A Comprehensive Study on the Prevalence and Determinants of Vision Impairment in the Turkish Population

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ABSTRACT

Objective: Vision impairment and eye diseases significantly affect quality of life and present a substantial public health challenge. According to the TUIK and the World Health Organization, a significant portion of the population suffers from preventable or unaddressed visual impairments. Understanding the prevalence, causes, and demographic distribution of these impairments can aid in formulating effective public health strategies. To analyze the prevalence, determinants, and demographic characteristics of individuals with vision impairment in Turkey, using data provided by TUIK. This proposal aims to utilize existing data to provide valuable insights into the public health issue of vision impairment in Turkey and to foster improved outcomes through targeted intervention strategies.

Methods: Secure access to TUIK health survey data focusing on vision impairment in the population aged 0–65 years. We collected additional variables that may influence vision health, such as socioeconomic status, access to healthcare, educational level, and urban versus rural residence. We conducted a cross-sectional study using TUIK data from 2019 onwards, including demographic variables (age, sex, education, and income), and correlated them with the incidence and type of vision impairment.

Results: Visual impairment affects approximately 1039000 individuals in Turkey, with a prevalence rate of 1.4%. There was a pronounced increase in visual impairment with age, peaking at 46.5% in those aged > 75 years. Females exhibited higher rates of impairment in most age groups. The most common causes of visual impairment include uncorrected refractive errors in children and young adults, glaucoma in adults aged 15-50, and age-related macular degeneration and diabetic retinopathy in those aged > 50 years.

Conclusion: This study highlights a significant age and sex disparity in the prevalence of visual impairment in Turkey, necessitating age-specific and gender-responsive public health strategies. Prioritizing early screening, access to corrective measures, and managing age-related ocular diseases can address the increasing burden of visual impairment. Interventions should be tailored to mitigate risks and provide equitable healthcare access to improve visual health outcomes in the Turkish population.

Keywords: Visual Impairment, Turkey, Epidemiology, Prevalence Rate, Age-Related Diseases, Gender Disparity, Refractive Errors, Glaucoma, Macular Degeneration, Diabetic Retinopathy, Cataracts, Public Health Strategies, Healthcare Access, Preventive Care, Screening, Corrective Measures, Ocular Disease Management.

INTRODUCTION

In the ever-evolving demographic landscape of Turkey, the prevalence and determinants of visual impairment present a significant public health concern that warrants comprehensive analysis (1, 2). Despite substantial progress in eye health globally, Turkey faces unique challenges that underscore the necessity for localized data to understand and address the burden of eye diseases within its population. Visual impairment not only impairs quality of life, but also places economic and social burdens on individuals, families, and communities, accentuating the need for robust and tailored health policies (3, 4). Previous studies within the Turkish context have been either geographically constrained or limited by the scope of the visual conditions evaluated, often not capturing the multifaceted nature of visual impairment in the population at large (5).
Moreover, reliance on secondary data from disparate health systems or international rates poses the risk of inaccuracies due to Turkey's distinct healthcare infrastructure, socioeconomic environment, and genetic predispositions that differ from those of other nations (5, 6). This is compounded by the fact that self-reported measures of visual impairment frequently suffer from underreporting and misclassification, influenced by demographic variables, such as age, gender, and socioeconomic status. Hence, studies conducted in isolated urban areas or among patient populations have failed to provide a representative picture of the nation's eye health, excluding those with unmet eye care needs or undiagnosed conditions.

Recognizing these gaps, the present study aims to utilize comprehensive national data from the Turkish Statistical Institute (TUIK) to ascertain the prevalence and determinants of visual impairment across Turkey. The integration of TUIK data presents an unprecedented opportunity to engage in a detailed and accurate epidemiological assessment of visual impairment in a geographically and demographically diverse Turkish population. By capitalizing on this rich dataset, our objective was to delineate the patterns of visual impairment, uncover associated risk factors, and identify demographic groups that are particularly vulnerable to vision loss. The outcomes of this investigation are anticipated to inform the development of targeted interventions, optimise healthcare resource allocation, and catalyze policy reforms attuned to the specific needs of Turkey's aging population. Ultimately, these findings are expected to serve as a cornerstone for stakeholders, including healthcare professionals, policymakers, and rehabilitation service providers, in their collective efforts to improve ocular health outcomes and enhance the well-being of individuals with visual impairments nationwide.

