## Abstract

**Background and aim:** Protein-energy malnutrition (PEM) in old age has shown to have negative consequences with regard to increased frequency of disease and functional dependency of other people. It is recommended to be aware of unintentional weight loss in old age, as a measure for PEM. The aim of this study was therefore to evaluate the prevalence of unintended weight loss and associated nutrition impact symptoms (NIS) among elderly in a Danish general practice.

**Design and method:** A case-based study of patients aged 70 years or above associated to a general practice in Denmark was conducted. This case study included a questionnaire-based investigation about weight loss, and a qualitative sub-group analysis about NIS, based on a literature search, in patients who claimed unintended weight loss >1 Kg.

**Results:** The study included 234 patients with mean age 76.9 (SD: 5.9). The prevalence of claimed unintentional weight loss was 17.5%. The sub-study enrolled 12 patients with unintentional weight loss, mean age: 78.9 years (SD: 6.9). The prevalence of chronic disease among the sub-study population was 91.7%. The feeling of early satiety, lack of appetite and eating alone, were the most prevalent NIS with 58.3% each, followed by polypharmacy (41.7%). Moreover, being alone and eating alone were the most frequently mentioned NIS.

**Conclusion:** The prevalence of unintended weight loss was 17.5%. Of the NIS studied, early satiety, lack of appetite, eating alone and polypharmacy were the most frequent. Preventing unintentional weight loss and thus PEM and its unwanted health related consequences may be achieved through increased focus on selected nutritional impact symptoms.

**Keywords:** polypharmacy, polypharmacy, nutritional impact symptoms, weight loss

## Introduction

Age-related anorexia, ageing, and disease can lead to malnutrition. According to the European Society of Clinical Nutrition and Metabolism (ESPEN), malnutrition is defined as either reduced body mass index (BMI) <18.5 kg/m<sup>2</sup> or a combination of weight loss and reduced BMI, or reduced gender-dependent fat free mass index (FFMI) in a subject who fulfils the criteria for being at risk of malnutrition by any validated screening tool. In the following, the term protein energy malnutrition (PEM) will be used. Unintentional weight loss will be used as measure for PEM [1,2].

Aging is associated with changes in body composition. Adverse effects of aging are decrease in skeletal muscle protein mass and muscle quality combined with an increase of body fat [3-9]. The process of age-related loss of skeletal muscle protein mass is called sarcopenia fat [3-9]. According to the ESPEN guidelines on definitions and terminology of clinical nutrition, the definition of sarcopenia relies on an algorithm based on loss of muscle mass and strength and/or function, estimated by any validated technique. The etiology of sarcopenia is multi-variant, but inadequate protein intake is a contributing factor [7,8]. Sarcopenia may lead to decreased physical function thus a decline in quality of life [4,6-8,10].

Frailty is a state of vulnerability and decreased resistance to disease and/or trauma. The definition of frailty is evolving but is related to advanced age and nutrition related components such as weight loss and sarcopenia. There was a strong consensus in the group of ESPEN that the phenotype of frailty is defined as the fulfilment of three out of the five criteria; weight loss, exhaustion, low physical activity, slowness and weakness. All risk factors for dependence and disability as well as decreased quality of life [2].

In the elderly, PEM is associated with severe adverse health outcomes. The consequences are extensive and include an increased risk for cognitive impairment as well as an increased risk of a dementia diagnosis [11-15]. PEM is associated with impaired immune function increasing the risk for infections [16]. Studies have shown that PEM was an independent risk factor for nosocomial infections and increases the risk for sepsis, thus significantly increasing mortality as an outcome [5,17-20]. PEM also increases the risk of pressure ulcers and poor healing of these. Studies have shown that oral nutritional supplements particularly high on protein can significantly reduce the development of pressure ulcers in at-risk patients and suggest that it may improve the healing of already existing pressure ulcers [21-23]. Moreover,

