

REVIEW ARTICLE

Repercussion of COVID-19 on Health and Nutritional Status of Elderly: Current ScenarioPreetika Khenduja¹, Manisha Sabharwal²¹PhDScholar, Department of Food and Nutrition, Lady Irwin College, University of Delhi, Delhi; ²Professor, Department of Food and Nutrition, Lady Irwin College, University of Delhi, Delhi

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Background

Ageing is an inevitable process with numerous changes in a physiological, biological, cognitive, and social environment. The COVID-19 pandemic has posed an unprecedented public health crisis globally. Both the problems adversely affect the nutritional and health status of the elderly. Malnutrition, increase risk of chronic morbidities, low socioeconomic status along with social deprivations influence the health and well-being of old age. Lack of physical activity is common due to loss of skeletal muscle mass and an increase of fat mass eventually causes functional inability. The review aimed to report the impact of Covid-19 on the health and nutritional status of the elderly. A thorough recent literature search was conducted using PubMed, Science Direct, and Google Scholar databases using specific keywords related to the aims. All related articles published on COVID-19 during 2020 and their effect on health and nutrition in the elderly were retrieved. The study found that nutritional status influences mortality and co-morbidities among the elderly during the COVID-19 situation. Furthermore, the study found that though nutritional indicators, that is, overweight or obese, significantly increase the risk of co-morbid conditions among older adults, good nutrition reduces the risk of all-cause mortality. Although ageing is an irreversible process, it is never too late to start practicing a healthy behavioral lifestyle for achieving healthy ageing.

Keywords

Nutritional Status; Malnutrition; Functional Ability; Physical Activity; Elderly

Introduction

Ageing is a programmed senescence. It is an irreversible and degenerative process. Ageing is defined in many ways- Chronological ageing i.e. person's age, Social ageing as the society's expectations of how people behave as they grow old, and Biological ageing which focuses on the organisms physical state as it ages. (1) The process of ageing involves multidimensional changes like biological, physiological, psychological, behavioral, environmental, and social and these may not be linear or consistent.

Gerontological literature classifies 60 years and above age as 'elderly.' It has further subcategorized as 'Young Old' (between 60-74 years); 'Old-Old' (between 75-90 years); 'Very Old,' (90 years and older); and 'Centenarian' (100+ years) of age. (2)

Population ageing is a global trend because of longer life expectancy which has also been reported in many demographic predictions. World Population Ageing report

(2019) reported that approximately 8.2% (205 million) of the world population will rise to 12.3% in 2015. By 2050, it is predicted that it will reach around 21.3%. Of this proportion, a threefold rise has been expected in aged people of 80 years and above. Developing countries account for over two-thirds of the world's elderly population. [Table 1](#) depicts the increasing trend in the elderly population worldwide and in India. (3) Asia has the largest proportion (53%) of the elderly population. A twofold increase in elderly from 12.2% (549 million) in 2017 to nearly 24.2% (1.3 billion) in 2050 is projected. According to the Census of India (2011), the proportion of the elderly population was 5.4% and has been projected to rise from 9.4% in 2017 to 19.1% in 2050. The life expectancy from 2010 to 2050 has also been projected to increase from 72 to 78 years which will lead to rise in ageing population. (4) Recent statistical data of states (2021) reported that Kerala has the highest proportion

(16.5%) of the elderly population, followed by Tamil Nadu (13.6%) and Punjab (12.6%). On the other hand, states with the lowest proportion are Bihar (7.7%), Uttar Pradesh (8.1%), and Assam (8.1%). Delhi has around 5.9% elderly population. (4)

Impact of Ageing on Health and Nutrition

India is experiencing a phenomenon known as triple burden of diseases- communicable, non-communicable, and infectious diseases. The twin epidemic of emerging infectious diseases are lifestyle diseases, caused due to change in living habits and lifestyle modifications, triggering diabetes, cardiovascular diseases, cancer, hypertension, etc. (5) Elderly are susceptible to infectious diseases due to immunosenescence with degenerative illness. Coupled with the underlying physiological changes, the risk of chronic diseases thus increases the burden of disability and mortality.

