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ORIGINAL ARTICLE – OPEN ACCESS



# Visual Impairments Among Immigrants Living in Northeast Turkey and Their Ocular Finding Differences Compared to the Local Population

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ABSTRACT

**Objective:** This study aims to evaluate the existing eye pathologies of immigrant patients due to visual impairment and to compare them with the local population.

**Materials and Methods:** Between November 2018 and August 2019, a total of 150 participants among immigrants and 440 participants among local people were included in the study. Analysis of disease prevalence was calculated as a ratio of the total cohort screened with available data. The average, standard deviation, percentage, and minimum and maximum values of the data were calculated.

**Results:** Of the 590 patients in the study, 440 were from the local population and 150 were immigrants comprising 90 Afghans and 60 Meskhetian Turks. The rate of the patients wearing glasses at presentation was higher in the local population than among the immigrant patients ($p<0.001$). The number of uncorrected refractive errors was significantly higher in immigrants than in the local population ($p<0.001$). The proportion of patients who stated that they had an eye examination for the 1st time was significantly higher among the immigrant patients ($p<0.001$). Infectious conjunctivitis, keratitis, and cataract were significantly higher among the Afghan patients ($p<0.001$). In the Afghan patients and local population, the history of ocular trauma was significantly higher compared to the Meskhetian Turks ($p<0.001$). In the Afghan patients, the presence of a corneal or conjunctival foreign body was significantly higher than in the other groups ($p<0.001$).

**Conclusion:** Ocular disorders, such as cataracts and associated legal blindness, infectious eye diseases, and uncorrected refractive error can be seen more in immigrants. To remedy this situation, there are many steps that all of the countries must take for these individuals to access the necessary health care.

**Keywords:** Finding, immigrant, impairment, ocular, visual

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## INTRODUCTION

The influx of immigrants is becoming a big problem day by day in Turkey as in the whole world. This situation brings serious concerns in terms of social, economic, and health services (1–3). These individuals, who generally have a low socioeconomic level in their countries of origin, also have many undiagnosed diseases related to ophthalmology (3, 4). Since immigrants generally work in heavy and arduous jobs, such as construction, cleaning, and framework (4–8), they face environmental risk factors that can be harmful to eye health (4, 8). These are mainly the overexposure to sunlight, chemicals, mechanical devices, plants, garbage, and similar foreign bodies, and contact of these materials with the surface of the eye can damage tissue in that area (8, 9).

There are many publications showing that uncorrected refractive errors are higher among immigrants than in the local population (4, 10–14). Difficulty in accessing ophthalmology clinics delays the diagnosis and surgery time of conditions such as pinguicula, pterygium, cataracts, and trauma in these individuals (10–12). Delay in the diagnosis of glaucoma and retinal diseases may cause more blindness among these individuals (11, 12). There are publications showing that the children of immigrant individuals have a higher rate of refractive errors such as myopia (13, 14). The main reason for this situation may be the change in the environment they live in and the intense education program to adapt to the country they live in (14).

In this retrospective study, it was aimed to evaluate the existing eye pathologies of immigrant patients who presented to the ophthalmology clinic due to visual impairment and to compare them with the local population.

## MATERIALS and METHODS

### Study Design and Participants

The flowchart of the recruitment of the participants is shown in Figure 1. The data including the examination findings of 1027 individuals from the local population and migrant patients that presented to the Erzincan Binali Yıldırım

