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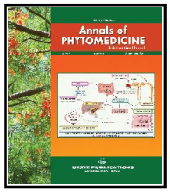

Review Article : Open Access

Current scenario of geriatric nutrition and health correlates: The silver age review

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Abstract

As the global population ages, with the number of individuals aged 60 and over projected to double to 2.1 billion by 2050, challenges in maintaining adequate nutrition arise. Physiological changes and geriatric complications often lead to reduced food and nutrient intake, with conditions such as sarcopenia affecting approximately 30% of individuals over 60. Malnutrition is prevalent among hospitalized and institutionalized elderly, with percentages ranging from 12-50% and 23-60%, respectively. Nutrient deficiencies increase the risk of age-related diseases like osteoporosis, cognitive decline, and cardiovascular issues. Dementia prevalence is higher among individuals with depressive mood, and dysphagia affects a significant portion of nursing home residents and hospitalized elderly. Immuno-senescence increases vulnerability to infections, autoimmune conditions, and cancers, contributing to declining physical and mental abilities. A healthy eating habit, incorporating functional foods and dietary supplements, is crucial for maintaining well-being in older adults.

1. Introduction

The global population is experiencing a significant demographic shift, with the elderly population, termed the 'Silver Age,' growing at a faster rate than the general population. This trend is projected to continue, with the number of individuals aged over 60 expected to double by 2050, reaching 2.1 billion (Groessl *et al.*, 2013; Nations, 2022). Within this demographic, a subgroup known as superagers, individuals in their 70s and 80s exhibiting youth-like abilities, has garnered attention from medical science. As ageing brings about physiological changes impacting metabolism, nutrient absorption, and overall nutritional needs, understanding the dietary demands of older adults becomes essential (Cristina and Lucia, 2021). Customized nutrition interventions have emerged as crucial tools in addressing specific health issues such as osteoporosis, cognitive decline, and cardiovascular illnesses (Cruz-Jentoft *et al.*, 2019). Moreover, research highlights the significance of diet in modulating gut microbiota, inflammation, and immunological response, all pivotal factors in age-related health outcomes. By elucidating the intricate relationship between geriatric nutrition and health, scientists aim to develop tailored dietary interventions to support healthy ageing and mitigate age-related illnesses, thereby alleviating the burden on both individuals and healthcare systems (Volkert *et al.*, 2019).

The ageing process brings about various geriatric syndromes and health challenges, including but not limited to osteopenia, sarcopenia, sensory impairments, chronic diseases, and cognitive decline (Choubisa, 2022; Kastanias *et al.*, 2017; Hooyman and Kiyak, 2011). Despite these challenges, maintaining proper nutrition, along with physical and mental exercise, plays a vital role in sustaining functional abilities and overall well-being (Siddiqui *et al.*, 2024). Figure 1 depicts micronutrient deficiencies, common geriatric syndromes, and geriatric management. Dietary principles for geriatrics emphasize the consumption of nutritious foods, adequate hydration, regular intake of fruits and whole grains, and avoidance of certain foods like fried foods, salt, and sugar (Bernstein and Munoz, 2019; Srilakshmi, 2011). Micronutrient deficiencies, often termed "hidden hunger," pose significant risks to elderly health and require attention to prevent irreversible harm. Additionally, addressing psychosocial aspects and designing care approaches tailored to the needs of older individuals are critical for promoting healthy ageing and supporting long-term care systems in ageing societies (Srilakshmi, 2011).

2. Barriers to food intake in geriatrics

Food consumption among older populations can be hindered by various obstacles as shown in Figure 2, impacting their overall health and nutritional status. Physiological changes associated with ageing, such as decreased appetite due to altered gut hormone levels,

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diminished taste and smell sensitivity, and changes in metabolic rate, often contribute to reduced food intake (de Boer *et al*., 2013). Additionally, age-related conditions like dysphagia, characterized by difficulty swallowing, are prevalent among older individuals, further complicating their ability to consume food (Thiyagalingam *et al*., 2021). Dental problems, including gum disease, tooth loss, and ill-fitting dentures, can also impair chewing and swallowing solid foods (Keller *et al*., 2004).

