The Role of Demographic Characteristics in the Outcomes of Cataract Surgery and Gender Roles in the Uptake of Postoperative Eye Care: A Hospital-based Study

Hassan Hashemi1,2, Seyed-Farzad Mohammadi1, Hadi Z-Mehrjardi1,2, Mercede Majdi1, Elham Ashrafi1, Shiva Mehravar1, Arash Mazouri1, Ramak Roohipoor1, and Mehdi KhabazKhoob2

1Eye Research Center, Farabi Eye Hospital, Tehran University of Medical Sciences, Tehran, Iran, 2Noor Ophthalmology Research Center, Noor Eye Hospital, Tehran, Iran, and 3Students' Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran

ABSTRACT

Purpose: To explore the effect of demographic characteristics on the outcomes of cataract surgery in terms of visual acuity and patient satisfaction, and gender role in the uptake of postoperative care.

Methods: Comprehensive ocular examinations were performed on 478 subjects (558 eyes) over the age of 50 years who underwent surgery for age-related cataract at the largest eye hospital in Iran. Demographic characteristics were obtained and surgical records were reviewed.

Results: Male subjects had significantly better outcomes in terms of uncorrected visual acuity (UCVA) and best spectacle-corrected visual acuity (BSCVA) (mean difference 0.12 and 0.13 logMAR; p = 0.004 and p < 0.001, respectively). Women were significantly less satisfied than men (73.2% vs. 83.6%; p = 0.011). Postoperative UCVA and BSCVA were better in patients with higher levels of education (both p < 0.001). Age had an inverse association with UCVA (p = 0.004) and BSCVA (p < 0.001). Women were twice as likely to need capsulotomy (p = 0.002). Men’s uptake of postoperative refractive care was 4-fold that of women’s (31% vs. 7%). In multivariable analyses, age, sex, education, presence of ocular comorbidity and need for capsulotomy, spectacle prescription and other care were associated with postoperative UCVA (all p < 0.05; adjusted R² = 0.256).

Conclusion: Female patients were shown to be at a clear disadvantage in cataract surgery; outcomes of the procedure and postoperative care were both poorer. Older age, lower level of education, ocular comorbidity and unmet postoperative need were also associated with a poorer outcome.

KEYWORDS: Cataract surgery outcome, Gender, Unmet need, Uptake, Postoperative care, Posterior capsule opacification, Refractive care

INTRODUCTION

Although cataract surgery is one of the most common intraocular operations worldwide, cataract is still the leading cause of blindness in the world and responsible for about 20 million cases of bilateral blindness globally.1,2 The most important objective of Vision 2020, beyond adequate cataract surgical rate (CSR) and cataract surgical coverage (CSC) to eliminate the backlog,2,3 is to ensure a high success rate for cataract surgery. The Iranian Cataract Surgery Survey documented an increase in the CSR from 526 in 2000, to 1331 in 2005.4 Also, the Tehran Eye Study showed that the average CSC in people aged 40 years and over was 67%, but the coverage was lower in females at 63% compared with 71% in males.5 The focus of 2009 World Sight Day was equal access to eye care for both men and women, in the light of
the latter’s comparatively poorer eye health status. In Oman, Khandekar and Mohammad documented disparities between the sexes in blindness and eye disease. Similarly, disparity in CSC and cataract-related blindness has been identified between the two sexes in other nearby developing countries like Pakistan, India, and Turkmenistan. A variety of factors can affect cataract surgery outcomes and patient satisfaction; these include demographic factors, socioeconomic status, the patient’s systemic and ocular health, quality of health care services, surgeon experience, and surgical technique. Studies about reasons for suboptimal outcome of cataract surgery have revealed underuse of postoperative refractive care services and posterior capsule opacification (PCO) as leading causes of vision impairment in Bangladesh, India, China, and Pakistan.

With increasing demand from the population for better visual and functional outcomes, the importance of uptake of postoperative care becomes more evident, while patient selection criteria have become more broad (e.g. now including patients with age-related macular degeneration). Different factors have been identified as causes for underuse of postoperative services (refractive and non-refractive) and barriers to patients’ uptake. However, female sex, low education, low health literacy, and high costs for such services cannot completely explain the poorer outcomes of cataract surgery.

Here we aimed to explore the effect of sociodemographic characteristics on the outcome of cataract surgery by studying vision status and patients’ overall satisfaction.

