



## Cataract Surgical Rate between 2006 and 2010 in Tehran Province

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### Abstract

**Background:** Considering population aging in Iran and the importance of cataract surgery in the old age, this study was performed to show the cataract surgical rate (CSR) between 2006 and 2010 in Tehran Province.

**Methods:** Eighteen centers were randomly selected from cataract surgery centers in Tehran. In each center, one week in every season was randomly selected and the number of cataract surgeries in the week was calculated. In total, 20 weeks were selected in each center in five years.

**Results:** The CSR increased linearly from 8011 cases per 1,000,000 population in 2006 to 12465 cases per 1,000,000 population in 2010. As for patients below 40 years of age, the percentage of the male patients was more while after the age of 40 years, the percentage of the female patients was more in all age groups. At least 96.2% of the surgeries in each year were performed using the phacoemulsification method. From 2006 to 2010, the percentage of outpatient surgery increased from 48.7% to 72.5%. On the other hand, hospitalization for one night or more had a decreasing trend from 2006 to 2010.

**Conclusion:** During 2006-2010, the CSR was acceptable in Tehran in comparison with other studies. However, attention should be paid to the increase in the population of the elderly people. Although more than 95% of the surgeries in the Province of Tehran are performed using the phacoemulsification method, the rate should increase to 100% in the eligible cases.

**Keywords:** Cataract surgical rate, Tehran, Trend, Middle-east, Visual impairment

## Introduction

Cataract is the primary cause of blindness in the world and is considered a prevalent disease in the elderly population (1). Although this disease is easily treated through surgery, the statistics of the WHO indicate that cataract is also the second cause of visual impairment after refractive errors (1). The VISION 2020 program was executed

from 1999 by the WHO and the International Agency for the Prevention of Blindness (IAPB). The most important objective of this program is to eliminate avoidable blindness by 2020 which also includes blindness due to cataract (2). In this regard, different indexes have been defined which should be achieved to accomplish the main objec-

tive of VISION 2020. One of the indexes for the prevention of blindness due to cataract is the cataract surgical rate (CSR).

CSR is the number of cataract operations per one million population per year. The CSR is very different in different reports and is affected by different factors such as the extent of development, resources, and infrastructures of a country. It also has a direct relationship the services and facilities of cataract surgery; therefore, it has been used as an important index for the achievement of the VISION 2020 objectives in the last decade (2, 3). The lowest acceptable CSR according to the WHO is 2000 operations per one million population which is very far from the current CSR in African countries (4). The CSR should increase in Iran in order to reach the objectives of the WHO (5).

Although more than 15% of the Iranian population lives in Tehran Province, there is no comprehensive information on the CSR in this part of the country. The last report, which presented the CSR of 2000-2005 (5), did not include the information of CSR in Tehran Province. Therefore, we evaluated CSR in Tehran Province in detail in this report, which is part of the study of the CSR in Iran between 2006 and 2010 (6).

## Materials and Methods

This cross sectional study was performed in 2011. The Target population of the study was cataract patients who received cataract surgery in a cataract surgery center in Tehran between 2006 and 2010.

### Sampling Methods

First, all centers in which cataract surgery was performed were identified based on the list of the Ministry of Health and some preliminary information was obtained from them. Based on the available information, the centers were divided into major and minor centers according to the total number of operations in 2008. Based on the estimate of the Ministry of Health, the centers with more than 3000 operations per year were categorized as major centers, and the centers with

3000 operations or less per year were considered as minor centers. The centers with less than 100 operations per year were excluded from the sampling frame. Finally, sampling was performed on 55 centers (13 major and 42 minor centers). Eighteen cataract centers in Tehran Province were randomly selected of which 9 were major and 9 were minor. One week in each season was randomly selected in each center and the number of cataract operations in that week was calculated. After selecting the centers, researchers who were previously trained by an ophthalmologist went to the centers and collected required data.