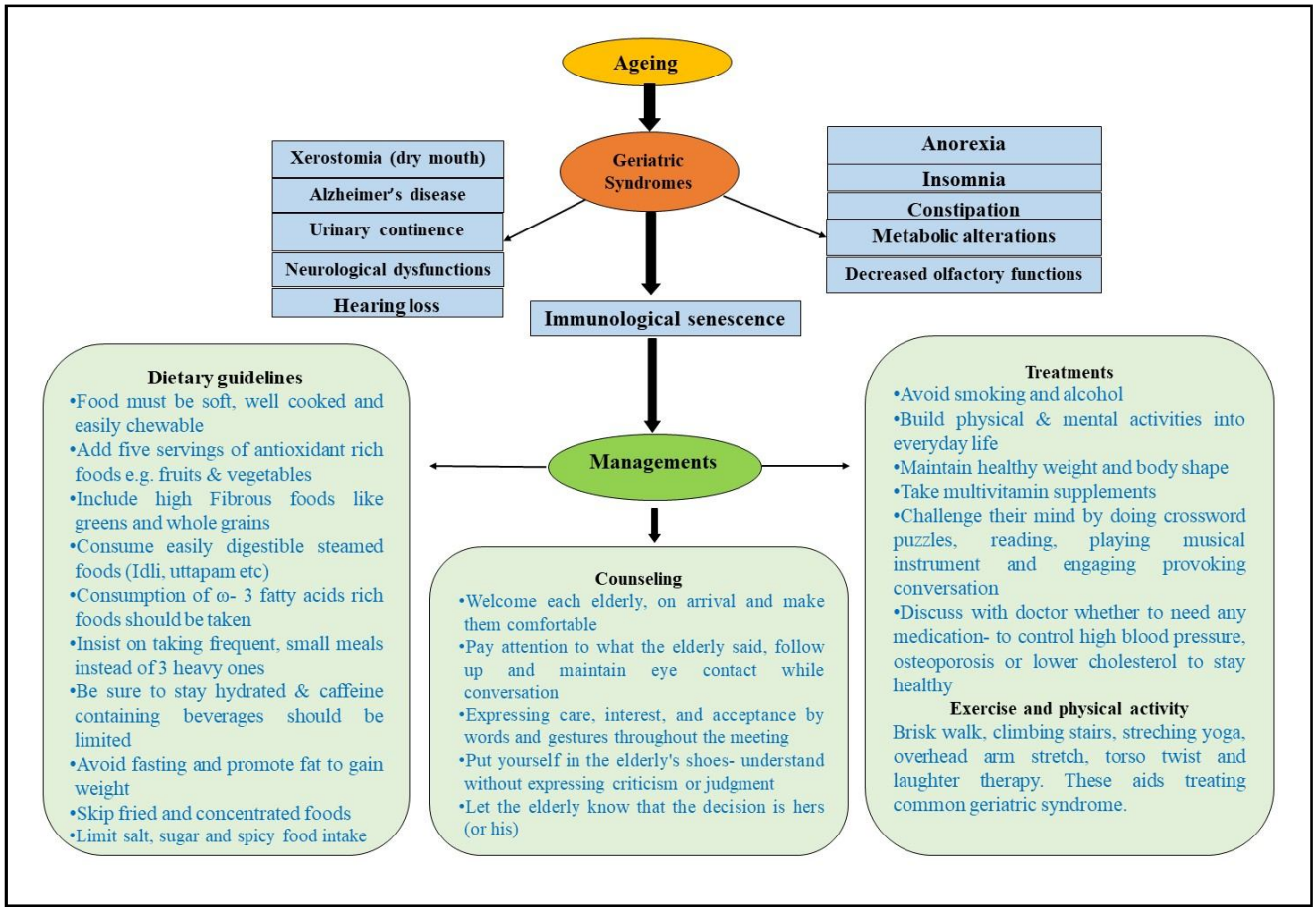

Figure 1: A web illustrating geriatric syndrome during ageing, associated health correlates and their management.

Cognitive and psychological factors play significant roles in influencing food consumption patterns among older adults. Mental health issues such as depression and anxiety can diminish appetite and alter dietary habits (Masana *et al*., 2019). Cognitive decline associated with conditions like dementia and Alzheimer's disease can lead to difficulties in meal preparation and consumption, as well as forgetting to eat altogether (Volkert, 2013). Social and environmental factors further compound these challenges. Social isolation, resulting from a lack of social connections during meals, can contribute to decreased appetite and reduced food intake. Financial constraints may limit access to nutrient-rich foods, forcing individuals to rely on cheaper, less nutritious alternatives. Limited mobility, stemming from physical constraints like frailty or mobility issues, can impede older adults' ability to shop for groceries, cook meals, or access healthy food options (Locher *et al*., 2005). These multifaceted barriers underscore the complexity of addressing nutritional needs in older populations and highlight the importance of comprehensive approaches that consider physiological, cognitive, psychological, social, and environmental factors.

3. Medicinal side effects

Polypharmacy among older adults, wherein multiple medications are taken for various health concerns, can lead to side effects impacting appetite, taste perception, and gastrointestinal function, ultimately affecting food intake. To address these challenges and ensure adequate nutrition for seniors, a multidisciplinary approach involving healthcare providers, caregivers, and community support networks is crucial (Onder *et al*., 2002; Yinusa *et al*., 2021). Despite the physiological, societal, and psychological changes associated with ageing, poor nutrition should not be viewed as an inevitable consequence. Different categories of older individuals, including those ageing successfully, normally, or with accelerated ageing, present various nutritional issues and risk factors, necessitating tailored solutions (Keller, 2007). Muscle wasting due to inadequate protein intake is prevalent among the elderly, contributing to sarcopenia, a condition characterized by progressive loss of muscle strength and mass (Larsson *et al*., 2019). Hormonal changes such as reduced responsiveness to satiety hormones and altered levels of appetite-regulating hormones like ghrelin and leptin further impact food intake in older adults (Doets and Kremer, 2016; de Boer *et al*., 2013; Martone *et al*., 2013; Turner and Ship, 2007).

Functional foods with bioactive constituents have emerged as valuable tools in preventing and manageing chronic diseases associated with diet, offering potential benefits for older individuals who often face multiple health concerns (Stratton *et al*., 2015). However, food choices are influenced by complex interactions between individuals, food options, cultural norms, and environmental factors, necessitating careful consideration of self-management motivations and barriers among homebound older adults. Interventions aimed at altering eating behaviors, particularly those focused on immunity-based approaches, should prioritize functional foods that are easy to prepare, affordable, and inclusive of caregivers (Locher *et al*., 2009). While oral nutritional supplements (ONS) are commonly used for protein supplementation among the elderly, their cost and acceptability remain significant challenges for widespread adoption.

