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Frailty syndrome in aging society

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ABSTRACT

Introduction: In the face of the progressive aging of society, focusing on the needs of people over 60 years old seems to be of particular importance. Among the most common diseases of the geriatric population, cognitive dysfunction, depression, urinary incontinence, sarcopenia and frailty syndrome are distinguished, which are collectively referred to as geriatric syndromes. The aim of this review is to discuss the phenomenon of frailty syndrome, taking into account its etiology, epidemiology, diagnostic criteria and treatment options.
Materials and methods: This article contains an overview of publications from the PubMed and Google Scholar databases.
Results: Frailty syndrome is defined as a multi-causal medical syndrome that increases the risk of loss of independence and/or death. Data on the incidence of this phenomenon remain inconsistent. An important role in pathogenesis is played by chronic inflammation, oxidative stress, sarcopenia and vitamin D3 deficiency, but also social aspects such as loneliness. One of the most important symptoms is sarcopenia, which is manifested by the loss of strength and muscle mass, leading to motor slowdown, reduced exercise tolerance or a feeling of weakness. It may also be accompanied by abnormal coagulation, anemia, malnutrition or affective disorders. Numerous scales have been developed that are used to diagnose frailty syndrome, enabling the individualization of the diagnostic process. Physical activity and diet play a key role in the process of prevention and treatment.
Conclusions: Population aging is an unquestionable challenge for modern medicine and contributes to the more frequent occurrence of frailty syndrome. Its pathogenesis is complex, but the knowledge of risk factors allows it to select a group of patients who should be carefully monitored. Due to diagnostic difficulties, prophylaxis including age-adjusted physical activity, diet and effective treatment of chronic diseases plays an important role.
Keywords: frailty syndrome; geriatric syndromes; sarcopenia; old age; review.

INTRODUCTION

Population aging is a common phenomenon. Epidemiological data show that currently about 11% of the population is over 60 years old, and it is estimated that this percentage will increase to 22% by 2050. Despite differences in life expectancy between different countries, this trend is visible worldwide [1]. However, a separate concept is healthy life expectancy. According to the latest statistics from the World Health Organization, the life expectancy at birth in the world in 2019 was 73.3 years, while the healthy life expectancy was 63.7 years [2]. Extending life expectancy is an unquestionable success of modern medicine, but providing adequate health care poses another difficult challenge [3]. Aging is a natural phenomenon and leads to changes in the functioning of the body, which is associated with the burden of chronic diseases and multi-morbidity [1]. The most common geriatric problems, even called geriatric syndromes, include sarcopenia, weight loss, depression, delirium, falls, cognitive dysfunction, urinary incontinence, and frailty syndrome (FS). These problems are multifactorial, coexist with each other, and often result in taking many medications, and thus have a significant impact on the quality of life and functioning of the elderly in society [4, 5]. Common risk factors for these conditions have been proposed, such as older age, cognitive and functional impairment, and mobility limitation [4]. A higher incidence of these diseases is also observed in cancer patients [6]. Most likely, there is a common pathophysiological mechanism of geriatric syndromes. This theory assumes that all these conditions may result from the accumulation of many impairments of systemic systems and thus the ability to compensate for various stressors is limited. In this regard, it is worth noting that many chronic diseases affect the occurrence of geriatric syndromes and that geriatric syndromes exacerbate the course of chronic diseases [4, 6].

Although medical advances have undeniably contributed to an increase in life expectancy, it is necessary to attempt to provide an adequate quality of such a long life, especially for the elderly. Despite attempts to delay it, aging is a natural and progressive phenomenon, leading to a range of problems, conditions and burdens [1, 3]. One of the more insidious conditions is FS, which researchers have struggled to define for many years [7]. According to the latest knowledge, metric age is not as important as biological age, and thus it is important to be vigilant not only for the patient's age, but also for his or her chronic diseases, psychological state, living conditions and, above all, well-being [7, 8, 9].

In this article, we will focus on discussing the problem of FS – its criteria, pathophysiology, epidemiology, prevention, and treatment.

