# Visual Impairment Analysis of Individuals Applying for Social Security Benefits

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## ABSTRACT

**Purpose:** It is aimed to reveal ocular disorders causing the most common and most severe vision loss and frequencies of treatable and preventable causes of vision loss in individuals with visual impairment in the study region.

**Materials and Methods:** The files of 3112 individuals who applied for social security benefits were analyzed retrospectively. 882 patients who had 10% and higher functional visual impairment were included in the study. Visual impairment was categorized as mild (10-29%), moderate (30-49%), severe (50-69%), profound (70-89%), and near-total vision loss (90-100%). The distribution of ocular disorders to age groups, gender, and visual impairment severity was analyzed and compared.

**Results:** Cataract (52.4%), age-related macular degeneration (20.6%), corneal disorders (9.3%), optic neuropathy (8.4%), and diabetic retinopathy (6.9%) were the most common disorders, respectively. More than half of the overall individuals and also individuals with severe and (near) total visual impairment had cataracts. 285 patients (32%) had severe or worse (50% and above) visual impairment and 81 (9.2%) patients had (near) total visual impairment (90% and higher).

**Conclusion:** Almost three-quarters of the visual impairment causes were avoidable in the study population. Cataract was still the leading cause of vision loss in individuals with visual impairment.


**Keywords:** Visual impairment, blindness, cataract, ocular disorder, vision loss.

## INTRODUCTION

The visual system is one of the systems that may be affected in individuals with impairment. In 2010, the WHO (World Health Organization) estimated that there were 285 million people with visual impairment of whom 39 million are blind.[1] WHO reported that 80% of visual impairment was avoidable meaning either could be prevented or treatable.[2] According to the data of the Turkish Statistical Institute, 8.4% of individuals with impairment had visual impairment in Turkey.[3]

Health-related quality of life and productivity were significantly impaired with vision loss[4,5] and the visual impairment has a big economic impact on countries even not including direct costs for medical care.[6] Thus, analyzing the causes of visual impairment to lead public health interventions is valuable.

Individuals with impairment could gain some social security benefits including financial, education, employment, and caregiving supports in Turkey as like other social states.[7] For formal applications, they apply to medical report committees in charge. After the evaluation according to the local state regulations, they receive a report indicating their impairments ratios in body systems including visual system.

In this study, we aimed to evaluate patients who had visual impairments according to reports given in our tertiary hospital and to present demographical, etiological, and statistical data. It is also aimed to reveal ocular disorders causing the most common and the most severe visual impairment in the study population. Additionally, it is aimed to reveal the frequencies of treatable and preventable causes.

## MATERIAL AND METHODS

### Study design and sample

In this retrospective study, the files of 3112 individuals who applied to university hospital between 2016 and 2018

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for medical reports to claim eligibility for social security benefits were analyzed. 882 patients who had 10% and higher functional visual impairment were included in the study. Visual impairment ratios were calculated according to regulatory guidelines in Turkey which are based on the guideline of the American Medical Association (AMA) which has formulas including best-corrected visual acuity and visual fields.[8] Age, gender, best-corrected visual acuity, ophthalmic disease and conditions, and visual impairment ratios (%) were recorded. Visual impairment was categorized as mild (10-29%), moderate (30-49%), severe (50-69%), profound (70-89%) and near-total vision loss (90-100%) as in AMA guideline.[8] Patients who were unable to express visual acuity because of mental conditions were excluded from the study.

The distribution of ocular disorders for age groups, gender, and visual impairment severity was analyzed and compared. Age groups were determined as younger than 60 years for the younger age group and 60 years and higher for the elderly group. The most common accompanying ocular disorders and disorders causing the highest visual impairment were detected. Subgroup analyses for disorders causing very severe and near-total visual impairment were also performed after excluding the individuals who had more than one ocular disorder.

### Statistical analysis

The statistical analysis was performed by SPSS software (IBM, version 18). The normality of data was tested by the Kolmogorov-Smirnov normality test. Mann-Whitney U test was used for comparison between independent variables. The Chi-square test was used for comparing the nominal-ordinal variables. P values lower than 0.05 were accepted as statistically significant. The ratios of ocular disorders were given in percentages.