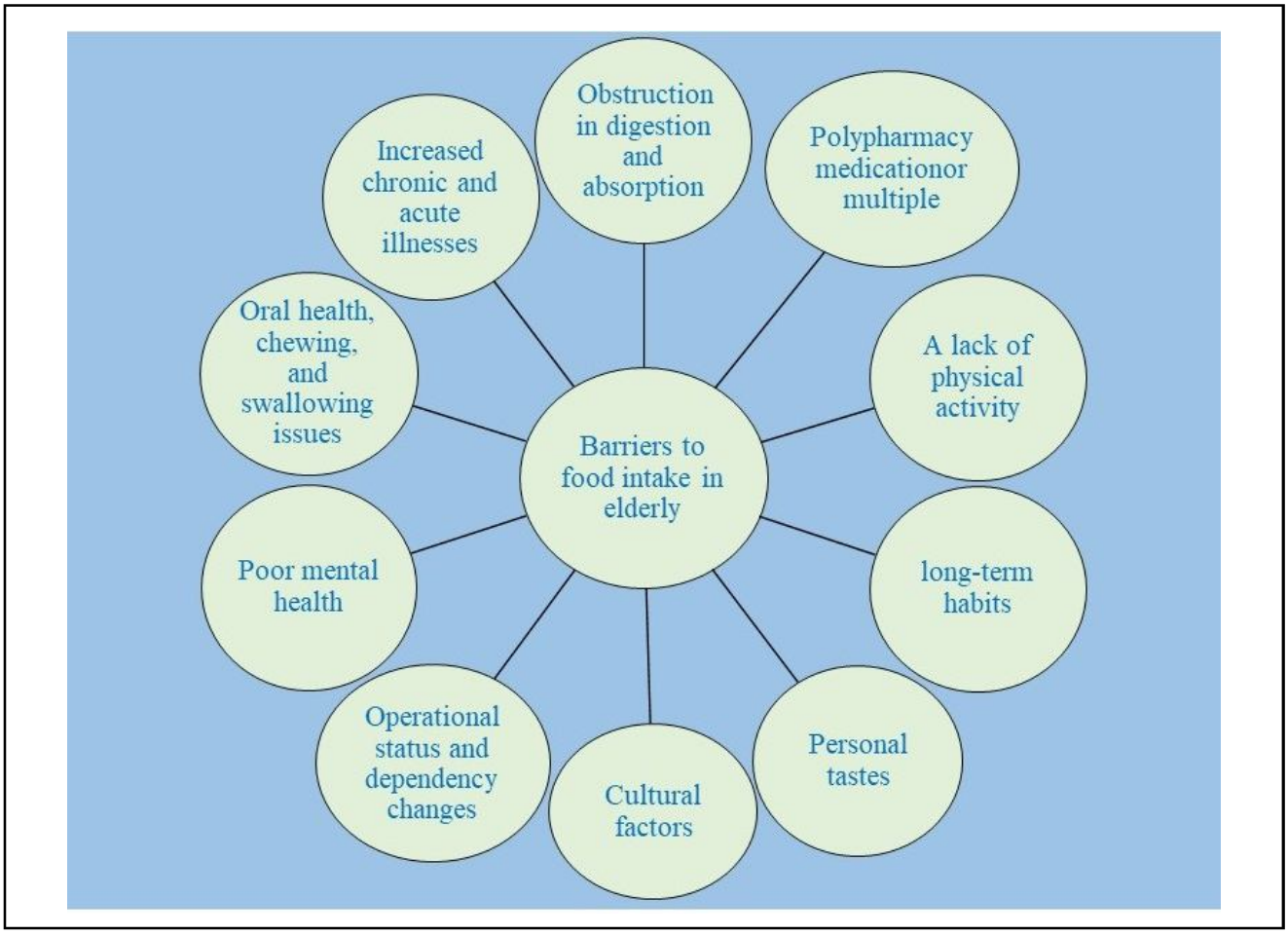

Figure 2: Barriers to food intake in older adults.

4. Biological changes in geriatrics

Getting older is an irreversible natural process that occurs throughout a person's life and remains till death till eternity (Cho *et al*., 2016). The rate of ageing differs with each individual as it begins with conception during growth, and the development (anabolism) process is reversed, resulting in impaired functioning of most of the organs (Bartke, 2019). Ageing research is expected to provide the information necessary for an effective fight to combat the detrimental loss of vital functions associated with the ageing process. Most humans have a limited heritable contribution to ageing, with genetic factors taking account for only 20-30 per cent of the average life variability in humans (Kenyon, 2010; Mitchell *et al*., 2001). The effect of genetic factors on longevity increases with age, and an increase in age can provide an opportunity to identify rare genetic variations (Sebastiani *et al*., 2012; Tan *et al*., 2010). Figure 3 depicts the different biological changes that occurred in the geriatric population.