**MATERIALS AND METHODS**

The study was conducted in Farabi Eye Hospital, the largest university-affiliated eye center in the capital Tehran, with a current annual volume of about 13,300 cataract surgeries (about 40% of the hospital’s total annual surgical procedures). The hospital is considered the main referral center for the near and northern provinces of Iran.

In order to assess the outcome of cataract surgery in the center, about 2000 charts of eyes operated for age-related cataract between 2002 and 2007 were randomly selected and reviewed. The sampling framework included patients over the age of 50 years at the time of surgery. Patients with a history of major head trauma, ocular inflammatory disease, or previous ocular surgery capable of inducing cataract were excluded.

A total of 558 eyes of 478 patients with a mean age of 67.2 ± 8.8 years were examined, of whom 240 (48.7% of eyes) were female. Participating subjects received comprehensive ocular examinations (prospective aspect of the study), while surgical records were reviewed thoroughly (retrospective aspect). Examinations included refraction (by experienced optometrists), applanation tonometry, and anterior and posterior segment examination (by ophthalmologists). Subspecialists in the anterior and posterior segment of the eye were frequently consulted in cases of unexplained visual loss and/or unexpected findings. The study protocol was approved by Tehran University of Medical Sciences Research Council and was conducted according to the tenets of the Declaration of Helsinki.

Postoperative visual acuity (uncorrected visual acuity, UCVA, and best spectacle-corrected visual acuity, BSCVA) and satisfaction were considered as the outcome variables. Visual acuity was measured using chart projectors (CP – 670 20/10–20/400, Nidek Co., Gamagori, Japan) and E letters at a distance of 4 meters. The smallest line at which the patient could read four letters correctly was recorded as the monocular visual acuity. If a person was unable to read the largest Es on the chart (20/400) at 4 meters, vision was recorded as counting fingers, hand motion, and light perception.

Subjects were also asked about their satisfaction with their surgery on a three-point scale: “satisfied”, “not sure” or “dissatisfied”. In cases of bilateral cataract surgery, satisfaction was recorded for each eye separately.

Ocular comorbidities referred to corneal opacity, glaucoma, high myopia, age-related macular degeneration, and diabetic retinopathy. Eyes with a small pupil, pseudoxefoliation syndrome, phacodonesis, surgically challenging corneal opacity, shallow anterior chamber (intumescent cataract and phacomorphic glaucoma), and mature cataract (if phacoemulsification was performed), were defined as surgically challenging eyes. Diabetes mellitus, hypertension, hyperlipidemia, and ischemic heart disease were considered as determinants of the subjects’ systemic health condition.

Subjects with uncorrected refractive error were considered to need a spectacle prescription. This was defined as a difference between postoperative UCVA and BSCVA of ≥0.2 logarithm of the minimum angle of resolution (LogMAR) in the operated eye. Unmet need for spectacle correction was described as the indication for glasses prescription, but such care had not been received for the operated eye. Need for capsulotomy was mainly decided according to the clinical judgment of the ophthalmologists on the basis of a history of visual loss after operation and no other probable cause of visual loss. Subjects who had capsulotomy before the study examination were considered to have had this need met.

Need for any other therapeutic and/or diagnostic procedure (such as visual field examination, fluorescein angiography and other imaging modalities, retinal photocoagulation for diabetic retinopathy, cataract surgery in the fellow eye, retained sutures in the operated eye, missed glaucoma follow-up examination, and referral for a neuro-ophthalmologic evaluation) for a subjects’ operated eye were included in the category of need for other care. Although these entities are
pathobiologically distinct, they show the gap in health care uptake and lack of regular in-time follow-up.

**STATISTICAL ANALYSIS**

Analysis was performed using SPSS version 15 (SPSS Inc., Chicago, IL, USA). All statistical tests were two-sided, and \( p < 0.05 \) was considered to indicate significance. Snellen visual acuity data were transformed into the LogMAR scale. Despite this transformation, data were still skewed (Kolmogorov-Smirnov test, \( p < 0.001 \)). Association of the respective variable with sex was assessed using nonparametric analyses (Mann-Whitney U test). K-independent-sample analysis (Kruskal-Wallis H test) was used to assess associations of categorical variables with UCVA and BSCVA. Analysis of the trend of changes in visual acuity between different age groups was done using analysis of variance (ANOVA) with linear contrast. For a clinically meaningful comparison, LogMAR values were back-transformed into the Snellen system. The \( \chi^2 \) test was used to explore the associations between satisfaction level and categorical variables.