in the elderly PEM is related to falls and fractures and is a result of low protein and calcium intake as well as vitamin D depletion on bone mass [22-26]. In an older primary care population, low vitamin D level is additionally associated with depression, and a significant relationship between decreased depression with increasing levels of vitamin D was shown [27], and the association between depression and PEM is well known [14,15,25,28,29]. PEM not only contributes to reduced quality of life, but thus also to many unwanted health outcomes, all of which have a negative effect on health-related quality of life [23,25,30-32]. Moreover, studies have shown an increased risk of hospitalization, longer stay and readmission rate as well as mortality when PEM is present [5,11,22,23,25,28,29,33-35].

The prevalence of PEM and of being at risk of PEM among elderly has been reported to vary between 1.8-22.8% and 5.4-50.5%, respectively. The variation may be due to different screening tools and settings. The prevalence of being at risk of PEM seems to be higher than the prevalence of PEM, which indicates possible potential for preventing of PEM and its consequences [12-15,26,36-42].

In old age, decreased physical functionality is often associated with unintentional weight loss. Avoiding unintentional weight loss is crucial for an individual's functionality and well-being, as unintentional weight loss and decreased physical function are closely associated and increase the risk for dependency and reduced ability to manage in own home [8,43]. In Denmark, it is thus recommended to be aware of weight loss among the elderly in general family practice through regularly weighing as malnutrition in general practice might be detected by focus on unintentional weight loss [44,45]. However, there is lack of studies indicating the prevalence and extent of unintentional weight loss among the elderly in general practice and associated nutritional impact symptoms (NIS) [13,44]. The purpose of focus on unintentional weight loss in general practice is to prevent weight loss, to avoid reduced physical functionality and adverse health outcomes by early nutritional intervention.

## Aim

To evaluate the prevalence of unintended weight loss and associated nutritional impact symptoms among elderly patients in a Danish general practice.

## Methods and material

This case-based study included a questionnaire-based investigation of weight loss in all patients who met the inclusion criteria, as well as a qualitative sub-group analysis about risk factors, based on a questionnaire about Nutritional Impact Symptoms (NIS), in patients who claimed weight loss and who agreed to participate in the in-depth interview.

## Setting and subjects

### Setting

Synes der skal være en kort beskrivelse af hvad der er i denne praksis: lokalisering, størrelse, enkeltmands? Optageområde og størrelse etc.

The study included patients from the general practice *Lægehust Bjergby* in Bjergby, North Jutland, Denmark. It is a solo practice with 1830 patients affiliated. The patients originate from both city and country and the practice is representative for its area with regard to gender and age distribution.

### Subjects

*Inclusion criteria:* All patients 70 years old or above affiliated to the general practice in Bjergby. The inclusion criterion for the subpopulation was unintentional weight loss of one kilogram or more within a year.

*Exclusion criteria:* Impaired general or cognitive condition, which prevents participating in an interview and/or intentional weight loss.

## Questionnaire and interviews

All patients 70 years old or above affiliated to the general practice were initially invited to the project by letter or mail. Those who did not respond were additionally contacted by phone, as stated in the letter.

According to the recommendations of The Social Agency of Denmark, unintentional weight loss of 1 kilogram was used as a measure for being at nutritional risk. To determine the prevalence of unintentional weight loss, a questionnaire whether the patients had unintentionally lost more than 1 kilogram within a year or had noticed looser fitting clothes was sent by letter or e-mail with an enclosed envelope, return postage paid, or a request to reply by e-mail, respectively.

Patients with unintentional weight loss who gave consent to contact, were further contacted by phone, and invited to an interview about NIS for unintentional weight loss. The Danish nutritional assessment form EVS, as well as the validated nutritional assessment tools; PG-SGA, MNA and MUST formed the basis for the interview guide [46-48].

