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Original Article

Cataracts among Adults Aged 30 to 49 Years: A 10-Year Study from 1995 to 2004 in Korea

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Purpose: To investigate the long-term characteristics of cataracts among adults aged 30 to 49 years in Korean over a span of 10 years.

Methods: Subjects between the ages of 30 to 49 years who underwent cataract surgery at St. Mary's Hospital from 1995 to 2004 (n = 976) were included. Patients with a history of ocular trauma, uveitis, other ocular or systemic diseases, and congenital cataracts were excluded. Additional information including type of lens opacity, urban/rural region, and pre- and postoperative visual acuities were analyzed. Lens opacity grading was conducted using Lens Opacity Classification System III. The Cochran-Armitage proportion trend test was used to analyze vision changes with the passage of time.

Results: Among the patients who had undergone cataract surgeries, 8.8% (976 / 11,111) met the inclusion criteria. The mean age was 41.7 ± 5.45 years. Gender breakdown of the patient population included 79.0% male and 21.0% female. In terms of home environment, 60.9% were from an urban region and 39.1% from a rural region. Opacity type included anterior polar (AP), posterior subcapsular (PSC), AP and PSC, cortical, and nuclear in 35.7%, 35.1%, 7.0%, 6.0%, and 5.4% of patients, respectively. At a 2-month postoperative follow-up appointment, 92.7% of patients showed a best-corrected visual acuity of more than 20 / 40.

Conclusions: Predominance of AP and PSC opacities as well as male patients was observed in this study population.

Key Words: Anterior polar opacity, Epidemiology, Korea, Posterior subcapsular opacity

There have been many studies on the characteristics and epidemiology of senile cataracts in Asians [1,2], blacks [3,4], and non-Hispanic whites [5-8] worldwide. Senile cataracts, also referred to as age-related cataracts, generally refer to cataracts occurring in adult patients aged greater than 60 years. A study of individuals aged 40 or older in Beijing, China found a cataract prevalence of 53.1% [9]. A survey of subjects at least 65 years of age in Shih-Pai, Taiwan demonstrated a cataract prevalence of 59.2% [10]. Additionally, a study of adults aged 21 years or older in Sumatra, Indonesia revealed a cataract prevalence of 23.0% [11]. In most studies cataract patients were greater than 60 years of age. It is notable that age is the most important risk factor for the development of cataracts [9,11]. Song et al. [12] reported the prevalence of cataracts in Korean patients over 20 years of age between 1994 to 2005 as 13.98% and the prevalence sharply increased in people aged 60 years or older in the study. According to a recent report of eye diseases from the Korea National Health and Nutrition Examination Survey [13], the prevalence of cataracts in participants over 19 years of age was 24.1%. On the other hand, congenital cataracts with or without ocular and/or systemic disorders have been reported by various studies [14-18]. However, congenital cataracts are also associated

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with several intrauterine infections [19,20].

In some studies [12,13] the prevalence of cataracts in specific age ranges has been demonstrated. However, to our knowledge, patients with cataracts aged 30 to 49 years in Korean have not been studied in detail over a long period of time. We assumed this population to have different characteristics compared to senile or congenital cataract patients in other races in many aspects. The purpose of this study is to investigate the long-term characteristics of cataracts among adults between the ages of 30 to 49 years in a Korean population over a study period of 10 years.

Materials and Methods

Subjects between the ages of 30 to 49 years who received cataract surgery at St. Mary's Hospital from 1995 to 2004 (n = 976) were included in this study. Medical records were evaluated retrospectively. Patients with a history of ocular trauma, uveitis, ocular or systemic diseases other than diabetes and hypertension, congenital cataracts, and those who received combined surgeries were excluded. The type of lens opacity, urban/rural region, and preoperative and postoperative visual acuities were analyzed. Seoul, the capital of Korea, is the largest city in the country and is home to 25% of the entire Korean population, was regarded as an urban region. Other cities and provinces outside of Seoul, Korea were considered to be rural regions.