The multiple linear regression model was employed to assess the effect of independent variables that showed significance lower than 0.2 in univariate analysis and/or had high clinical relevance (the variable 'systemic comorbidity'; Table 5) on postoperative UCVA and BSCVA (Table 6). Backward procedure was applied for variable selection. The final model included independent factors that were significant at \( p < 0.05 \).

Uptake of postoperative care was measured through the following formula:

\[
Uptake(\%) = \frac{\text{Met need}}{\text{Total need}} \times 100
\]

where total need = met need + unmet need.

**RESULTS**

The mean age of the population was 67.2 ± 8.8 years. Table 1 shows demographic characteristics of the study population. The mean preoperative visual acuity of examined eyes was 1.34 LogMAR (Snellen equivalent < 20/400), and postoperative UCVA and BSCVA were 0.36 and 0.21 LogMAR (Snellen equivalent = 20/40 and 20/32), respectively (Table 2). Of all examined eyes, 62.4% of UCVA and 79.4% of BSCVA were better than 20/40. The overall opinion of subjects was that the outcome of their operation was acceptable; 78.5% were satisfied, 10.6% were not sure, and just 10.9% were dissatisfied. Patients who were satisfied had better visual acuity in terms of both UCVA and BSCVA (both \( p < 0.001 \)).

As shown in Table 2, male sex was associated with better visual acuity (UCVA and BSCVA) and satisfaction at the time of visit (\( p = 0.004, p < 0.001 \), and \( p = 0.011 \), respectively). BSCVA was worse than 20/40 (0.3 LogMAR) in 28% (76 eyes) of women, but only 13.6% (39 eyes) of men (\( \chi^2 \) test, \( p < 0.001 \)). Men and women were significantly different in terms of educational status, systemic conditions and frequency of unmet needs (\( p < 0.001, p < 0.001 \) and \( p = 0.015 \), respectively; Table 3). Relationships of UCVA, BSCVA and

### Table 2 Visual acuity (LogMAR) and satisfaction status, by sex.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female (( N = 272 ))</th>
<th>Male (( N = 286 ))</th>
<th>Total</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative UCVA</td>
<td>1.33 ± 0.75</td>
<td>1.35 ± 0.77</td>
<td>1.34 ± 0.76</td>
<td>0.776</td>
</tr>
<tr>
<td>Postoperative UCVA</td>
<td>0.42 ± 0.45</td>
<td>0.30 ± 0.37</td>
<td>0.36 ± 0.41</td>
<td>0.004</td>
</tr>
<tr>
<td>Postoperative BSCVA</td>
<td>0.28 ± 0.42</td>
<td>0.15 ± 0.26</td>
<td>0.21 ± 0.35</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Satisfied, %</td>
<td>73.2</td>
<td>83.6</td>
<td>78.5</td>
<td>0.011</td>
</tr>
</tbody>
</table>

UCVA, uncorrected visual acuity; BSCVA, best spectacle-corrected visual acuity.

### Table 3 Demographic data and surgery details, by sex.

<table>
<thead>
<tr>
<th>Demographic and surgical variables</th>
<th>Female, n (%)</th>
<th>Male, n (%)</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age ± SD, years</td>
<td>67.1 ± 8.8</td>
<td>67.0 ± 8.9</td>
<td>0.867</td>
</tr>
<tr>
<td>Systemic comorbidity*</td>
<td>172 (63.2)</td>
<td>118 (41.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ocular comorbidity†</td>
<td>40 (14.7)</td>
<td>27 (9.4)</td>
<td>0.068</td>
</tr>
<tr>
<td>College degree</td>
<td>2 (0.7)</td>
<td>16 (5.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mature cataract rate</td>
<td>31 (11.4)</td>
<td>38 (13.3)</td>
<td>0.498</td>
</tr>
<tr>
<td>Surgically challenging eye</td>
<td>47 (17.3)</td>
<td>60 (20.9)</td>
<td>0.284</td>
</tr>
<tr>
<td>Phacoemulsification</td>
<td>202 (74.6)</td>
<td>213 (74.5)</td>
<td>0.622</td>
</tr>
<tr>
<td>Experienced surgeon</td>
<td>178 (65.4)</td>
<td>192 (67.1)</td>
<td>0.720</td>
</tr>
<tr>
<td>Cumulative unmet need‡</td>
<td>117 (43.0)</td>
<td>88 (30.7)</td>
<td>0.015</td>
</tr>
<tr>
<td>Need for capsulotomy</td>
<td>39 (14.3)</td>
<td>17 (5.9)</td>
<td>0.002</td>
</tr>
<tr>
<td>Need for spectacle correction</td>
<td>59 (21.7)</td>
<td>54 (18.9)</td>
<td>0.058</td>
</tr>
<tr>
<td>Need for other care</td>
<td>19 (6.9)</td>
<td>17 (5.9)</td>
<td>0.605</td>
</tr>
<tr>
<td>IOL power, D**</td>
<td>19.96</td>
<td>19.90</td>
<td>0.845</td>
</tr>
</tbody>
</table>