## Hand grip strength

Hand grip strength (HGS) was used as a marker for muscle strength as well as muscle mass, since these factors have been shown to correlate [49]. HGS was measured by a dynamometer (Grip SAEHAN® Digital Hand Dynamometer, DHD-1(SH1001)). With the subjects seated and the forearm flexed 90 degree at the elbow and the shoulder adducted to the torso, the maximum HGS was measured in the dominant arm. Three measurements were conducted with 15 seconds of rest between each measurement. The maximum result was recorded and included in the study. All HGS tests were conducted and recorded by the same investigator.

## Qualitative method-interview

A semi-structured interview guide was used. The overall theme for the interview was to explore which factors impact nutritional status and unintentional weight loss. The patients were encouraged to talk about their own personal experiences.

The interviewer was the same (first author) throughout all interviews. The interviews took place in a consultation room at the general practice in Bjergby.

## Data analysis-interview

The interviews were recorded using an OLYMPUS WS-811 digital voice recorder. Afterwards, the interviews were transcribed and re-read for understanding by the interviewer. For analysis, a thematic approach was used. Patterns of meaning were found and coded into units of meaning to the research question. Four themes were found and the quotations are presented to represent these themes. The quotes were translated into English by author. Translations were confirmed by the co-authors.

## Statistical analysis

The data were analyzed using Microsoft Excel 2010 and IBM SPSS statistics 25. For the categorical variables, descriptive statistic included number and percentage, and for the continuous variables, mean and standard deviation. Fisher's exact test was used to assess statistical significance.

## Ethics

The study was conducted according to the declaration of Helsinki.

The patients were informed in writing with possibility for supplemental oral information. The patients had to take action to participate, thus giving consent. The patients were informed that consent could be withdrawn at any time with no consequences for further treatment.

If unintentional weight loss and associated NIS were found, the patients were offered an appointment at the GP to follow-up.

The study fulfils the regulations set by the data protection agency and was approved by a request of to the local ethical committee.

## Results

### Recruiting process and data collection

Initially 303 patients were recruited. Fifty patients did not respond giving a response rate of 83.5%. Of these, 253 replied of which 234 wanted to attend, 12 did not want to attend, 4 had changed physician and 3 had died. Out of 234, 41 stated a weight loss of 1 kilogram or more within a year. Seventeen patients agreed to participate in an interview. Of these, three were excluded due to intentional weight loss and two due to weight gain, giving a sub-study population of 12 (Figure 1).

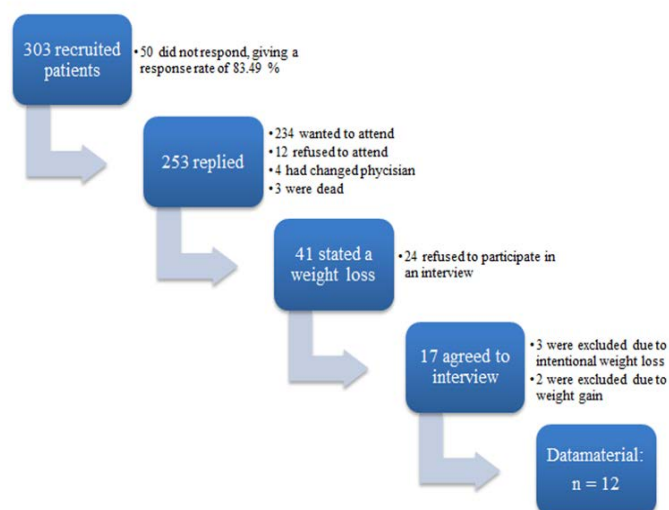


Figure 1. Flowchart of data collection.

### Demographic information

The study included 234 patients, 101 male and 133 female. Mean age was 76.9 (SD: 5.9). 162 patients were in the age group 70-79, and thus 72 patients were  $\geq 80$  years old (Table 1).

### The prevalence of unintentional weight loss

As shown in Table 2, 41 patients (19 males) claimed an unintentional weight loss. Compared to the initial study group, this group was older having a mean age of 80.24 ( $p=0.0001$ ) and included a larger proportion of the eldest elderly ( $p=0.007$ ) (Table 2).

