



# Cataract prevalence in Central-West region of São Paulo State, Brazil

*Prevalência de catarata na região centro-oeste do Estado de São Paulo, Brasil*

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## ABSTRACT

**Purpose:** Cataract is considered the main preventable cause of blindness and visual impairment mainly in poor countries. This study was done to evaluate if cataract is still an important cause of blindness in Central-West region of State of São Paulo, Brazil. **Methods:** A cross-sectional study was conducted with a systematically randomized sample of households in five cities located in Central-West region of São Paulo State, Brazil. The sample consisted of 4,229 individuals (8,458 eyes) of all ages. All household members were considered eligible. They were submitted to a complete ophthalmological examination (visual acuity with and without visual correction, biomicroscopy, fundoscopy, tonometry, and refractometry). Cataract diagnosis was given to eyes presenting lens opacity in biomicroscopy exam, according to Lens Opacities Classification System II (LOCS II). Eye with a best correction, presenting visual deficiency or blindness caused by cataract was considered after excluded other pathologies that decrease visual acuity (VA). We considered as visual deficiency eyes with  $0.05 < VA \leq 0.3$  and as blind eyes with  $VA \leq 0.05$ . Visual impairment was considered for individuals with  $0.05 < VA \leq 0.3$  in the best eye, with the best correction and blindness for individuals with  $VA \leq 0.05$  in the best eye, with the best correction. We considered the number of eyes with cataract, the number of eyes with visual deficiency and blindness and the number of individuals with visual deficiency and blindness. Occurrence frequency was evaluated for eyes separately and together. **Results:** Cataract frequency in this population was 4.94% (209 individuals), affecting mainly people over 50<sup>th</sup>s (92.34%) and females (61.11%). Cataract was the cause of visual impairment for 0.96% and blindness for 0.52% of the total population. **Conclusion:** Our results showed that cataract prevalence in studied region population of the is similar to developed countries.

**Keywords:** Cataract/epidemiology; Visually impaired persons; Blindness; Brazil

## INTRODUCTION

Cataract is the main treatable cause of blindness all over the world and still is responsible for more than 75% of world blindness<sup>(1-3)</sup>.

Blindness from cataract incapacitates individuals, increases their dependency, reduces their social condition, authority within the family and community, and leads to early retirement. Vision restoration by cataract surgery has economical and social benefits for the family, the individual, and the society. Studies have shown that cataract operations increased the carrier annual productivity by around 1500% of surgery's cost<sup>(4)</sup>.

Developed countries are substantially increasing their surgical capacity. This is mainly due to facoemulsification techniques<sup>(5)</sup>.

Several causes determine the existence of cataracts; they include trauma, association with systemic diseases or drug use, consequence of other diseases, and possible congenital disorders, but the most common cataract etiology is related to senility.

Due to population increased life expectancy, few countries have managed to eradicate cataract blindness<sup>(6)</sup>, mainly in less favored areas and in marginalized population groups<sup>(7)</sup>.

The estimation for developing countries is that the prevalence of blindness from cataracts varies from two to five thousand people per million. Although they are not managing to increase the number of operations at the same rate as countries mainly due to developed high costs of facoemulsification; the aging population rate in less developed countries is also higher and populations over 65 are expected to double in the next 20 years<sup>(8)</sup>.

In Brazil over 50's population is estimated to be between around 10% and 13% of country's 160 million inhabitants. Estimating that 2% of those over 50's require this operation, it would be necessary to treat 360,000 people<sup>(4)</sup>.

As Brazil is a continental country, it has enormous cultural diversities and each region has its own socio-economic profile. Each region can have extreme development rates, next to those of poor or developed countries.

Despite this, in recent years many assorted forms of intervention in Brazilian population had been done, with government projects looking for and treating those with cataracts. It is therefore important to know whether cataracts continue to be an important cause of poor vision and blindness in our region.

The objective of this study was to establish the current prevalence of cataracts in our region, comparing our results with the disease's context in our country and in the world.