MATERIALS AND METHODS

In this article, we reviewed the articles available on the PubMed and Google Scholar databases using keywords such as: "frailty syndrome", "geriatric syndromes", "sarcopenia", "old age", and "review". The articles analyzed included original research papers and review articles published between 2002–2023. Studies providing information on the etiology, epidemiology, diagnosis, prevention and treatment of FS, written in English and Polish, were selected.

FRAILTY SYNDROME – DEFINITION AND DIAGNOSTIC CRITERIA

According to one of the most popular definitions, formulated by Linda Fried, FS is a condition associated with a decrease in physiological reserves and resistance to stress factors as a result of reduced efficiency of organs and systems [10]. This leads to a disturbance in the body's homeostasis, and an increased risk of complications and adverse events [7]. A new definition that defines frailty as a multi-cause medical syndrome that increases the susceptibility of an individual to loss of independence or death was created in 2013. The characteristics of the syndrome include reduced strength and endurance as well as disturbed physiologic function [8]. Frailty syndrome is a clinical syndrome that should be diagnosed in primary care. Appropriate intervention makes it possible to reduce the severity of symptoms and reverse the consequences [4]. Currently, the definition does not depend on the chronological but the biological age of the organism, due to the fact that the symptoms of the syndrome are also present in younger patients with chronic diseases [7].

According to Fried, frailty can be diagnosed when at least 3 out of 5 of the following disorders are present: motor slowness (assessed by gait speed), decreased physical activity (assessed using the Minnesota Leisure Time Activity Questionnaire), feeling of weakness in the hand muscles (assessed by a dynamometer), fatigue (assessed on the Center for Epidemiologic Studies Depression – CES-D scale), weight loss (loss of at least 5 kg in a 12-month period) [10, 11]. The finding of 1 or 2 of the above-mentioned abnormalities indicates a high risk of developing FS [10]. Many other scales are used in diagnostics, which are summarized in the following Table 1.

TABLE 1. Scales used in the diagnostics of frailty syndrome (FS)

Scale	Components	Interpretation
Fried frailty phenotype (FP)	unintentional weight loss (≥5 kg in 12 months), weakness or poor handgrip strength (assessed by a dynamometer), fatigue (assessed in CES-D scale), decreased physical activity (assessed using the Minnesota Leisure Time Activity Questionnaire), slow walking speed [10]	meeting ≥3 out of 5 criteria indicates frailty, while meeting 1 or 2 components proclaims a high risk of a FS [10]
Edmonton Frail Scale (EFS)	social support, cognitive disorders, health behaviors, medications used, nutrition, mental state, functional independence, urinary incontinence, fecal incontinence [10]	0–3 points – no FS; a max. score of 17 indicates a fully developed FS [10]
Clinical Frailty Scale (CFS)	assesses the degree of independence in the elderly, taking into account the coexistence of chronic diseases, cognitive disorders and disability [7, 10]	it is possible to get 1–7 points; obtaining 1 point indicates a good general condition, while 7 points indicate a dependence in functioning [10]
FRAIL	tiredness, endurance (climbing stairs), mobility (gait), comorbidities, weight loss [10, 12]	it is possible to get 0–5 points on the scale: 0 points – no FS, 1–2 points – risk group "pre-frail", 3–5 points – FS [7, 10]
Strawbridge questionnaire	physical condition, nutrition, mental state, social functioning [10]	disturbances in ≥2 of those areas indicate FS [10]
Frailty Index	the ratio of abnormalities in functioning to the number of assessed aspects of functioning [13]; it contains 30 components related to age and health; the score ranges 0–1 and frailty is diagnosed with a score of 0.25 [14]	

TABLE 1. Scales used in the diagnostics of frailty syndrome (FS)

