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Dietary approaches to prevent the development of cataract in elderly

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Introduction

The global population continues to be rapidly aging .The number of elderly will increase to approximately three times to more than two billion in 2050.[1] This will lead to increase of burden of chronic age related diseases worldwide. Age related cataract is one of the leading cause of blindness in the world.[2] With aging lens proteins aggregate thereby resulting in lens clouding and cataract formation .The light cannot pass through this clouded lens causing vision loss. Previously researchers have reported that cataract onset delay of approximately10years may reduce the number of cataract surgery by half.[3]Therefore, this mini review article will examine and summarize nutritional interventional strategies to prevent/delay age related cataract in elderly. There is a growing interest in the role of dietary factors in cataract because modifications like changing eating habits or supplementation will serve as a primary preventive measure in the development of lens opacity .These eye lens opacity results due to glucose toxicity involving processes like oxidative stress non-enzymatic glycation and enhanced polyol pathway.Role of dietary factors in these processes is as follows:

Role of antioxidants

Dietary antioxidants/ carotenoids like lutein and zeaxanthin are present in the human eye lens.These compounds filter harmful short wave blue light and reduce H_2O_2 mediated damage of lens protein, lipid as well as DNA,[4] thereby functioning as antioxidants and stabilizing membrane integrity .These carotenoids rich food are carrot, corn, egg yolk etc. Similarly ,vitamins present in the diet,[5] e.g. vitamins A,C,[6] and E,[7] prevent damage to lens proteins, membranes, enzymes from activated oxygen species resulting in antioxidant activity .These vitamins are present in carrot, citrus fruits, corn oil etc. Flavonoids e.g. myrcetin and flavones also exert antioxidant effects due to their ability to scavenge free radicals, donate hydrogen as hydrogen donating compounds, and act as singlet oxygen quenchers and metal ion chelators .These flavonoids can be obtained from apple, grapes, bananas, berries, green leafy vegetables etc.

Role of phytochemicals

Phytochemicals such as quercetin, kaempferol and ellagic acid are potential Aldose reductase inhibitors (ARI).The enzyme aldose reductase within the lens converts glucose to sorbitol and is responsible for the accumulation of sorbitol in eye lens. Hence Aldose Reductase inhibitors can be used as potential therapeutic agents to prevent the onset or progression of diabetic cataract.[8–10] Example of Dietary ARI are rutin from lemon, curcumin from turmeric, catechol from tea leaves etc. which can be used as a food supplement in elderly to prevent/delay the development of cataract.

Role of polyphenols

Aging leads to accumulation of advanced glycation end products, which may contribute to lens opacity.[11] Polyphenols are strong anti-glycating agents (AGA) and are used as anti-cataract agents. These are common constituents of fruits, vegetables, cereals, seeds, nuts, chocolate and beverages such as coffee, tea, and wine.Several polyphenols such as anthocyanins,Ginkgo biloba, quercetin and resveratrol have shown significant preventive and therapeutic benefits against age related development of cataract.

Role of co-enzyme 10

Several pathways are involved in cell apoptosis. Mitochondria-dependent pathway is associated with lens opacification during aging process**.** Coenzyme Q10 (ubiquinone) is a vitamin-like benzoquinone compound which is a light induced Inhibitors of human lens epithelial cell apoptosis(IHLECA) and may help in prevention and delay of age related development of cataract.[12–14] Sources of coenzyme Q10 are spinach, cabbage, nuts, soybean etc. which can be used as a dietary supplement in prevention of cataract in elderly (Table 1).

Table 1 Dietary factors and their action in prevention/delay of cataract in elderly

S.No.	Dietary item	Antioxidants action	ARI action	AGA action	IHELECA action
1.	Orange	Yes	Yes	Yes	Yes
2.	Green Tea	Yes	Yes	Yes	Yes
3.	Pomegrante	Yes	No	Yes	No
4.	Fennel/Saunf	Yes	Yes	No	No

Role of synergistic combination of dietary factors

Research on synergistic combinations of carotenoids and polyphenols has shown inhibition of few pro-inflammatory pathways. These polyphenols of curcumin and carnosic acid synergistically produce the inhibitory effect of some carotenoids (lycopene, lutein, and beta-carotene) on the secretion of inflammatory mediators such as NO, TNF-alpha, and PGE_2. At the same time, the synergistic anti-inflammatory effect is also observed when carotenoids are present in combination with other polyphenols (quercetin, resveratrol, and gallic acid).[15,16] To conclude, literature review suggests that a range of commonly consumed food items can prevent or delay changes

responsible for age related cataract development .These dietary approaches adopt one or more processes in prevention of development of cataract in elderly. Antioxidant activity of diet is one of the most important processes that can be used as nutritional interventional strategies in elderly to prevent or delay cataract development.

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None.

Conflicts of interests

The authors of this manuscript have no competing interests.

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