## METHODS

This study was a population-based, cross-sectional ophthalmic household randomized survey, performed in five cities from Center-West region of the State of São Paulo, for which the reference center is Botucatu city, Brazil. Botucatu is a municipality located 225 km from São Paulo, the state capital and 898 km from Brasília. It lies at 22°53'09" S, 48°26'42" W and has a total of 1486.4 km<sup>2</sup>. The main aims of this project were to estimate prevalence and causes of cataract of people in this region.

The eligible population consisted of permanent, non-institutionalized residents of this region over the age of 1 year. The participants were selected using a random, stratified, household cluster sampling technique, done systematically according to local census data<sup>(9)</sup>: the first house was selected randomly; the next house was the sixth house on the even-numbered side of the street and so on, successively. If the chosen dwelling was uninhabited or refused to participate, the first

house to the right was selected. If the next household refused to participate, the first house to the left of the initial house was selected, and so on, successively. All persons of the household inhabitants were eligible to participate in the study.

The established sample was composed of 5,555 individuals, of which 4,229 (8,458 eyes) were examined (78% of the intended sample).

## Data collection

Data collection of this study lasted 2 years and was carried out in the years 2005 and 2006, using the Mobile Ophthalmology Unit belonging to Botucatu School of Medicine - UNESP. All study personnel underwent training and all procedures were standardized prior to onset. Specific observations were performed by 1-2 members of the team in order to minimize interobserver variability. A medical and ophthalmic history was obtained from each patient in Portuguese by qualified health care workers using a closed question protocol and containing age, gender, acuity, and ophthalmological data.

Each participant then received a comprehensive vision and eye examination which uncorrected visual acuity (VA) was measured for the right eye followed by the left with a consistently illuminated illiterate E Snellen chart at 5 meters. The VA was then retested with the patients existing refraction. Near vision was assessed with a Jaeger chart at 25 to 30 cm with and without a reading addition. If the corrected VA was less than 1.0, a subjective refraction using standard protocols was performed and the best corrected visual acuity (BCVA) recorded using the result of this refraction. If the subject was unable to read the largest letter at 5 meters with the subjective refraction, testing was repeated at 1 meter. If they were unable to read the largest letter at 1 meter then the VA was recorded as count fingers (CF), hand movements (HM), light perception (LP) or no light perception (NLP). The intraocular pressure (IOP) was measured using a noncontact pneumotonometer (CT-60 computerized tonometer, Topcon, Tokyo, Japan) and the mean of 3 measurements was recorded. If the IOP was higher than 25 mmHg then the measurements were repeated using a Goldman tonometer attached to the slit lamp. Slit lamp biomicroscopy (BQ-900, Haag Streit, Bern, Switzerland) was performed, followed by pupil dilatation with 1% tropicamide. The subjects then underwent ophthalmic fundus examination using the indirect ophthalmoscopy at the slit lamp with a 90 D Volk lens and then using a Schepens indirect binocular ophthalmoscope with a 20 D Volk lens.

The patient was then evaluated by an automatic refractor and subjective refraction, noting VA of each eye results after the test. VA was classified into four categories: VA > 0.7; 0.3 < VA < 0.7; 0.05 < VA < 0.3; and VA < 0.05. Optical correction was prescribed as showed VA improvement after refraction.

Cataract diagnosis was given to eyes presenting lens opacity in biomicroscopy exam, according to Lens Opacities Classification System II (LOCS II).

Eyes with best correction, presenting visual deficiency or blindness caused by cataract were considered after excluded

other pathologies that decrease the visual acuity. We considered visual deficiency eyes with  $0.05 < VA \leq 0.3$  and as blind eyes with  $VA \leq 0.05$ .

Visual deficiency was considered for individuals with  $0.05 < VA \leq 0.3$  in the best eye, with best correction and blindness for individuals with  $VA \leq 0.05$  in the best eye, with the correction.

We also decided to consider the number of eyes with cataract, and the number of blind or visual impaired eyes as well as the number of individuals with blindness and or visual deficiency.