Scale	Components	Interpretation
Gérontopôle Frailty Screening Tool (GFST)	housing situation, weight loss, fatigue, memory disorders, difficulties in moving, slowing of gait [8]	an abnormality found in any of those criteria indicates the need to assess whether further frailty diagnosis is required [8]
Study of Osteoporotic Fractures index (SOF index)	weight loss of more than 5% over a 12-month period, inability to get up from a sitting position 5 times, subjective feeling of energy loss [13]	meeting all criteria indicates a FS, while 2 criteria indicate „pre-frail" [8]
Tilburg Frailty Indicator (TFI)	part A covers determinants of frailty, such as socio-demographic factors, chronic diseases, lifestyle, living environment, and traumatic experiences in the last 12 months; part B takes into account the physical, psychological and social components of FS [12, 13]	the score ranges 0–15 points; a score of 5 or more indicates FS [13]; FS diagnostics using TFI can be useful for FS prevention [7]
Vulnerable Elderly Survey-13	the patient's age, subjective assessment of their health condition and difficulties in performing specific activities (such as shopping, managing money, walking across the room, doing light housework,and bathing) is taken into account; evaluation of physical fitness includes walking across the room, bending, and crouching; the second category of functional and physical disorders consists of questions about difficulties in lifting and carrying heavy objects weighing approx. 4.5 kg, reaching or extending the arms above the shoulders and walking approx. 1.5 km, as well as writing or handling and grasping small objects and doing heavy housework [13]	it is possible to get 0–15 points; obtaining at least 3 points indicates a higher risk of functional impairment [13]
Modified Physical Performance Test	the ability to perform certain activities is assessed: walking, writing, picking up a coin, putting a book back on a shelf, putting on and undressing a coat, simulating eating, climbing stairs, turning 360° [13]	4 points are awarded for each completed task; a max. of 36 points can be obtained; obtaining 25–32 points indicates a mild form of FS; 17–24 points indicates a moderate form, and a lower score indicates a loss of independence [13]
Physical Frailty Score	walking a distance of 3 m in less than 10 s, getting up from a sitting position without using hands [13]	the inability to perform 1 activity indicates a moderate FS, and difficulties in both components indicate an advanced form [13]
Groningen Frailty Indicator (GFI)	the 15-question questionnaire covers physical (mobility, health problems, physical fatigue, visual and auditory skills), mental (mood disorders, depression), cognitive (cognitive functioning) and social (emotional isolation) aspects; it allows for the assessment of the severity of changes in the FS and functional disorders in everyday activities [12]	≥4 points indicates FS [12]; the results of several studies indicate that GFI may be a useful tool for screening FS in elderly cancer patients [2]

CES-D – Center for Epidemiologic Studies Depression scale

Some of the diagnostic tools, such as the Fried criteria and the FRAIL scale take into account only the physical dimension of the FS, while others like the Frailty Index also cover social and psychological aspects of functioning [7]. The tools like the Clinical Frailty Scale (CFS) and the FRAIL scale are used in screening. The CFS score requires clinical observation of the patient by a physician, while FRAIL is based mainly on the patient's self-assessment of their health status [15]. Subjective methods include: Tilburg Frailty Indicator, Groningen Frailty Indicator and Vulnerable Elderly Survey-13. Modified Physical Performance Test and Physical Frailty Score are objective while the Frailty Index, Fried's Frailty Phenotype, Edmonton Frail Scale, Study of Osteoporotic Fractures Index and FRAIL scale take into account both objective and subjective assessment of patient's health [13].

The choice of a diagnostic tool for the detection and assessment of FS should mainly depend on the characteristics of the target group. The lack of a clear definition of frailty causes discrepancies in the diagnostic criteria used. Diagnostic tools should be selected taking into account the patient's comorbidities, which results from the heterogeneity of the syndrome and its secondary nature to other diseases [12]. The described scales have a specific purpose and research group for which they were created that should be taken into account when choosing a diagnostic tool [10].

