

# Nutraceutical frontiers in geriatric women's health: Discovering new strategies to wellness



## Rashmi Saxena Pal, M V N L Chaitanya\*

School of Pharmaceutical sciences, Lovely Professional University, Jalandhar - Delhi,  
Grand Trunk Rd, Phagwara, Punjab 144411.  
Email: chaitanya.phyto@gmail.com

### Abstract

The United Nations predicts that 53% of the world's 60-year-olds will be women in 2050. As the world's population ages, providing healthcare for geriatric women becomes more important. Nutraceuticals have the potential to be innovative in geriatric feminine care by addressing issues of aging such as hypertension, heart failure, dementia, osteoporosis, and reduced immune systems. Phytoestrogens for menopausal symptoms, flavonoids, polyphenols, carotenoids, and isothiocyanates are examples of promising nutraceuticals, as are formulations aimed at brain health, cardiovascular function, muscular strength, and bone density. This chapter focusses on geriatric nutrition and nutraceutical therapies, with the goal of guiding women in using evidence-based functional foods to improve their health and vitality. By researching these nutraceutical frontiers, we want to chart new nutritional aspects in geriatric women's health, harnessing the newest advances to enhance quality of life in the ageing females.

**Keywords:** Nutraceuticals, phytochemicals, Geriatric women health

### 1. Introduction

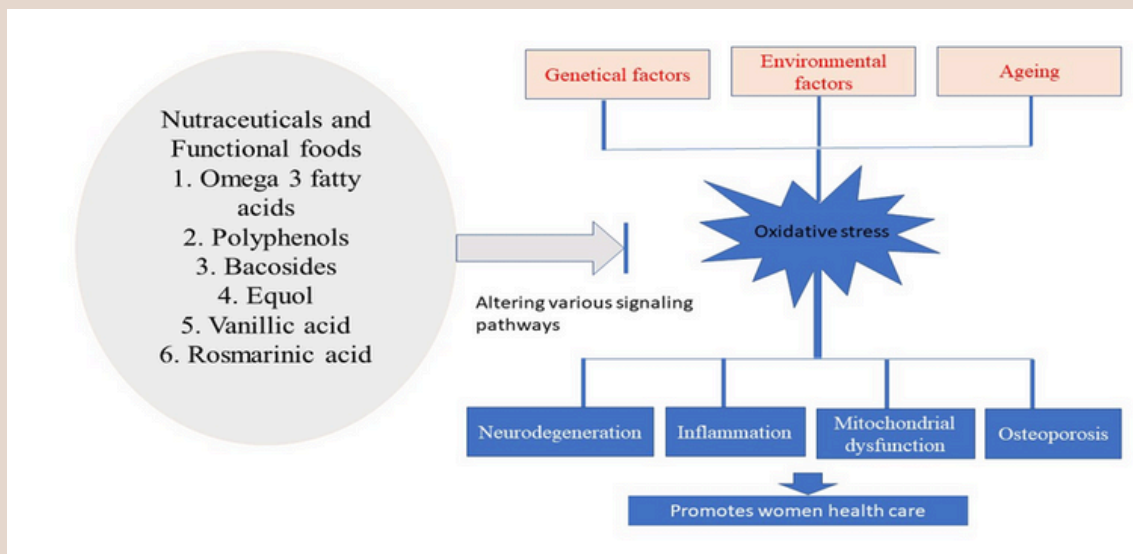
Nutraceuticals are bioactive substances that have health-promoting properties amplified and are used for the treatment and prevention of certain illnesses. Type 2 diabetes, heart disease, lung illness, cancer, gastrointestinal issues, and neurological problems are among the most common long-term health conditions treated with these medications. High blood pressure, heart failure, dementia, osteoporosis, cataracts, diabetes, and trouble breathing are just a few of the many frequent health conditions that older people endure. Diseases caused by infectious organisms are more common and deadly among the elderly, and a reduced immune system is one reason why. Nutritional status is an important determinant of infection pathogenesis and frequency (1).