Nutrition is a key determinant of health of elderly and has numerous roles in ageing to maintain functionality and quality of life. Due emphasis has to be prioritized in medical set up on health promotion (such as healthy eating habits and regular physical exercise) and disease prevention (such as risk reduction and delaying the progression of chronic illness) in order to attain healthy ageing. Ample evidence reported that malnutrition is common in geriatric population. Dietary intake gets affected by biological, physiological changes and sensory impairment collectively hampers their appetite. (6) Furthermore, poverty, other social and health issues including food insecurity and nutrition transition lead to compromised health and nutrition of elderly. Hence, this review studies the prevalence and aims at highlighting the understanding and exploration of factors that affect health and nutritional status among the elderly during the COVID-19 pandemic.

Material & Methods

A thorough recent literature search was conducted in PubMed, Science Direct, MEDLINE and Google Scholar databases using specific keywords related to the objectives. The MeSH term used for initial search was COVID-19. The keywords used to search the literature database were 'Health', 'Nutrition', 'Food', 'Diet', 'Epidemiology of Ageing', 'Physical Activity', 'Functional Ability', 'Nutritional Status', 'Elderly'. Search was limited to research articles in English language. Because research on this topic was limited, all the available reviews, retrospective and prospective studies were reviewed and when possible, case reports or case studies were excluded. We accessed full text articles of the included studies. Articles or reports published by government and authorized organization on COVID-19 and their effect on health and nutrition among the elderly were retrieved and reviewed as appropriate to the topic.

Results and Discussion

COVID-19 Pandemic and its Impact on Nutrition: Coronavirus disease- 19 (COVID-19), was a pandemic declared by World Health Organization (WHO) on March, 2020 which majorly affected elderly particularly those who had co-morbidities. (7) The risk of Covid-19 infection and mortality is majorly determined by three underlying causes- inaccessibility to nutritious food at household level due to stay at home orders, poor health and hygiene, and lack of treatment from health care services or caregiver at home. However, the immediate causes amongst elderly are poor dietary intake and presence of chronic co-morbidities whose interplay determines the nutritional state of an elderly. (8) Quality of diet is essential for supporting the immune system and reducing infection risks.

During the pandemic crisis, the shift towards low consumption pattern of nutrition foods might have significant implications on malnourished individuals who are more susceptible to infection. Malnutrition has been predicted as a negative prognostic cause. Symptoms of COVID-19 infection may also impact food intake as there is loss of appetite, change of sensitivity of olfactory and taste receptors. (6)

Obesity has also been found as an adverse prognostic reason for COVID-19. Obesity and co-morbidities are connected to physiological alterations that promote infection susceptibility, pathogenicity, and hence the impact of obesity on COVID-19 transmission and severity has piqued curiosity. (9) Lockdowns and restricted movement in social areas, change in eating habits and lifestyle factors resulted in nutritional deficiencies making elderly more prone to obesity. Thus, the best safeguard against the COVID-19 pandemic is to ensure good nutrition. A healthy diet is an important line of defence against chronic morbidities. It is considered as the most cost-effective technique for assisting healthcare systems in managing patients and persons in their COVID-19 recovery. (9)

With increasing age total energy intake declines and the requirement of many nutrients increases to maintain the declining functionality of organs. This makes it even more difficult for the elderly to meet their nutrient requirements. The age-related changes are associated with digestive, physiological, sensory, and cognitive eventually affect the nutritional status of elderly. Therefore, it is very essential to eat a well-balanced diet for healthy ageing. (6) Good nutritional status benefits both the individual and society in form of decreased health care costs, improvement in physical functioning, reduced risk of morbidities, thus promoting independent living. Decreased intake of micronutrients like iron, calcium, vitamin D, vitamin C, vitamin B12 have been found to have inverse relationship with incidence of morbidities and mortality. Recent research shows an

