

# Cataract etiology and prevention in traditional Persian medicine texts

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## Abstract

**Context:** According to the World Health Organization, cataract is the most common retrievable blind cause in the world. Nowadays, surgery is the only treatment to restore vision in patient with cataract. In regard to the high costs of surgery, prevention has a particular importance. In modern medicine, cataract risk factors are hardly preventable.

**Aims:** Determination of the etiology and preventive solutions of cataract in traditional Persian medicine (TPM).

**Settings and Design:** This is a summative qualitative content analysis that focused on Persian medicine texts in from 4<sup>th</sup> to 13<sup>th</sup> AH centuries.

**Materials and Methods:** TPM literature were searched during centuries 4<sup>th</sup> to 13<sup>th</sup> AH, by using this key words: “Nuzūl-ul-mā’”, “Ā’b murwārīd” and “Ā’b āvardan chishm” or just “Mā’,” and Databases (PubMed, PMC, Google Scholar, and Scopus) were searched by: Cataract; risk factor, etiology, prevention and treatment of cataract; This research has been done in seven phases.

**Statistical Analysis Used:** All data about the treatment of cataract were collected and categorized into modern style.

**Results:** According to TPM, to prevent cataract, first, it must be reduced or eliminated the causes of cataract; Those causes are classified to four themes such as physical factors, habits and inappropriate lifestyle, diseases, and age. Persian Physicians (*Hakīm*) proposed and used some prevention and medications to change some of these etiological factors to decrease the incidence of cataract.

**Conclusions:** In this research, a wide range of preventive measures for cataract is observed which cannot be found in modern medicine. Changes in some etiological factors such as lifestyle can prevent this disease. Affirming this claim depends on clinical researches.

**Keywords:** Avicenna, Cataract etiology, Cataract prevention, Traditional Persian medicine

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## INTRODUCTION

Cataract is a kind of ophthalmic disease which starts with opacity of the lens and then gradually by the increase in cloudiness of the lens the disease ends up with the decrease in vision.<sup>[1]</sup> Cataract is the primary cause of blindness and accounting for 51% blindness throughout the world.<sup>[2,3]</sup> The World Health Organization estimated from a recent global review of surveys that there are 37 million people worldwide who were blind in 2002. By the year 2020, this number is predicated to reach 40 million in the world.<sup>[4]</sup> There are many risk factors which can cause or affect the development and progress of it, such as age, smoking, alcohol consumption, exposure to sunlight, low education, poor lifestyle habits, including malnutrition and physical inactivity, metabolic syndrome, diabetes mellitus, systemic corticosteroid use, and possibly prolonged administration of high doses of inhaled corticosteroids.<sup>[5-7]</sup> Yet, age-related cataract is the common cataract in the world.<sup>[8]</sup> The effectiveness of physiological antioxidants such as pyruvate and nutritional antioxidants such as ascorbate Vitamin E and carotenoids in delaying the development of experimental cataract has been reported by some investigators.<sup>[9-11]</sup> Prevention of reactive oxygen production or scavenging of free radicals would be effective method to prevent or delay cataract formation or progression.<sup>[12]</sup> Nowadays, surgery is the exclusive effective treatment in these patients which is commonly used in the world.<sup>[13,14]</sup> Although a surgical replacement of the natural lens with an artificial lens is significantly effective in restoring vision to most patients, it is no free of complication.<sup>[15]</sup> Thus, prevents cataract or delays the onset of cataract would be very important.

Traditional Persian medicine (TPM) is a style of traditional medicine based on more than 1000 years of Persian medical practice.<sup>[16]</sup> Although TPM's rate of promotion has varied during its history, it has never been static.<sup>[17]</sup> TPM (as a complementary medicine) is based on elements (*Arkan*), temperaments (*Mizāj*), humors (*A'lat*), organs (*A'ada*), spirits (*A'rah*), forces (*Qumā*), and function (*A'f'al*).<sup>[16,18]</sup> According to TPM, the human body comprised the four primary elements: Earth, water, fire, and air.<sup>[19,20]</sup> TPM doctrine that based on this and four simple, four combined qualities (temperaments) and four humors.<sup>[21]</sup> The ingested food undergoes four stages of digestion, producing four humors in body; humors are blood, phlegm, yellow bile, and black bile which are constructed during the digestion process. The balance of four humors plays an important role in maintaining the health and eliminating the disease.<sup>[22-25]</sup>