Total number	234
Male (%)	101(43.2 %)
Female (%)	133 (56.8 %)
Age, mean (SD)	76.94 (5.6)
Age, 70-79 (%)	162 (69.2 %)
Age, $\geq 80$ (%)	72 (30.8 %)

Table 1. Demographic features of  $n=234$  enrolled in the study.

Weight loss	41 (17.52 %)
Male	19 (46.34 %)
Female	22 (53.66 %)
Age, mean (SD)	80.24 (7.91)
Age, 70-79	19 (46.34 %)
Age, $\geq 80$	22 (53.66 %)

Table 2. The prevalence of unintentional weight loss in the study population and related demographic features.

Total number	12
Male	3 (25 %)
Female	9 (75 %)
Age, mean(SD)	78.91 (6.9)
Age, 70-79	6 (50 %)
Age, $\geq 80$	6 (50 %)
Living in a nursing home	0 (0 %)
Living in own home	12 (100 %)

Table 3. Demographic features of  $N=12$  subjects enrolled in the sub-study.

### Demographic information on the sub-study

The sub-study included 12 patients (three males). The mean age was 78.91 (s.d. 6.9) distributed with 6 patients in each age group. All patients lived in their own homes. Of the 29 patients who was not enrolled in the sub-study 55.17% were male, the mean age was 78.1 (s.d. 8.3) and only one was living in a nursing home (Table 3).

### Characteristic of the sub-study population

Table 4 shows that the prevalence of chronic disease among the subjects in the sub-study population was high. Only one did not have a chronic disease. Hypertension had the highest frequency of 58.3%. None of the subjects suffered from chronic obstructive pulmonary disease (COPD) or heart failure and only three and two, respectively, suffered from asthma and diabetes.

### Prevalence of nutritional impact symptoms among the sub-study population

Among the subjects who had suffered unintentional weight loss, the feeling of early satiety, lack of appetite and eating alone were the most prevalent NIS with 58.33% each, followed by polypharmacy (41.67%). Of the patients, 25% suffered from obstipation, diarrhoea, tiredness preventing cooking, and pain. Moreover, 16.7% suffered from nausea, changed taste, and sadness or depression. Only one complained of dental problems and none complained of either ulcers or pain in the mouth, dysphagia, dyspnoea by eating, or need for help with eating. Table 5 presents the results for NIS among the sub-study population.



<b>Chronic disease, total</b>	11 (91.7 %)
<b>Hypertension</b>	7 (58.3 %)
<b>Asthma</b>	3 (25 %)
<b>Diabetes</b>	2 (16.7 %)
<b>COPD</b>	0 (0 %)
<b>Heart failure</b>	0 (0 %)
<b>Other</b>	5 (41.7%)

**Table 4.** Prevalence of chronic disease among the sub-study population.

<b>Somatic factors</b>	
Lack of appetite	7 (58.3%)
Sense of early satiety	7 (58.3%)
More than 3 types of prescribed medicine	5 (41.7%)
Obstipation	3 (25%)
Diarrhoea	3 (25%)
Tiredness prevents cooking	3 (25%)
Pain	3 (25%)
Nausea	2 (16.7%)
Changed taste	2 (16.7%)
Vomiting	1 (8.3%)
Xerostomia	1 (8.3%)
Dental problems	1 (8.3%)
Discomfort with smell of food	1 (8.3%)
Ulcers or pain in the mouth	0 (0%)
Dysphagia	0 (0%)
Dyspnoea by eating	0 (0%)
<b>Psychological factors</b>	
Sadness or depressed	2 (16.7%)
<b>Social factors</b>	
Eating alone	7 (58.3%)
Need for help to eat	0 (0%)
<b>Physical function</b>	
Stated functional level	9 (75%)
As usual, without limitations	2 (16.7%)
Limited in physical strenuous activity, but upright and able to perform easy work	1 (8.3%)
Upright, can manage himself/herself, but does not have very much energy. In bed less than 50% of the day	0 (0%)
Can manage himself/herself to a limited extent, bedridden or in chair more than 50% of waking hours	0 (0%)
Bedridden the most of the day	0 (0%)
<b>Hand grip strength (kg), mean (SD)</b>	
Male, 70 - 74	42.5*
Male ≥ 75	28.6 (7.6)
Female, 70 - 74	26.7 (7.8)
Female, ≥ 75	24.1 (6.1)
*Exact number due to only one patient in this age group	