inverse relationship especially between vitamin D sufficiency and severe COVID-19 symptoms. This also has an impact on the immune system reaction. The global prevalence of hunger and deficiency of micronutrients is predicted to have an influence on COVID-19 outcomes. (9) Recent research in both developed and developing countries have documented the nutritional vulnerability among older people as depicted in [Table 2](#). Evidence studies reported that adequacy of protein is critical for maintaining functional status with age. The elderly who consumed a low protein diet than requirement showed significant losses in lean tissue and muscle function. (5) Research reported that vitamin B6, vitamin B12, and folate are required to prevent the accumulation of homocysteine, an amino acid that has been associated with the risk of vascular disease. Likewise, a study had also shown associations between low concentrations of these vitamins and cognitive decline. (17) Vitamin B12 has another function to maintain neurological function; however, elderly people have greater difficulty in absorbing because of atrophic gastritis. (18) A study on 340 Iranian elderly in 2015 reported that severe vitamin B12 deficiency was present in 12.4% whereas, folate deficiency was present in 5.6%. (17) Studies have also found a decline in renal function which causes the mal-absorption of calcium and accelerated bone loss. The requirement for calcium and vitamin D also increases with age. Despite the greater availability of sunlight in most developing countries, relative to most developed countries, the elderly often have less exposure of sunlight and decreased ability to form pre-vitamin D3- in the skin with UV light exposure. (19) The low calcium and vitamin D in the diets along with dietary and physical inactivity causes changes associated with osteoporosis. It has become an increasingly major problem in this population.

Dietary Recommendation Advised During Covid-19 Pandemic: Elderly tend to become less active physiologically, therefore need fewer calories to maintain their weight. However, to replace the loss of muscle mass and bone density, protein-rich foods such as pulses, toned milk, egg-white, lean meat, fish, etc. should be added in their diet. The daily intake of oil should not exceed 20g in which use of ghee, butter, vanaspati, and coconut oil should be avoided. As elderly are prone to various nutritional deficiencies, they need foods rich in calcium, micro-nutrients and fibre. Apart from cereals and pulses, elderly need to consume two servings of milk and milk products and 3-4 servings of fresh vegetables and fruits in order to provide fibre, micro-nutrients and antioxidants. These foods improve the quality of the daily diet and bowel function. The elderly should eat small frequent meals in a day, be hydrated, limit the intake of excess of salt, sugar, processed and preserved foods. The efficacy of the immune system is also depends on good quality diet therefore, vitamins- A, B6, B12, C, D, folate and E and trace elements- zinc, copper, selenium and iron, as well as

essential amino acids and omega-3 fatty acids play key roles in reducing the risk of infection. While no foods or dietary supplements can prevent infection, maintaining a nutritious diet is an important part of supporting a strong immune system. (20)

Impact on Functional Ability: Functional ability can be defined as the capability to perform self-care, self-maintenance, and physical activity. Changes in ageing and its associated problems are often reflected in the decline of functional independence which limits use of the muscles, physiological changes in exercise tolerance and body composition. The association of functional inability was also reported with an accumulation of the burden of chronic morbidities, their associated disabilities, lifestyle factors (smoking and alcohol use), neuropsychological changes in cognition and a diminution of social support networks. (21) Because of several factors, the elderly become less independent and find it difficult to perform activities of daily living (ADL) like eating, bathing, dressing, transferring from bed to chair, and walking while instrumental activities of daily living include cleaning, housekeeping, food preparation, cooking, grocery shopping, and transportation. (22) Recent research in both developed and developing countries have documented the functional inability among older people as depicted in [Table 3](#).

Sarcopenia is a condition of loss of muscle mass associated with ageing. It is a major problem in the elderly population that affects both the health status and quality of life. In addition, sarcopenia has a negative role in age-related morbidities progression. Also, the losses in strength and general neuromuscular de-conditioning that accompany a decrease in the capacity to perform activities of daily living. It is often associated with an increase in fatigability and gets accelerated by inactivity, poor nutrition, and/or chronic illness. (32)

Obesity and sarcopenia among the elderly may potentiate each other (sarcopenic obesity). In the Elder Health Survey, the prevalence of sarcopenia and sarcopenic obesity (relatively high ratios of body fat to muscle mass) were 15% and 2% respectively, in 60-69 years old and with an age of fewer than 80 years, the prevalence rises to 40% (approximately) and 10% respectively. Elder people diagnosed with both the condition of sarcopenia and obesity is at the greatest risk of disability. (32) Therefore, a nutritious diet with adequate protein intake and regular exercise shows great promise in preventing sarcopenia and delay functional inability among elderly.