The term "biological changes" refers to a broad category of age-related changes that occur in the body's many physiological systems in older people. Overall health, functional ability, and susceptibility to diseases can all be affected by these changes (Cruz-Jentoft *et al*., 2019). Musculoskeletal system sarcopenia, or the loss of muscular mass and strength, is a common age-related condition that impairs mobility and increases the risk of falls. As people age, their bone density diminishes, leading to osteopenia and osteoporosis, both of which increase the risk of fractures (Sözen *et al*., 2017).

Ageing affects multiple physiological systems, each with its own set of challenges. The cardiovascular system experiences arterial stiffening and reduced cardiac output, increasing the risk of hypertension and cardiovascular diseases (Lakatta and Levy, 2003; Odden *et al*., 2012). Immuno-senescence, the age-related decline in immune function, contributes to autoimmune diseases, cancer

susceptibility, and decreased response to vaccinations and infections, often accompanied by chronic low-grade inflammation (Goronzy and Weyand, 2013; Franceschi and Campisi, 2014). Neurological changes include brain volume reduction, cortical thinning, and cognitive decline, leading to conditions like Alzheimer's disease (Alzheimer's Association, 2021). Moreover, the accumulation of senescent cells and the effects of SASP proteins contribute to tissue degeneration, linking ageing to various degenerative diseases such as osteoarthritis, pulmonary fibrosis, and diabetes (Ferrucci *et al*., 2020). Addressing these physiological changes through tailored interventions is essential for promoting healthy ageing and enhancing the quality of life for older individuals (Fjell and Walhovd, 2010).

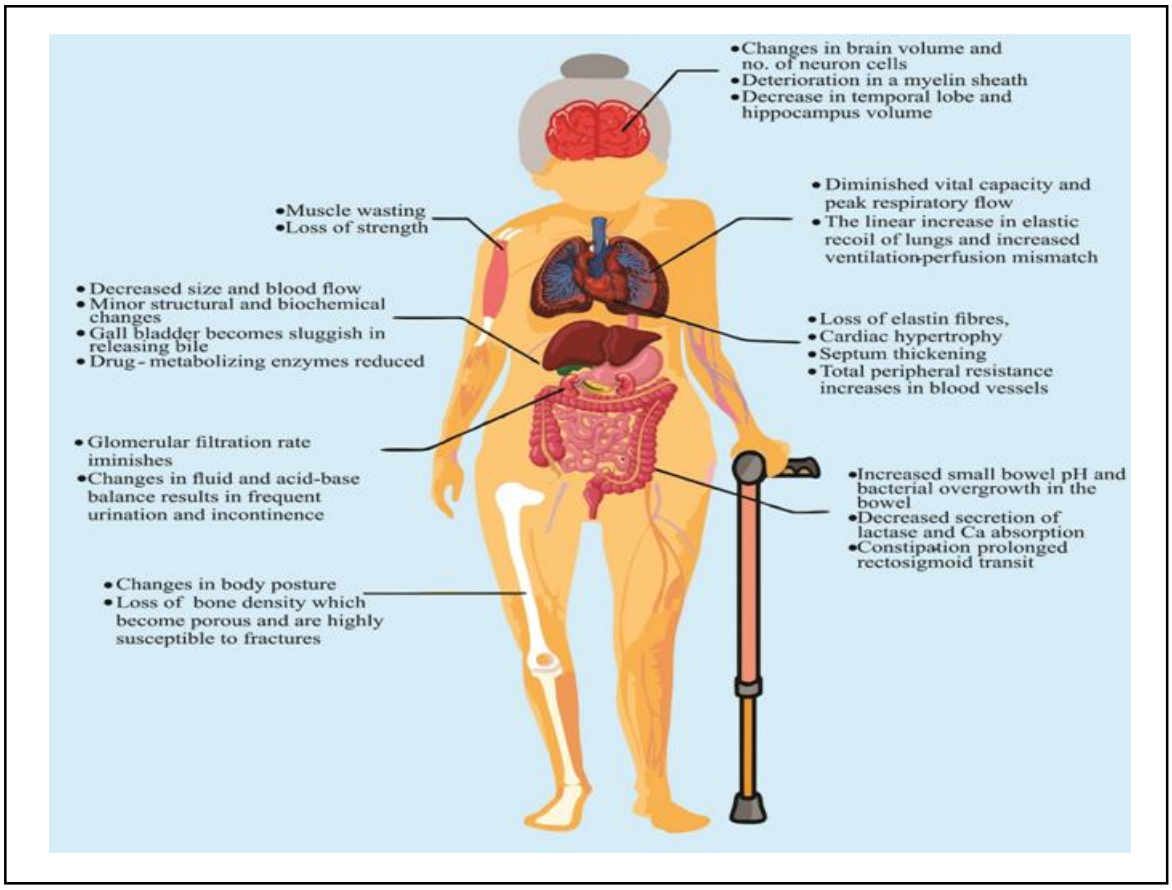

Figure 3: Biological manifestation in organ system.

There are numerous changes in the body of aged people and on the basis of these changes their nutritional requirements are also dependent on those changes. Changes in body, body posture and nutritional requirements have been studied by various researchers and are shown in Table 1.