Collected data was transferred to a Microsoft Excel spreadsheet to analyze cataract prevalence in study population for both eyes and for individual eyes. The remaining data were evaluated according to descriptive statistics, frequency analysis, and concordance proportion, with a 95% confidence interval.

**RESULTS**

We detected 209 individuals with cataracts in studied population resulting in a cataract prevalence of 4.94%.

Most of those presenting cataract were over 50 years old (92.34%) (Graph 1).

With regard to gender, most of those with cataracts were female (61.1%) (Graph 2).

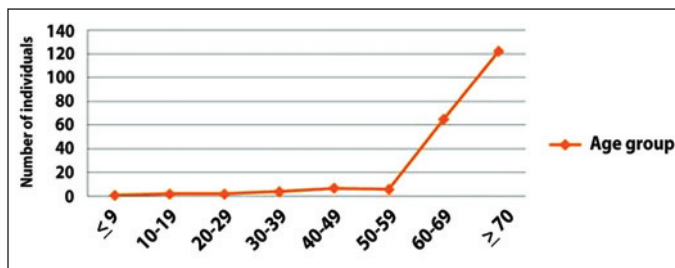
Graph 3 shows the population distribution according to visual acuity without visual correction in each eye.

Correcting the refractive errors, VA improved in some individuals, increasing the number with normal VA, according to the Snellen chart (Graph 4).

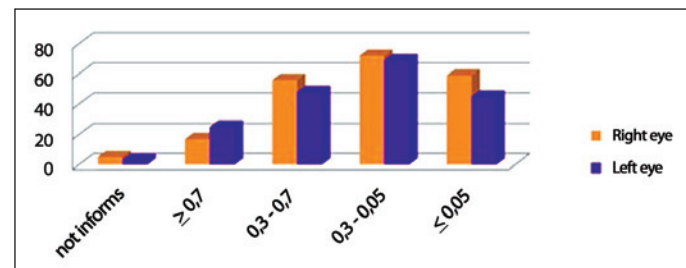
There were 209 individuals with cataracts in the studied population. However, evaluating cataract as the cause of poor vision, this number reduced to 110.

Some inferences were made from these data. Analyzing the 4,229 individuals, 209 had cataract and 110 had cataract with visual deficiency or blindness. Analyzing those 110 individuals, 47 individuals (42.73%) had visual deficiency or blindness just in one eye and 63 individuals (57.27%) had visual deficiency or blindness in both eyes. Analyzing those 63 individuals, 33 individuals (52.38%) had both eyes with visual deficiency, 8 individuals (12.69%) had one eye blind and the other with visual deficiency, and 22 individuals (34.92%) had both eyes blind. Analyzing the 8,458 eyes, we found 355 (4.19%) eyes with lens opacity, 173 eyes (2.04%) with cataract and visual deficiency or blindness. Analyzing those 173 eyes, 108 eyes (62.43%) had visual deficiency and 65 eyes (37.57%) were blind.

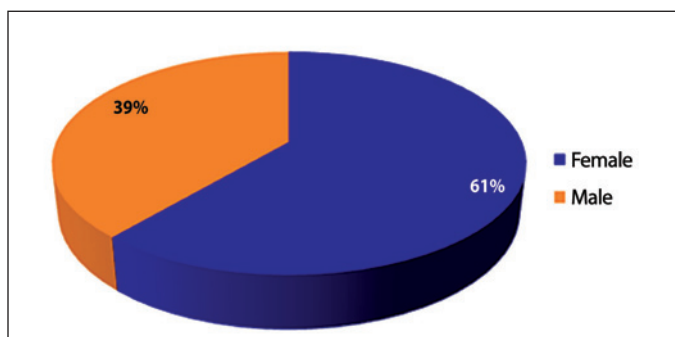
Evaluation of the number of those with visual deficiency, defined as individuals with  $VA \geq 0.3$  and  $VA < 0.05$  in the better eye with the better visual correction, in relation to general population, or to the total evaluated, the prevalence of visual deficiency was 0.96% (41 individuals). Evaluating those with cataract blindness, defined as individuals with  $VA \leq 0.05$  in the better eye with the better visual correction, prevalence of cataract causing blindness in the general population was 0.52% (22 individuals).