### Data Collection

After introducing the researcher to the center, necessary coordination was made with the hospital's archives and statistics centers. Since most outpatient centers are inactive during the two-week New Year holidays, sampling was done in the whole year except for the first two weeks of every year. In other words, sampling was done in 50 weeks of the year. With the cooperation of the researcher and the archives staff of the centers, sampling was done using random numbers. One week in every season was randomly selected and the number of cataract surgeries in that week was recorded. Since we intended to perform sampling on the data of 5 years from 2006 to 2010 and 4 weeks were selected in one year, a total of 20 weeks were selected for each center, and the number of cataract surgeries in the 20 weeks was determined. For more detailed investigation, a number of patient records proportionate to the number of cataract surgeries were randomly selected in every center and evaluated for the type of surgery, age and sex, and other indexes.

The variables evaluated in the study were age, sex, year of surgery, type of anesthesia, hospitalization status, and type of cataract surgery.

### Statistical Analysis

The collected data was analyzed in two stages: the data of CSR and the data of random patient records. When calculating a rate, the numerator is a certain event in a defined time and the denominator is the whole population. Therefore, we first

calculated the total number of cataract surgeries in all centers in Tehran. To calculate the number of surgeries in Tehran, the number of surgeries in minor and major centers was determined. Then, the proportion of the minor and major centers in our study to the minor and major centers across the country was calculated and the weight of mi-

nor and major centers was determined accordingly. After that, to calculate the number of surgeries in the selected centers per year, since 4 weeks in each year was selected, the number of surgeries in the 4 weeks was multiplied by 12.5, reaching a total of 50 weeks per year. Finally, CSR was calculated according to the following equation (6).

$$CSR = \frac{[\text{Number of cataract surgeries at major centers} \times 12.5 \times \text{weight of major centers}] + [\text{Number of cataract surgeries at minor centers} \times 12.5 \times \text{weight of minor centers}]}{\text{Population of Tehran province in the given year}}$$

In the second part, since a random sample of patient records were evaluated in each center, the age and sex distribution of the participants, percentage of the type of surgery, mean stay in the hospital, and complications during the surgery were analyzed.

## Results

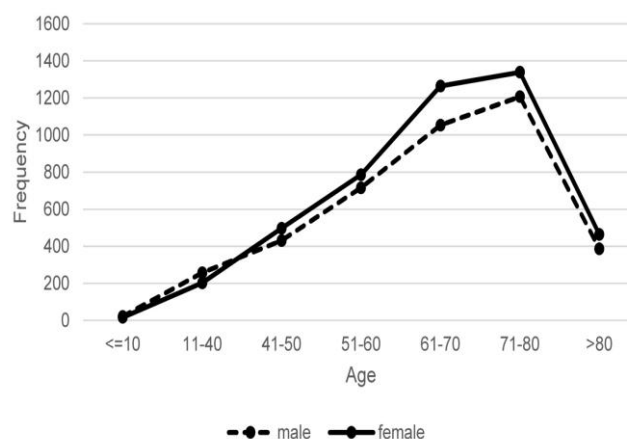
Tehran had 55 cataract surgery centers of them, 13 were major and 42 were minor centers. Based

on the sampling protocol of this study, 9 major and 9 minor centers were selected. Considering the proportion of these centers to the whole centers, the weight of the minor and major centers was calculated 4.7 and 1.4, respectively. Table 1 shows CSR based on the number of operations in each year and the population of Tehran Province. According to Table 1, CSR increased linearly from 8011 in 2006 to 12465 in 2010 per one million populations.

**Table 1:** Cataract surgery rate (CSR) between 2006 and 2010 in Tehran Province

	2006	2007	2008	2009	2010
Number of operations	92179	105021	148584	142688	151871
Population of Tehran Province	11,506,995	11,671,561	11,839,118	12,009,712	12,183,391
CSR	8011	8998	12550	11881	12465

To evaluate the details of cataract surgery in Tehran Province, the patient records of 8727 operations during 2006 and 2010 were randomly selected. According to the records, 46.7% of the operations were performed on male patients, 52.4% were performed on female patients, and gender was unspecified in 0.9% of the operations. The mean age of the patients was  $64.3 \pm 14.2$  years (from 1 to 100 years). Figure 1 presents the distribution of cataract surgery based on male and female genders and age groups. According to Fig. 1, male patients constituted the majority of the patients before the age of 40 while the percentage of the female patients was higher in all age groups after 40 years of age.