Table 1: Biological changes in organ function and their effect on nutrition in the elderly individuals

Organ functions	Changes	Effect on nutrition	References
Body posture	Loss of bone density and becoming porous and weak are highly susceptible to fractures	Increase the requirement for calcium	Ginsberg *et al*., 2021
Sarcopenia	Muscle wasting and loss of strength	Increased intake of protein	Beyer *et al*., 2012
Ophthalmic function	The opacity of the eye lens	Increase the requirement for vit. A	Fowler *et al*., 2019
Taste and smell (Anosmia-reduced sense of smell, hypogeusia-reduced sense of taste)	Decreased taste buds and papillae on the tongue Decrease in taste and olfactory nerve endings	Loss of ability to detect salt and sweet Decrease palatability causing poor food intake Reduced sensory stimulation, which may interfere with metabolic processes	
Xerostomia-dry mouth	Loss of saliva-producing acinar cells A decrease in salivary secretion causes Oropharengeal Dysphasis	Difficulty in chewing and swallo-wing makes them avoid certain foods, particularly crunchy, dry and sticky foods	Bhattacharyya, 2014; Familiari *et al*., 2022

Teeth	Loss of teeth and wearing dentures temporary or permanent	Consumption of meats and fresh fruits and veggies has decreased. As a result, energy, iron, and vitamins, particularly vit. C, folate, and beta carotene, may be deficient.	Kaur *et al*., 2019; Mac Giolla Phadraig *et al*., 2015
Gastric function and emptying	Decreased secretion of hydrochloric acid, intrinsic factor, and pepsin rapid liquid emptying after the age of 60	Decreased bioavailability of proteins, vitamins, and minerals Decreased absorption of protein-bound vit. B_{12} and folate	Soenen *et al*., 2015
Small intestine	Increased small bowel pH and bacterial over-growth in the bowel decreased in Ca absorption decreased secretion of lactase constipation-prolonged rectosigmoid transit	Increase in bovine or bacterial folate synthesis to counteract malabsorption possibly a risk factor for osteoporosis	Bai *et al*., 2016
Liver and biliary function	Decreased size and blood flow minor structural and biochemical changes gall bladder becomes sluggish in releasing bile the activity of drug-metabolizing enzymes reduced	The rate of albumin synthesis may be decreased susceptible to gallstones Drug doses need to be lower	Baiocchi *et al*., 2021
Metabolic function	Impaired glucose intolerance due to less beta cell mass, fat tissue infiltration, and effect in increased production of adipokines reduced metabolic rate as a result of altered body composition and decreased physical activity body protein level decreases	Require dietary modifications, exercise, and oral pharmacologic agents decreases activity level	Xu *et al*., 2015
Neurological function	Changes in brain volume and no. of neuron cells deterioration in a myelin sheath decrease in temporal lobe and hippocampus volume	Serotonin, carnitine, and other compounds derived from lysine and methionine may be less synthesized as a result of Alzheimer's disease, which may slow mental decline. Carotenoids appear to have protective effects on ageing and cognitive function.	Winterer *et al*., 2021
Immune competence	Impaired ability to fight off disease and suscep-tibility to infection due to decline in lympho-cytes and increase in inflammatory cytokines	Supplementation with vit. E, zinc, and polyunsaturated fatty acids can be increased	Shamu *et al*., 2021
Psychological factors	Depression, loneliness	Can affect appetite digestion, energy, energy level, weight, well being	Thapa and Nielsen, 2021;
Cardiovascular function	Loss of elastin fibres, cardiac hypertrophy, septum thickening, and total peripheral resistance increases in blood vessels	Prevalence of hypertension, modification of diet accordingly	Bernstein and Luggen, 2009; Paneni *et al*., 2017
Lungs and thorax	Diminished vital capacity and peak respiratory flow the linear increase in elastic recoil of lungs and increased ventilation-perfusion mismatch kyphoscoliosis (change in the shape of the spinal column) occur	Low intake of high fiber and antioxidant-rich diet require mediterranean diet to reduce bacterial infections and protect from tuberculosis	Bernstein and Luggen, 2009; Butland *et al*., 2000
Renal function	Glomerular filtration rate can diminish as much as 60 percent; changes in fluid and acid-base balance results in frequent urination and incontinence	Protein, sodium, and potassium nutrition may be affected.	Coelho *et al*., 2020
Integumentary system	Skin becomes thin and less elastic and there is a loss of collagen and adipose tissue, which manifests as wrinkles.	The capability of the skin to produce vit. D, sense perce-ption, thermoregulation, and mechanical protection	Bernstein and Luggen, 2009; Byers-Connon, 2023

5. Nutritional consideration for geriatrics

Elderly individuals often face numerous health challenges that impact their nutrient requirements, including physiological changes such as delayed gastric emptying, altered hormone levels, decreased lean body mass, and diminished senses of smell and taste, all of which can affect their nutritional status (Tattari *et al*., 2022). Age-related disorders and physiological changes in swallowing function contribute significantly to dysphagia, leading to both nutritional deficiencies and an increased risk of pneumonia (Sura *et al*., 2012). The modified food pyramid for older adults emphasizes the importance of nutrient-dense foods such as whole grains, variety in the vegetable and fruit groups, low-fat dairy products, and sources of protein and healthy fats (Valicente *et al*., 2023). Despite a decrease in energy needs with age, the need for protein and other nutrients increases due to common cognitive decline, highlighting the importance of metabolism in converting food into energy and building essential molecules like proteins and lipids (Tapoyn, 2017). The expert group of the ICMR NIN recommends specific nutrients for older individuals as part of the Recommended Dietary Allowances (RDA Short Report, 2020) shown in table 2.