Micronutrient deficits are more common in the elderly because of the many circumstances that make it difficult for them to eat, such as social, structural, financial, and emotional constraints. As a result, we must immediately turn our focus to find solutions to the growing problem of age-related chronic diseases. People should make a concerted effort to live healthier lives, including eating better, on an individual level (2).

The specialty of geriatrics is concerned with the special needs of the aged in terms of health care and with helping them maintain their independence while dealing with long-term health conditions.

Caring for the elderly is complex and requires a one-of-a-kind strategy. The discovery of effective nutritional therapies to promote healthy ageing is a dynamic and complex subject of study, given that ageing is associated with a higher risk of chronic disease, disability, and mortality. At some point in the future, the global population will start to age. Variations in nutritional status help to explain differences in infection incidence and pathogenesis. It was observed that micronutrient deficits are more common among the elderly for a variety of reasons, including physical, social, financial, and emotional obstacles to eating (3).

The focus must so return to the question of how to reduce the prevalence of age-related chronic diseases. One-way individuals can impact their personal health and wellness is by improving their nutrition. Thus, this chapter takes a nutraceutical approach by outlining the phytochemicals that are important for the health of geriatric women, with a particular emphasis on cognitive function, cardiovascular function, bone and joint health, immune system function, plus inflammatory functions represented in the Figure 1. (4).



**Figure 1. Importance of functional supplements in preventing various diseases**

Numerous studies have demonstrated the effects of nutraceuticals from fruit or plant extracts in reducing oxidative damage and promoting healthy aging in invertebrate models. The active ingredients in nutraceuticals that are generally produced by plants as secondary compounds appear to help plants overcome stressful conditions. The beneficial properties of nutraceuticals can be attributed to the varieties of phytochemicals, such as phenols, flavonoids, anthocyanin glycosides, triterpenoids, and proanthocyanidin oligomers (5).

## 2. Nutraceuticals for heart and brain health

### 2.1. Omega 3 fatty acids

The requirement for nutraceuticals in the treatment of neurodegenerative disorders in elderly women. There is evidence that nutraceuticals, which include antioxidants and omega-3 fatty acids, have the potential to assist in slowing the advancement of neurodegenerative illnesses in elderly women. It is possible that the quality of life of persons who are afflicted with these conditions could be improved by the use of these natural substances, which can assist promote brain health and cognitive function (6).

### 2.2. Polyphenols

Blood vessel narrowing, hypertension, and pressure overload are some of the disorders that can alter the heart's structure, leading to conditions like hypertrophy. Elevated levels of reactive oxygen species (ROS), potent vasoconstrictor molecules such as endothelin-1 (ET-1) and angiotensin II (AngII),

and signalling pathways triggered through MAP38 kinases and NFκB display these alterations. One mechanism of ROS-mediated vascular abnormalities, like proliferation and hypertrophy in VSMCs, is the activation of protein kinase B (PKB), extracellular signal-regulated kinase 1/2 (ERK1/2), and protein tyrosine kinase (Pyk2) signalling, which has been associated with ET-1 (7).

Still, polyphenols are gaining recognition as potential therapeutic agents that can protect against cardiovascular diseases and oxidative stress. We have long believed that polyphenols primarily exert their beneficial effects by modulating cellular antioxidant defence mechanisms and increasing synthesis of detoxification enzymes like GST, GPx, NAD(P)H quinone oxidoreductase1, NQO1, and others. But recent research has shown that polyphenols can control signal transduction pathways. A large body of evidence, including clinical trials, epidemiological data, *in vitro* and *in vivo* animal studies, has been gathered to prove two things: first, that a diet rich in polyphenols improves health, and second, the mechanism of action and protective effects of these compounds (8).

Since ancient times, complementary and alternative medicines have been utilized as all-encompassing therapeutic treatments for a variety of human ailments, including neurological problems, diabetes, cancer, and skin conditions. The following herbs has been used as medicine all throughout the world, particularly for the treatment of various neurological conditions.

