



Serum Selenium Level in Cataract

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KEYWORDS

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ABSTRACT:

Introduction : Cataract is most common cause of blindness in old age. Cataract usually occurring at or above 50 year age is age related cataract. surgery is gold standard for treating cataract. 30-50% Of cataract patients develops PCO after surgery and puts more burden on health care system. Delaying the onset of cataract by 10 years will reduce expenses and need for surgical intervention. Oxidative stress is main cause in genesis of senile cataract. Oxidative stress is due to imbalance between the production of reactive oxygen species and cellular antioxidant defence mechanism. Glutathione/glutathione peroxidase 1 and 4 (GSH/GPX1/GPX2) which play role of key enzyme in protecting lens against reactive oxygen species (ROS). Selenium is present in Glutathione peroxidase 1 and 4(selenoprotein). suboptimal serum selenium affect antioxidative defence system which increases lens opacity. few studies have shown that altered selenium level is associated with development of cataract in animals. So this study will give us idea about is there association of serum selenium with cataract and if there, it will help to lessen burden on healthcare system.

Objective : Aim of the study is to analyse association between serum selenium and age related cataract(ARC).

Material and method : A total 354 individuals were participated into the study: group I,177 diagnosed patients of age related cataract of age group 50-60 years and group II,177 age, sex matched healthy controls. Serum selenium level were assayed by Inductively Coupled Plasma-Mass Spectrophotometry (ICP-MS) method.

Result : Mean age (54.98 ± 0.17 Vs. 57.11 ± 0.16 years, $p = 0.68$). Hundred (56.49%) cases and 104 (58.75%) control were females. Serum selenium level (84.47 ± 0.36 Vs. 65.06 ± 0.38 $\mu\text{g/L}$, $p < 0.0001$).

Conclusion : Present study strongly indicate that low selenium is associated with cataract, so selenium has obvious role in cataract prevention

Introduction :

Cataract is most common cause of blindness in old age and second leading cause of visual impairment worldwide[1,29]. Studies have shown that 36 million people are blind worldwide and among them 12 million are due cataract [2]. Cataract is opacity in lens [3,11]. When cataract interferes with daily routine, surgery is gold standard for treating cataract by replacing opaque

lens by artificial lens but not always accessible medical option particular to middle and low income country [29]. In developing country cataract blindness is more. Many country have less clinician to meet demand and outcome of mass surgery programme may be low quality and unsatisfactory [5]. 30-50% Of cataract patients develops PCO after surgery which is most frequent complication of surgery within 2 years of surgery and need laser treatment and so puts significant



financial burden on healthcare system [9,10]. Burden of cataract impaired vision will surpass the available resources for its surgical treatment so alternate approach is to delay the onset of cataract [6]. Delaying the onset of cataract by 10 years will reduce expenses and need for surgical intervention [6,7].

Cataract usually occurring at or above 50 year age is age related cataract(ARC) [26]. Cataract may be due to one or more triggering factors [8]. Oxidative stress is main cause in genesis of senile cataract [8,11]. Oxidative stress may be due to imbalance between the production of reactive oxygen species and cellular antioxidant defence mechanism [12]. Free radicals like hydroxyl radical, free superoxide, H_2O_2 , hypochlorous acid are constantly present in living cell and gives oxidative stress to these cells [13]. To relieve this stress several homeostatic mechanism works [13]. Among them are Glutathione/glutathione peroxidase 1 and 4 (GSH/GPX1/GPX2) which play role of key enzyme in protecting lens against reactive oxygen species (ROS) [14]. Role of glutathione peroxidase is well established in cataract formation prevention [24].

Glutathione peroxidase 1 and 4 are selenoprotein which selenium is present in the form of selenocysteine at active site [15]. Optimal serum selenium level in human is 78.9 – 94.7 $\mu\text{g/L}$ [14]. There are studies which has shown that suboptimal serum selenium level is associated with heart failure, respiratory diseases, thyroid malignancy, inflammatory disease [16,14,18,19]. There is study which has shown suboptimal serum selenium affect antioxidative defence system which increases lens opacity causing senile cataract [20]. There are few studies which have shown altered selenium level is associated with development of cataract in animals [22,23]. So this study will give us idea about is there association of serum selenium with cataract and if there, it will help to lessen burden on healthcare system.

Method and material:

Cross sectional case control study were done in LTMMC & GH, SION from October 2023 to april 2024. Total 354 individuals were included into study. For cases and control selection inclusion and exclusion criteria were applied. For cases, 177 diagnosed patients of cataract between age 50-60 years were taken.

Exclusion criteria included taking steroid treatment, on radiation therapy, known case of diabetes, H/O ocular trauma, previous ocular surgery, smoker, presence of chronic systemic illness, hereditary malignancy, patients taking micro-/macroelements and/or vitamin based supplementation and high risk professionals like steelworker/welder. For control 177 age and sex matched disease free healthy adult of age group 50-60 years were taken.

Selenium level assay in biological samples : Serum selenium level is used for selenium measurement in research[14]. Fasting 5 ml venous blood sample of all patients collected in morning in LTMMC, ophthalmology OPD and serum frozen at -20° within 2 hrs of collection until analyzed. Serum selenium is determined by Inductively Coupled Plasma-Mass Spectrophotometry (ICP-MS) method. Blood samples initially centrifuged at 3000 rpm for 10 minutes. Then supernatant volume diluted 100 fold with 0.65% nitric acid solution SUPRAPUR. This processed sample was used for serum selenium determination by ICP-MS. Serum selenium level of cases and control were compared. Mean values are interpreted with their 95% confidence interval. Statistical analysis was made using student's t test; $p < 0.05$ are considered as statistically significant.

Statistical Analysis :

All statisticalal data were analysed using Graphpad prism 5 software. Sample is collected by simple random sampling method. Total 354 individuals were taken which had divided into two groups. We used mean, standard error expressed with 't' test and to compare two groups (cases group and control group). All statistical analysis results with a two tailed p value < 0.05 were considered significant.

Result :

All participant had an intraocular pressure within 8-21 mmHg. Total 354 individuals were taken into study. 177 were taken into cases group and 177 were taken into control group females. The baseline characteristics: Mean age (54.98 ± 0.17 Vs. 57.11 ± 0.16 years, $p=0.68$). Hundred (56.49%) cases and 104 (58.75%) control were females. Serum selenium level (84.47 ± 0.36 Vs. 65.06



$\pm 0.38 \mu\text{g/L}$, $p < 0.0001$) which was significantly lower in cases as compared to control.

Discussion :

Selenium found in soil, water and some food [17]. Selenium an essential mineral is indispensable for maintaining normal functions of metabolism [17]. Selenium supplementation is through balanced diet from meat and plant product [27]. The daily intake between 100 and 200 μg Se is considered safe for adults [28]. As mentioned in introduction there are some studies suggesting suboptimal serum selenium level may adversely affect health including lens metabolism [16,17,18,19]. Selenium is essential component of glutathione peroxidase and selenoprotein [25,15]. Glutathione peroxidase protects lens against reactive oxygen species (ROS) [14]. In this study serum selenium level was significantly lower in patients as compared to control group. This difference also seen in studies by Post M et al. [14] and Karakucuk S. et al [20]. Cataract is associated with low serum selenium level.

Conclusion : Present study strongly indicate that low selenium is associated with cataract, so selenium has obvious role in cataract prevention so we strongly recommend to consume adequate selenium in diet, so it can delay or prevent the cataract formation.

Conflict of Interest: None declared.

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