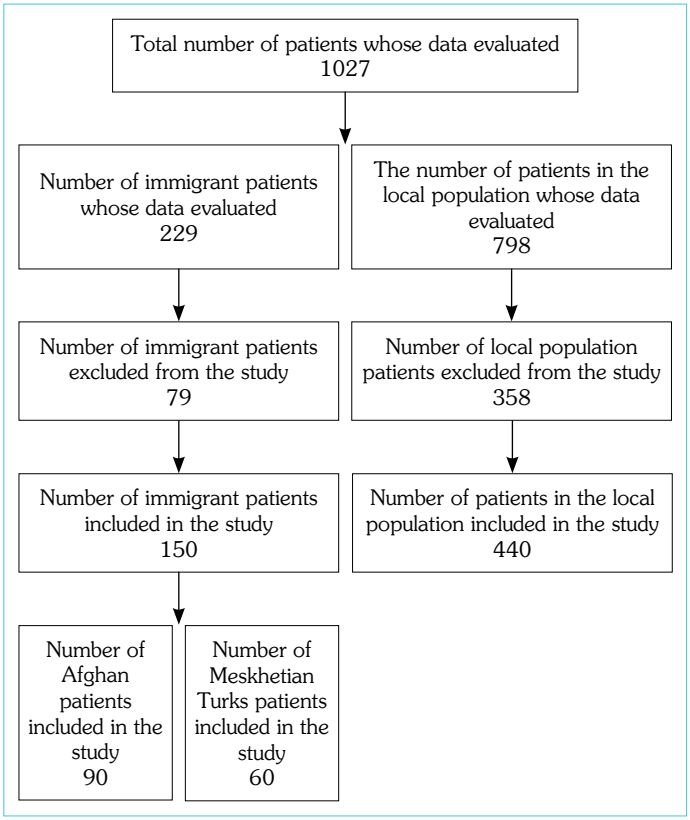


**Figure 1. The flowchart of the recruitment of the participants**

Üniversitesi Mengücek Gazi Training and Research Hospital Eye Clinics between November 2018 and August 2019 were reviewed retrospectively. Patients without refraction expression that could not comply with a refractive examination were excluded from the study. Patients who could not undertake biomicroscopic, gonioscopic, and fundoscopic examinations for different reasons and those that were unable to comply with applanation tonometry, pachymetry, specular microscopy, optical biometry/ocular ultrasound, and corneal topography examinations were also excluded from the study.

All the patients included in the study consisted of those who had low vision and could be examined for refraction. The results of the biomicroscopic examination, gonioscopy, intraocular pressure measurement with applanation tonometry, fundoscopic examination, pachymetry, specular microscopy, optical biometry, spectral domain optical coherence tomography (SD-OCT), and corneal topography were recorded. Reduced visual acuity at presentation was analyzed and stratified by type of ocular disease.

### Clinical Evaluation

The best-corrected visual acuity calculation was made using LogMAR with the help of a Snellen chart given to all patients included in the study. Visual acuities were measured under photopic conditions with the Nidek ophthalmic unit (Nidek Co. Ltd., Japan). The slit-lamp biomicroscopic examination was performed using the Nidek ophthalmic unit (Nidek Co., Ltd., Japan). The gonioscopic examination was undertaken using a Volk G-3 three-mirror glass goniofundus lens (Volk Optical, Inc., USA). The fundoscopic examination was made using 90 D Volk lenses (Volk Optical, Inc., USA) under biomicroscopy. The intraocular pressure measurements were performed with a Goldmann applanation tonometer (Haag-Streit, UK). Optical biometry measurements were made with an Optical Biometer AL-Scan (Nidek Co., Ltd., Japan) device. Corneal topography measurements were carried out with an OPD scan-3 topography device (Nidek Co., Ltd., Japan). SD-OCT measurements were performed with an Optical Coherence Tomography RS-3000 Advance 2 AngioScan (Nidek Co., Ltd., Japan) device. All the ocular examinations were performed by the same clinician to prevent interobserver variation. For any child patient failing the screening, a pediatric ophthalmologist performed a comprehensive ocular examination the following day using portable equipment. This examination began with the assessment of visual acuity, fixation, and ocular alignment using the cover–uncover test. An undilated slit-lamp examination was performed. Then, pupil dilation with one drop each of 1% cyclopentolate (Sikloplejin 1%, Abdi İbrahim, İstanbul, Turkey) and 1% tropicamide (Tropamid 1%, Bilim İlaç, İstanbul, Turkey) was administered. For those patients whose pupils remained reactive to light on retinoscopy after a 30 min waiting period, a second set of drops was administered. Axial length measurement was performed with ultrasonic biometry using ocular ultrasound in patients who had mature cataracts with an intensity that could not be measured in optical biometry. During the examination, the corneal foreign body was detected and the foreign body was removed, and the patients were called for follow-up 1 week after topical antibiotics, and 24 h eye occlusion was recommended. Autorefractometer measurement and best-corrected visual acuity evaluation, applanation tonometry, SD-OCT, and optical biometry and specular microscopic evaluation were performed in patients with a complete epithelial healing. In patients whose epithelial defect was not completely closed, the above-mentioned measurements of the related eye were carried out on the 15$^{th}$ day.