Impact on Physical Activity: Physical inactivity is the fourth leading cause of mortality worldwide. Inactivity means an insufficient level of activity to meet recommendations that increases the risk of adverse chronic health conditions and shortens life expectancy. Approximately, one- third of adults worldwide are inactive, and elderly are at particular risk of inactivity. (33)

Over the past 30 years, an extensive body of evidence has accumulated regarding the benefits that accrue to elderly who participate in regular physical activity. The important role of physical activity in promoting functional health, delaying or preventing non-communicable diseases such as osteoporosis, coronary artery disease, diabetes, and reducing mortality has been established. In addition, regimen of physical activities in life decreases the risk of falling, improves sleep hygiene, reduces stress, enhances mood and general well-being, and also improves blood pressure and decreases relative abdominal fat. (34, 35, 36) Various studies have been conducted worldwide and in Indian setting that reported the prevalence of physical inactivity status among the elderly. (Table 4) The decline in physical activity with age is one of the most consistent observations in behavioral epidemiology. This can be partially attributed to the ageing process in which changes to the cardiovascular, muscular, and skeletal systems impact the ability to be active. The disabilities and morbidities both increase with advancing years restrict the elderly from maintaining an optimal level of physical activity thereby adversely affecting their overall well-being and quality of life. (45)

Gradual changes with ageing lead to loss of function, weakness, chronic morbidities, and mortality. Evidence shows that elderly are the most sedentary and physically inactive segment. There is a loss of muscles mass around 0.5-1% per year resulting in a decrease of strength that is crucial for preventing falls in the elderly. A recent review of studies on fall revealed that the prevalence of fall ranges from 26% to 37%. It was also reported that injuries due to fall are associated with visual impairment, vertigo, imbalance, presence of osteoarthritis, hearing impairment, and depression. (46) Although this deterioration cannot be stopped, it can counteract the physical inactivity and functional inability with balanced nutrition. The elderly with poor mobility should be physically active to enhance balance that may prevent falls.

Physical activity represents the most effective way to offset the decline of age-related morbidities and inabilities. It is never too late to start the physical activity than not being done. The World Health Organization (WHO) published guidelines on the importance, type, and amount of physical activity in elderly people as it is an efficient and cost-effective way of preventing the decline of functional capacity. Recommendations are 150 minutes of moderate-intensity physical activity in a week or 75 minutes, if vigorous-intensity is applied or an equivalent combination. (33) It helps in managing or delaying certain chronic conditions. To prevent falls among older adults, strength, balance, and flexibility exercises are the most effective strategies. Physical activity has a positive influence on independence in self-care activities, raises self-esteem, and improves the quality of life, higher life expectancy, and decreased mortality. (46)

Studies from developed and developing countries highlight the association of physical activity with depression. Evidence studies have also found several demographic factors that influence physical activity such as gender, education, and marital status. (47) Factors such as social support from family or friends, availability of exercise and recreational facilities helps to encourage participation in physical activity. Motivation, self-efficacy (a conviction in one's capacity to carry out a course of action), and self-regulation abilities (e.g., feasible goal-setting, regular tracking of physical activity) are few examples of personal determinants. (48) Strong evidence reported association of physical inactivity to chronic health conditions. It is imperative to develop a strong commitment to improving physical activity levels in older adults. Although, the process of ageing is natural and inevitable, an adequate level of physical activity may slow down the loss of functional abilities that eventually help elderly people to achieve healthy ageing.