**Table 5.** Prevalence of NIS among the sub-study population.

As shown in Table 5, 75% stated their functional level to “As usual, without limitations”. Only 16.7% stated that they were “Limited in physical strenuous activity, but upright and able to perform easy work” and only one stated “Upright, can manage himself/herself but does not have very much energy. In bed less than 50% of the day”. The division of HGS is shown in Table 5.

### Interview - Themes

The units of meaning identified in interviews were clustered into the following four significant themes:

1. Impact of being alone and eating alone
2. Impact of lack of appetite and sense of early satiety
3. Impact of psychological factors
4. Impact of infections and poor wound healing

In order to achieve clarity, the themes are described separately, but in real life, the themes interact.

### Impact of being alone and eating alone

Being alone and eating alone was the most frequently mentioned factor which impacts food intake, and thus nutritional status and unintentional weight loss. The loss of a spouse leaves the surviving spouse with no need for or reason to cook. “You are not going to cook for yourself. -I do not cook hot meals for myself... When there is no-one else, you don’t cook.” The patients also expressed that investing time in cooking was not worth it as long as they were eating alone “I simply do not want to cook anymore. You have to buy it, you have to cook it and it takes time and I do not feel like doing it anymore.”. One patient found no reason to keep much food in her fridge just for herself. “There are also limits to what you can keep in the fridge when you are alone.” This reflects the perception that only one person is not enough to worry about food or cooking.

In addition, it seems to have importance if it is the wife or the husband who dies first. A male patient said: “When I became alone, I did not get that regular diet as it should be. I can cook, but you know, you can easily skip a day.” This statement reflected a man who had to learn how to cook after the loss of his wife. Moreover, two of the male patients who were interviewed both had a food delivery arrangement of one kind or another. Furthermore, this age group is of a generation with gender roles where the woman controls the kitchen as one patient expresses: “I have a husband, but he is not very good at cooking, but then he is of a different generation...”. She was not living or eating alone, but when she was sick and unable to cook, there was no one to cook for her and her husband because of their mutual gender roles. “What one could wish when you are sick is that someone would make a really delicious meal so you do not have to work in the kitchen yourself.”

It is worth noting that the impact of being alone and eating alone is also mentioned by patients who are not alone but who can relate to or have friends or family who are alone “I do not think I could make myself eat alone, so I could do without eating.”. “I can imagine what it would be like to be alone. There’s two of us, and then it is nicer to cook.” “I talk with my woman friends too; they have the exact same problem.”. The statements reflect that the majority of the patients are already familiar with the issue. Moreover, the patients felt that when they ate with others they had a good time and even ate more than when they were alone, “Company also makes you eat more”. Eating with others could even cause the lack of appetite to disappear.

### Impact of being alone and eating alone

The effect of different psychological factors on nutritional status and unintentional weight loss is also mentioned frequently. “The

mood is not so good and then the appetite is not that big either". The loss of a spouse or even a child leaves the survivors with a tremendous sorrow. "It feels empty and sad, but you have to learn to live with it and get used to it... I think it will take some time...". This reflects a period of sorrow, but some patients also expressed a feeling that nothing matters. However, it was not only the sorrow following a loss that affected the patients; it was also the stressful situation during the period where the spouse or child was sick. "My husband became more and more ill, and I had to take care of everything". This reflects a period when the patients had to take care of their loved ones with regard to care, personal hygiene, cooking, and keeping the house and garden, all while they forgot or disregarded their own health.