**Fig. 1:** The age trend of the cataract surgery in both genders in Tehran

Table 2 shows the percentage of different methods of surgery in each study year. According to Table 2, at least 96.2% of the operations in each year were performed using the phacoemulsification method.

Table 3 presents the data of hospitalization following cataract surgery. As Table 3 shows, the percentage of outpatient surgery increased from 48.7% to 72.5% and the percentage of one night hospitalization or more decreased from 2006 to 2010.

Moreover, 28.8% of the operations were performed on the second eye, 63.0% had cataract surgery for the first time, and the remaining was unspecified.

The trend of the changes during the five years showed that the prevalence of the second eye cataract surgery increased from 2006 to 2010.

General anesthesia in cataract surgery decreased from 65.9% in 2006 to 50% in 2010, while topical anesthesia increased from 33.3% in 2006 to 42.1% in 2010.

**Table 2:** The percentage of different methods of surgery in each study year

Year	Method of surgery			
	Intracapsular	Extracapsular	Phacoemulsification	Lensectomy
2006	0.3%	1.7%	97.9%	0.1%
2007	0.2%	2.1%	97.5%	0.2%
2008	0.3%	1.0%	98.2%	0.5%
2009	0.7%	1.0%	97.8%	0.5%
2010	1.3%	1.2%	96.2%	1.3%
<b>Total</b>	0.6%	1.3%	97.4%	0.6%

**Table 3:** Hospitalization following cataract surgery between 2006 and 2010 in Tehran Province

Year	Hospitalization (%)		
	Outpatient	One night inpatient	Two nights or more inpatient
2006	48.7	44.2	7.1
2007	58.2	32.9	8.9
2008	65.7	27.2	7.1
2009	70.3	24.7	5.0
2010	72.5	22.0	5.5

## Discussion

The CSR in Tehran Province is very important because more than 15% of the population of Iran live in Tehran Province. This is the first report of CSR and its details in Tehran. According to the results, CSR increased from 8011 in 2006 to 12465 in 2010 per one million populations. The CSR in Iran from 2000-2006 was considerably lower than the results of the present study (5), which indicates an increase in CSR in Iran. Moreover, in comparison with the mean CSR in Iran between 2006 and 2010, which was 4723-6328 operations per one million populations, the CSR in Tehran was considerable high.

However, Tehran, as the capital of Iran, has the highest number of cataract surgery centers and many people travel to Tehran from different parts of Iran, or even the neighboring countries, to have their surgery for its more referral centers, or this reason. Therefore, the high CSR in the study might be partly due to patients from other parts of Iran or neighboring countries and the referral nature of the centers in Tehran. These points should be considered while comparing the findings of this study with the results of other investigations.

The CSR reported in other studies is presented in Table 4, which varies from 100 operations to more than 10,000 operations per one million populations (4, 7). The CSR was not high in 1990s in

different countries but increased substantially in recent years as a result of new method of surgery and improved facilities. However, the CSR in many African countries is still lower than the

standards of WHO (4, 8) while the CSR has been acceptable in developed countries like Sweden, USA, and Australia since many years age (Table 4).

**Table 4:** Summary of other studies on the cataract surgical rates (CSR) in different countries

Country	Year	CSR per1000000
USA(21)	1980	1330
USA(20)	1984	1200
Sweden (22)	1990	3600
UK(8)	1990	2700
Sweden(23)	1992	4470
USA(21)	1992	4700
Sweden(24)	1992	4500
USA(21)	1994	5070
China (25)	91-96	3802
Malay (25)	91-96	2058
India (25)	91-96	3384
Australia(26)	1999	6300
USA(20)	2000	5110
USA(20)	2004	8000
South Africa(27)	2005	1000
Canada(28)	2006-2007	11000
Sweden(23)	2009	9000
Ethiopia(29)	2010	406
USA(7)	2010	9500
South Africa(27)	2010	2000
USA(7)	2011	11000
Nigeria(4)	-	100

Nonetheless, this index should be considered in many countries. For example, the CSR was lower than the WHO standards in many Latin American countries even in recent years (2005-2008) (9). All these findings suggest that the CSR is high in Tehran Province. Although a high CSR along with Cataract Surgery Coverage are among the objectives of the WHO and International Agency for the Prevention of Blindness, attention should be paid to the quality of surgery and evaluation of vision following cataract surgery at the most important outcomes of the operation. In this regard, exclusive studies should be performed to evaluate the status of vision following cataract surgery in Tehran Province to confirm their quality besides their quantity. It seems that the high CSR in Teh-

ran, in addition to the appropriate facilities and surgery centers, is owing to its strategic geopolitical situation, since part of the operations in Tehran is performed on patients from other cities and provinces.