Conclusion

The projected growth of older people worldwide and concomitant rise in infectious and chronic morbidities has the potential to place a significant burden on healthcare services. Several evidences indicate that malnutrition and under nutrition adversely affect the health and nutritional status of elderly. Balanced diet and regular physical activity is, therefore, crucial in ageing for the maintenance of good health, functional independence, and quality of life. Awareness intervention programs and good healthcare services are needed to promote healthy ageing.

Recommendation

Ageing is an irreversible process; nevertheless it is never too late to start practicing a healthy behavioral lifestyle for achieving healthy ageing.

Relevance of the study

The study highlights the importance of nutrition in maintaining health during old age to achieve healthy ageing.

Authors Contribution

PK: Design, Literature review, Manuscript preparation and editing; MS: Conceptualization, Manuscript review and finalization

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Tables

TABLE 1 INCREASING TREND OF ELDERLY POPULATION (PERCENTAGE)

Age (years)	1950		2017		2030		2050	
	World	India	World	India	World	India	World	India
60 and above	8	5.4	12.7	9.4	16.4	12.5	21.3	19.1
65 and above	5.1	3.1	8.7	6	11.7	8.5	15.8	13.4
80 and above	0.6	0.4	1.8	0.9	2.4	1.3	4.3	2.6

TABLE 2 DUAL BURDEN OF MALNUTRITION AMONG ELDERLY

	Authors, Year	Locale of study	Sample size	Underweight (%)	Over-weight (%)	Obese (%)
Global	Ngadiarti, 2022 (10)	Indonesia	52	63.5	-	-
	Turkson, 2018 (11)	South Africa	300	14	63.6	-
	Kucukerdonme, 2017 (12)	Ankara, Turkey	872	1	49	18
India	Govind, 2020 (13)	Kerala	245	14.3	41.6	-
	Gupta, 2019 (14)	Uttarakhand	980	26.6	22.8	-
	Khole&Soletti, 2018 (15)	Maharashtra	131	11.5	26.2	7.7
	Goswami, 2016 (16)	Delhi	711	20.8	19.4	6.6

TABLE 3 FUNCTIONAL INABILITY AMONG ELDERLY BASED ON KATZ AND LAWTON SCALES

	Authors, Year	Locale of study	Sample size	ADL(%)	IADL(%)
Global					
	Jędrzejczyk, 2022 (23)	Spain	100	29	67
	Alhalafi, 2021 (24)	Riyadh, Saudi Arabia	504	24.6	58.5
	Chalise, 2020 (25)	Nepal	150	30	52
	Araújo, 2019 (26)	Brazil	159	17.6	54.1
	Aguiar, 2019 (27)	Brazil	360	21.4	78.3
India					
	Chauhan, 2022 (28)	LASI (Wave-1)	31,464	22	48
	Salagre, 2022 (29)	Maharashtra	262	19.1	25.2
	Patel, 2021 (30)	BKPAI study (Kerala, Tamil Nadu, Maharashtra, Himachal Pradesh, Punjab, Odisha, West Bengal)	9,512	7.5	56.8
	Sharma, Parashar & Mazta 2014 (31)	Himachal Pradesh	400	5.5	21.8

TABLE 4 PREVALENCE OF ELDERLY BEING PHYSICALLY INACTIVE

	Authors, Year	Locale of study	Sample size	Tool used	Physically inactive (%)
Global					
	Costa, 2020 (37)	Brazil	1,201	IPAQ	41.7
	Kleinke, 2020 (38)	Germany	192	IPAQ	47.5
	Hanif, 2021 (39)	Bangladesh	4,817	GPAQ	38.4
	Wang, 2018 (40)	China	2,076	GPAQ	28.6
	Low, Sok Teng, 2017 (41)	Malaysia	132	RAPA	50.8
India					
	Prasad, 2021 (42)	Karnataka	89	IPAQ	66.3
	Kaur, 2019 (43)	Delhi	225	Self-developed questionnaire	58.6
	De, 2018 (44)	West Bengal	106	GPAQ	34

IPAQ- International Physical Activity Questionnaire; GPAQ- Global physical activity questionnaire, RAPA- Rapid Assessment of Physical Activity questionnaire