### **2.3. Bacoposides**

Bacoposides are triterpene saponins that have been extracted from the plant *Bacopa monnieri*. Extracts and pure chemicals derived from Bacopa have shown tranquillizing, anti-anxiety, anti-depressant, anti-convulsant, and analgesic properties. There have been reports of the counteraction of haloperidol-induced catalepsy. Bacosides increased the activity of protein kinases in the hippocampus, hypothalamus, and cerebral cortex. Studies have shown that Bacopa extract has protective effects against the reduction in SOD, buildup of intra neuronal lipofuscin, and necrotic alterations caused by aluminum trichloride in the CA-1 area of the hippocampus and cerebral cortex. It has also been shown to have antioxidant, free radical scavenging, and anti-lipid peroxidation properties (9).

### **2.4. Equol**

Equol, scientifically referred to as 4',7-isoflavandiol, is an isoflavan compound having a molecular formula of C<sub>15</sub>H<sub>14</sub>O<sub>3</sub> and a molecular weight of 242.27 g/mol. Intestinal bacteria often create it, and it is classified as a metabolite of soy isoflavones, known as nonsteroidal oestrogens. S-equol is a major bacterial metabolite of the soy isoflavone daidzein. It is known to be a phytoestrogen that acts by binding to the nuclear estrogen receptors (ERs) that are expressed in various brain regions, including the cerebellum (10).

### **2.5. Vanillic acid**

Many human diseases, including neurodegenerative disorders, have been linked to the pattern recognition receptor signalling event known as the receptor for advanced glycation end products (RAGE). This is especially true in Alzheimer's disease (AD). One flavouring ingredient, vanillic acid (V.A.), is a derivative of benzoic acid with several biological uses, such as reducing inflammation, protecting neurons, and enhancing antioxidant defenses. The molecular pathways by which V.A. exerts its neuroprotective effects, Hence VA is a good phytochemical-based nutraceutical supplement in addressing the neuronal disorders in old women (11).

## **3. Nutraceuticals for osteoporosis health**

Postmenopausal osteoporosis is the most common bone condition in industrialized countries and presents a major public health problem. Nutritional variables are essential in maintaining bone health and may potentially aid in preventing or treating bone-related issues. Calcium and vitamin D, which have been well researched and supported by strong scientific evidence, are essential elements of the non-pharmacological therapy for this condition.

A major public health concern, postmenopausal osteoporosis is the most common bone condition in industrialized nations. Bone health and the prevention or treatment of bone disease are both impacted by nutritional variables. The non-pharmacological therapy for this illness includes calcium and vitamin D, which have been well researched and have strong scientific backing. However, it seems that other dietary factors that have received less attention impact bone metabolism. Here are some of the important phytochemical based nutraceuticals in the treatment of osteoporosis (12).

### **3.1. Phytate**

Natural foods including grains, legumes, and nuts contain large amounts of myo-inositol hexaphosphate, often known as phytate or IP6. To stop crystals from growing, it can cling to their surfaces and interfere with their creation. Immobilizing these inhibitors on crystal surfaces can further slowdown crystal cleavage. Phytate has promise as a therapy for osteoporosis due to its affinity for metal cofactors.

Phytate, found in foods like whole grains, beans, and oilseeds, can store phosphorus and is thus an essential part of the DASH and Mediterranean diets. It has been classified as a nutraceutical due to scientific evidence that provides hope that it can treat or prevent various diseases. Rapid attenuation of bone mass loss, reduction of vascular calcifications, and prevention of calcium salt crystallization are all outcomes. In addition to its remarkable anti-inflammatory and antioxidant properties, phytate improves glucose and lipid metabolism, two factors linked to diabetes complications. There was a statistically significant correlation between a lack of phytate intake and low lumbar spine bone mineral density. These results suggest that a daily dose of 307 mg is necessary to avoid bone mineral loss. As a result of its ability to adsorb on the surfaces of HAP, phytate may have a preventive impact on bone resorption (13).