EPIDEMIOLOGY

The available reports on the prevalence of FS vary widely. These discrepancies depend on the adopted definition, established criteria for diagnosis, and the age of the people participating in the study. The meta-analysis by Collard et al. included studies in which participants were at least 65 years of age

and obtained sufficient information regarding the definition on the basis of which FS was diagnosed. A total of 21 studies were selected, of which 11 studies provided additional information on the prevalence of FS by sex, and 4 studies looked at the prevalence of FS by age group. It has been shown that the prevalence of frailty among people over 65 years of age ranged 4.0–59.1%, with this result averaged to 10.7%. It has also been proven that it affects women almost twice as often as men (9.6% in women compared to 5.2% in men) and that its incidence increases with age (15.7% in those aged 80–84 years and 26.1% in those over 85) [11, 16, 17].

A systematic review published by O'Caoimh et al. in 2021 analyzed the prevalence of FS in 62 countries around the world, depending on the criteria used to diagnose the disease. Studies including a representative community sample that provided information on the prevalence of FS in patients over 50 years of age were qualified for analysis. A necessary criterion for inclusion of the study was also the description of the FS using any externally validated measure of frailty. Using scales based on the physical frailty measures of an elderly person (including Fried's Frailty Phenotype criteria), the incidence of FS was 12%, while it increased to 24% when using the Frailty Index, which was based on the patient's interview [18]. Divergent data were also obtained by comparing 10 diagnostic tools used to identify people with FS, where the results ranged 14.8–52.9%. The study group consisted of patients at least 65 years of age attending primary care practice in Amsterdam. Moreover, patients in the study underwent a comprehensive geriatric assessment, taking into account additional variables that allowed comparison between groups. The analyzed variables included: sex, level of education, body mass index, presence of chronic diseases, amount of drugs used, assessment of cognitive functions, and the assessment of one's own health or level of physical activity [14].

Siriwardhana et al.'s review of the prevalence of FS included studies involving people over 60 years of age living in low- and middle-income countries [19]. The data obtained were compared to the above-mentioned review conducted in 2012 by Collard et al., which estimated that in high-income countries the incidence of FS is 10.7% [16, 19]. The analysis showed that in low- and middle-income countries, 17.4% of the population over the age of 60 suffers from this disease, which indicates that it is more common there than in high-income countries [19].

An analysis of 18,227 people living in 10 European countries showed that the prevalence of FS in Europe in people over 65 years of age is approx. 17%, with the lowest rate in Switzerland (5.8%) and the highest in Spain (27.3%). It was also estimated that the average number of respondents of this age in the prefrailty is 42.3%. The incidence of FS among younger patients between 50–64 years of age is 4.1%, and those in the prefrailty are 37.4% in this age group. In the group of patients over 65 years of age, the results were adjusted for the level of education and demographic data, such as age and sex. It has been shown that the level of education contributes to differences in the prevalence of frailty and prefrailty syndrome in individual countries [20].

Data on the prevalence of FS in Poland were estimated in the work published by Bieniek and Szewieczek. The study included 100 patients staying in one of the geriatric wards in Katowice, both women and men, aged 60–95 years. Fried criteria were used to diagnose the FS, using a standard protocol translated into Polish. The syndrome was observed in 12.5% of people between 60–69 years old and in as many as 33.3% of patients over 90 years old, while the prefrailty occurred in 31.3% of those between 60–69 years old [21].

Interestingly, the prevalence of FS varies according to the tool used, but in the studies we analyzed, values of several percent were the most common, with an increase in prevalence observed with age, where FS was found in up to 1 in 3 people over 90 years of age. A higher prevalence was also observed among women [14, 16, 17, 18, 19, 20, 21]. Considering that life expectancy in women is higher than in men further contributes to the prevalence of FS.

ETIOLOGY

The exact etiology of frailty syndrome remains unknown [22]. Findings emphasize that the syndrome's genesis is complex. The co-occurrence of sociodemographic, physical, behavioral and environmental factors contribute to its development. Aging process and chronic inflammation have a significant impact on the progression of FS. Oxidative stress, reduced vitamin D3 levels, polypharmacy, sarcopenia, and social factors such as loneliness and lack of social support are also involved [23].