*Includes hypertension, hyperlipidemia, diabetes mellitus, ischemic heart disease.
†Includes age-related macular degeneration, high myopia, diabetic retinopathy, corneal opacity, glaucoma.
‡Cumulative unmet need for capsulotomy, spectacle correction and other care were included.
**Mean power (in diopters, D) of the inserted intraocular lens (IOL).

SD, standard deviation.
Satisfaction with age are shown in Table 4; older age was associated with poorer outcome in terms of UCVA and BSCVA (p = 0.004 and p < 0.001, respectively; Figure 1), but not satisfaction rate. When adjusted for ocular and systemic comorbidities, increasing age was still associated with poorer visual outcome. Higher educational status was associated with a significantly better postoperative visual outcome (UCVA p = 0.008, and BSCVA p = 0.002). Satisfaction level showed a similar trend, as 77.4% of those without a high school diploma, 87.8% with high school diplomas, and 88.9% of those with university degrees, were satisfied (χ2 test p = 0.307).

In the multiple regression analysis, the association of postoperative UCVA with age, sex, education, presence of ocular comorbidity, need for capsulotomy, spectacle prescription and other care were significant (all p values < 0.05; adjusted R2 = 0.256), while systemic comorbidity was excluded from the final model (p = 0.419; Table 6). Similar results were obtained when BSCVA was the outcome in multivariable analysis.
Of patients with at least one ocular comorbidity at the time of surgery, 56.7% were satisfied, in comparison with patients who had no ocular comorbidity, of whom 81.5% were satisfied \((p < 0.001)\). Of patients who had challenging ocular surgery, 71.0% were satisfied, in comparison with 80.4% of those whose eyes were not surgically challenging \((p = 0.077)\). There was no significant association between satisfaction and systemic disease \((p = 0.275)\).

In 56 eyes (10% of all eyes) there was an indication for laser capsulotomy, and for 24 eyes capsulotomy had been already carried out (patients’ uptake of this service was about 30%). Women were twice as likely to need capsulotomy (odds ratio 2.64, 95% confidence interval 1.46–4.81), although they had a higher rate of postoperative capsulotomy \((p = 0.152)\).

Of all examined eyes, 141 eyes needed spectacle prescriptions, and of those, just 28 had met this need (20% uptake). Sex-specific uptake of postoperative refractive correction care was 7% (4 eyes) for women, much lower than men at 31% (24 eyes). Less than 10% of the studied population needed further postoperative care other than capsulotomy and spectacle prescription.

**DISCUSSION**

Although the Iranian Cataract Surgery Survey and Tehran Eye Study documented that health care indices for cataract (CSR and CSC) had significantly improved during recent years in Iran, there is little evidence about quality of cataract care.

Despite the Iranian Cataract Surgery Survey finding no difference in the rate of intraoperative complications between the two sexes, our study showed that male patients had better visual outcome and were more satisfied. It should be noted that this observation could not be explained by several potential determinants of the outcome, including patients’ preoperative visual acuity and cataract maturity (Tables 2 and 3). Likewise, studying cataract-operated patients in rural China showed a significant disparity between the sexes in terms of postoperative visual acuity of patients. As illustrated in Table 6, in the multivariable analysis the effect of sex on postoperative UCVA and BSCVA was still significant when adjusted for education and unmet need. This finding suggests that the relatively poorer outcome in women cannot completely be explained by their lower uptake of postoperative care, including laser capsulotomy and refractive error correction (Table 3).

Not only a history of postoperative laser capsulotomy but also the need for laser capsulotomy at the time of examination were significantly higher in women. This is consistent with previous reports, which showed higher prevalence of PCO among women that might be attributed to sex-related hormonal and biological differences. In a prospective study of 313 subjects, Congdon showed that PCO was three times more prevalent among females.