One of the interesting points of this study was the non-linear increase in the CSR in the Province of Tehran. As mentioned in results, the CSR increased until 2008, decreased in 2009, and again increased in 2010. It is difficult to explain this finding. In another report on the CSR across in Iran, the results were similar to the Province of Tehran. Although the results of Tehran could affect the results of Iran due to the high number of cataract surgery candidates, we believe that some economic factors were responsible for the de-



creasing trend of CSR in 2009. Lack of accurate information on the population of Iran during 2006-2009 could be another reason for this finding.

Regarding the details of the cataract surgery, as mentioned earlier, male patients constituted the majority of the patients before the age of 40 while the percentage of the female patients was higher in all age groups after 40 years of age. The prevalence of cataracts is higher (10-13) and the age of onset is lower in women, which we believe is the reason for the higher percentage of the female patients above the age of 40. More concern of the women about their health can also explain this finding. It seems that the higher frequency of cataract operations in men under the age of 40 is related to the type of cataract. Since a major proportion of cataracts in patients below the age of 40 result from trauma, and considering the fact that trauma occurs more in men than women (14,15), we believe that the higher frequency of cataract surgery in men below the age of 40 is a result of more traumatic cataract in men in this age group. According to our findings, the highest percentage of cataract surgery was observed in patients who were 71-80 years old, which in line with the results of previous studies (16-18). Therefore, it is important to pay attention to other diseases accompanying ocular diseases and their effects on the outcome of cataract surgery in this age group.

The phacoemulsification method was used in at least 97% of the cataract operations during the five years of the study while previous studies from Iran reported lower rates (16), indicating the acceptable growth of this method in Tehran in recent years. Considering the fact that most of the cataract surgery centers in Tehran Province are located in the city of Tehran, most of them are well equipped and provide quality services; however, it is interesting to compare this finding with other reports from different parts of the world. In Ireland, more than 99% of the operations have been performed using the phacoemulsification method since 1999, which is high when compared to our finding (19). The phacoemulsification method was used in more than 99% of the cataract operations in the US in 2004 (20). In general,

these findings show that although a high percentage of the operations in Tehran between 2006 and 2010 were performed using the phacoemulsification method, this rate was even higher in studies conducted years before that in some other countries. Therefore, efforts should be made to use the phacoemulsification method in 100 of the eligible cases in the future.

Based on the findings of the present study, the trend of the outpatient cataract surgery showed an increase and hospitalization due to cataract surgery showed a decrease from 2006 to 2010, which seems to be due to safer methods of surgery. The phacoemulsification method has fewer complications when compared to other methods of cataract surgery and the duration of hospitalization decreases consequently. However, the interesting finding was that the trend of the use of phacoemulsification method and the trend of outpatient cataract surgery did not increase in a parallel fashion. As mentioned earlier, the use of the phacoemulsification method did not change considerably during the five years of the study while outpatient surgery increased from 48.7% to more than 70%. The reason could be that in previous years when the phacoemulsification method was becoming prevalent, there were postoperative complications since the ophthalmologists were not experienced enough while after some years, with the increase in the expertise of the ophthalmologists, most of the operations were performed under topical anesthesia and as a result, the need for hospitalization decreased.

Our findings also showed that topical anesthesia had an increasing trend.

## Conclusion

During 2006-2010, the CSR was acceptable in Tehran in comparison with other studies. However, attention should be paid to the increase in the population of the elderly people. Although more than 95% of the surgeries in the Province of Tehran are performed using the phacoemulsification method, the rate should increase to 100% in the eligible cases.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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The authors declare that there is no conflict of interests.

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