The process of aging disrupts immune system functions, leading to an impaired response to inflammatory agents [24, 25]. Chronic inflammation is observed in patients affected by FS. The process leads to increased levels of interleukin-6, interleukin-1β, C-reactive protein, and tumor necrosis factor alpha. As a result, metabolic pathways are disrupted, which clinically manifests as muscle mass loss and weakness [26]. Chronic inflammation also impacts the endocrine system. Abnormal levels of dehydroepiandrosterone sulfate, cortisol, insulin-like growth factor, growth hormone or sex hormones are also observed in patients [22, 25]. An association between FS and elevated coagulation parameters has been reported. Chronic inflammation, as well as the aging process itself, causes hypercoagulability [15, 26].

Another theory links oxidative stress to the development of FS [27]. During the aging process, mitochondria, the main metabolic centers of the cell, become a source of increased reactive oxygen species (ROS). In the proper cell senescence, the resting metabolism decreases. However, with the onset of chronic diseases, resting metabolism increases. The increase in energy production enables the maintenance of cellular homeostasis, but is also associated with the release of more free radicals, which induces oxidative stress. Excess ROS, through activation of nuclear pathways, result in the development of inflammatory processes that contribute to FS [28]. The described mechanism may explain the higher prevalence in geriatric patients suffering from chronic diseases.

The results of the study suggest that elevated calcidiol levels show a negative correlation with the prevalence of FS [29]. Vitamin D3 regulates calcium concentration in the body by acting on nuclear receptors and activating genes responsible for the synthesis of osteopontin, osteocalcin, a calcium-binding protein, as well as protein controlling intracellular calcium transport and phospholipid metabolism. Increased number of type II muscle cells due to protein production leads to muscle strength improvement. Vitamin D deficiency reduces muscle mass and strength, and thus impaired mobility, which is one of the components of FS [30].

Sarcopenia, defined as a progressive and systemic loss of skeletal muscle mass and strength, is considered to be an element of FS. It is sometimes referred to as a condition preceding this syndrome. The changes characteristic of sarcopenia are caused by an imbalance between the endocrine, immune and neurological systems. Disturbances mentioned above result from inflammatory processes in the FS [31, 32].

Both malnutrition and obesity may participate in pathogenesis. Muscle mass deficiency is a component common to both conditions. The risk of developing FS is proportional to the duration of obesity. Patients with excess body fat also have chronic inflammation, which further contributes to the development of FS [33].

Studies describe different conclusions regarding the relationship between multimorbidity and the development of FS. It is believed that there is an interrelation between these conditions. The presence of several diseases can both predispose to and result from FS [22, 32, 34, 35]. Pinheiro et al. observed that the risk of FS may be higher in patients with hypertension, urinary incontinence, diabetes and cognitive changes [36]. Donatelli and Somes noticed that FS often coexists with osteoporosis, osteoarthritis, pulmonary disease and heart or renal failure [24]. Frailty syndrome may be a stand-alone disease as well [22, 32]. In some studies, no association between FS and multimorbidity was found [37, 38].

Polypharmacy, which is common in the geriatric population, is also a presumed factor in the etiology of FS. Studies confirm a correlation between taking 4 or more medications per day and the occurrence of FS [39]. Elderly patients, due to a physiological decrease in drug metabolism, are more likely to experience intensified drug effects. In addition, they are more prone to drug interactions [23].

Isolation, lack of social interactions and loneliness may increase the chance of developing FS. It has also been shown that higher levels of education can be a protective factor. Better education correlates positively with quality of life, socioeconomic conditions and health knowledge [36].

Soysal et al. in their meta-analysis show a cross-correlation between depression and FS. Patients diagnosed with FS are 4 times more likely to develop depression. Similarly, those with depression have been observed to have an increased chance of developing FS [40].