Ocular examinations

Using a slit lamp biomicroscope, two ophthalmologists (KSN and SKC) of St. Mary's Hospital, The Catholic University of Korea examined the anterior segment of both eyes. The eye that required cataract surgery was considered for this study. The pupils of all other subjects were dilated with topical tropicamide/phenylephrine hydrochloride (Mydrin-P; Santen, Osaka, Japan) eye drops until the pupil diameter was at least 7.0 mm. Nuclear opalescence and brunescence were assessed with a narrow slit beam and cortical and posterior subcapsular (PSC) opacities were assessed with retroillumination. Lens opacity grading was conducted using the internationally recognized objective lens grading system, Lens Opacity Classification System III (LOCS III) [21]. The two ophthalmologists compared the lens opacities to standard LOCS III photographs.

Definitions of cataract

The LOCS III is a systemic method of grading the severity of lens opacities according to photographic standards using four major characteristics: nuclear opalescence, nuclear color, cortical cataract, and PSC cataract. A cataract was defined as a LOCS III score of 4 or more for nuclear opalescence or nuclear color, a LOCS III score of 2 or more for a cortical cataract, and a LOCS III score of 2 or more for a PSC cataract. We also analyzed distinct types of cataracts: nuclear only, cortical only, PSC only, or mixed. Additionally, anterior polar (AP) type subcapsular opacities were evaluated because they are frequently found in this age group. An AP opacity was defined as a subcapsular opacity at the center of the pupil seen in the non-dilated and dilated states. In our study, due to the large percentage of AP and PSC opacities a mixed type lens opacity (AP + PSC) category was created to compare the percentage of patients with cortical only or nuclear only type opacities. The mixed type opacity was thus defined as a combination of nuclear and cortical opacities without a AP or PSC opacity component.

Operating procedure

Operating procedures included either phacoemulsification or extracapsular cataract extraction with intraocular lens implantation under local anesthesia.

Statistical analysis

The Cochran-Armitage proportion trend test technique was used to identify changes of each parameter with the passage of time. The results assume that the proportions follow a linear trend on the logistic scale. The quoted *p*-values are 2-sided and were considered to be statistically significant when calculated to be <0.05. Data analysis was conducted using SAS ver. 9.1 (SAS Institute, Cary, NC, USA).

Results

Epidemiology

A total of 11,111 patients underwent cataract surgery in our hospital from 1995 to 2004. Of the 11,111 patients, only

976 subjects (8.8%) met the inclusion criteria. The overall mean age was 41.7 ± 5.45 years. Patient demographics are listed in Table 1. Male patients accounted for the majority of the patient population, 79.0% (771 / 976), while female patients accounted for 21.0% (205 / 976) of the study population. In terms of home environment, 60.9% (594 / 976) of subjects were from an urban region and 39.1% (382 / 976) were from a rural region.

The proportion of adults with cataracts aged 30 to 49 years from 1995 to 2004 was 11.5%, 9.7%, 9.2%, 7.9%, 8.7%, 10.4%, 6.5%, 7.4%, 12.1%, and 5.9%, respectively in each year. The proportion of adults with cataracts displayed a statistically significant decrease with the passage of time ($p = 0.0002$) (Fig. 1). The proportion of male patinets from each year showed statistically significant decrease with the passage of time ($p = 0.0002$). The proportion of total female patients from each year showed no statistically significant trend with the passage of time ($p = 0.0599$).

Lens opacities

The most common lens opacities were AP opacities (35.7%, 348 / 976) and PSC opacities (35.1%, 343 / 976). Mixed AP and PSC opacities (7.0%, 68 / 976), cortical opacities (6.0%, 59 / 976), and nuclear opacities (5.4%, 53 / 976) followed in descending order. Of note, the mixed AP and PSC opacities were more common than cortical opacities or nuclear opacities alone (Fig. 2). Mixed nuclear and cortical type lens opacities accounted for 10.8% (105 / 976) of the study population.