### Statistical Analysis

IBM SPSS version 22.0 was used for all statistical analyses in the study. Analysis of disease prevalence was calculated as a ratio of the total cohort screened with available data. The average, standard deviation (SD), percentage, and minimum and maximum values of the data were calculated. The Shapiro–Wilk test was used to observe the distribution of the parameters. Continuous variables were expressed as mean±SD and categorical variables as frequencies and percentages. According to the normality test results, the non-parametric Kruskal–Wallis or parametric ANOVA test (Tukey and Scheffe adjusted) was used to compare groups (ethnicity-related groups). Levene's test was used to assess for equality of variances. The Pearson Chi-square test was used to analyze the categorical variables. All of the results were appraised at a confidence interval of 95% based on a significance level of $p<0.05$.

### Ethics Approval

The research protocol was approved by the Ethical Committee of Erzincan Binali Yıldırım University Faculty of Medicine, under the registration number 33216249-604.01.02-E.44524.

## RESULTS

The demographic distribution and basic clinical characteristics of the participants are presented in Table 1. A total of 150 participants among immigrants and 440 participants among local

**Table 1.** Demographic distribution and basic clinical characteristics of participants

| Characteristics | Afghan | Meskhetian | Local population | p |
|---|---|---|---|---|
| Age (mean±SD) | 44.4±20.7 | 45.9±19.8 | 46.4±21.5 | 0.778 |
| Age group (n; patient) (%) | | | | |
| Under 18 years | 11 (12.2) | 6 (10) | 48 (10.9) | 0.421 |
| 18 years and over | 79 (87.8) | 54 (90) | 392 (89.1) | 0.421 |
| Gender (M/F) | 45/45 | 29/31 | 224/216 | 0.894 |
| Wearing spectacles at presentation (n; patient) (%) | 18 (20) | 10 (16.7) | 128 (29.1) | 0.001* |
| Uncorrected refractive error (n; patient) (%) | | | | |
| (Needing glasses-wearing glasses) | 57 (63.3) (75–18) | 31 (51.7) (41–10) | 128 (29.1) (256–128) | <0.001* |
| Reported blurry vision (n; eyes) (%) | 142 (78.9) | 94 (78.3) | 276 (31.4) | <0.001* |
| No previous ocular examination (n; patient) (%) | 48 (53.3) | 35 (58.3) | 32 (7.3) | <0.001* |
| Legally blind (n; patient) (%) | 5 (5.6) | 1 (1.7) | 8 (1.8) | <0.001¥ |

M: Male; F: Female *: Statistically significant between the local population and immigrants (p<0.001). No significant difference was observed between Afghan and Meskhetian individuals (p>0.05). ¥: Significantly higher in Afghan patients than the other individuals (p<0.001). Kruskal–Wallis or ANOVA test and *post hoc* comparisons (Tukey and Scheffe adjusted) were made

people met the inclusion criteria of the study. Of the 150 patients in the immigrants group, 90 were Afghans and 60 were Meskhetian Turks from Georgia. The local population consisted of 224 (50.9%) male and 216 (49.1%) female patients. In the immigrant patients group, 45 (50%) of Afghan patients were male and 45 (50%) were female, and 29 (48.3%) of the Meskhetian Turks patients were male and 31 (51.7%) were female. There was no difference between the groups in terms of gender distribution (p>0.05). The mean age was 44.4±20.7 years in Afghan patients, 45.9±19.8 in Meskhetian Turks, and 46.4±21.5 in local population. No difference was observed between the groups in terms of mean age (p>0.05). Blurred vision was detected in 276 eyes (276/880, 31.4%) of the 178 patients in the local population. Blurred vision was detected in 142 eyes (142/180, 78.9%) of the 72 patients in Afghan patients and in 94 eyes (94/120, 78.3%) of the 48 patients in Meskhetian Turks. Reported blurry vision was significantly higher in immigrants than in the local population (p<0.001). Among the patients in the local population, the number of patients wearing glasses was 128 (29.1%) when examined (45 only far, 34 only near, and 49 both near and far). The number of patients wearing glasses was 18 (20%) among Afghans (six only far, four only near, and eight both near and far) and 10 (16.7%) among the Meskhetian Turks (four only far, three only near, three both near and far). The rate of the patients wearing glasses at presentation was higher in the local population than among the immigrant patients (p<0.001).