### **3.2. Other plant-based phytochemicals**

However, individual phytochemicals, which are plant-based chemical compounds abundant in fruits and vegetables, such as isoflavones, polyphenols, genistein, lycopene, and carotenoids, have been shown to enhance bone mineral density (BMD) and osteogenesis. Research has demonstrated that lycopene has positive effects on bone health, especially in women who have gone through menopause. A cross-sectional study was conducted on postmenopausal women aged 50-60 years. The study revealed a significant positive correlation between the intake of lycopene through diet and the levels of lycopene in the blood. Furthermore, it was observed that women with high blood lycopene levels had lower protein oxidation and lower serum levels of markers indicating bone resorption (14).

Furthermore, a study examining data from the NHANES 2005–2018 investigation, involving 4820 persons aged 50 or older, revealed that individuals who consumed larger amounts of  $\beta$ -carotene and  $\beta$ -cryptoxanthin had a reduced occurrence of osteoporosis in comparison to those with lower levels of intake. Moreover, a clear correlation was found between increased consumption of  $\beta$ -carotene and elevated bone mineral density (BMD) in both the entire hip and lumbar spine regions. The results indicate that consuming more foods that are high in  $\beta$ -carotene and  $\beta$ -cryptoxanthin, such as carrots, sweet potatoes, and citrus fruits, could potentially improve bone health and decrease the likelihood of osteoporosis in elderly individuals (15). The findings of our investigation, which establish a correlation between PI and osteoporosis in postmenopausal females, align with prior research.

Furthermore, anthocyanins may inhibit NO, ROS, and PGE2 production and prevent overstimulation (15). There are several fruits, vegetables, and plants that contain caffeic acid and rosmarinic acid, which are the structural analogues of caffeine and rosmarinic acid, respectively. RA and CA both exhibit anti-inflammatory, antirheumatic, antibacterial, antioxidant, and anticarcinogenic effects. The longevity of healthy *C. elegans* can be extended by caffeic acid (CA)

and rosmarinic acid (RA). 108 total findings suggesting chlorogenic acid mediated lifespan extension are consistent with these observations. Results from this study indicate that RA and CA work together to increase longevity via metabolic and stress response pathways (16,17).

The findings suggest that the various roles of phytochemicals in plants can potentially lower the risk of developing osteoporosis and experiencing fractures. It was observed that the Anthocyanin rich foods like Fruits, vegetables, and cereals contain anthocyanins, which are water-soluble pigments with anti-inflammatory potential. They could potentially lessen inflammation in bodily tissues by preventing the secretion of substances that promote inflammation, decreasing TLR4 expression, and blocking the activation of the NF-κB and MAPK signalling pathways which were represented in the Table 1.

**Table 1. Molecular mechanisms of various phytochemicals as functional supplements**

S. No.	Name of the phytochemical	Biological source	Marketed Formulations	Molecular Mechanisms	Ref
1.	Omega 3 fatty acids: alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA).	<i>Linum usitatissimum, Juglans regia, Persea americana, Salvia hispanica, Citrullus lanatus, Cucurbita pepo</i>	<i>Omega flax, prostate support, Inlife pumpkin seed extract supplement, Nutri advanced black walnut complex.</i>	The cystolic preservation of nuclear factor kappa B (NF-κB) inhibits the increase in proteolytic and pro-inflammatory substances.	(18)
2.	Polyphenols in heart care: Resveratrol, Epigallocatechin Gallate EGCG, curcumin, quercetin, Anthocyanins, flavonoids, tannins.	<i>Arachis hypogea, Vitis rotundifolia, Thea sinensis, Curcuma longa, Brassica oleracea var. italica, Saraca indica Linn</i>	Trans Resveratrol 500mg, EGCG green tea extract tablets, Carbamide forte curcumin, nutraxin plus,	The activity resulted in an increase in the production of PPARα and its co-activator PGC1α, which are both involved in the metabolism of lipids.	(19)
3.	Bacosides	<i>Bacopa monneiri</i>	Nutri grow - Bacopa monneiri extract tablets, In life brahmi extract tablets	The molecular foundation of bacosides' neuroprotective action is thought to be their ability to regulate mRNA translation and surface expression of neuroreceptors such AMPAR, NMDAR, and GABAR in different regions of the brain.	(20)
4.	Equol	<i>Glycine max</i>	Cureveda brainboost, Nutrined equol, Equolibrum	It acts by decreasing the Beta amyloid plaques, decrease oxidative stress, increase glial cell migration, and increase in brain metabolic activity.	(21)