Among the proportions of lens opacity types, the proportion of mixed AP and PSC opacities showed a statistically significant decrease with the passage of time ($p < 0.0001$) while the proportion of cortical opacities displayed a statistically significant increase with the passage of time ($p < 0.0001$). Other proportions of lens opacity types did not show any statistical significance. The Cochran-Armitage test results of other lens opacities and the previously discussed elements are demonstrated in Table 2.

Others

The percentage of subjects with a preoperative best-corrected visual acuity (BCVA) less than 20 / 40 was 73.2% (714 / 976). After a postoperative period of 2 months, 92.7% (905 / 976) subjects showed a BCVA of more than 20 / 40. The shortest follow up period was 2 months and some patients are still being followed presently.

Discussion

In this study, the percentage of subjects who underwent cataract surgery aged 30 to 49 years was 8.8% (976 / 11,111). This number is much less than previously mentioned in the Kim study [12] that reported a prevalence of cataracts in patients older than 20 years old as 13.98% or the prevalence of cataracts in patients over 19 years of age from the Korea National Health and Nutrition Examination Survey [13] that was found to be 24.1%. Although the proportion is different from the prevalence, this result suggests that age is the most important risk factor for the development of cataracts [9,11].

Since there are few reports regarding the epidemiology of cataracts among adults aged 30 to 49 years, it is difficult to compare the prevalence of cataracts in Korea with other countries. However, the prevalence of cataracts in patients aged 40 to 49 years old have been reported as 7.0% [2] and 6.5% [9] in two Chinese studies. Considering the fact that the prevalence of cataracts is lower in younger subjects, the 8.8% of 30 to 49 years old in this study, which did in-

Table 1. Demographics of the patients aged 30 to 49 years old who underwent cataract surgery over a 10-year period in Kore

		Subject aged 30 to 39 years	Subject aged 40 to 49 years	Total subjects
Mean age (yr)		36.2	45.3	41.7
Sex	Male	299 (78.7)	472 (79.2)	771 (79.0)
	Female	81 (21.3)	124 (20.8)	205 (21.0)
Region	Urban	216 (56.8)	378 (63.4)	594 (60.9)
	Rural	164 (43.2)	218 (36.6)	382 (39.1)

Values are presented as number (%).

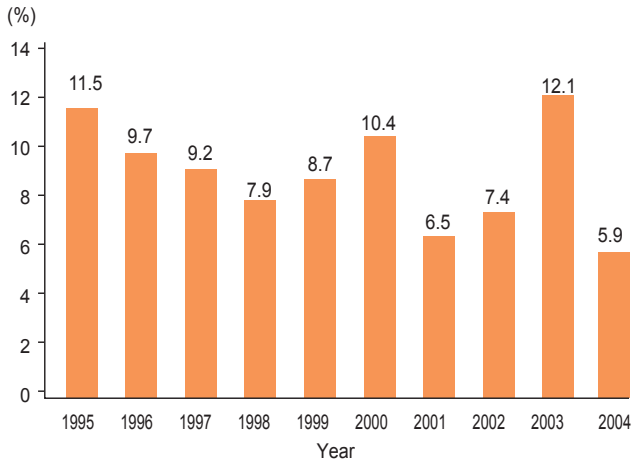

Fig. 1. Changes of the proportion of adults with cataracts aged 30 to 49 years over 10 years. The proportion of adults aged from 30 to 49 years who underwent cataract surgery displayed statistically significant decrease in the prevalence of cataracts as time progressed (Cochran-Armitage test, $p = 0.0002$).