Among the Afghan patients, 75 needed glasses. Fifty-seven (63.3%) of Afghan patients had uncorrected refractive errors (23 patients needed only far, 14 only near, and 20 both near and far). Among the Meskhetian Turk patients, the number of people who needed glasses was 41. Thirty-one (51.7%) of Meskhetian Turk patients had uncorrected refractive errors (14 patients needed only far, 7 only near, and 10 both near and far). Among the local population, the number of people needing glasses was 256. Of the participants from the local population, 128 (29.1%) had uncorrected refractive errors (48 patients needed only far, 35 only near, and 45 both near and far). The number of uncorrected refractive errors was significantly higher in immigrants than in the local population (p<0.001).

Forty-eight (53.3%) of the 90 Afghan patients included in the study were the first to have an eye examination. Seventy-eight (86.7%) of the Afghan patients had their first eye examination after coming to Turkey. Thirty-five (58.3%) of 60 Meskhetian Turk patients in the study were the first to have an eye examination. Forty-nine (81.7%) Meskhetian Turk patients had their first eye examination in Turkey. For the local population, 32 (7.3%) patients had their first eye examination; however, the proportion of patients who stated that they had an eye examination for the 1st time was significantly higher among the immigrant patients (p<0.001).

The ophthalmologic conditions of the study participants are shown in Table 2.

Blepharitis was present in 62 eyes (34.4%) of 31 patients in the Afghan group and 46 eyes (38.3%) of 23 patients in the Meskhetian Turks group (p>0.05). In the local population, 184 (20.9%) eyes of 23 patients had blepharitis. There was a statistically significant difference between the local population and immigrants in terms of blepharitis (p<0.001).

In the initial visit, infectious conjunctivitis was present in 23 eyes (12.8%) of the Afghan patients. In 9 eyes (7.5%) of the Meskhetian Turks patients, infectious conjunctivitis was observed (p<0.001). In 64 eyes (7.3%) of the patients in the local population, infectious conjunctivitis was observed. In the Afghan patients, infectious conjunctivitis was significantly higher (p<0.001).

Keratitis was observed in 10 eyes (5.6%) of nine of the Afghan patients, 3 eyes (2.5%) of three patients in the Meskhetian Turk patients, and 20 eyes (2.3%) of 20 patients in the patients from the local population. Keratitis was significantly higher among the Afghan patients (p<0.001). In the Afghan patients, anterior scleritis was observed in 6 eyes (3.3%) of four patients and episcleritis in 8 eyes (4.4%) of five patients. Underlying tuberculosis