CLINICAL SYMPTOMS

The dominant symptoms are musculoskeletal disorders, most often in the form of sarcopenia, which may be accompanied by osteopenia and osteoporosis, followed by weakness, motor slowdown, impaired exercise tolerance and fatigue. One of the common symptoms of FS is anemia coagulation disorders [10, 41]. Intellectual disorders may also coexist in patients with FS. In addition to the aforementioned deterioration of cognitive functions, affective disorders may appear – from moderately lowered mood to severe depression, and weakening of the sight and hearing [10, 42]. An increased risk occurs in the case of low levels of anabolic hormones (growth hormone, sex hormones), chronic malnutrition, genetic factors (low birth weight) and low physical activity [11, 42].

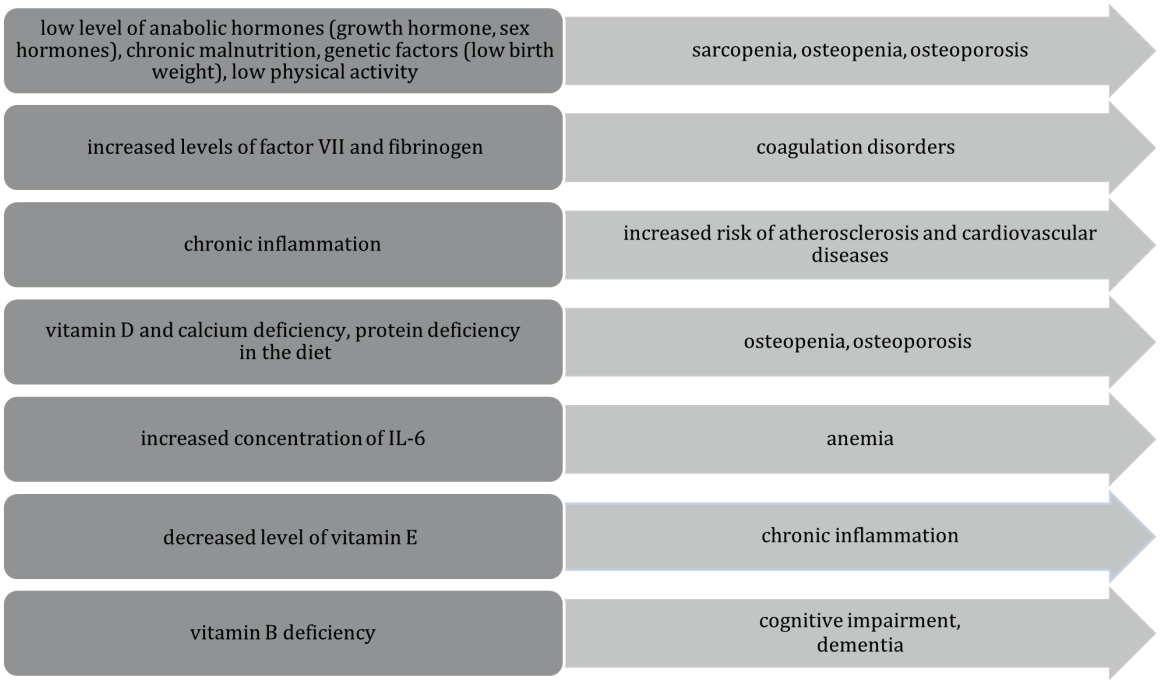
Changes in the neuroendocrine system are also characteristic of FS. There is a decrease in the concentration of sex hormones (testosterone, estrogens), dehydroepiandrosterone sulfate, insulin-like growth factor and growth hormone [43]. Abnormalities in the secretion of glucocorticosteroids are observed, and a relationship has been found between a decrease in the 24-hour variability of cortisol concentration and an increase in the symptoms of the disease [11].

Moreover, coagulation disorders may occur, which are caused by an increased concentration of factor VII and fibrinogen, as well as activation of inflammatory processes. Chronic inflammation in the body adversely affects the functioning of the endocrine, musculoskeletal and cardiovascular systems, increasing the risk of atherosclerosis and cardiovascular diseases [41]. Accompanying anemia may be caused by an elevated concentration of interleukin-6, which inhibits the production of erythropoietin and the absorption of iron from the gastrointestinal tract [10].