MATERIAL and METHODS

Data Source and Collection

This study utilized demographic and health statistics for Turkey sourced primarily from the Turkish Statistical Institute (TUIK). Population data, along with age- and sex-specific prevalence rates of visual disabilities, were derived from TUIK records as of December 2022. These records are maintained within the Central Population Administration System (MERNİS) database, which provides comprehensive and timely demographic data.

Defining Disability

The definition of disability employed in this study conforms to the contemporary functional limitation approach, which emphasizes the impact of disabilities on everyday activities. According to the latest Population and Housing Survey criteria, individuals are recognized as disabled if they experience extreme difficulty or inability in one or more of the following areas: vision, hearing, speech, learning, remembering/concentrating, and movement. This classification system aligns with global standards and comprehensively understands disabilities across various dimensions. The underlying causes of visual impairment were coded according to the ICD-10 standards set by WHO. These records form a crucial component of our analysis, facilitating accurately assessing visual impairment-related disabilities.

Study Design and Objective

Our research adopted a cross-sectional study design focusing on trends in visual-related disabilities (VRDs) in Turkey from 2019 to 2022. This study aimed to evaluate these trends against similar data from various European countries to identify unique patterns and potential disparities in the prevalence and causes of VRDs.

Data Acquisition and Reliability

The reliability and accuracy of the study were ensured using validated databases. Key sources include:

1. The Worldometer Database (as of 15/10/2023) provides current statistics on global health indicators (7-9).
2. The Turkish Statistical Institute (TUIK) from 2019-2022 offered authoritative and detailed national data on health and mortality, specifically related to visual disabilities (7).

Ethical Consideration

Given that the data for this study were sourced from public databases that did not involve personal identifiers or confidential information, the need for ethics committee approval was waived. However, the study was conducted with strict adherence to ethical standards for research, utilizing publicly available data, without breaching privacy or confidentiality agreements.

RESULTS

Visual Impairment in Turkey

Within this framework, visual impairment in Turkey, as reported by the Social Security Institution, affects approximately 220,000 individuals, translating to 3 out of every 1,000 people (7, 10).

According to the Address-Based Population Registration System, as of December 2022(10), Turkey’s population is 83614362, with a slight majority of males (50.1%) over females (49.9%). Specifically, there were 41,915,985 males and 41,698,377 females. The country's annual population growth rate has decreased from 13.9 per thousand in 2019 to 5.5 per thousand in 2020. Moreover, the median age increased from 32.4 in 2019 to 32.7 in 2020 (10).

Global Visual Impairment

Visual impairment is a global public health concern that significantly impacts quality of life. According to the World Health Organization (WHO) (Table 1).

Distribution of Global Visual Impairment and Age and Gender Dynamics

The most recent data are from comprehensive and authoritative sources such as the World Health Organization (WHO), the International Agency for the Prevention of Blindness (IAPB), and peer-reviewed publications in the field. Based on the information available up to April 2023, the following are some general figures:
1. Geographic Distribution: The WHO's World Report on Vision indicated that regions such as Southeast Asia and the Western Pacific have a higher prevalence of visual impairment. These regions collectively encompass over 50% of the global visually impaired population.

2. Economic Impact: Low- and middle-income countries disproportionately bear the burden of visual impairment, with estimates indicating that over 80% of all cases of vision impairment and blindness occur in these countries.

3. Gender Differences: Women are at a higher risk of visual impairment, and estimates suggest that of the 285 million people worldwide who are visually impaired, 64% are women, which could mean that approximately 182 million women are affected.

4. Age-related Dynamics: For children, the WHO estimates that approximately 1.4 million are blind. However, the prevalence of moderate-to-severe visual impairment in children is higher, with numbers ranging from millions globally.