### Ethics

The study was conducted in accordance with the declaration of Helsinki. The ethical committee of the Medical Faculty of Kırşehir Ahi Evran University approved the study. (Number:2017-14/157)

## RESULTS

460 females (52.2%) and 422 (47.5%) males total of 882 patients were included in the study. The median age of females [76 (6 - 105) ] was significantly higher than males [67 (4 - 96)] in the study ($p < 0.001$). The overall median age was 72 (4-105) years. The distribution of ocular disorders in the whole study was summarized in Table 1. Cataract, age-related macular degeneration, corneal disorders, optic neuropathy, and diabetic retinopathy were the most common disorders, respectively (Table 1).

**Table 1:** *Distribution of ocular diseases among all the patients.*

| OCULAR DISORDER | Number | Percentage % | OCULAR DISORDER | Number | Percentage % |
|---|---|---|---|---|---|
| Cataract | 462 | 52.4% | Pterygium | 6 | 0.7% |
| AMD | 182 | 20.6% | Vitreous degeneration | 5 | 0.6% |
| Corneal disease | 82 | 9.3% | Myopic maculopathy | 4 | 0.5% |
| Optic neuropathy | 74 | 8.4% | Choroidal coloboma | 4 | 0.5% |
| Diabetic retinopathy | 61 | 6.9% | Open globe trauma | 4 | 0.5% |
| Amblyopia | 42 | 4.8% | Paralytic Diplopia | 3 | 0.3% |
| Posterior capsular opacity | 31 | 3.5% | Albinism | 3 | 0.3% |
| Glaucoma | 29 | 3.3% | Congenital Cataract | 3 | 0.3% |
| Aphakia | 29 | 3.3% | Congenital ptosis | 2 | 0.2% |
| Phthisis bulbi | 29 | 3.3% | Uveitis | 2 | 0.2% |
| Strabismus | 28 | 3.2% | Macular hole | 2 | 0.2% |
| Degenerative myopia | 23 | 2.6% | Central retinal vein occlusion | 2 | 0.2% |
| Diabetic macular edema | 22 | 2.5% | IOL subluxation | 2 | 0.2% |
| Eviscerated eye | 19 | 2.2% | Cystoid macular edema | 1 | 0.1% |
| Maculopathy | 16 | 1.8% | Lagophthalmos | 1 | 0.1% |
| Retinitis pigmentosa | 15 | 1.7% | Hypotony maculopathy | 1 | 0.1% |
| Epiretinal membrane | 12 | 1.4% | Lens subluxation | 1 | 0.1% |
| Keratoconus | 9 | 1.0% | Vitreous hemorrhage | 1 | 0.1% |
| Nystagmus | 8 | 0.9% | Others | 19 | 2.2% |

**AMD:** Age-related macula degeneration, **IOL:** intraocular lens

When the number of accompanying ocular pathologies was analyzed for each patient, 535 (60.7%) patients had single pathology and 290(32.9%) patients had two, 56 (6.3%) patients had three, and 1 patient (0.1%) had four accompanying pathologies. The most common accompanying two ocular disorders and their severe visual impairment ratios were summarized in Table 2. The most common accompanying ocular disorders were cataract and age-related macular degeneration (AMD) (n=62, 7%) followed by cataract and corneal disease (n=21, 2.4%). The highest severe visual impairment ratios were in patients with cataract and optic neuropathy together (n=9, 69.2%) followed by age-related macular degeneration and corneal diseases together (n=9, 64.2%) (Table 2).

The distribution of ocular disorders in gender groups was summarized in Table 3. When the ratios of ocular disorders were compared between genders, the ratios of cataract and age-related macular degeneration were significantly higher in females and the ratios of corneal diseases, amblyopia, phthisis bulbi, glaucoma, retinitis pigmentosa were significantly higher in males, and remaining ocular disorders were not statistically different ($p<0.05$, Table 4).