Persian medicine physician (*Hakim*) has given more concentration to the prevention of disease rather than cures. Preserve health was significant that the principal duty of physicians was to keep people healthy and to treat them if they become sick. There are several factors, which are imperative for the maintenance of good health, which is referred to as follows: air, food and drink, sleep and wakefulness, evacuation and retention, body movement and repose, and mental movement and repose.<sup>[26]</sup>

Cataract has been recognized and called under the name of descent of the water (*Nuzul-ul-mā'*) and "*Ā'b āvardan chishm*" or just water "*Mā'*" in Persian medical contexts.<sup>[18]</sup> Persian medicine physicians believe that cataract is an obstructive disease in which external moisture accumulates between the lens and cornea. They mentioned different (several) colors of the opacity that some types (kinds) could be diminished in the initial stage with effective medication and food.<sup>[19-25]</sup> Based on this idea, cataract can be prevented by certain lifestyle modification and avoidance of other etiologic factors. Because they are believed that effective treatment of disease, occurs when cure and elimination of etiologic causes happen simultaneously.<sup>[19,27,28]</sup> In this study, we tried to collect etiologic factors of cataract based on ancient Persian medicine texts. Thus to this end, we will propose solutions for the prevention of cataract to the community of new medical researchers.

## MATERIALS AND METHODS

This article is a summative qualitative content analysis. All approaches to qualitative content analysis require a similar analytical process of seven classic steps:<sup>[29]</sup>

1. Formulating the research questions to be answered – "What is cataract disease in Persian Medicine texts?" In the Persian medicine texts, we do not find any disease that called as "Cataract." To find the name of "Cataract" disease in the context of Persian medicine, we tried to collect all data's about cataract in the context of up to date modern texts; this information includes physiology, etiology, symptoms, signs, risk factor, and treatment of cataract. And then, we tried to find one or more diseases have the most overlap with cataract disease. As a result, Cataract in Persian Medicine texts is known as "*Nuzul-ul-mā'*"; "*Ā'b murwārid*" and "*Ā'b āvardan chishm*" or just "*Mā'*"
2. Selecting the sample to be analyzed – In this study, all of the available Persian medicine texts that are reference for the study of specialized Ph.D. students in this field were selected. These texts included manuscripts (the book itself or its electronic file) in

different centuries from 4<sup>th</sup> to 13<sup>th</sup> AH; first, we studied and searched seven basic therapeutic (*Moalejat*) books:

- i. Cannon of Avicenna (al-Qānūnī al-Ṭibb)<sup>[17]</sup>
- ii. Complete book of the medical art (Kāmil al-ṣinā‘a al-ṭibbīya) of Haly Abbas<sup>[24]</sup>
- iii. Treasure dedicated to the king (Zakhīra-iKhwārazmshāhī) of Khwarazm of Sayyid Esmail Ğurġānī<sup>[25]</sup>
- iv. Kirmānī’s ṣarḥ ‘Asbāb wa ‘Alāmāt<sup>[26]</sup>
- v. Yamani’s Nūr Al-‘uyūn<sup>[27]</sup>
- vi. šāh Arzānī’s Ṭibb Akbari.<sup>[28]</sup>
- vii. Nāzīm ġahān’s ‘iksīr ‘A‘zam.<sup>[30]</sup>

In the second step, the databases were searched using key words of “Cataract’s risk factors, etiology, prevention, and treatment” in PubMed, PMC, Google Scholar, and Scopus.

3. To identify explicit versus euphemistic terms – Word frequency counts for each identified term calculated with source, to contextualize the codes. Modern equivalent terms were identified.
4. Coding process – All Persian Medicine physicians (*ḥukamā*), when written about special disease, were recorded their knowledge and experience under three titles: definition and name (*Nam e Bimari*), ethology (*Asbab va Ela*), and treatment (*Darman*). According to knowing this predominant pattern in TPM context, we coded and categorized all data under these titles and six stages. We tried to translate these finding from Arabic and Ancient Persian to modern medicine language.
5. Defining the categories [Figure 1] – All data were classified in three categories: definition (Stages 1, 2), etiology (Stage 3), and treatment (Stage 4, 5, 6) of Ā‘b murwārīd.” “Definition” was divided to these subcategories: name of disease (Stage 1), symptom and signs (Stage 2). “Treatment” was divided into recommendations to prevention (*Tadabir*) (Stage 4), food and drug treatments (Stage 5), and

manual intervention (Stage 6).<sup>[31]</sup> This article is focused on Stages 3–5.