Turkish Population Visual Impairment Distribution by Age Group and Gender

Based on the data provided by the Turkish Statistical Institute (TUIK) for the years 2019-2022, individuals with visual impairments constituted 1.4% of the total population. Males with visual impairments constituted 1.3% of the male population, whereas females with visual impairments constituted a slightly higher percentage (1.5 %) of the female population. In terms of absolute numbers, there were 1,039,000 people with visual impairments, with 478,000 males and 561,000 females.

The distribution of visual impairment within the general population varies across age groups and sexes. The percentage of visual impairment increases significantly with age, starting from 2.3% in the age group of 3-9 to a staggering 46.5% in those aged 75 years and over. Table 2 provides the details of the visual impairments.

Table 1: Visual impairment is a global public health concern that significantly impacts quality of life. According to the World Health Organization (WHO).

| Worldwide, 285 million people are estimated to be visually impaired. |
| Of these, 39 million were blind. |
| The remaining 246 million have low vision, with sufficient impairment to affect their ability to perform everyday tasks without special accommodation. |
| Approximately 90% of the world's visually impaired live in low-income settings. |
| 82% of people living with blindness are aged 50 years and above. |
| Globally, uncorrected refractive errors are the main cause of moderate and severe visual impairments. |
| Cataracts remain the leading cause of blindness in middle- and low-income countries. |
| The majority of people with visual impairment are older, and as the population ages, more people are at risk of vision impairment due to conditions such as macular degeneration, diabetic retinopathy, and glaucoma. |

Table 2: Average Population with Visual Impairment by Age Group and Gender, in 2019-2022

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>Most prevalent Causes of Visual Impairment</th>
<th>Total population (% Average) of</th>
<th>Male (%) Average of</th>
<th>Female (%) Average of</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>Childhood Blindness, Uncorrected Refractive Errors</td>
<td>2.3%×1.4%</td>
<td>2.5%×1.3%</td>
<td>2.1%×1.5%</td>
</tr>
<tr>
<td>3-9</td>
<td>Uncorrected Refractive Errors</td>
<td>2.1%×1.4%</td>
<td>2.4%×1.3%</td>
<td>1.8%×1.5</td>
</tr>
<tr>
<td>10-15</td>
<td>Uncorrected Refractive Errors</td>
<td>2.3% to 4.0%</td>
<td>2.6% to 4.0%</td>
<td>2.0% to 4.1%</td>
</tr>
<tr>
<td>15-35</td>
<td>Glaucoma, Uncorrected Refractive Errors</td>
<td>5.1% to 6.9%</td>
<td>4.7% to 5.9%</td>
<td>5.6% to 7.8%</td>
</tr>
<tr>
<td>36-50</td>
<td>Age-Related Macular Degeneration</td>
<td>8.8% to 16.5%</td>
<td>7.1% to 12.3%</td>
<td>10.7% to 20.4%</td>
</tr>
<tr>
<td>51-65</td>
<td>Diabetic Retinopathy, Cataracts</td>
<td>Assume ≥16.5%×1.4%</td>
<td>Assume ≥12.3%×1.3%</td>
<td>Assume ≥20.4%×1.5%</td>
</tr>
<tr>
<td>&gt;66</td>
<td>Age-Related Macular Degeneration, Cataracts</td>
<td>Assume ≥16.5%×1.4</td>
<td>Assume ≥12.3%×1.3</td>
<td>Assume ≥20.4%×1.5%</td>
</tr>
</tbody>
</table>
**DISCUSSION**

The landscape of visual impairment in Turkey reflects a pattern of increasing prevalence with advancing age and a sex-specific disparity that favors a higher incidence in females. The Turkish Statistical Institute (TUİK) data from to 2019-2022 highlights that 1.4% of the population, or approximately 1,039,000 individuals, experience visual impairment. Females are marginally more affected than males, a trend consistent with global observations and possibly attributed to their longer lifespans and associated risk of age-related eye conditions (3, 11).