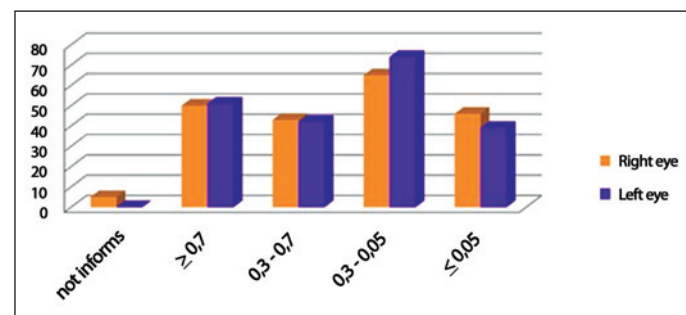
Graph 1 - Cataract carriers according to age group - UNESP, Botucatu - 2008



Graph 3 - Population distribution according to visual acuity without visual correction in each eye - UNESP, Botucatu - 2008



Graph 2 - Cataract carriers according to gender - UNESP, Botucatu - 2008



Graph 4 - Population distribution according to visual acuity with visual correction in each eye - UNESP, Botucatu - 2008

These accounts were made excluding those with other complaints that could have jeopardized their poor vision and that could have been worse than lens opacity, there were 99 individuals (2.34%) with cataracts and other complaints. Besides cataract, there are other concomitant diseases, as age related macular degeneration, chorioretinitis scars, advanced glaucoma and pterygium, that may affect visual acuity and, even cataract removal, patients may not get any visual improvement.

So although cataract was diagnosed in 209 individuals, a complete ocular and systemic evaluation pointed out just 110 patients that could really improve their vision and were referred for surgery. 78.18% of those identified (86 individuals) underwent surgery.

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### DISCUSSION

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Data on cataract prevalence are difficult to be compare because samples are variable according to prevalence rates in groups of people or in different age groups.

Although we observed a 4.94% prevalence of cataract in this population, the prevalence of cataract as the cause of blindness adopting the WHO definition which considers visual acuity lower than 0.05 in the better eye, cataract is only responsible for 0.96% of visual deficiency and 0.52% of blindness in the studied region.

Observing data from other Brazilian regions and developing countries, the prevalence of blindness from cataract in the general population is much higher than what was seen here, with 1.49% in the metropolitan region of São Paulo<sup>(10)</sup>, 2.11% in a Brazilian indigenous group from Amazonia<sup>(11)</sup>, 2.61% of the whole population in Cambodia<sup>(2)</sup>; 4.26% in Nigeria<sup>(12)</sup>; 1.17% of the over 50 population in Ruanda and Kenya<sup>(13)</sup>; and 2.01% of over 50's in Paraguay<sup>(14)</sup>.

Compared to other Latin American countries, our data is similar to the metropolitan area of Buenos Aires that has 0.5% of bilateral blindness caused by cataract<sup>(15)</sup>.

In developed countries such as Japan, cataract as a cause of blindness has already been eradicated<sup>(6)</sup>.

However, in more remote areas or poorer sub-populations of some countries, such as Australian Aborigines, or Latin Americans in Los Angeles, prevalence indices are closer to those in poor countries<sup>(16)</sup>.

Therefore, considering the Central-West region of the State of São Paulo, even though Brazil is a developing country, the cataract prevalence is close to that of developed countries. However, it is very important to consider that our region is located in the most developed state of our country and is well assisted by ophthalmological services, and also that data was collected during a screening period for cataract surgeries, when federal Brazilian government made resources available for treating the disease, estimating that in that year 360 thousand cataract operations had been performed across the country<sup>(17)</sup>.

The existence of Brazilian Public Health Services which provide free unrestricted treatment to any individual and which

have capacity to perform cataract surgery, does not guarantee that patients really have access to treatment, reestablishing their visual acuity. The decision to operate or not rests on the patient who can refuse treatment due to lack of knowledge, or even have accessing difficulties. Also, as age related cataract is one of the main causes, patient general health is also an important part of the decision of whether to operate or not, as the patient may already have other senility problems.