Table 2: Geriatric nutritional requirement according to RDA 2020 by ICMR

Group	Men			Women		
Category of work	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy
Body wt. (kg)	65			55		
Protein (g/d)	54.0			45.7		
CHO (mg/d)	130			130		
Calcium (mg/d)	1000			1000		
Phosphorus	1000			1000		
Magnesium (mg/d)	385			325		
Iron (mg/d)	19			29		
Zinc (mg/d)	17			13.2		
Iodine (µg/d)	150			150		
Thiamine (mg/d)	1.4	1.8	2.3	1.4	1.7	2.2
Riboflavin (mg/d)	2.0	2.5	3.2	1.9	2.4	3.1
Niacin (mg/d)	14	18	23	11	14	18
Vitamin B_6 (mg/d)	1.9	2.4	3.1	1.9	1.9	2.4
Vitamin B_9 (µg/d)	300			220		
Vitamin B_{12} (µg/d)	2.5			2.5		
Vitamin C (mg/d)	80			65		
Vitamin A (µg/d)	1000			840		
Vitamin D (IU/d)	600			600		
Sodium (mg/d)	2000					
Potassium (mg/d)	3500					
Copper (mg/d)	2					
Manganese (mg/d)	4					
Chromium (µg/d)	50					
Selenium (µg/d)	40					

Source: RDA Short Report, 2020.

5.1 Energy

The body needs the energy to remain functional. Both voluntary and involuntary actions are covered by this such as respiration and circulation, as well as physical work. Carbohydrates, proteins, fats, and alcohol all provide energy to the body. The energy balance of a person depends on his or her energy intake and expenditure. The energy requirement for the population over 60 years old decreases as the BMR, muscle mass, and mass of other metabolically active tissues decrease (Bernstein and Munoz, 2012).

5.2 Carbohydrates

Carbohydrates are the primary source of energy. All body cells, including the brain and nervous system, require energy, which is provided by carbohydrates, which include sugars (simple carbs), starches, and fibre (complex carbs) (Bernstein, 2010). The quantity

and quality of CHO have a significant impact on chronic disorders and non-communicable diseases that are related to nutrition. According to the current committee's RDA Short Report, 130 mg/day of carbs is recommended (RDA Short Report, 2020).

5.3 Proteins

Proteins are the major structural components of all human cells. Volpi *et al*. (2013) reported that essential amino acids, particularly leucine, stimulate the synthesis of muscle proteins. However, this synthesis is compromised when elderly people consume less than 3 g of leucine each day. The 3 g threshold is attained after consuming approximately 25 to 30 g of high-quality protein (Volpi *et al*., 2013). According to previous committee approaches, the recommended protein intake is 11-12 per cent of the total calorie intake; currently, with a safe protein requirement of 0.83 g/kg/day, it is advised to be 0.66 g/kg/day (RDA Short Report, 2020).

5.4 Vitamins

Water-soluble vitamins, particularly the metabolic interactions of vitamin B complex, are of great interest to the geriatric population due to their vital roles in various physiological processes, although ageing poses risks for nutritional health problems (Morris *et al*., 2007). The dietary reference intake (DRI) for vit. B_{12}, B_6, and folate is crucial for maintaining optimal health in older adults, with specific recommendations varying by age and sex (RDA Short Report, 2020). Micronutrient deficiencies, including those in vit. C and B complex, thiamine, pyridoxine, calcium, magnesium, and zinc, have been linked to cognitive dysfunction, emphasizing the importance of meeting recommended intake levels to support cognitive health (Huskisson *et al*., 2007). On the other hand, fat-soluble vitamins such as vit. A, with recommended daily concentrations of 900 mcg for men and 700 mcg for women, and vit. D, with suggested intakes ranging from 400 to 1000 IU/day, are crucial for overall health, particularly in older age groups (Weber and Grune, 2012; Giustina *et al*., 2022). Additionally, vit. E and vit. K, with recommended daily concentrations of 15 mg and 120-150 mcg for men, and 15 mg and 90 mcg for women, respectively, are essential for maintaining health and well-being in older adults (Jellum *et al*., 2018).

5.5 Minerals

For individuals aged 51 and older, the recommended intake of calcium has increased to 1000 mg per day, up from the previous suggestion of 600 mg per day, with milk serving as a valuable source containing 300 mg of calcium per 250 ml (Papageorgiou *et al*., 2022). Phosphorus requirements for this age group remain consistent at 700 mg/day for both men and women, with specific values for men aged 51 and older set at 420 mg per day and 320 mg per day for women (Arias-Fernández *et al*., 2022; RDA Short Report, 2020). Due to the higher prevalence of hypertension and changes in sodium metabolism with ageing, individuals aged 51 to 70 are advised to limit their sodium intake to 1200 mg daily, while an adequate intake of chloride is set at 2.0 g per day for men and women in this age range, decreasing to 1.8 g per day for those over 70 (RDA Short Report, 2020). Zinc requirements for men over 51 are set at 11 mg per day, while women in the same age group should aim for 8 mg daily. Additionally, adults aged 51 and older are recommended to consume 900 mcg/day of copper and 150 mcg/day of iodine to support thyroid function (Bernstein and Luggen, 2009; RDA Short Report, 2020)