6. Trustworthiness – Credibility, conformability, and dependability: Given the explanation of different stage of methods such as key words and coding process. Anyone who has the ability to read and understand Arabic and Ancient Persian language and texts, can derive similar results.
7. Transferability – According to the goals and results of this study, this issue is not considered.
8. Analyzing the results<sup>[31,32]</sup> – According to summative qualitative content analysis and given the skill of the authors of this article, we tried to collect all data about the prevention and treatment of cataract and categorized these findings into modern style, to achieve this goal: “These findings can be made available for new researches.”

## RESULTS

In Persian Medicine contexts, treatment strategies for all disease included three main categories: the first step of the treatment is a change in lifestyle (*ḥifẓi ṣiḥḥa*), the second step is medication (treatment by food and herbs single or in combination), and the final step is manual intervention and surgery.<sup>[15,28-30,33,34]</sup> According to Persian Medicine physicians (*ḥukamā*) doctrine,<sup>[35]</sup> the causes of cataract classified into four categories: physical factors, habits and inappropriate lifestyle, diseases, and age.<sup>[1,15,22-27,36-38]</sup>

1. Physical factors such as trauma and external exposure to cold or snowy weather
2. Habits and inappropriate lifestyle include:<sup>[28,30,34,39,40]</sup>
  - Consuming foods that produce steams, such as raw garlic and onion, cabbage, kohlrabi
  - Consuming foods that produce dense humors, such as beet, tick and sticky foods, pizza cheese, and pasty pottage
  - Sleep immediately after meal
  - Coitus immediately after meal
  - Heavy body lifting
  - Decanting of very hot water on the head
  - Continual eating wet foods and the foods that are difficult for digestion: compact food and polyphagia
  - Everything that cools brain temperament such as consumption of all type of milks, fishes, much fatty foods, vinegar and drunkenness, and oversleeping.
3. Disease – History of some diseases such as severe consecutive vomiting; chronic headache; severe bleeding; any chronic disease; human with cold temperament especially after chronic diseases; and obstruction in optic nerve
4. Age – The last factor, old age could be risk factors for

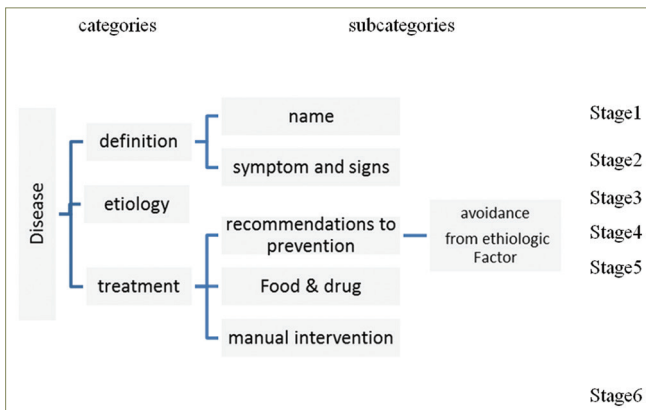


Figure 1: Definition of categories

visual weakness (normal aging process makes brain temperament to be cold).<sup>[15,23,27]</sup>

As a secondary result, decrease in the consumption of food which produces steam, and abstaining hard-digesting foods or foods that cool brain (make cold brain), and avoiding the exposure of severe cold to eyes, or trying to treat chronic headache, and decreasing of bleeding and avoiding the one-sided sleep in chronic patients during a long time are suggested to prevent or hinder cataract.

## DISCUSSION

Nowadays, new researches indicate significance treatment in cataract, but there is no proven therapy to either prevention of cataract formation or slowing progression of lens opacity once it develops.<sup>[8]</sup> However, observational studies suggest that some interventions may be helpful such as eating a healthy diet,<sup>[41-47]</sup> diets rich in lutein, zeaxanthin, and B Vitamins;<sup>[9,44,45,48]</sup> smoking is associated with a higher risk of developing nuclear cataract,<sup>[7,42,46,47,49-52]</sup> and postmenopausal estrogen use (longer than 10 years) may reduce the risk of nuclear cataracts.<sup>[53]</sup> Increased dietary glycemic load is not associated with risk for cataract,<sup>[47]</sup> and no studies have been performed to evaluate whether blood sugar control in patients with diabetes correlates with cataract risk. Multiple randomized trials have investigated whether vitamin supplementation can prevent cataracts.<sup>[43,44]</sup>