Population awareness and active search for cases as performed by us using a Mobile Unit is important to decrease patient's resistance against surgery, reaching out to the poorer populations where the eradication of the problem is difficult, which occurs even in developed countries<sup>(7)</sup>.

Some interesting points raised in this study as the number of people, who, even with lens opacity, improved their visual acuity with the use of optical correction, and thus were able to postpone surgery. This reinforces that there is a need to perform a complete ophthalmological examination when making a population cataract study.

Another important point is the coexistence of other ocular diseases with lens opacity, such as retinal alterations. It is therefore obligatory to make the completest possible eye examination to avoid operating individuals that will not have their visual acuity or quality of life improved by the surgery.

Sadly, the rates highlighted in this paper do not reflect Brazilian current situation. There are regions where cataract incidence is much higher, where there is more need of actions to reduce the rate of blindness from cataract. Concentrated efforts are required to combat the disease as the population is aging at a faster rhythm and cataract prevalence over 40 years age groups double every 10 years<sup>(18)</sup>.

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### CONCLUSION

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Cataract prevalence in the population of Central-West region of the State of São Paulo was 4.94%. Cataract as the cause of visual deficiency in this population was 0.96% and blindness was found to be 0.52%. These findings are similar to levels in developed countries.

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### RESUMO

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**Objetivo:** A catarata é a principal causa tratável de cegueira e deficiência visual em países subdesenvolvidos. Este estudo foi realizado para avaliar se a catarata continua sendo uma importante causa de cegueira no centro-oeste do Estado de São Paulo. **Métodos:** Um estudo transversal, de caráter observacional, realizado em cinco cidades da região centro-oeste do Estado de São Paulo, para as quais o centro de referência é a cidade de Botucatu. A amostra estabelecida para este estudo, de forma aleatória, seria composta por 5.555 indivíduos, sendo que foram examinados 4.229 indivíduos (8.458 olhos), ou seja, 78% da amostra pretendida. Os indivíduos foram submetidos a um exame oftalmológico completo que consistia em avaliação

da acuidade visual (com e sem correção), tonometria, biomicroscopia, fundoscopia e exame refracional. O diagnóstico de catarata foi dado aos indivíduos que apresentassem opacidade de cristalino na biomicroscopia, de acordo com o Sistema de Classificação de Opacidade do Cristalino II (LOCS II). Olhos apresentando deficiência visual ou cegueira, com a melhor correção e causados por catarata, foram considerados após excluir outras patologias que pudessem causar baixa da acuidade visual (AV). Olhos com deficiência visual foram considerados quando  $0,05 < AV \leq 0,3$  e olhos cegos quando  $AV \leq 0,05$ . Indivíduos com deficiência visual foram considerados quando  $0,05 < AV \leq 0,3$  e indivíduos cegos quando  $AV \leq 0,3$ , no melhor olho com a melhor correção. Foi considerado o número de olhos com catarata, o número de olhos com deficiência visual e cegueira e o número de indivíduos com deficiência visual e cegueira. **Resultados:** A prevalência de catarata na população estudada foi de 4,94% (209 indivíduos), afetando principalmente indivíduos com mais de 50 anos (92,34%) e do sexo feminino (61,11%). A catarata foi a causa de deficiência visual para 0,96% e a causa de cegueira para 0,52% de toda a população estudada. **Conclusão:** Nossos resultados mostraram que a prevalência de catarata na população estudada é semelhante aos índices de países desenvolvidos.