5.6 Antioxidants and Dietary fibres

Committee recommendations stress the importance of antioxidants in the diet, advocating for a daily intake of 400 g of fruit and vegetables rich in nutrients like beta-carotene, vit. C, polyphenols, and flavonoids to prevent chronic diseases (RDA Short Reports, 2020). Including vegetable oil as a vit. E supplement is also advised. Regular consumption of antioxidants, vitamins, and minerals is essential to combat oxidative stress and delay the onset of diseases like Alzheimer's and cataracts (Niang *et al*., 2023). Additionally, considering dietary fiber, the committee suggests an intake of approximately 40 g per 2000 kcal of energy intake to support digestive health, alleviate constipation, and maintain lower cholesterol levels (RDA Short Report, 2020). These dietary guidelines emphasize the importance of a balanced diet rich in fiber, vitamins, and minerals for overall health and well-being.

5.7 Water

Based on existing research of the IOM and WHO fluid recommendations, the water requirement was calculated using a factorial approach, with modifications made for body mass and energy needs to fit the Indian context. The current recommendation for water consumption from beverages in old age is 33 ml/kg body mass for a sedentary lifestyle and 38 ml/kg body mass for a moderate lifestyle, regardless of sex (RDA Short Report, 2020).

6. Ageing and health correlates

Ageing is a natural process that presents both opportunities and difficulties. The human body changes physically, physiologically, and cognitively as we age. A healthy diet is essential for successful ageing and for maintaining physical fitness. This decreases quality of life and leads to physical and cognitive dysfunction. Reduced food intake is linked to nutrient deficiencies, which harm health and lead to typical ageing-related issues (Kaur *et al*., 2019). Elderly people frequently suffer from deafness, cataracts and retinopathy, neck and backache and joint pain, chronic obstructive lung disease, diabetes, depression, and dementia. As people get older, they are more likely to have multiple problems occurring at once. Appetite loss is a common symptom of ageing. John Morley coined the phrase "Anorexia of Ageing" to describe this decline (Pilgrim *et al*., 2015). Furthermore, new research indicates that treatments such as exercise, dietary restriction, and pharmaceutical drugs that target these fundamental systems may be able to delay ageing and encourage healthy ageing trajectories. In addition to expanding our knowledge of the basic mechanisms influencing longevity, an understanding of the correlations between ageing and health may help develop policies to slow the ageing process and enhance general health in the ageing population (López-Otín *et al*., 2013; Kennedy *et al*., 2014; López-Otín *et al*., 2016; Campisi *et al*., 2019).

6.1 Geriatrics and malnutrition

Malnutrition poses a significant threat to older adults, with prevalence rates ranging from 12 to 50 per cent in hospitalized individuals and 23 to 60 per cent in institutionalized older adults (Evans, 2005). Vulnerable retired generations are particularly at risk due to factors such as social isolation and parental neglect (Ramic *et al*., 2011). To mitigate the adverse effects of malnutrition and improve clinical outcomes, early detection and tailored interventions are crucial. Strategies such as comprehensive nutritional assessments, customized

dietary plans, and the use of oral nutritional supplements, alongside multidisciplinary collaborations involving healthcare providers, caregivers, and community support agencies, are essential (Volkert *et al*., 2019; Cruz-Jentoft *et al*., 2021; Verlaan *et al*., 2017). Emphasizing healthy ageing, the WHO has prioritized efforts to address malnutrition within the geriatric population, advocating for policy frameworks that encompass various sectors to support effective intervention and management strategies (Rudnicka *et al*., 2020; Evans, 2005).

6.2 Geriatrics and osteoporosis

The WHO ranked osteoporosis as the second most serious health concern, trailing only cardiovascular disease. Reduced Ca and vit. D food intake among elderly people has been linked to nutrient deficiencies and poor health (Gennari, 2001). Thus, bone mineral density decreases in elderly individuals as a result of increased osteoclast bone resorption activity and a concomitant decrease in osteoblast-mediated bone formation (Pignolo *et al*., 2021). The manifestations of bone fractures in elderly patients include an increased incidence of bone fractures. The lifetime milk consumption of postmenopausal women who consume 800 mg of Ca can postpone the development of osteoporosis (Mohammadi *et al*., 2022). Other ageing factors such as decreased estrogen production associated with menopause, may also contribute to osteoporosis. Reduced intestinal absorption of Ca and vit. D production, decreased physical activity and increased parathyroid hormone secretion may all contribute to osteopenia.

6.3 Geriatrics and cardiovascular disease

Ischemic heart disease (IHD) is a leading cause of death and morbidity in older adults. Previous clinical research has shown that older people are more prone to cardiovascular diseases (Weinsaft and Edelberg, 2001). In primary middle-aged populations, dietary fibre- which includes non-digestible polysaccharides, resistant starch that naturally occurs, and oligosaccharides and lignins in plants has been associated with a decreased risk of ischemic heart disease and stroke (Félix-Redondo *et al*., 2013). Dietary fibre may positively effects on blood pressure, PP glucose and triglyceride levels, insulin secretion, and serum lipid levels, which can stop or postpone the onset of atherosclerosis in adolescence and middle age. The consumption of dietary fibre later in life may not be linked to a higher risk of cardiovascular disease (CVD), as such influences may be less powerful in elderly individuals with more advanced atherosclerosis (Mozaffarian *et al*., 2003).