**Table 2.** Ophthalmologic conditions of the study participants

| Characteristics | Afghan | | Meskhetian | | Local population | | p |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | |
| Myopia (eyes) | 37 | 20.6 | 28 | 23.3 | 176 | 20 | 0.485 |
| Hyperopia (eyes) | 39 | 21.7 | 27 | 22.5 | 184 | 20.9 | 0.621 |
| Astigmatism (eyes) | 24 | 13.3 | 15 | 12.5 | 104 | 11.8 | 0.514 |
| Presbyopia (eyes) | 46 | 25.6 | 32 | 26.7 | 216 | 24.5 | 0.623 |
| Blepharitis (eyes) | 62 | 34.4 | 46 | 38.3 | 184 | 20.9 | <0.001* |
| Dry eye (eyes) | 36 | 20 | 22 | 18.3 | 160 | 18.2 | 0.358 |
| MGD (eyes) | 32 | 17.8 | 22 | 18.3 | 144 | 16.4 | 0.317 |
| Aller. conjunct. (eyes) | 25 | 13.9 | 14 | 11.7 | 104 | 11.8 | 0.459 |
| Infec. conjunct. (eyes) | 23 | 12.8 | 9 | 7.5 | 64 | 7.3 | <0.001¥ |
| Keratitis (eyes) | 10 | 5.6 | 3 | 2.5 | 20 | 2.3 | <0.001¥ |
| Strabismus (patients) | 7 | 7.8 | 4 | 6.7 | 36 | 8.2 | 0.246 |
| ARMD (patients) | 9 | 10 | 5 | 8.3 | 64 | 14.5 | <0.001* |
| DRP (patients) | 10 | 11.1 | 6 | 10 | 64 | 14.5 | 0.039* |
| RVO (patients) | 3 | 3.3 | 1 | 1.7 | 28 | 6.4 | 0.001* |
| Glaucoma (patients) | 5 | 5.6 | 3 | 5 | 56 | 12.7 | <0.001* |
| Cataract (eyes) | 53 | 29.4 | 27 | 22.5 | 188 | 21.4 | <0.001¥ |
| Keratoconus (eyes) | 7 | 3.9 | 5 | 4.2 | 40 | 4.5 | 0.519 |
| Blepharoptosis (eyes) | 2 | 1.1 | 4 | 3.3 | 25 | 2.8 | 0.145 |
| Nasolac. duct obs. (eyes) | 17 | 9.4 | 11 | 9.2 | 76 | 8.6 | 0.324 |
| Corn./conj. for body (eyes) | 24 | 13.3 | 5 | 4.2 | 51 | 5.8 | <0.001¥ |
| Prev. ocular trau. (eyes) | 7 | 3.9 | 2 | 1.7 | 16 | 1.8 | 0.001¥ |

MGD: Meibomian gland dysfunction. Aller. conjunct.: Allergic conjunctivitis. Infec. conjunct.: Infectious conjunctivitis. Nasolac. duct obs.: Nasolacrimal duct obstruction. Corn./conj. for body: Corneal/conjunctival foreign body. Prev. ocular trau.: Previous ocular trauma. *Statistically significant between the local population and immigrants (p<0.001). No significant difference was observed between Afghan and Meskhetian individuals (p>0.05). ¥: Significantly higher in Afghan patients than the other individuals (p<0.001). Kruskal–Wallis or ANOVA test and *post hoc* comparisons (Tukey and Scheffe adjusted) were made. ARMD: Age-related macular degeneration: DRP: Diabetic retinopathy; RVO: Retinal vein occlusion

(TB) was detected in 2 patients (2.2%) with scleritis and 2 patients (2.2%) with episcleritis. In the Meskhetian Turk patients, 3 eyes (2.5%) of two patients had anterior scleritis and 5 eyes (4.2%) of four patients had episcleritis. No underlying disease was detected. In the local population, scleritis anterior was detected in 24 eyes (2.7%) of 24 patients and episcleritis in 39 eyes (4.4%) of 32 patients. Underlying TB was detected in 3 patients (0.7%) with scleritis and 3 (0.7%) with episcleritis. There was no difference between the groups in terms of scleritis and episcleritis (p>0.05) but underlying TB was significantly higher in the Afghan patients (p<0.001).

Age-related macular degeneration (ARMD) was present in 9 (10%) of the Afghan patients (dry type in eight and wet type in one) and 5 (8.3%) of the Meskhetian Turk patients (only dry type). ARMD was observed in 64 (14.5%) patients in the local population (dry type in 44 and wet type in 20). ARMD was significantly higher in the local population (p<0.001).

Diabetic retinopathy (DRP) was present in 10 (11.1%) of the Afghan patients (non-proliferative in nine and proliferative in one) and 6 (10%) of the Meskhetian Turk patients (all non-proliferative). In the local population, 64 (14.5%) patients had DRP (non-proliferative in 52 and proliferative in 12). DRP was significantly higher in the local population (p<0.001).

Glaucoma was present in 5 (5.6%) of the Afghan patients and in 3 (5%) of the Meskhetian Turk patients. At 56 (12.7%), patients with glaucoma were found significantly higher in the local population (p<0.001).

Cataract was observed in 53 (29.4%) eyes of 35 patients among the Afghan patients while this condition was found in 27 (22.5%) eyes of 19 of the Meskhetian Turk patients. In the local population, cataract was observed in 188 (21.4%) eyes of 108 patients. Cataract was significantly higher in the Afghan patients (p<0.001).