**Descritores:** Catarata/epidemiologia; Portadores de deficiência visual; Cegueira; Brasil

#### REFERENCES

- West S. Epidemiology of cataract: accomplishments over 25 years and future directions. *Ophthalmic Epidemiol.* 2007;14(4):173-8.
- Rutzen AR, Elish NJ, Schwab L, Graham PJ, Pizzarello LD, Hemady RK, Maldonado MJ; Cambodia Eye Survey Group. Blindness and eye disease in Cambodia. *Ophthalmic Epidemiol.* 2007;14(6):360-6.
- Tabin G, Chen M, Espandar L. Cataract surgery for the developing world. *Curr Opin Ophthalmol.* 2008;19(1):55-9.
- Kara José N, Alves MR. Catarata: um problema de saúde pública. In: Kara-José N, organizador. *Prevenção da cegueira por catarata.* Campinas: UNICAMP; 1996.
- Hatch WV, Cernat G, Singer S, Bell CM. A 10-year population-based cohort analysis of cataract surgery rates in Ontario. *Can J Ophthalmol.* 2007;42(4):552-6.
- Iwase A, Araie M, Tomidokoro A, Yamamoto T, Shimizu H, Kitazawa Y; Tajimi Study Group. Prevalence and causes of low vision and blindness in a Japanese adult population: the Tajimi Study. *Ophthalmology.* 2006;113(8):1354-62.
- Wearne SM. Remote Indigenous Australians with cataracts: they are blind and still can't see. *Med J Aust.* 2007;187(6):353-6.
- Brian G, Taylor H. Cataract blindness-challenges for the 21<sup>st</sup> century. *Bull World Health Organ.* 2001;79(3):249-56. Comment in: *Bull World Health Organ.* 2001;79(3):257-8. *Bull World Health Organ.* 2001;79(3):258-9. *Bull World Health Organ.* 2001;79(3):259-60. *Bull World Health Organ.* 2001;79(3):260-1.
- Brasil. Ministério do Planejamento, Orçamento e Gestão. Instituto Brasileiro de Geografia e Estatística - IBGE. Censo Demográfico 2000. Rio de Janeiro: IBGE; 2000.
- Araújo Filho A, Salomão SR, Berezovsky A, Cinoto RW, Morales PHA, Santos FRG, Belfort Júnior R. Prevalence of visual impairment, blindness, ocular disorders and cataract surgery outcomes in low-income elderly from a metropolitan region of São Paulo - Brazil. *Arq Bras Oftalmol.* 2008;71(2):246-53.
- Rehder JR, Sobral Neto H, Carvalho F, Lima VL, Pereira R, Barreiro J, Angelucci RI. Prevalência e causas de cegueira e baixa de acuidade visual entre grupos indígenas da Amazônia legal. *Arq Méd ABC.* 2001;25(2):59-62.
- Onakpoya OH, Adeoye AO, Akinsola FB, Adegbehingbe BO. Prevalence of blindness and visual impairment in Atakunmosa West Local Government area of southwestern Nigeria. *Tanzan Health Res Bull.* 2007;9(2):126-31.
- Mathenge W, Nkurikiye J, Limburg H, Kuper H. Rapid assessment of avoidable blindness in Western Rwanda: blindness in a postconflict setting. *PLoS Med.* 2007;4(7):e217.
- Duerksen R, Limburg H, Carron JE, Foster A. Cataract blindness in Paraguay - results of a national survey. *Ophthalmic Epidemiol.* 2003;10(5):349-57.
- Nano ME, Nano HD, Mugica JM, Silva JC, Montaña G, Limburg H. Rapid assessment of visual impairment due to cataract and cataract surgical services in urban Argentina. *Ophthalmic Epidemiol.* 2006;13(3):191-7.
- Cotter SA, Varma R, Ying-Lai M, Azen SP, Klein R; Los Angeles Latino Eye Study Group. Causes of low vision and blindness in adult Latinos: the Los Angeles Latino Eye Study. *Ophthalmology.* 2006;113(9):1574-82.
- Padilha MA. O direito de ver [Internet]. Rio de Janeiro: Sociedade Brasileira de Oftalmologia. [citado 2007 Jul 27]. Disponível em: <http://www.sboportal.org.br/sbo/scripts/ap/destaques/3.asp>
- Kahn HA, Leibowitz HM, Ganley JP, Kini MM, Colton T, Nickerson RS, Dawber TR. The Framingham Eye Study. I. Outline and major prevalence findings. *Am J Epidemiol.* 1977;106(1):17-32.