**Table 2:** *Most common accompanying ocular disorders in the patients and severe visual impairment (50% and above) ratios among these patients.*

| Accompanying Disorders | n (%) | Severe Visual Impairment n (%) |
|---|---|---|
| Cataract and AMD | 62 (7.0%) | 18 (29%) |
| Cataract and corneal disease | 21 (2.4%) | 9 (42.8%) |
| Cataract and DRP | 21 (2.4%) | 7 (33.3%) |
| AMD and corneal disease | 14 (1.6%) | 9 (64.2%) |
| Strabismus and amblyopia | 14 (1.6%) | 2 (14.2%) |
| Cataract and optic neuropathy | 13 (1.5%) | 9 (69.2%) |
| Cataract and PCO | 13 (1.5%) | 5 (38.4%) |
| DME and DRP | 13 (1.5%) | 8 (61.5%) |
| AMD and optic neuropathy | 12 (1.4%) | 2 (16.6%) |
| Glaucoma and Cataract | 11 (1.2%) | 2 (18.1%) |
| Cataract ad phthisis bulbi | 11 (1.2%) | 6 (54.5%) |

**AMD:** age-related macular degeneration, **DRP:** Diabetic retinopathy, **PCO:** Posterior capsular opacity, **DME:** Diabetic macular edema.

**Table 3:** *Distribution of ocular disorders in age groups ( below 60 years and 60 years and above).*

| OCULAR DISORDER | Male n=422 | | Female n=460 | | OCULAR DISORDER | Male n=422 | | Female n=460 | |
|---|---|---|---|---|---|---|---|---|---|
| | Count | % | Count | % | | Count | % | Count | % |
| Cataract * | 204 | 48.3% | 258 | 56.1% | Nystagmus | 4 | 0.9% | 4 | 0.9% |
| AMD * | 72 | 17.1% | 110 | 23.9% | Choroid coloboma | 3 | 0.7% | 1 | 0.2% |
| Corneal disease * | 50 | 11.8% | 32 | 7.0% | Myopic maculopathy | 2 | 0.5% | 2 | 0.4% |
| Optic neuropathy | 35 | 8.3% | 39 | 8.5% | Pterygium | 2 | 0.5% | 4 | 0.9% |
| Amblyopia * | 28 | 6.6% | 14 | 3.0% | Congenital Cataract | 2 | 0.5% | 1 | 0.2% |
| Phthisis bulbi * | 23 | 5.5% | 6 | 1.3% | IOL subluxation | 2 | 0.5% | 0 | 0.0% |
| DRP | 22 | 5.2% | 39 | 8.5% | Vitreous degeneration | 2 | 0.5% | 3 | 0.7% |
| Glaucoma * | 20 | 4.7% | 9 | 2.0% | Paralytic diplopia | 1 | 0.2% | 2 | 0.4% |
| Retinitis pigmentosa* | 17 | 4.0% | 6 | 1.3% | Albinism | 1 | 0.2% | 2 | 0.4% |
| Strabismus | 15 | 3.6% | 13 | 2.8% | Congenital ptosis | 1 | 0.2% | 1 | 0.2% |
| Aphakia | 14 | 3.3% | 15 | 3.3% | Lagophthalmos | 1 | 0.2% | 0 | 0.0% |
| PCO | 11 | 2.6% | 20 | 4.3% | Uveitis | 1 | 0.2% | 1 | 0.2% |
| Degenerative myopia | 11 | 2.6% | 12 | 2.6% | Hypotony maculopathy | 1 | 0.2% | 0 | 0.0% |
| DME | 9 | 2.1% | 13 | 2.8% | Cystoid macula edema | 0 | 0.0% | 1 | 0.2% |
| Eviscerated eye | 8 | 1.9% | 11 | 2.4% | Macular hole | 0 | 0.0% | 2 | 0.4% |
| Keratoconus | 7 | 1.7% | 2 | 0.4% | CRVO | 0 | 0.0% | 2 | 0.4% |
| Epiretinal membrane | 6 | 1.4% | 6 | 1.3% | Lens subluxation | 0 | 0.0% | 1 | 0.2% |
| Maculopathy | 6 | 1.4% | 10 | 2.2% | Vitreous hemorrhage | 0 | 0.0% | 1 | 0.2% |
| Open globe trauma | 4 | 0.9% | 0 | 0.0% | | | | | |