The sequelae of ocular trauma (blunt or penetrating) causing visual impairment were present in 7 eyes (3.9%) of six Afghan patients and 2 (1.7%) eyes of two Meskhetian Turk patients. In the local population, there were 33 (3.8%) eyes of 33 patients with a history of ocular trauma. In the Afghan patients and local population, the history of ocular trauma was significantly higher compared to the Meskhetian Turks (p<0.001).

**Table 3.** Optical biometry and specular microscopy findings in study participants

| Characteristics | Afghan | Meskhetian | Local population | p |
|---|---|---|---|---|
| Axial length | 23.20±1.52 | 23.31±1.97 | 23.11±1.78 | 0.897 |
| CCT | 531.23±37.76 | 529.94±34.03 | 533±39.94 | 0.476 |
| ACD | 3.32±0.43 | 3.35±0.45 | 3.38±0.76 | 0.678 |
| AVG. K | 44.27±1.35 | 44.55±1.59 | 44.46±1.45 | 0.914 |
| CD | 2684.1±568.4 | 2737.7±536.5 | 2731±582.8 | 0.395 |
| AVG% | 381.39±142.55 | 369.93±149.3 | 376±146.8 | 0.498 |
| HEX% | 65.84±4.99 | 65.79±4.78 | 68.1±5.2 | 0.286 |
| CV | 31.06±5.06 | 30.04±4.51 | 31.56±4.05 | 0.549 |

CCT: Central corneal thickness; ACD: Anterior chamber depth; Avg K: Average K value; CD: Endothelial cell density; AVG%: Average cell size variability %; HEX%: Percentage of hexagonal cells; CV: Coefficient of variation

**Table 4.** Demographic and clinical characteristics of pediatric study participants

| Characteristics | Afghan | Meskhetian | Local population | p |
|---|---|---|---|---|
| Number of patients | 11 | 6 | 48 | |
| Age (Mean±SD) | 11.2±5.1 | 11.9±5.4 | 11.7±6 | 0.654 |
| Gender (M/F) | 6/5 | 3/3 | 23/25 | 0.978 |
| Wearing spectacles at presentation (n; patient) (%) | 2 (18.2) | 1 (16.7) | 11 (22.9) | 0.008* |
| Uncorrected refractive error (n; patient) (%) (Needing glasses-wearing glasses) | 4 (36.4) | 2 (33.3) | 7 (14.6) | <0.001* |
| No previous ocular examination (n; patient) (%) | 6 (54.5) | 3 (50) | 12 (25) | <0.001* |
| Myopia (eyes, n [%]) | 2 (18.2) | 1 (16.7) | 6 (12.5) | ϕ |
| Hyperopia (eyes, n [%]) | 3 (27.3) | 2 (33.3) | 9 (18.8) | ϕ |
| Astigmatism (eyes, n [%]) | 2 (18.2) | – | 4 (8.3) | ϕ |
| Strabismus (patients, n [%]) | 1 (9.1) | – | 4 (8.3) | ϕ |
| Nasolac. duct obs. (eyes, n [%]) | 1 (9.1) | – | 4 (8.3) | ϕ |

M: Male; F: Female. *: Statistically significant between the local population and immigrants (p<0.001). No significant difference was observed between Afghan and Meskhetian individuals (p>0.05). Kruskal–Wallis or ANOVA test and *post hoc* comparisons (Tukey and Scheffe adjusted) were made. ϕ: Statistical analysis was not performed due to the lack of enough data

The number of eyes detected to have corneal or conjunctival foreign bodies was 24 (13.3%) in the Afghan patients and 5 (4.2%) among the Meskhetian Turks. In the local population, 51 (5.8%) eyes had corneal or conjunctival foreign bodies in the initial examination. In the Afghan patients, the presence of a corneal or conjunctival foreign body was significantly higher than in the other groups (p<0.001).

The optical biometry and specular microscopy measurements are shown in Table 3, revealing that there was no difference between the immigrants and the local population (p>0.05).

In pediatric patients, ocular findings and demographic data are shown in Table 4. The ratio of the uncorrected refractive error and lack of previous ocular examination were significantly higher in immigrants than the local population in pediatric group (p<0.05).

## DISCUSSION

The majority of immigrants exist at very low levels in social and economic terms in the countries where they live. Their health status can be very poor and some ocular pathologies are more common in immigrants because they work in dangerous jobs and hard working conditions (6).

