Critical Analysis of Nutrition Management in Cataract Disease

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Abstract:
It goes without question that most of the nutrients associated with potential benefits for eye disease are obtained from similar food sources. This makes it more practical for a patient to reach their dietary consumption goals. Alfredo et al (2017) points out that the timing of cataract extraction depends on different factors that may speed up or delay surgery. A review by Alexandria (2017) recommends for the creation of public health tools such as the analysis of dietary patterns of individuals with eye disease. Such tools will be important for researchers who may want to establish diet-based therapies. This therefore calls for dietary research and development of clinical education materials through a multidisciplinary approach of both nutritionists and ophthalmologists. The variables of this study are in line with dietary research recommendations and the results of this study are important in providing baseline information for such interventions.

Keywords: Nutrition management, cataract disease

1. Individual Characteristics and Lens Opacities
Cataracts account for about half of 37 million blind people and are therefore the leading causes of visual impairment and blindness worldwide. The prevalence of blindness due to cataracts varies from country to country yet 49% of the total disability adjusted-life years have been reported owing to cataracts, especially in developing countries. (Rao et al, 2011). Several lifestyle and socio-demographic characteristics, as well as medical conditions such as diabetes, have been reported to affect the risk of cataracts

In a multivariate analysis for Age Related Cataract (ARC), there was a strong association between cataract and factors such as female sex, increase in age, illiteracy besides other factors. Studies reported that lower educational levels were associated with a higher prevalence of cataract. Possibly, it is because of confounding variables such as illnesses, nutritional factors and exposure to sunlight according to Nirmalan et al, (2004). Furthermore, BMI has also been previously reported to be associated to cataract and this association is confounded by lower socio-economic status among other variables. Increasing age is also associated with high prevalence of cataract. These are some of the demographic and socioeconomic characteristics that this study looked at in order to strengthen the findings of the study.

2. Nutrition and Cataract
Raman et al (2016) when looking at food components and ocular path physiology found out that cataracts induce damage to the eye through the mechanism of oxidative stress. This stress may aid in the progression of cataract because it facilitates the damage of the cellular eye components resulting in the accumulation of advanced glycation end products leading to the increase in lens opacity. A much earlier study by Taylor et al (1995) led to the conclusion that oxidative damage to the lens cell membrane is an important factor in the initiation and the progression of cataract. Vinson et al (2006), points out that free radicals can exceed naturally occurring antioxidants and consequently cause oxidative stress because of various factors such as excessive alcohol consumption, smoking, excessive exposure to sunlight, improper diet and diabetes. Raman et al (2016) further states that antioxidants are the first line of defense against oxidative stress. The AREDS has also shown that antioxidant therapy reduces AMD progression by 25%. The above findings show a great relationship between nutrients and cataract in relation to oxidative stress. It is also important to note that plasma antioxidant capacity can be increased by consuming a diet that is rich in food sources of the antioxidants. Various studies have established a protective association of cataract with carotene, vitamin C, vitamin E, lutein, zeaxanthin and B vitamins. Delcourt et al (2010) reports that an antioxidant rich diet is significant in delaying the progression of cataract. Findings from the above-mentioned studies support the evidence that nutrition plays a key role in cataract incidence and progression. Majority of these studies are interventional studies and randomized control trials and they support the protective association of antioxidants and cataract. However, this study took a cross-sectional approach as the research design. Despite the findings of interventional studies, further existing knowledge and practices of patients have not been clearly established yet the burden of cataract is increasing.
3. Antioxidants

Nuclear cataract has been associated with dietary antioxidant intake besides smoking and oxidative stress (Kelly et al., 2005). Various studies on the effect of vitamin C intake, vitamin C supplementation and serum vitamin C concentrations have often given inconsistent results. Some studies have found protective effects while others have found no overall effect (Mares et al., 2010). Other nutrients such as vitamin E, vitamin A and antioxidants lutein and zeaxanthin have been explored to establish their effect on cataract progression and mostly cohort studies have been successful in finding a protective effect according to Jacques et al., (2005).

3.1. Vitamin C

It is also referred to as ascorbic acid and is a water-soluble antioxidant vitamin. It protects the lens from photo-oxidative destruction. Shui et al., (2009) associates a significant concentration in the aqueous humor that bathes the lens to reduction of oxidation products in the lens. Fruits and vegetables are the classical sources of vitamin C. Akanksha, (2016) points out that most studies have investigated the use of vitamin C in combination with other nutrients and this therefore recommends for further research. The Blue Mountains eye study found that use of both diet and vitamin C over a period of ten years reduced the incidence of cataracts. Yonova-Doig et al., (2016) on genetic and dietary factors influencing progression of nuclear cataract found that dietary vitamin C was protective against both nuclear cataract at baseline and nuclear cataract progression. This study assessed the frequency of consumption of vitamin C rich food sources to evaluate the nutritional practices among cataract patients.

