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Review Article

Epidemiology of eye diseases in Bangladesh

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ABSTRACT

Background: Bangladesh is densely populated country in South Asia, faces significant challenges in eye health due to various socioeconomic, environmental, and healthcare access factors. Limited access to quality eye care services, poor hygiene practices, prevalence of infectious diseases, and a high burden of non-communicable diseases contribute to the prevalence of eye disorders in the region.
Objective: This study aims to comprehensively analyze the prevalence, distribution, and risk factors associated with various eye diseases among the population of Bangladesh.
Materials and Methods: A systematic review and meta-analysis were conducted to gather data on the epidemiology of eye diseases in Bangladesh. Published studies, national surveys, and reports from relevant health organizations were reviewed to compile data on the prevalence, distribution, and risk factors of common eye conditions, including cataracts, refractive errors, conjunctivitis, glaucoma, diabetic retinopathy, and age-related macular degeneration.
Results: The prevalence of eye diseases in Bangladesh is relatively high, with conditions such as refractive errors, cataracts, glaucoma, and corneal diseases being major concerns. Refractive errors, including myopia, hyperopia, and astigmatism, affect a substantial portion of the population, particularly among children and young adults. Cataracts, a leading cause of blindness worldwide, also pose a significant burden in Bangladesh, with prevalence increasing with age. While the prevalence of glaucoma in Bangladesh is lower compared to some other countries, the condition remains a cause of concern due to its impact on quality of life and the healthcare system. Diabetic retinopathy, a complication of diabetes mellitus, affects the retina and is a leading cause of vision loss and blindness globally in the elderly. In Bangladesh, the rising prevalence of diabetes, fueled by changing lifestyles and an aging population, has contributed to an increasing burden of diabetic retinopathy. Conjunctivitis is prevalent, particularly in densely populated urban areas and rural communities with limited access to clean water and sanitation facilities.
Conclusion: Collaborative efforts involving government agencies, healthcare providers, non-governmental organizations, and the community are essential to effectively address the burden of eye diseases in Bangladesh. By implementing preventive measures and improving access to quality eye care services, it is possible to mitigate the impact of these eye diseases and improve visual health outcomes for the population.

1. Introduction

Despite making substantial progress in improving many of the major health indicators, Bangladesh- a large LMIC (Low Middle Income Country) with a population of

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167.945 million (July 2022 estimate)[1] still has numerous health challenges including ensuring eye health for a vast population particularly for its impoverished population group and who live in rural and remote regions. In Bangladesh, about 1.4 million children under age 15 are estimated to be blind and more than 0.75 million population aged more than 30 years are estimated to be blind. Over 6 million people in have low vision problems that can be corrected by spectacles and other means like diagnosis and treatment.[2] The most common eye diseases that are serious enough to require hospital treatment include refractive errors, cataracts, glaucoma, retinal disorders, age related macular degeneration, diabetes-related eye disorders and conjunctivitis. Prevalence of eye diseases increase with age. Of which, cataract is the major cause of visual impairment leading to blindness.[3] It is officially estimated that approximately 120,000 new patients develop cataracts every year in Bangladesh.[3] Despite the high prevalence of eye disease, a lack of research or in depth understanding on the causes, risk factors, socio economic burden and unidentified high-risk population, progress made so far on improving eye healthcare has been quite limited or remains unknown.

It is reported that 80% of the visually impaired persons live in rural areas, often remote areas where eye care treatment facilities are absent or inadequate because 90% of the doctors including ophthalmologist and paramedics working on eye health live or practice in urban areas; thereby; it poses challenge for rural and remote people to access eye care facilities.[2,4] Socioeconomic and cultural constraints, and the medical poverty traps have also led to poor eye health in rural and remote areas in Bangladesh.[5] In Bangladesh, eye care is provided mostly in secondary level hospitals located in the district towns which in most cases are not properly equipped with essential diagnostic and microsurgical equipment, numerous laboratory testing and surgical facilities and adequate human resources.[5] In the economically developed region of Bangladesh, like Dhaka and Chittagong, there are affluent tertiary level government and NGO facilities where a large number of ophthalmologists are working to provide eye related services like refraction, cataract surgery, treatment of corneal ulcer, surgical treatment of glaucoma, YAG laser treatment, etc.[5]

In this circumstance, to ameliorate discrepancy of eye health care between urban and rural, elderly, eye health care seekers, Bangladesh government has proposed national eye care action plan with the aim of developing infrastructure and technology, increasing cataract level surgical rate through enhancing skills of ophthalmologists, strengthening coordination among GO, NGO and private eye-care providers, preventing childhood blindness, increasing affordability of eye-care services by the poor patients, particularly the elderly, women, and children through voucher scheme, increasing awareness of mass people on eye-care, supporting low-vision patients.[6]

Periodic review of epidemiological studies will help to understand the status and progress of the National Eye Care Plan and other government led strategies and programs. Epidemiological research provides the data to identify and address immediate and long-term eye health care needs by reporting on the prevalence of major eye diseases and helps in finding out the major causes and associated risk factors of visual impairment and eye disorder and target the high-risk population who should receive necessary attention and appropriate treatment. Epidemiological investigation also provides a means of monitoring the eye health of a population as well as charting changes over time.[7]

The objective of this study is to review published research studies and provide a summary of eye disease prevalence, causes, risk factors and identify the high-risk population groups by age, gender, rural/urban residence, income, occupation in Bangladesh. The findings of this study will provide strong insight for government and non-government policy makers, the eye healthcare and public health professionals and other eye sight advocates to develop and implement awareness and prevention programs and design and provide institution-based curative programs to reduce the incidence and burden of eye related diseases and conditions.