Despite this wide and varied range of researches on the prevention of cataracts, but there is no evidence that any particular type of change performance that can be prevent cataract or slow cataract progression.<sup>[43,44]</sup>

Whereas according to the Persian medicine texts, several items can be preventive for the creation of cataract including trauma (head and eye); external exposure to cold or snowy weather; eating foods that produce steams, such as raw garlic and onion, cabbage, and kohlrabi; eating foods that produce dense humors, such as beet, tick and sticky foods, pizza cheese, and pasty pottage; sleep after meal; coitus immediately after meal; heavy body lifting; decanting of very hot water on head; continual eating moist foods and the foods that is difficult for digestion; compact food and polyphagia; every things that cools brain temperament such as eating all type of milks, fishes, much fatty foods, vinegar; and drunkenness and oversleeping. Severe consecutive vomiting, chronic headache, severe bleeding, chronic disease; human with cold temperament, especially after chronic diseases and obstruction in the optic nerve.<sup>[15,22,23,25-27]</sup>

These results can be used as hypothesis for clinical researches that can help to reduce this disease. In this

study, we tried to collect etiology of cataract according to the viewpoint of Persian Medicine physicians. According to mentioned causes by Persian Medicine, some solution can be recommended to prevent cataract or hinder its development. It can mean that they have been used more commonly during centuries from 11 to 20 AD in TPM to prevent cataract. These results can be used as hypothesis for clinical researches that can help to reduce this disease.

This study has some weaknesses such as low number of books that are reviewed; lack of relevant studies in modern medicine. As a result, we could not provide a precise comparison between modern and TPM about cataract prevention.

## CONCLUSIONS

According to etiology and risk factors of cataract, there are wide range of preventive measures for cataract to be observed. Those preventive measures cannot be found in modern medicine. Changes in lifestyle such as abstinence from certain foods can prevent this disease. These results can be used as hypothesis for clinical researches that can help to reduce this disease.

## Conflicts of interest

There are no conflicts of interest.

## Authors' contribution

All authors contributed to this research.

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## REFERENCES

1. Sheikh Rezaee M, Jekar A, Moallemee M, Bonyadi A. A review on cataract in the cannon of medicine and Nur-al-uyun. *J Mazandaran Univ Med Sci* 2017;27:223-31.
2. Drinkwater JJ, Davis WA, Davis TM. A systematic review of risk factors for cataract in type 2 diabetes. *Diabetes Metab Res Rev* 2019;35:e3073.
3. Sreelakshmi V, Abraham A. Anthraquinones and flavonoids of *Cassia tora* leaves ameliorate sodium selenite induced cataractogenesis in neonatal rats. *Food Funct* 2016;7:1087-95.
4. Katzung BG, Basic and clinical pharmacology, 14<sup>th</sup> edition. McGraw-Hill Education medical; 2017.
5. Lindblad BE, Håkansson N, Philipson B, Wolk A. Metabolic syndrome components in relation to risk of cataract extraction: A prospective cohort study of women. *Ophthalmology* 2008;115:1687-92.
6. West SK, Valmadrid CT. Epidemiology of risk factors for age-related cataract. *Surv Ophthalmol* 1995;39:323-34.