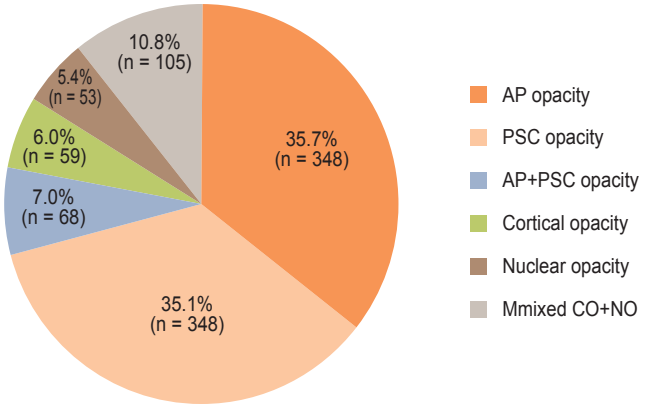

Fig. 2. The proportion of each type of lens opacity in adults aged from 30 to 49 years who underwent cataract surgery. Anterior polar (AP) opacity (35.7%, 348 / 976) and posterior subcapsular (PSC) opacity (35.1%, 343 / 976) were the most common type of lens opacity among all subjects. Mixed AP and PSC opacities (7.0%, 68 / 976) were more common than cortical opacities (6.0%, 59 / 976) alone or nuclear opacities (5.4%, 53 / 976) alone. Mixed nuclear and cortical type lens opacities accounted for 10.8% (105 / 976) of the total opacity types. CO = cortical opacity; NO = nuclear opacity.

Table 2. Changes in proportion of demographic factors over the 10 year study period in adults aged 30 to 49 years who underwent cataract surgery in Korea

Changes of parameters over 10 years	*p*-value/statistical significance
Cataracts among adults aged 30 to 49 years	0.0002/decreased
Male (n = 771)	0.0002/decreased
Female (n = 205)	0.0599/no significance
AP opacity (n = 348)	0.0901/no significance
PSC opacity (n = 343)	0.7223/no significance
Mixed AP and PSC opacity (n = 68)	<0.0001/decreased
Cortical opacity (n = 59)	<0.0001/increased
Nuclear opacity (n = 53)	0.2897/no significance

Cochran-Armitage Trend test. n indicates the total number of patients of each sex and lens opacity type over 10 years.
AP = anterior polar; PSC = posterior subcapsular.

clude younger subjects, seems to be higher than other Chinese studies. The prevalence of cataracts among patients aged 30 to 49 years was 12.8% in the Korea National Health and Nutrition Examination Survey [13], which is greater than the proportion found in our study. A possible explanation for this is that all patients with cataracts may not have undergone surgery.

In this study, male subjects made up 79.0% of the patient population and and females accounted for 21.0%, which is a noticeable male predominance of the study population. The most common type of lens opacity was the AP opacity (35.7%), which is a rare condition outside of Korea. Kim and Joo [22] demonstrated that the prevalence of AP opacities in Korea was high in comparison with other countries and was significantly higher in males. According to the study of Kim et al. [23], AP opacities were much more common in males (81.4%) and in those younger than 40 years (45.4%) in a Korean population. The racial factor of Koreans is considered to have affected our results such that the proportion of adults aged 30 to 49 years with cataracts was relatively higher with a predominance of AP opacities and male subjects than other races.

The AP opacity is limited to the anterior subcapsular area and the resultant lens opacity occurs in a relatively small area. This opacity, however, induce severe visual disturbance [24]. As shown by our results, AP opacities

occurred mainly in males aged 30 to 49 years and caused severe vision impairment in this active population and led to heavy social and economic losses. The AP opacity and PSC opacity had greater subjective and objective effects on vision more so than other lens opacity types [25-29], such that cataract surgical intervention is indicated at earlier stages [30,31]. This may be another reason why in our study, most subjects (70.8%) between 30 to 49 years of age who received cataract surgeries had either an AP or PSC opacity.