**AMD:** age-related macular degeneration, **DRP:** diabetic retinopathy, **PCO:** posterior capsular opacity, **DME:** diabetic macula edema, **CRVO:** central retinal vein occlusion, **IOL:** intraocular lens. *: statistically significant difference between sex groups ( $p<0.05$)

**Table 4:** *Distribution of ocular disorders in age groups ( below 60 years and 60 years and above).*

| OCULAR DISORDER | Below 6o years n=280 | | 60 years and above N=602 | | OCULAR DISORDER | Below 6o years n=280 | | 60 years and above N=602 | |
|---|---|---|---|---|---|---|---|---|---|
| | Count | N % | Count | N % | | Count | % | Count | % |
| Cataract * | 70 | 25.0% | 392 | 65.1% | Myopic maculopathy | 2 | 0.7% | 2 | 0.3% |
| AMD * | 15 | 5.4% | 167 | 27.7% | Choroid coloboma | 2 | 0.7% | 2 | 0.3% |
| Corneal disease | 30 | 10.7% | 52 | 8.6% | Paralytic Diplopia | 1 | 0.4% | 2 | 0.3% |
| DRP | 23 | 8.2% | 38 | 6.3% | Nystagmus * | 6 | 2.1% | 2 | 0.3% |
| Optic neuropathy * | 38 | 13.6% | 36 | 6.0% | Uveitis | 0 | 0.0% | 2 | 0.3% |
| PCO * | 3 | 1.1% | 28 | 4.7% | CRVO | 0 | 0.0% | 2 | 0.3% |
| Glaucoma | 9 | 3.2% | 20 | 3.3% | IOL subluxation | 0 | 0.0% | 2 | 0.3% |
| Aphakia | 11 | 3.9% | 18 | 3.0% | Cystoid macula edema | 0 | 0.0% | 1 | 0.2% |
| Phthisis bulbi* | 16 | 5.7% | 13 | 2.2% | Keratoconus* | 8 | 2.9% | 1 | 0.2% |
| DME | 11 | 3.9% | 11 | 1.8% | Albinism | 2 | 0.7% | 1 | 0.2% |
| Epiretinal membrane | 3 | 1.1% | 9 | 1.5% | Congenital ptosis | 1 | 0.4% | 1 | 0.2% |
| Degenerative myopia* | 14 | 5.0% | 9 | 1.5% | Macular hole | 1 | 0.4% | 1 | 0.2% |
| Eviscerated eye* | 11 | 3.9% | 8 | 1.3% | Vitreous hemorrhage | 0 | 0.0% | 1 | 0.2% |
| Strabismus* | 20 | 7.1% | 8 | 1.3% | Open globe trauma* | 4 | 1.4% | 0 | 0.0% |
| Amblyopia * | 35 | 12.5% | 7 | 1.2% | Congenital Cataract * | 3 | 1.1% | 0 | 0.0% |
| Pterygium | 1 | 0.4% | 5 | 0.8% | Lagophthalmos | 1 | 0.4% | 0 | 0.0% |
| Retinitis pigmentosa* | 20 | 7.1% | 3 | 0.5% | Hypotony maculopathy | 1 | 0.4% | 0 | 0.0% |
| Vitreous degeneration | 2 | 0.7% | 3 | 0.5% | Lens subluxation | 1 | 0.4% | 0 | 0.0% |
| Maculopathy* | 14 | 5.0% | 2 | 0.3% | | | | | |

**AMD:** age-related macular degeneration, **DRP:** diabetic retinopathy, **PCO:** posterior capsular opacity, **DME:** diabetic macula edema, **CRVO:** central retinal vein occlusion, **IOL:** intraocular lens. *: statistically significant difference between age groups ( p<0.05)

Cataract and AMD were the most common ocular disorders for both females and males (Table 3).