7. Tang Y, Wang X, Wang J, Jin L, Huang W, Luo Y, *et al.* Risk factors of age-related cataract in a Chinese adult population: The Taizhou eye study. *Clin Exp Ophthalmol* 2018;46:371-9.
8. Truscott RJ, Friedrich MG. The etiology of human age-related cataract. Proteins don't last forever. *Biochim Biophys Acta* 2016;1860:192-8.
9. Devamanoharan PS, Henein M, Morris S, Ramachandran S, Richards RD, Varma SD. Prevention of selenite cataract by Vitamin C. *Exp Eye Res* 1991;52:563-8.
10. Gupta SK, Trivedi D, Srivastava S, Joshi S, Halder N, Verma SD. Lycopene attenuates oxidative stress induced experimental cataract development: An *in vitro* and *in vivo* study. *Nutrition* 2003;19:794-9.
11. Mathew JP, Thomas VC, Thomas I. Selenite cataract and its attenuation by Vitamin E in wistar rats. *Indian J Ophthalmol* 2003;51:161-70.
12. Javadzadeh A, Ghorbanihaghjo A, Bonyadi S, Rashidi MR, Mesgari M, Rashtchizadeh N, *et al.* Preventive effect of onion juice on selenite-induced experimental cataract. *Indian J Ophthalmol* 2009;57:185-9.
13. Baltussen R, Sylla M, Mariotti SP. Cost-effectiveness analysis of cataract surgery: A global and regional analysis. *Bull World Health Organ* 2004;82:338-45.
14. Zargarani A, Ahmadi SA, Daneshamouz S, Mohagheghzadeh A. Ancient Persian pharmaceutical vessels and tools in Iranian Archaeological Museums. *Pharm Hist (Lond)* 2012;42:68-71.
15. Bonyadi A, Mozaffarpur SA, Azadbakht M, Mojahedi M. The emergency of fritilla imperialis in written references of traditional persian medicine: A historical review. *Herb Med J* 2017;2:39-42.
16. Rezaeizadeh H, Alizadeh M, Naseri M, Ardakani M. The traditional Iranian medicine point of view on health and disease. *Iran J Publ Health* 2009;38:169-72.
17. Ibn sina (Avicenna) H. Canon of Medicine. Book 1 & 2. Beirut: Lebanon; 2009. (in Arabic).
18. Hamedi SH, Jokar A, Abbasian A. Viewpoints of Iranian Traditional Medicine (ITM) about etiology of constipation. *J Gastroint Dign Syst S* 2012;8:12.
19. Parvinroo S, Kamalinejad M, Sabetkasaei M. Pharmacological concepts of temperament in Iranian traditional medicine. *Iran J Public Health* 2014;43:1463-5.
20. Moknatjou R, Jokar A, Shokousadat H, Honarvar M. The noticeable therapeutical approaches of Iranian traditional medicine for Alzheimer disease. *Int J Med Plants* 2013;15:225-30.
21. Jokar A, Masoomi F, Sadeghpour O, Nassiri-Toosi M, Hamedi S. Potential therapeutic applications for *Terminalia chebula* in Iranian traditional medicine. *J Tradit Chin Med* 2016;36:250-4.
22. Masoomi F, Feyzabadi Z, Hamed S, Jokar A, Sadeghpour O, Toliyat T, Fakheri H. Constipation and laxative herbs in Iranian traditional medicine. *Iran Red Crescent Med J* 2016;18:e24574.
23. Yosefi SS, Moradi Kor N, Sadeghpour O, Jokar A, Askarfarashah M. New aspects to digestive process and importance of stomach a basic cause for disease. *Eur J Exp Biol* 2014;4:209-10.
24. Ahvazi AEA. Kamil-Sana'a al-Tibbiya . Lithograph Edition of Astan-e Quds-e Razavi. Mashhad, Iran; 1973. (in Arabic).
25. Jurjani SE. Zakhireh Kharazmshahi. Tehran: The Academy of Medical Science Islamic Republic of Iran Publisher; 2002.
26. Kermani NA. Sharhe Asbab. Tehran: Almai Publisher; 2001.
27. Jorjani Y, Abu ruh Muhammad bin Mansur. Nur Al-Uyun. Tehran: Miras-e Maktoob Publisher; 2013.
28. Arzani Hakim MA. Teb e Akbari.vol 2. Qom: Jalal Addin; 2008. p. 641-2.
29. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res* 2005;15:1277-88.
30. Azam Khan M. Exir Azam (Persian). Vol. 1. Tehran: Institute of Meical History, Islamic Medicine and Complementary Medicine; 2008. p. 65-198.
31. Alok S, Raveendran J, Shaheen M. Conflict management strategies used by Indian software companies: A summative content analysis. *IUP J Soft Skills* 2014;8:47.
32. Patton MQ. Qualitative evaluation checklist. *J of Evaluation checklists* project. 2003;21:10.