6.4 Geriatrics and Alzheimer's disease

An important health problem is postoperative cognitive deterioration in older patients. The two psychiatric conditions that most frequently affect older people are depression and Alzheimer's disease. The potential connection between the use of general anesthetic and the onset and progression of Alzheimer's disease is also gaining attention (Bittner *et al*., 2011). It is still unclear whether depression increases elderly people's vulnerability to dementia. The prevalence of dementia and baseline depressive mood, specifically Alzheimer's disease, were examined in older residents of the community (Santiago and Potashkin, 2021). The hypothalamic-pituitary-adrenal (HPA) axis is activated in depression by the inflammatory response system (IRS), which results in the generation of corticotrophin-releasing hormone (CRH), and adrenocorticotropin hormone (ACTH), and an increase in serotonin and catecholamine (Lee *et al*., 2000).

6.5 Geriatrics and Parkinson's disease

The increased risk of gait abnormalities and falls in gerontoneurologic patients can be attributed to neurodegenerative conditions such as dementia, delirium, or the use of psychotropic drugs, indicating an underutilization of neurological expertise in addressing these issues (Axer *et al*., 2010). Parkinson's disease, characterized by motor symptoms like slowness of movement and tremors, is associated with lower well-being and increased mental and physical illness, with dementia developing in a significant proportion of advanced-stage patients (Simpson *et al*., 2014; Davie, 2008; Aarsland *et al*., 2003). Recognizing the multifaceted challenges of Parkinson's disease, the "Active ageing model for Parkinson's disease" integrates various factors such as physical activity, social interaction, psychological well-being, and personalized care, aiming to enhance the quality of life and care for individuals affected by the condition (Chan and Liang, 2013)

6.6 Oropharyngeal dysphasic-swallowing problem

Bolus flow can be hampered by xerostomia, which frequently affects the mouth, pharynx, and esophagus. This can lead to the retention of particles in the throat. While it has been demonstrated that functional salivary production is stable across the age spectrum, older adults show a decreased salivary reserve as a result of a reduction in saliva-producing acinar cells. Therefore, older adults are more affected by the drying effects of polypharmacy (Ney *et al*., 2009). A complex series of voluntary and involuntary motor, sensory, and psychological tasks must be coordinated to swallow. Presbyphagia, or healthy ageing, is characterized by changes in swallowing function (senescent swallowing). On the other hand, dysphagia is a pathology that affects 4 per cent of the population and can develop at any age (Bhattacharyya, 2014). It is, however, more common in the senior population and can develop at any age (Barczi *et al*., 2000), but it can affect almost 68 per cent of the geriatrics living in nursing homes and 30 per cent of senior patients who are hospitalized (Seitz *et al*., 2010). As we grow, dysphagia has become a rising healthcare concern.

6.7 Alterations in the immune system

Ageing involves the gradual decline in the functional capacity of various organs, including the immune system, which plays a crucial role in maintaining overall health (Zmora *et al*., 2017). Immune ageing, or immune senescence, is characterized by a decrease in immune functions, attributed to factors such as the loss of lymphoid tissue and changes in cell composition (Ginsberg *et al*., 2021; Linton and Dorshkind, 2004). This decline in immune responses has been associated with an increased susceptibility to illnesses such as cardiovascular diseases, autoimmune diseases, cancers, and diminished responses to infections and vaccinations (McEniery *et al*., 2008; Stern *et al*., 2003; Grubeck-Loebenstein *et al*., 2009; McElhaney and Effros, 2009). Research indicates alterations in the proportion of CD4 to CD8 T cells and an increase in natural killer cells with advancing age (Koch *et al*., 2008). Understanding and mitigating immune senescence is crucial, given projections of a doubling in the proportion of the elderly population by 2040 (Ponnappan and Ponnappan, 2011).

7. Conclusion

The elderly population, known as the "Silver Age," faces significant challenges due to age-related physiological and psychological changes,

compounded by evolving societal dynamics. Their well-being reflects the development of a civilized society, highlighting the importance of addressing their needs. Malnutrition is prevalent among seniors, stemming from various factors including physiological changes and socioeconomic disparities. To promote global health and well-being among older adults, dietary modification, supplementation, and adequate nutrient intake are crucial. Researchers must focus on nutrition and the development of easily consumable foods tailored to the needs of seniors, who are more susceptible to nutritional disorders due to geriatric complications and psychosocial factors. The current state of geriatric nutrition underscores the imperative of addressing complex issues within the "Silver Age" population. Malnutrition remains a pressing concern, influenced by physiological changes, comorbidities, and socioeconomic factors. However, advancements in geriatric medicine offer promising avenues for intervention. Comprehensive nutritional assessments, personalized dietary interventions, and interdisciplinary collaboration can mitigate the adverse health effects of malnutrition. Additionally, deeper insights into cellular processes and molecular pathways related to ageing present opportunities for targeted therapies that support healthy ageing. By integrating research findings into clinical practice, healthcare practitioners can enhance the quality of life and overall health of older individuals, ensuring that the "Silver Age" is characterized by vitality and resilience rather than mere longevity.

Conflict of interest

The authors declare no conflicts of interest relevant to this article.

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