Many studies have investigated the epidemiology of cataracts in different races and at different ages [2,9,10,32]. Subjects of these studies were at least 40 years and older in Singapore, China, Taiwan, and Australia. These studies all showed predominance of the nuclear opacity and more females than males, which were different from the results of our study. In older subjects of various races, even in other Asian races, the results were also different compared with the present study. However, the prevalence of cataracts increased with age in all of these studies, which is consistent with our study results. Thus, it is likely that age affects the development of cataracts in all ages and races.

The overall proportion of cataracts among adults aged 30 to 49 years showed statistically significant decreases with the passage of time (Cochran-Armitage test, p = 0.0002). Due to the wide distribution of ophthalmic services and the development of cataract surgery, authors hypothesized that the rate of cataract surgery in this age group would increase with the passage of time. However, the results were the opposite of our expectations. The Korean society is getting older and the proportion of young people is getting smaller as time progresses. According to the census taken by the Korean Statistics Department the proportion of the population aged 30 to 49 years decreased to 31.16% in 2005 from 34.51% in 1995. It seems that the aging social trend has been reflected to our results.

One of the limitations of our study is that the subjects were not representative of the general population, but rather patients who underwent cataract surgeries. Therefore, the data may show some differences with the general population and more vision threatening lens opacity types may have been overrepresented, which may have resulted in an underestimate of nuclear or cortical opacities. However, considering the lower prevalence of cataracts in the younger age group and only severe visual disturbances may lead to ophthalmological examination, it seems reasonable to select subjects who have undergone cataract surgery for the purpose of larger data collection.

The population of the present study was not evenly distributed throughout the nation. However, nearly 40% of subjects were from a rural area, which is a considerable proportion regarding that the location of the hospital in Seoul, Korea. Since Korea is a racially homogeneous nation and data from rural areas was substantially included, the regional differences seem to have little influenced on the study population.

In conclusion, our results have revealed long-term characteristics and changes in the prevalence of cataracts among adults aged 30 to 49 years in Korea over a 10-year study period. The proportion of patients with cataracts this age group was relatively higher and had a predominance of AP and PSC opacities as well as male patients in comparison with studies of senile cataracts in other races. Further studies on the assessment of the risk factors and studies based on the general population with larger sample numbers are required to substantiate these results.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

References

1. Hu TS, Zhen Q, Sperduto RD, et al. Age-related cataract in the Tibet Eye Study. *Arch Ophthalmol* 1989;107:666-9.
2. Seah SK, Wong TY, Foster PJ, et al. Prevalence of lens opacity in Chinese residents of Singapore: the tanjong pagar survey. *Ophthalmology* 2002;109:2058-64.
3. West SK, Munoz B, Schein OD, et al. Racial differences in lens opacities: the Salisbury Eye Evaluation (SEE) project. *Am J Epidemiol* 1998;148:1033-9.
4. Leske MC, Connell AM, Wu SY, et al. Prevalence of lens opacities in the Barbados Eye Study. *Arch Ophthalmol* 1997;115:105-11.
5. Sperduto RD, Hiller R. The prevalence of nuclear, cortical, and posterior subcapsular lens opacities in a general population sample. *Ophthalmology* 1984;91:815-8.
6. Adamsons I, Munoz B, Enger C, Taylor HR. Prevalence of lens opacities in surgical and general populations. *Arch*