33. Aghili Khorasani Shirazi MH. Kholassat Al- Hekmeh(the principal's of traditional Iranian Medicine). Edited by Nazem E.Qom: Esmailian;2006. (in persian).
34. Ghods R, Gharooni M, Amin G, Nazem E, Nikbakht Nasrabadi A. Hypertension from the perspective of Iranian traditional medicine. *Iran Red Crescent Med J* 2014;16:e16449.
35. Arzani Hakim MA. Mofarah al-Gholoob. Lahore: Eslamiah; 1915. p. 297-325.
36. Nejabat M, Maleki B, Nimrouzi M, Mahbodi A, Salehi A. Avicenna and cataracts: A new analysis of contributions to diagnosis and treatment from the Canon. *Iran Red Crescent Med J* 2012;14:265-70.
37. Gilani MK. Hefz al- Sehat Naseri. Edited by Chooapani R. Tehran: Almaee Press; 2009.
38. Shabaninezhad E, Zargarani A, Mehdizadeh A, Khalili MR. Cataract in traditional Persian medicine manuscripts 9-11 Centuries AD (Canon, Mansuri-fi Teb and Ferdos al-Hekmah). *Bina J Ophthalmol* 2013;18:344-8.
39. Sedaghat F, Ghanavati M, Nezhad Hajian P, Hajishirazi S, Ehteshami M, Rashidkhani B. Nutrient patterns and risk of cataract: A case-control study. *Int J Ophthalmol* 2017;10:586-92.
40. Jorjani SE. Al- Aghraz al- Tebbieh val- Mabahes al-Alaiaa (medical Goals and Allia's Discussion). Edited by Tajbaksh H. 2<sup>nd</sup> ed. Tehran: Tehran university pub; 2009. (In persian).
41. Mares JA, Voland R, Adler R, Tinker L, Millen AE, Moeller SM, *et al.* Healthy diets and the subsequent prevalence of nuclear cataract in women. *Arch Ophthalmol* 2010;128:738-49.
42. Chang JR, Koo E, Agrón E, Hallak J, Clemons T, Azar D, *et al.* Risk factors associated with incident cataracts and cataract surgery in the age-related eye disease study (AREDS): AREDS report number 32. *Ophthalmology* 2011;118:2113-9.
43. Christen WG, Glynn RJ, Gaziano JM, Darke AK, Crowley JJ, Goodman PJ, *et al.* Age-related cataract in men in the selenium and Vitamin E cancer prevention trial eye endpoints study: A randomized clinical trial. *JAMA Ophthalmol* 2015;133:17-24.
44. Mathew MC, Ervin AM, Tao J, Davis RM. Antioxidant vitamin supplementation for preventing and slowing the progression of age-related cataract. *Cochrane Database Syst Rev* 2012;6:CD004567.
45. Moeller SM, Voland R, Tinker L, Blodi BA, Klein ML, Gehrs KM, *et al.* Associations between age-related nuclear cataract and lutein and zeaxanthin in the diet and serum in the carotenoids in the age-related eye disease study, an ancillary study of the women's health initiative. *Arch Ophthalmol* 2008;126:354-64.
46. Reddy AK, Patnaik JL, Miller DC, Lynch AM, Palestine AG, Pantheva MB. Risk factors associated with persistent anterior uveitis after cataract surgery. *Am J Ophthalmol* 2019. pii: S0002-9394 (19) 30068-6.
47. Schaumberg DA, Liu S, Seddon JM, Willett WC, Hankinson SE. Dietary glycemic load and risk of age-related cataract. *Am J Clin Nutr* 2004;80:489-95.
48. Glaser TS, Doss LE, Shih G, Nigam D, Sperduto RD, Ferris FL 3<sup>rd</sup>, *et al.* The association of dietary lutein plus zeaxanthin and B vitamins with cataracts in the age-related eye disease study: AREDS report no 37. *Ophthalmology* 2015;122:1471-9.
49. Lindblad BE, Håkansson N, Wolk A. Smoking cessation and the risk of cataract: A prospective cohort study of cataract extraction among men. *JAMA Ophthalmol* 2014;132:253-7.
50. Andrade C. Antidepressants, mood stabilizers, antipsychotics, and the risk of cataract. *J Clin Psychiatry* 2019;80. pii: 19f12744.
51. Leske MC, Chylack LT Jr, Wu SY. The lens opacities case-control study. Risk factors for cataract. *Arch Ophthalmol* 1991;109:244-51.
52. Singh S, Pardhan S, Kulothungan V, Swaminathan G, Ravichandran JS, Ganesan S, *et al.* The prevalence and risk factors for cataract in rural and urban India. *Indian J Ophthalmol* 2019;67:477-83.
53. Lai K, Cui J, Ni S, Zhang Y, He J, Yao K, *et al.* The effects of postmenopausal hormone use on cataract: A meta-analysis. *PLoS One* 2013;8:e78647.