On the other hand, there also exist symptoms connected with FS indirectly. The reduced physical activity and weakness associated with FS cause a loss of appetite, and thus intensify malnutrition, which leads to a deficiency of vitamins, minerals and nutrients, especially proteins. Moreover, an insufficient supply of protein and energy leads to a decrease in strength and muscle mass. A deficiency of vitamin D and calcium disturbs the calcium-phosphate metabolism, which increases the risk of osteopenia and osteoporosis. The reduced level of vitamin E limits the oxidation of free radicals and consequently reduces the body's ability to inhibit inflammatory processes. Deficiency of iron and vitamin B12 contributes to the development of anemia, and deficiency of B vitamins increases the risk of cognitive dysfunction [11, 41, 44]. Additionally, people with FS may be overweight or obese because adipose tissue is deposited in skeletal muscles, which impairs their function and leads to the development of sarcopenic obesity [41, 42].

The most common symptoms of FS with their direct/measurable causes are gathered in Figure 1. It should be emphasized that Figure 1 comprises only symptoms concerning physical health, connected with malnutrition, hormone and coagulation factors disorders, chronic inflammation as well as genetic factors and low physical activity.

Frailty syndrome may also affect mental health especially when intellectual disorders coexist in patients. In addition to the aforementioned deterioration of cognitive functions, affective disorders may appear – ranging from moderately lowered mood to severe depression, along with weakening of sight and hearing [10, 42].



IL-6 – interleukin-6

FIGURE 1. Symptoms of frailty syndrome (left side of the graph) and their causes (right side of the graph)

PREVENTION AND TREATMENT

Prevention of FS is possible through the early implementation of appropriate management, which should be individually tailored to the needs of each patient. In the prevention and treatment of FS, along with proper nutrition, physical activity holds a significant role [9, 45]. Physiotherapy can help combat the features of FS, such as unintentional weight loss, muscle weakness, exercise intolerance, subjective fatigue, gait slowing, and the risk of falls [46]. It is crucial to note that FS is reversible, emphasizing the importance of prevention and timely intervention when symptoms arise.

As per guidelines published by Ki et al. in 2021, preventing frailty among community-dwelling older adults involves training that combines various activities, including aerobic and resistance training, along with exercises that enhance flexibility and balance. Gradually increasing exercise intensity over 2–3 weeks is recommended [47]. Another systematic review highlights the importance of overall physical activity, as well as resistance training or a combination of endurance, balance and resistance training in preventing frailty among individuals aged 65 years and above [48]. In terms of slowing down the progression of existing FS, the most frequently recommended form of activity is progressive resistance training [49].

It is necessary to emphasize an individual approach to the patient. According to the recommendations established by the U.S. According to the Department of Health and Human Services, older individuals should engage in moderate aerobic physical activity for at least 150 min (2 h and 30 min) per week [50]. Different countries, in an effort to meet the needs of aging societies, are implementing interventions aimed at counteracting the development of FS. In Canada, a group of 135 people participated in physical exercise 2 times a week in 1-hour sessions for 3 months, resulting in improved walking speed, muscle strength and a significant enhancement in overall physical condition within the research group [45]. Furthermore, there are reports that even 1 training session per week can be beneficial for the elderly [51]. It is worth mentioning that resistance contributes to bone health by reducing the risk of bone demineralization and falls, owing to its effect on increasing muscle strength. The role of the inflammatory component in the pathogenesis of FS underscores the need to include dietary ingredients with established anti-inflammatory effects. Initiating rehabilitation for seniors should commence with a series of brief exercises, progressing towards more advanced and lengthier activities [46].