A stressful situation also seems to have a significant impact on nutritional status. Patients who had experienced stressful situations such as relocation because of harassment or living in a psychologically harmful relationship were likely to state that it had an influence on their appetite and wellbeing. "It is a big step when you are 81 years old and had counted on staying there for the rest of your life. I am very glad I did it, but I honestly think I was too old to move. It affected me, I am mentally strong, but it affected me. It did, and one with the other..."

It is also worth noting that some of the patients found their weight loss convenient and something they had always dreamt of because they had felt slightly overweight. "I was busy, and then you lose the 2-3 kilograms you've always dreamed about." But this dream of weight loss may give compliance in treatment for unintentional weight loss. When encouraged to gain weight, the patients admit that they may have another agenda giving statements like "But on the other hand, I do not intend to get too fat, because for my entire life from I was 4-5 years old to not so many years ago, I have always labelled myself as a "fattie" and I do not have the ambition to become that again." Or "Then get such a drum. If only it was on the sides or on the bum. Then I think of my grandmother she had such a big belly." Previous nutritional status therefore seems to have impact on current nutritional status and unintentional weight loss. One patient also expressed that she did not understand why weight loss was an issue in Denmark, which is a developed country. "Now, it is not really the biggest problem here in Denmark, is it? Are we not closer to the opposite problem with overweight people?". This statement reflects the media, which focus on overweight and promotes weight loss without regard for the age and health of the individual.

### **Impact of lack of appetite and sense of early satiety**

The impact of appetite and satiety also plays a crucial role for the nutritional status of the majority of patients. "I do not have the appetite I once had. Not at all. I can easily go around and forget that I am hungry. I do not feel hunger." "I rarely feel hungry, I would say, but I try to eat." This reflects two patients who, owing to a lack of appetite, would often forget to eat for a whole day. In addition, the patients described a feeling of early satiety "When I compare myself to others I do not eat much at a time". Not only did the patients describe a feeling of eating less than others but also a feeling of not eating the amount they used to in their younger years. One patient coped with her lack of appetite by self-medication with Saroten®: "When my appetite is poor I take Saroten® a couple of days. That helps" Another patient coped with his early satiety by using his getting older as an excuse. "I do not eat as much as I usually do, but that is to do with my getting older." Moreover, it is particularly problematic for those patients who are suffering from both a lack of appetite and early satiety. "I do not eat very much anymore... I have poor appetite... and I am not as fond of food as I used to be..."

### **Impact of infections and poor wound healing**

It is worth noting that some of the patients suspect infection in these cases pleuritis and urinary tract infections to be the triggering factor of their unintentional weight loss. "It all started with my bladder infection, which was not treated because I could not feel it. Then I became very ill and got infection throughout my entire body." One patient whose only comorbidity was osteoporosis had also noticed poor wound healing. "I get wounds really easily. They bleed a lot and take a long time to heal." Moreover, two patients who had experienced a relatively large weight loss were neglecting it. Unintentional weight loss is among others a red flag for cancer. The fear of a serious diagnosis might be the reason why they haven't got an appointment at the doctor. However, the outreach approach in the study caught them and they were referred to further investigation.

### **Discussion**

This study aimed to evaluate the prevalence of unintended weight loss and associated nutritional impact symptoms among elderly patients in a selected example from a Danish general practice. This study was a case-based study of patients aged 70 years and above associated to a general practice in Bjergby, North Jutland. Patients with unintentional weight loss were identified by using a questionnaire and a sub-population was further investigated with in-depth interviews and measurement of HGS.