In our study, a difference between the sexes was also noted in postoperative spectacle uptake. The disparity in the need for spectacle prescription was mild (ie, the residual refractive error was not significantly different between the sexes), but uptake was significantly less in women than men: one in 12 eyes in need of spectacle correction received such care, compared with one in 2, respectively. In a study of over 12,700 subjects in Bangladesh, women had lower met need for refractive care than men (spectacle coverage 21% for women and 30% for men). In this regard, patients, especially women, should be informed not to attribute their secondary visual loss to failure of cataract surgery and simple aging, and be encouraged to seek refractive care postoperatively. However, further in-depth studies on gender-related barriers to uptake of postoperative care with regard to economic status, health literacy and access to eye care services are recommended.

Visual outcomes were significantly worse in the older age groups (Figure 1 and Table 4). This observation might be attributable to the fact that older age is associated with a higher prevalence of ocular comorbidities like pseudoexfoliation syndrome, age-related macular degeneration, more advanced glaucoma, and diabetic retinopathy status. This is similar to our observation that patients who had ocular comorbidity or a surgically challenged eye were less satisfied, although we found that age was associated with poorer visual outcome, regardless of the above comorbidities.

Of the demographic factors, education also showed a direct association with visual outcome. This is similar to findings of Saw who observed that higher education was associated with better postoperative visual acuity and fewer complications in subjects who had undergone cataract surgery. The Shahrood Eye Cohort Study of Iran found that visual impairment was three times more common in people with low income than in those with higher economic status. It also showed that education and age were significant determinants of this disparity.

It should be noted that sex-related patterns of health care use are particularly modified by culture and socioeconomic development. Finger suggested an interaction between sex and socioeconomic status in cataract care use. He argued that economic status acts as an enabler for seeking operative and postoperative care, and it is poorer economic status and access to money that deters female patients from seeking care and/or a lower willingness to pay. It is known that females have less access to disposable financial resources, and mere lower economic status does not have the same implications for men as for women.

Women have also been shown to seek eye care services, ie, cataract surgery and trachoma surgical services, comparatively later than male patients and consequently a worse outcome is probable.
Moreover, noncompliance with follow-up and needed postoperative care are more common among women and socioeconomically deprived people. However, our findings were not in support of late referral for women, as cataract severity and presenting visual acuity was comparable between both sexes. But, we found poorer ocular and systemic health in women that may originate from their lower health concern and literacy. Probably, a similar pattern can affect their uptake of different medical services, including eye care services. Social, demographic, and economic factors that might modulate access, uptake, willingness to pay, and health literacy are numerous: place of residence, referral base, culture, occupation, education, etc, and their interaction is notoriously intricate and beyond the scope of this study.

Although findings from this study revealed a significant gap between the sexes, results should be interpreted carefully due to the hospital-based nature of the study. In Iran, a gap between the sexes would presumably be greater in other provinces due to their comparatively lower socioeconomic status and access to eye care services. Also, our data on satisfaction should be approached cautiously as we applied a very simple scale; we did our best to assess satisfaction with fellow eyes in a separate fashion but this might not have yielded accurate results. Detailed symptom assessments and formal measurement of vision-related quality of life are now state of the art approaches. It is noteworthy that at first we aimed to assess the effect of education and economic status of patients on their uptake of postoperative care, but the population was homogeneous in terms of literacy and economic status.

In conclusion, we showed that older age, female sex, lower education, ocular comorbidity, and postoperative unmet need are independently associated with a poorer outcome in cataract patients. Despite that women needed more postoperative care, they received less. This means that there is a significant opportunity for cataract care improvement through closing the gap between the sexes. Ophthalmologists should approach marginalized patients (older, female and of lower socioeconomic status) more proactively and comprehensively, for ocular comorbidities, and specifically through follow-ups, for PCO and postoperative refractive correction. Studying sex-related factors and barriers to surgery as well as postoperative care is recommended.

**ACKNOWLEDGMENTS**

It is noteworthy that this study was the MPH thesis of the third author [H.Z.M.] who would like to acknowledge Prof. Akbar Fotouhi for his supervision.

**Declaration of interest:** The study was supported in part by a grant from Iran’s Ministry of Health (#7491) awarded to the Eye Research Center of Tehran University of Medical Sciences for achieving the second rank in Razi Medical Sciences Research Festival 2006. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

**REFERENCES**


[18] Riley AF, Malik TY, Grupcheva CN, Fisk MJ, Craig JP, McGhee CN. The Auckland cataract study: co-morbidity,
[45] Rootman I, Ronson B. Literacy and health research in Canada: where have we been and where should we go? Can J Public Health 2005;96 Suppl 2:S62–S77.