Nutritional factors may impact both the onset and modification of FS [52]. Malnourished seniors tend to exhibit characteristics of FS more frequently. Consequently, it is advisable to conduct screening tests within the older patient population. Such tests should include anthropometric measurements, biochemical tests, and an analysis of medical and community histories. Protein deficiency is a common observation in the senior population, therefore in elderly people with FS or those at risk, the recommended supply of protein with the diet should be higher than the current standards for adults (0.8 g/kg b.w./day) and amount to 1.0–1.2 g/kg/day. This approach aims to mitigate the age-related decline in muscle mass. It is worth mentioning that increasing the supply of protein does not apply to seniors with renal failure [53]. The inflammatory aspect's significance in the pathogenesis of FS underscores the importance of incorporating dietary components with established anti-inflammatory effects. Prominent examples of such substances include omega-3 fatty acids and antioxidants. Equally important is

the supplementation of calcium, zinc and selenium [54]. In essence, it can be argued that the recommended diet for FS is the Mediterranean diet, given the reduced consumption of fruits, vegetables, nuts and beneficial fatty acids in the senior population with FS [55]. A 2022 study published in The American Journal of Clinical Nutrition followed a group of over 2,000 seniors over 11 years and found that carotenoid intake had the greatest impact on their overall health. The results of this study indicated that a 10 mg intake of carotenoids led to a notable 16% reduction in the risk of FS [56].

DISCUSSION

The central question remains: how can we protect older patients from FS? As previously mentioned, FS is an insidious and often challenging-to-diagnose condition, yet its prevention is attainable primarily through appropriate physical exercise and a balanced diet [45, 52]. Its early detection is important and the choice of FS diagnostic tool used should be tailored to the specific target group [12]. Therefore, further research is necessary to adapt diagnostic tools and this is recognized as a significant concern in our review.

Although the exact etiology remains unknown, several contributing factors have been identified. With the identification of such a factor, it is possible to prevent, delay and treat FS. As we indicated above, a particular role in the etiology is attributed to the presence of chronic inflammation and the aging process. In treatment, therefore, we should focus particularly on combating inflammatory processes in chronic diseases [22, 23]. Interestingly, obesity itself has a strong influence on the occurrence of FS, not only through a deficiency in muscle mass, but precisely through the chronic inflammation induced by adipose tissue itself [33]. Factors such as feelings of loneliness, isolation, lack of social contact, low levels of knowledge about health and adequate nutrition, also contributing to the development of FS, can be actively tackled by trying to activate older people and through appropriate education [36]. Above all, the focus should be on catching risk factors early enough to prevent the development of FS. As useful and in many cases necessary as treatment may be, it can also contribute to the occurrence of FS. The phenomenon of polypharmacy, common among the elderly, has been observed in studies as a factor in the development of FS [39].

It is also worth noting the impact of FS on other diseases in the elderly. People suffering from depression have an increased risk of developing FS, and this can worsen the condition and even lead to severe depression [40, 42].

All these elements make FS a complex condition that can have a significant impact on the quality of life of the elderly. Therefore, a deeper investigation of this problem and greater awareness on the part of all clinicians dealing with geriatric patients is required. As we mentioned above, the development of appropriate diagnostic tools would significantly contribute to improving the quality of life of patients by detecting the disease earlier.

LIMITATIONS OF THIS STUDY

It is worth noting that a significant limitation is the lack of an unambiguous definition of the fragility syndrome and discrepancies in the diagnostic criteria, which must take into account the patient's comorbidities. This contributes to the difficulties in developing clinical trials and identifying the target research group, as well as significant discrepancies in scientific reviews. Depending on the criteria used, the incidence of FS varies. In addition, unclear etiology and comorbidities result in the need for an individual approach to the treatment and prevention of FS in each patient, which is often a great challenge for physicians in common practice.

CONCLUSIONS

One of the most popular definitions termed the FS as a state of reduced reserves and greater susceptibility to stress factors, which results from the aging of the body. The exact prevalence of the syndrome is unknown, but it has been observed to affect women more often. Chronic inflammation, oxidative stress, and social factors play an important role in the emergence. The most important symptom is sarcopenia resulting in deterioration of performance and weakness. Several diagnostic scales have been developed and the selection of the appropriate one should be adapted to the target group. Physical activity and diet are implemented in prevention and treatment.

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