Ophthalmol 1991;109:993-7.
7. Klein BE, Klein R, Linton KL. Prevalence of age-related lens opacities in a population. The Beaver Dam Eye Study. *Ophthalmology* 1992;99:546-52.
8. Mitchell P, Cumming RG, Attebo K, Panchapakesan J. Prevalence of cataract in Australia: the Blue Mountains eye study. *Ophthalmology* 1997;104:581-8.
9. Xu L, Cui T, Zhang S, et al. Prevalence and risk factors of lens opacities in urban and rural Chinese in Beijing. *Ophthalmology* 2006;113:747-55.
10. Tsai SY, Hsu WM, Cheng CY, et al. Epidemiologic study of age-related cataracts among an elderly Chinese population in Shih-Pai, Taiwan. *Ophthalmology* 2003;110:1089-95.
11. Husain R, Tong L, Fong A, et al. Prevalence of cataract in rural Indonesia. *Ophthalmology* 2005;112:1255-62.
12. Song KJ, Han MY, Kim SY, et al. Prevalence estimation of cataract based on a screening test. *J Korean Ophthalmol Soc* 2007;48:768-73.
13. Yoon KC, Mun GH, Kim SD, et al. Prevalence of eye diseases in South Korea: data from the Korea National Health and Nutrition Examination Survey 2008-2009. *Korean J Ophthalmol* 2011;25:421-33.
14. Zetterstrom C, Lundvall A, Kugelberg M. Cataracts in children. *J Cataract Refract Surg* 2005;31:824-40.
15. Jain IS, Pillay P, Gangwar DN, et al. Congenital cataract: etiology and morphology. *J Pediatr Ophthalmol Strabismus* 1983;20:238-42.
16. Bardelli AM, Lasorella G, Vanni M. Congenital and developmental cataracts and multimalformation syndromes. *Ophthalmic Paediatr Genet* 1989;10:293-8.
17. Cassidy L, Taylor D. Congenital cataract and multisystem disorders. *Eye (Lond)* 1999;13(Pt 3b):464-73.
18. Sachdev N, Tiakumzuk S, Aulakh R, Brar GS. Anomalous bilateral lateral rectus muscles and anterior polar cataract with dysmorphic features. *J AAPOS* 2009;13:319-21.
19. Melamed J, Eckert GU, Spadoni VS, et al. Ocular manifestations of congenital toxoplasmosis. *Eye (Lond)* 2010;24:528-34.
20. Sharan S, Sharma S, Billson FA. Congenital rubella cataract: a timely reminder in the new millennium? *Clin Experiment Ophthalmol* 2006;34:83-4.
21. Chylack LT Jr, Wolfe JK, Singer DM, et al. The lens opacities classification system III: the Longitudinal Study of Cataract Study Group. *Arch Ophthalmol* 1993;111:831-6.
22. Kim H, Joo CK. The prevalence and demographic characteristics of anterior polar cataract in a hospital-based study in Korea. *Korean J Ophthalmol* 2008;22:77-80.
23. Kim HJ, Park JW, Joo CK. An epidemiological study of the risk factors associated with anterior polar cataract. *J Korean Ophthalmol Soc* 2003;44:606-14.
24. Majima K, Majima Y. Histopathological and cell biological analyses of the formation mechanism of anterior polar cataract. *Ophthalmologica* 1999;213:34-9.
25. Hess R, Woo G. Vision through cataracts. *Invest Ophthalmol Vis Sci* 1978;17:428-35.
26. Cinotti AA. Evaluation of indications for cataract surgery. *Ophthalmic Surg* 1979;10:25-31.
27. Jaffe NS. Glare and contrast: indications for cataract surgery. *J Cataract Refract Surg* 1986;12:372-5.
28. Koch DD. Glare and contrast sensitivity testing in cataract patients. *J Cataract Refract Surg* 1989;15:158-64.
29. Neumann AC, McCarty GR, Steedle TO, et al. The relationship between cataract type and glare disability as measured by the Miller-Nadler glare tester. *J Cataract Refract Surg* 1988;14:40-5.
30. Stifter E, Sacu S, Benesch T, Weghaupt H. Impairment of visual acuity and reading performance and the relationship with cataract type and density. *Invest Ophthalmol Vis Sci* 2005;46:2071-5.
31. Stifter E, Sacu S, Weghaupt H. Functional vision with cataracts of different morphologies: comparative study. *J Cataract Refract Surg* 2004;30:1883-91.
32. McCarty CA, Mukesh BN, Fu CL, Taylor HR. The epidemiology of cataract in Australia. *Am J Ophthalmol* 1999;128:446-65.