5.	Vanillic acid	<i>Angelica sinensis</i> , <i>Citrus paradisi</i> , <i>Rosmarinus officinalis</i> , <i>Vaccinium subg. Oxycoccus</i>	Sheneed cranberry, Nicholas nutraceuticals cranberry extract tablets, Rosemary Leaf Extract, Support Sleep & Cognitive Health 60 veg Capsules	Decrease in Ache& Bche, increase of mitochondrial biogenesis modulation of gene expression	(22)
6.	Phytate	<i>Avena sativa</i> , <i>Prunus dulcis</i> <i>Sesamum indicum</i>	Swanson Avena sativa capsules	In Parkinson's disease phytates may have a neuroprotective role identified in a cell culture model through decreasing caspase-3 activity as well as DNA fragmentation in normal and iron-excess conditions.	(23)
7.	B-carotene, $\beta$ -cryptoxanthin, Astaxanthin	<i>Prunus persica</i> , <i>Carica papaya</i> , <i>Pyrus mallus</i>	Now natural $\beta$ carotene capsules	Activation of the PD and ALS enzymes prevents neuropathy.	(24)
8.	Lycopene	<i>Lycopersicon esculentum</i>	Carlson lycopene capsules, Lycosuch plus capsule	Scientists have discovered that lycopene's neuroprotective effects are mediated by mechanisms such as reducing inflammation and oxidative stress in the brain, stopping neurons from dying, and restoring mitochondrial function.	(24)
9.	Anthocyanins	<i>Vaccinium corymbosum</i>	Bluerich blue berry concentrate	Enhance cognitive skills, decrease neurodegeneration via the P13K/ Akt/Nrf2 pathway, and raise markers of pre- and postsynaptic memory.	(25)

#### 4. Conclusion

The specific healthcare requirements of older women must be given top priority by healthcare practitioners, legislators, and academics. Better healthcare outcomes for this population can be achieved by reducing healthcare access and quality gaps, increasing the use of gender-specific considerations in medical practice, and pushing for legislative changes. To guarantee that older women get the treatment they need, ongoing policy and research initiatives are crucial. Finally, in order to make sure that older women get good healthcare, it is important to identify and meet their specific needs. Improving results for this group can be achieved through research on gaps in healthcare access, advocacy for policy changes, and medical practice that incorporates gender-specific concerns.

Based on the information presented above, it is clear that nutraceuticals derived from commonly consumed plant foods increase health-span, shield against stress and ageing, and promote longevity. Demand for personalized nutritional intervention is on the rise, and the consequences of diet composition will play a big role in explaining why. However, additional research and scientific evaluation are necessary to determine the individual and combined impacts of nutraceuticals in food composition. Researchers are looking at the possible therapeutic effects of certain nutraceuticals and synthetic versions of them. The use of model organisms has yielded several encouraging results, which point to the involvement of systems that have been preserved throughout evolution in their therapeutic effects. The molecular mechanisms of ageing that are common to many animals have been better understood, and this new knowledge is guiding the development of effective treatments for ageing. Nevertheless, in order to prove that any medicines or nutraceuticals can successfully postpone ageing or age-related diseases in humans, more comprehensive research is needed.

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