3.2. Vitamin E

It is also called alpha-tocopherol and is a fat-soluble vitamin. It is widely distributed in plant foods and is particularly concentrated in plant oils. Animal fats contain small amounts of this vitamin. Its biochemical functions include scavenging free radicals and preventing lipid peroxidation. Plasma tocopherol is the main measure of nutritional status in relation to this vitamin. Vitamin E is found within the lens fibers and membranes and reduces photo peroxidation of lipids within the lens. Dietary vitamin E intake, dietary and supplemental vitamin E intake and high serum tocopherol levels were significantly associated with decreased risk of cataract in a study conducted by Zhang et al., (2015). This study also looked at frequency of consumption and diet diversification of foods rich in vitamin E.

4. Lutein and Zeaxanthin

These are carotenoids that are found in dark green leafy vegetables and egg yolks. Epidemiologic studies show an inverse relationship between their intake with both cataract and AMD thereby showing their protective role in eye health besides reducing the risk of certain types of cancers, heart disease and stroke. According to Ma et al., (2014), they prevent oxidative stress and lipid peroxidation in the epithelial cells. The Nurses’ Health Study examined the relationship between dietary intake and cataract extraction and the results showed that frequent intake of lutein rich spinach and kale was associated with decreased risk of cataract extraction (Chasan et al., 1999).

Moeller et al., (2008) indicated that a high dietary intake of lutein and zeaxanthin would lower the incidence of nuclear cataracts by 23%. An approximate intake of 4-6mg per day had reduced rates of cataract extraction showing that dietary intake also has an effect on delaying the progression. This study looked at knowledge on foods that slow cataract progression and the frequency of consumption of dark green vegetables and egg yolks as the most available sources of lutein and zeaxanthin.

5. Other Nutrients

The results of a case-controlled study in Athens, Greece to assess the association between diet and cataract show a protective association of cataract with carotene, vitamin C and E. However, from the same study, higher carbohydrate intake was associated with increased risk of cortical cataract and a higher glycemic index with nuclear cataract. The consumption of other foods like meat and related micronutrients like cholesterol also showed to increase the risk of oxidative stress related eye conditions, (Theorodopoulou et al., 2014).

Horng et al., (2014) points out that excessive intake of sodium can cause hypertension and subsequently lead to the development of cataract. Excessive caffeine consumption, low glycemic index diets also have a negative association with the incidence and the progression of cataract.

6. Nutritional Practices

Some of the practices to be looked at in this study are dietary practices and use of nutrient supplements. Dietary practices refer to a person’s choices on food consumption and will be looked at in terms of food frequency and diet diversification. There is an overwhelming body of evidence suggesting that diets high in fruits and vegetables are associated with low risk of chronic diseases including cataract since this food group is a major source of the antioxidant nutrients.

A lot of compounds in the diet have been claimed to have an antioxidant activity. Relatively few of these potential antioxidants have been tested in clinical trials of substantial size and duration.

Antioxidant vitamin supplementation has been studied (in the AREDS II) as a means for prevention for formation or slowing the progression of cataract. It is however important to note that results from observational studies have been inconsistent. For example, two trials using daily multivitamins/minerals demonstrated a reduction in the progression of nuclear cataract but an increased risk of posterior sub-capsular cataract (Chew et al., 2013).
In a controlled clinical trial of nutritional supplements for ARC (Chew et al, 2012), separate clinical trials tested multivitamins/minerals use (where n = 2141), and a combination (where n = 3249) containing retinol and zinc, riboflavin and niacin, vitamin C and molybdenum, selenium, vitamin E, and beta-carotene, using a factorial design with these four different vitamin/mineral combinations. Findings from the studies showed that, the risk of nuclear cataract progression was decreased by at least 36% and 44%, for multivitamins and combination, respectively, in 5 to 6 years. It is also important to note that, there appeared to be an increased risk of posterior subcapsular cataract with the use of riboflavin/niacin combination. Conclusively, from this population, the results of the two trials suggested that vitamin/mineral supplements may be beneficial for slowing the progression of lens opacities. In contrast to other studies, individual nutrients were not evaluated in these studies.

7. References

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