### **The prevalence of PEM**

This study revealed a prevalence of 17.5% of PEM measured by unintentional weight loss. The prevalence of PEM has been reported to vary among studies, due to different screening tools and settings. In 1999, Beck, A.M. et al. found a prevalence of 38% of PEM among 65+ years old patients affiliated to general practice according to the MNA [13]. However, since then studies has shown the MNA to over-diagnose PEM [50,51]. Using unintentional weight loss as measure in general practice, there is a smaller but still relatively large group of elderly people who needs nutritional attention in order to treat or to prevent weight loss and its unwanted health-related consequences. Compared to the initial group, the group who had unintentionally lost weight were significantly older. This indicates increasing age as a risk factor for developing PEM. Likewise, other studies have also found increasing age as a significant risk factor for developing PEM [12,15,29,41]. It is notable, though that with the population projection from the Statistics Denmark, the problem will increase further as the proportion of elderly citizens, especially the oldest, in the community increases.

### **Nutritional impact symptoms-prevalence and their mutual impact**

The most prevalent NIS was eating alone as well as lack of appetite and early satiety. Eating alone as a risk factor for loss of weight and thus PEM is a well-known phenomenon in the literature, as several studies have found it to associate significantly with PEM [14,15,23,39]. Notably, in this study, eating alone as a decisive NIS not only expressed by quantitative data, but also was confirmed and further elaborated on during the qualitative interviews. The impact of being alone and eating alone may even be a larger problem than first assumed in quantitative investigations. The interviews revealed deeper insight than the quantitative data were able to do. The patients found it crucial to have someone to cook for and eat with, including those who were not alone. Age-related anorexia is also a well-known phenomenon and a common problem for elderly people and is closely related to a greater degree of early satiety as; among other factors satiety lowers the appetite

[52,53]. Lack of appetite and early satiety being a prevalent NIS therefore correlates well with other studies that have investigated risk factors for PEM [23,52,53].

The study revealed that 41.67% of the patients consumed more than three types of prescribed medicine. In Denmark, the prevalence of polypharmacy among 75-year-old elderly persons is estimated at 54% when defining polypharmacy as five or more types of prescribed medicine. Notably, an increased risk of various unwanted conditions have been associated with polypharmacy in home-living elderly medical patients [54,55]. Polypharmacy may therefore be useful to identify patients at risk. However, polypharmacy should not be avoided at all costs. It can be appropriate as it is invariably connected to multi-disease and should thus only be seen as a marker for an elderly person's risk of unwanted outcomes.

The least prevalent NIS were found to be ulcers or pain in the mouth, dysphagia, and dyspnoea by eating as well as need for help with eating. Serra-Prat, M. et al. found a prevalence of 27% of oropharyngeal dysphagia in a randomly selected population from a Primary Care Centre in Spain, indicating a higher prevalence of dysphagia than the current study revealed [56]. Also a study from Helsinki which investigated swallowing difficulties among nursing home residents found a prevalence of 14% of oropharyngeal dysphagia [57]. Furthermore, a Danish study found a prevalence of oropharyngeal dysphagia of 34.4% among elderly patients admitted with community acquired pneumonia [58]. In the present study, all participants were living in own home, and none suffered from dysphagia. This may reflect a relatively healthy study population with regard to the ability to manage in own home, despite age and chronic disease. This was opposite to our expectations, since we assumed a greater proportion of patients with oropharyngeal dysphagia and oral cavity problems. These findings may reflect a study sample that may not be representative for the age group, however this selection was not intended.

Unintentional weight loss among elders is often associated with decreased physical functionality. Despite that, this study revealed a high physical functional level corresponding to age. Both stated functional level and measured level by HGS shows expected functional level when using Bohannon RW's references values [59]. This may similarly reflect a relatively healthy study population as one could assume a greater prevalence of elderly persons who are suffering from unintentional weight loss have sarcopenia and thus frailty [7,10]. Further investigation with regard to decreased physical functionality as a NIS among patients affiliated to a general practice has to be made.