The distribution of ocular disorders in age groups (younger than 60 years, (31.7%) vs. 60 years and above, (68.3%) ) was summarized in Table 4. The ratios of cataract, age-related macular degeneration, and posterior capsular opacity were significantly higher in the elderly group (60 years and above) compared to the younger patients and the ratios of optic neuropathy, phthisis bulbi, degenerative myopia, eviscerated eye, strabismus, amblyopia, retinitis pigmentosa, maculopathy, nystagmus, keratoconus, open globe trauma, congenital cataract were significantly higher in younger age group (p<0.05, Table 4). The remaining ocular disorders were not statistically significant between these groups.

The distribution of patients according to the degree of visual impairment severity was as following: Mild 361 (40.9%), moderate 236 (26.8%), severe 146 (16.6%), profound 58(6.6%), (near) total 81 (9.2%). Two hundred eighty-five patients (%32) had severe or worse (50% and above) visual impairment and 81 (9.2%) patients had (near) total visual impairment (90% and higher). There was not any significant difference between males and females concerning ratios of severe and wore visual system impairment [137(32.5%) and 148(32.2%) respectively, (p=0.943)]. There were 280 (31.7%) patients who were younger than 60 years old and 602(68.3%) patients who were 60 years old and older. When severe and worse vision loss were compared between patients who were younger than 60 years old and 60 years old and older, there was not any significant difference statistically [84 (30%) and 201 (33.4%) respectively, (p=0.353)]. There were no significant differences between gender and age groups for (near) total visual impairment (p=0.90 and p=0.901, respectively).

The distribution of single ocular disorders in patients with severe visual impairment (113 patients, 12.8% of overall) was analyzed after excluding the patients with accompanying disorders and summarized in Table 5. The distribution of single ocular disorders in patients with near-total /total visual impairment (90% and above) was summarized in Table 6.

**Table 5:** *Distribution of single ocular disorders in patients with severe visual impairment (%50 and above).*

| OCULAR DISORDER | Count | % |
|---|---|---|
| Cataract | 78 | 58.65% |
| AMD | 20 | 15.04% |
| Optic neuropathy | 8 | 6.02% |
| Corneal disease | 7 | 5.26% |
| Diabetic retinopathy | 6 | 4.51% |
| Degenerative myopia | 4 | 3.01% |
| Maculopathy | 3 | 2.26% |
| Diabetic macular edema | 1 | 0.75% |
| Posterior capsular opacity | 1 | 0.75% |
| Phthisis bulbi | 1 | 0.75% |
| Retinitis pigmentosa | 1 | 0.75% |
| Keratoconus | 1 | 0.75% |
| Nystagmus | 1 | 0.75% |
| Vitreous hemorrhage | 1 | 0.75% |
| TOTAL | 133 | 100.00% |

**Table 6:** *Distribution of single ocular disorders in patients with near-total /total visual impairment (90% and above).*

| OCULAR DISORDERS | Count | % |
|---|---|---|
| Cataract | 23 | 60.5% |
| Diabetic retinopathy | 4 | 10.5% |
| Corneal disease | 3 | 7.9% |
| AMD | 2 | 5.3% |
| Maculopathy | 2 | 5.3% |
| Optic neuropathy | 1 | 2.6% |
| Phthisis bulbi | 1 | 2.6% |
| Retinitis pigmentosa | 1 | 2.6% |
| Vitreous hemorrhage | 1 | 2.6% |
| TOTAL | 38 | 100.0% |

## DISCUSSION

In the study, the most common ocular disorder was cataract followed by age-related macular degeneration, corneal disorders, optic neuropathy, and diabetic retinopathy, respectively (Table 1). Ceyhan et al reported that in patients who applied for impairment report, the most common disorders were macula diseases, eviscerated/phthisic eyes, amblyopia, optic nerve diseases, and degenerative myopia.[9] However, in their study the mean age was 41.69 years which was much lower than the mean age (67.2 years) in our study, this difference might explain the difference in ocular disorder etiology.