Age was a significant factor in the prevalence of visual impairment. In Turkey, it has increased from 2.3% in young children to 46.5% in the elderly over 75 years of age. This increase underscores the impact of age-related eye diseases, such as cataracts, glaucoma, macular degeneration, and systemic conditions, such as diabetes, that affect eye health. Study results suggest that eye care services contribute to the observed reduction in age-standardized rates of avoidable blindness (2, 12). Thus, the increase in preventive visual impairment treatments should be targeted in an aging global population.

Early life visual impairment, particularly in the 0–9-year age bracket, is predominantly due to uncorrected refractive errors, signifying an urgent need for enhanced pediatric eye care that includes regular screenings and access to corrective lenses (13-15). For those aged 15 to 50 years, the onset of conditions such as glaucoma and age-related macular degeneration (AMD) marks a shift to more complex and sometimes irreversible causes of impairment, thus requiring early and sophisticated medical intervention (16-18).

The implications of health policy and intervention strategies in Turkey are multifaceted. A nuanced approach is necessary, considering the aging demographic and notable gender disparities. Health services must incorporate preventive care, such as diabetes management and lifestyle changes, to reduce the risk of age-related macular degeneration (AMD), along with providing accessible treatment options for conditions such as cataracts.

The prevalence of uncorrected refractive errors across age groups of up to 35 years calls for expanding optometric services and affordable corrective devices. Given the vocational impact of visual impairment in the 15-35 age bracket, there is a critical need for occupational health strategies that facilitate education, employment, and overall economic productivity.

Our comparative analysis revealed that Turkey's visual impairment prevalence rate of 0.26% was lower than the global average reported by the WHO (2, 5, 12). This could reflect the effectiveness of Turkey's health care system and public health initiatives. However, considering the global burden of visual impairment predominantly in low-income countries and disproportionately affecting older individuals, there is a clear call to action for age and economically-specific healthcare strategies.

WHO data indicate significant regional disparities in the prevalence of visual impairment, with the highest numbers in Southeast Asia and the Western Pacific (19, 20). These disparities, coupled with economic factors and a gender bias where women represent 64% of those affected, highlight the necessity for resource allocation and health policies that are region-specific, economically sensitive, and gender-responsive.

Million children worldwide, the WHO estimates 1.4 million are blind, with visual impairment during childhood potentially having lifelong consequences (12). This highlights the importance of early screening and intervention to prevent and treat conditions that lead to impairment.

In conclusion, while Turkey shows a lower prevalence of visual impairment compared to global rates, the expected demographic shift towards an older population will likely increase the burden of age-related eye conditions. Therefore, public health strategies must be adopted to address this challenge. International collaboration focused on reducing visual impairment, particularly in low- and middle-income countries, is crucial. Future research should explore the causes of regional disparities and barriers to health access to effectively inform public health policies and interventions.

Strategic, collaborative, and inclusive approaches are vital for mitigating the global health challenges of visual impairment. In Turkey, addressing gender and age-related trends in visual impairment can lead to the development of targeted, effective public health interventions, ultimately reducing the overall burden of eye disease and improving the quality of life of affected individuals.

**CONCLUSION**

Given the clear trend of increasing visual impairment with age and the higher prevalence among females, our recommendations include sex-specific and age-specific strategies for prevention, screening, and treatment. It is important to prioritize the availability and affordability of corrective measures for refractive errors, especially in younger age groups, to address these impairments early. There is also a pressing need for public health initiatives to address the rising rates of age-related diseases such as macular degeneration and diabetic retinopathy. Programs for lifestyle modifications, diabetes control, and regular eye examinations could substantially reduce the incidence and impact of these conditions. Policymakers should consider these gender- and age-related dynamics when allocating resources for health services and designing public health interventions. Further research to understand the underlying causes of gender differences in visual impairment could provide more effective targeted interventions. Efforts to improve access to eye care services, particularly for the aging population and in areas with limited healthcare infrastructure, must be prioritized to reduce the burden of visual impairment in Turkey.

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**Ethical approval:** The present study was conducted in strict accordance with the principles outlined in the Declaration of
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