Additionally, the psychological factors appeared to have a great impact on unintentional weight loss. As expected, depressed mood and stressful situations had a negative influence on the patient's appetite and desire to eat, but more interestingly, the qualitative data revealed that the patient's previous nutritional status had a great impact on their view of their weight loss and their body. Some have perceived themselves as being overweight and found it convenient that they suddenly lost those extra pounds. A study by Craven et al. [60] investigated community-living older adults' perception of body weight and revealed that of the underweight males and females, respectively 13% and 23% perceived their weight as being higher than it ought to be. Their previous weight status and possibly their incorrect perception of body weight therefore may have made them less aware of the importance of not losing weight in old age, increasing their risk of unintentional weight loss and PEM. A meta-analysis of the inverse relationship between body mass index and mortality in older nursing home

residents even showed that overweight status was protective for all-cause mortality compared with underweight and normal weight status [61]. The elderly person's perception of an optimum body weight therefore may be incorrect, as a normal body mass index may not reflect the optimum weight status for an elderly person, especially if exposed to unintended weight loss.

### **Unintentional weight loss as a measure for being at risk of or having PEM**

It is important as a general practitioner or other healthcare professional to be aware that many NIS apply and interact as unintentional weight loss has a multi-faceted ethiology. To prevent unintentional weight loss through identification of associated NIS can be a difficult task. The Danish recommendations are regular weighing to detect any kind of weight loss [44]. However, this study has revealed a variety of NIS which have the potential to be detected before weight loss occur. Especially being alone and eating alone have proven to be major risk factors for unintentional weight loss as well as lack of appetite in combination with early satiety. In addition, several patients have mentioned acute disease, especially infections, as a triggering factor. This provides the basis for drawing attention to selected factors with the purpose of preventing unintentional weight loss. A golden standard screening approach could not be deducted from the results of this limited study but should be tested in a larger case-control study. Furthermore, the study gave no information on sarcopenia, since no measurement of muscle mass was made.

### **Method – strengths and limitations**

A case-based study of patients aged 70 or above affiliated to the general practice in Bjergby, North Jutland was chosen. The general practice in Bjergby is representative for its rural area and for the region of North Jutland with regard to gender and age distribution. The qualitative data have been prioritised and added a larger value than the quantitative data due to the sub-study's low sample size and thus an increased risk of type-2-errors as well as the fact that the study does not contain a control group. The data generated from the questionnaire were self-reported. This may have selected a group of patients whose health both physically and mentally enables them to participate, deselecting the sickest patients. This forms the basis of a sub-study population without participation of nursing home residents, which may have distorted the data as one could assume a larger proportion of patients with PEM and e.g. dysphagia among elderly nursing home residents. Furthermore, patients with dementia were excluded due to ethical aspects since a demented patient is not able to provide informed consent. This contributes to the distortion of the data too, as it can be assumed that PEM are highly prevalent among patients with dementia. Moreover, the sub-study group had a high self-rated functional level also reflecting a relatively healthy sample.

### **Conclusion**

The prevalence of PEM measured by unintentional weight loss in this selected population of patients affiliated to a Danish general practice was 17.5%. However, the number is likely to be affected by population bias, as only a single nursing home resident participated. Of the NIS studied, early satiety, lack of appetite, eating alone and polypharmacy were the most frequent. The investigation of NIS among elderly patients with unintentional weight loss revealed that being alone and eating alone has a great impact on nutritional status along with lack of appetite, early satiety and psychological factors. These results suggest that more attention to patients having these NIS have the potential to prevent unintentional weight loss and its unwanted health related consequences.



## Perspectives

In future research, the prevalence of PEM should be tested with a study designed to include the sickest patients, e.g. through a follow-up study with weighing at baseline and again one year later of patients  $\geq 70$  years affiliated to a general practice to construct a more representative sample.

The present study has a relatively small sub-study population and does not take the prevalence of NIS among those without an unintentional weight loss into account. The investigation of NIS should therefore be tested in a larger case-control study to create more power of the results and similarly to construct a more representative sample.

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