A previous population-based meta-analysis from different countries reported that women had a higher blindness rate than men,[10] but in our study group, there was not any significant difference between genders for severe and (near) total visual impairment (p=0.492, p=0.90, respectively).

Olcaysu et al.[11] evaluated the frequency of disorders in younger and elderly patients and reported that the frequencies of amblyopia, degenerative myopia, and hereditary retinal dystrophy were higher in the younger group (<65 years) and cataract, AMD, and glaucoma in the elderly group ≥65 years were higher, respectively. Koc et al.[12] evaluated patients with low vision and blindness in two age groups ( 18-50 years and above 50 years) and indicated that retinal dystrophies (37%), congenital eye anomalies (14%), and myopic degenerations (13%) were the most common in younger age group and AMD (21%), diabetic retinopathy (17%), corneal opacities (14%), cataract (12%) and glaucoma (9%) were most common in the elderly age group. Kıvanc et al. analyzed the patients older than 64 years old with severe (50% and above) visual impairment who applied for medical reports in eastern Turkey and reported that the most common pathologies were cataracts, glaucoma, and age-related macular degeneration.[13] Even in higher-income countries, cataract is a leading cause of vision loss in elderly patients.[14] In the elderly population of our study, the most common disorders were cataract, age-related macular degeneration, corneal disease, diabetic retinopathy, and optic neuropathy, respectively (Table 4). When younger and elderly age groups (<60 years old and ≥60 years old ) were compared, the ratios of cataract, age-related macular degeneration, and posterior capsular opacity (PCO) were significantly higher in the elderly group and the ratios of optic neuropathy, phthisis bulbi, degenerative myopia, eviscerated eye, strabismus, amblyopia, retinitis pigmentosa, maculopathy were significantly higher in younger age group (Table 4). This is consistent with cataract, age-related macular degeneration, and PCO after cataract operations would be more common with aging.

In our study, more than half of the overall individuals and also individuals with severe and (near) total visual impairment had cataract in the study population (Table 1 and 5). According to WHO data, uncorrected refractive errors (42%) and cataract (33%) were the leading causes of visual impairment, and cataract (51%) and glaucoma (8%) were the leading causes of blindness worldwide.[2] In high-income countries and Europe, leading causes of blindness were uncorrected refractive error, cataract, age-related macular degeneration, glaucoma, and diabetic retinopathy.[15]

For some high-income countries, the most frequent reason for visual impairment was AMD followed by cataract.[16-18] Refractive errors were not included in our study as etiological factors as the social benefit reports do not cover uncorrected refractive errors in Turkey and reports should be recorded as best-corrected visual acuity. Besides, a wide range of social security coverage including individuals with impairments enables spectacle usage for refractive errors. However, the high cataract ratio was consistent with WHO data. Further investigations may reveal the reasons why these individuals stand back or hesitate to have cataract surgery which is quite efficient for the treatment. Turkish social security agency covers cataract surgeries for these patients and multiple cataract surgeons were available in the region. One of the reasons hesitating to get operated on for these individuals might be the concern about losing social benefits available for them, but this should be analyzed with further studies.

When overall avoidable visual impairment reasons were analyzed in our study including cataract, corneal disease, diabetic retinopathy, and macular edema, posterior capsular opacity (PCO), glaucoma, aphakia, and pterygium (Table 1), it accounts for almost 80% percent of the study population which is similar to reported WHO ratio.[2] And avoidable visual impairment ratios were almost 70% for severe visual impairment and almost 80% for (near)total visual impairment (Table 5 and 6).

As a limitation of the study, for age-related macular degeneration, additional information about the subtype could not be given as relevant information was not available in the medical records. The strength of this study is the analysis of a high number of individuals with visual impairment.

## CONCLUSION

Almost three-quarters of the visual impairment causes were avoidable in individuals with visual impairment in the study population. Cataract was the leading cause of visual impairment and also for severe visual impairment. Public health interventions should concern about these avoidable causes to lessen the burden of visual impairment in our region. Further studies are needed to reveal personal, social, and financial reasons why individuals stand back or hesitate to get treatment in the health system.

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