Our study consisted of immigrants from Afghanistan and the Meskhetian Turks from Georgia. The former mostly worked in construction and agriculture that required heavy labor. In the Afghan patients, infectious conjunctivitis and keratitis were significantly higher as expected. The history of ocular trauma was higher in the Afghan population than in the Meskhetian Turks population. For example, the rate of patients with corneal/conjunctival foreign bodies detected during the examination was higher among the Afghan patients (13.3%). Many studies have shown that immigrant individuals are more prone to ocular trauma and infections (5, 15).

Immigrants may experience difficulties in accessing health services (2, 3). Although immigrant patients are included in the scope of health insurance in Turkey, they can have problems in accessing health services, and diagnosis and treatment processes are disrupted (3, 16). In our study, most of the migrant patients

stated that they had their first eye examination in Turkey, and the incidence of blurred vision was higher among migrant patients than patients in the local population. The proportion of patients with uncorrected refractive errors was over 50% in both of the immigrant patient groups. The rate of cataracts, causing low vision that required surgery, was higher among the Afghan immigrants. Thus, compared to the local population, the rate of referral to the ophthalmologist is lower when the visual impairment develops in these immigrant patients.

Although there was no difference between the groups in terms of the incidence of episcleritis/scleritis and chorioretinal inflammation, the underlying TB rate was significantly higher in the Afghan patients when further examination was requested to examine the etiology of these diseases. Although a routine vaccination program exists in almost all countries regarding TB, these individuals with low socioeconomic status could have difficulties in accessing the vaccination program, and many do not know whether Bacillus Calmette-Guérin vaccination has been administered (17–20).

Blepharitis is one of the most common infestations in routine ophthalmology practice, and in our study, this situation was higher in immigrant individuals than in the local population. Among the patients in the study, the rates of glaucoma, ARMD, and DRP were higher in patients in the local population than in immigrant patients. While the leading causes of vision loss in developed countries around the world are ARMD, diabetic eye complications, and glaucoma, cataracts are considered among diseases causing more frequent vision loss in underdeveloped countries (21–24). In developed countries, patients can undergo phacoemulsification surgery before the development of serious vision loss (21, 24).

The main cause of low vision was uncorrected refractive error for both immigrants and local population in the study. The leading cause of blindness was cataract in immigrants while retinal diseases (such as ARMD, DRP, and RVO) and glaucoma in local population in our study. When evaluated in terms of the presence of legal blindness in the patients included in the study, 5/90 (5.6%) of the Afghan patients, 1/60 (1.7%) of the Meskhetian Turk patients, and 8/440 (1.8%) of patients in the local population were considered to have legal blindness. This situation shows that the Afghan patients have a lack of adequate ophthalmological services. The main reason for this situation is the lower socioeconomic level of the Afghan migrant patients compared to the local population and Meskhetian Turk population in Northeast Turkey.

There are many publications showing that uncorrected refractive error, cataract, ocular infections, foreign body, and trauma are higher among immigrants than in the local population similar to our study (4, 9–12, 24, 25).

Erdem's study showed that Syrian refugees have been affected by several causes of preventable blindness, although they had free access to public health services in the country (25). The possible reasons of this situation are difficulties associated with lack of knowledge regarding eye health services and challenges arising from organizational problems related to the delivery of health services. The author also recommended that providing regular eye disease screening programs and rehabilitation services may be beneficial in preventing blindness in the refugee population.

## CONCLUSION

Ocular disorders such as uncorrected refractive error, cataract, infections, foreign body, and trauma can be seen more in immigrants. To remedy this situation, there are many steps that all the countries of the world must take for these individuals to access and benefit from the necessary health services.

**Ethics Committee Approval:** The Erzincan Binali Yıldırım University Clinical Research Ethics Committee granted approval for this study (date: 23.09.2019, number: 33216249-604.01.02-E.44524).

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – AU; Design – AU; Supervision – AU, Eİ; Materials – Eİ, NGT; Data Collection and/or Processing – NGT, TU; Analysis and/or Interpretation – AU, TU; Literature Search – AU, Eİ; Writing – AU; Critical Reviews – AU.

**Conflict of Interest:** The authors have no conflict of interest to declare.

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