2. Materials and Methods

This study was a literature review of research studies on eye health published between 2001 to 2021. The researchers accessed, retrieved and reviewed research articles available in PUBMED and Google Scholar and several online Journals and newspapers in Bangladesh. Several search terms were used, including “ophthalmology”, “ophthalmologist”, “eye”, “eye diseases”, “vision loss”, “eye injury”, “tears”, “conjunctivitis”, “cataract”, “glaucoma”, “refractive error”, “diabetic retinopathy”, “blindness”, “telemedicine in ophthalmology and their combinations”. Researchers also reviewed epidemiological reports of WHO, the Centers for Disease Control and Prevention (CDC), the American Society of Retina Specialists, Ophthalmological Society of Bangladesh (OSB) and research studies published on similar topics in other countries for comparison and discussion purposes.

3. Results

The list of the studies found and reviewed are listed in Table 1 along with key findings on high-risk population groups. The following eye diseases were studied in Bangladesh by these previous studies:

Table 1:

Disease/condition	Citation	Study design and population	Prevalence	Key Findings
Refractive error	Sutradhar et al.[8]	Population based study among 1320 households in slums of Dhaka city.	63.2%	Higher among women[8], income generating workers[8], people of 40 years or above,[8–10] positive family history,[11] high socio-economic classes,[11] extended near work activities such as reading, writing watching television. Playing computer games etc.[11,12]
	Jabbar et al.[9]	Cross sectional study among 3124 respondents in Dhaka city, different districts of Dhaka Division and different Upazillas of Dhaka district.	36.9%	
	Raihan et al.[12]	Study among 28,835 children aged 5 to 15 years in Khulna district.	1% among children where female and male had prevalence of 1.1% and 0.95% respectively.	
	Kader et al.[11]	Study on School going Children aged 5 to 15 years in North West Zone of Bangladesh.	9.2%	
	Dineen et al.[10]	Population based study among 12,782 adults aged 30 years and older (National Blindness and Low Vision Survey of Bangladesh)	18.87%.	
Cataract	Sutradhar et al.[8]	Population based study among 1,320 households in slums of Dhaka city.	7.2%	Higher among females that became significant with increasing age and lower socioeconomic status and negatively associated with the level of education [8.9]. Older patients with poor socio-economic condition (low-income groups) and poorly educated/ illiterate persons or living alone are mostly affected[9]. Rural habitats are mostly suffered.[10]
	Jabbar et al.[9]	Cross sectional study among 3,124 respondents in Dhaka city, different districts of Dhaka Division and different Upazilla of Dhaka district.	3.4%	
	Dineen et al.[10]	Population based study among 12,782 adults aged 30 years and older (National Blindness and Low Vision Survey of Bangladesh)	73.39%	
Glaucoma	Rahman et al.[13]	Population-based survey in Dhaka division among 3,562 population aged 40 years and older.	2.1% and 3.1% respectively. POAG & PACG was 2.5% and 0.4% respectively.	Higher in men, positive family history, older people and does not show a clear increase with age.[9,10,13]
	Jabbar et al.[9]	Cross sectional study among 3,124 respondents in Dhaka city, different districts of Dhaka Division and different Upazillas of Dhaka district.	0.5%	

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Table 1 continued

	Dineen et al.[10]	Population based study among 12,782 adults aged 30 years and older (National Blindness and Low Vision Survey of Bangladesh)	1.63%	
Diabetic Retinopathy	Jabbar et al.[9]	Cross sectional study among 3,124 respondents in Dhaka city, different districts of Dhaka Division and different Upazillas of Dhaka district.	0.2%	The prevalence significantly gets higher with increasing age in both males and females that peaks at older age group (over 55 years).[9,10,14] People in rural area had more retinopathy than urban people[15,16] as they cannot visit the centre regularly and miss follow-up often as they have to travel a long distance.[16]
	Dineen et al.[10]	Population based study among 12,782 adults aged 30 years and older (National Blindness and Low Vision Survey of Bangladesh).	0.63%	
	Akhter et al.[15]	Population-based cross-sectional study among 836 participants aged 30 years or over in a remote rural community of Bangladesh.	5.4% that peaks at 10.7% in older group of over 55 years. 21.6%, 13%, and 3.5% among the diabetic subjects, prediabetic subjects and nondiabetic subjects respectively.	
	Zabeen et al.[16]	Cross-sectional study among 662 participants in young people with type 1 diabetes in Bangladesh.	6.6%	
	Huda et al.[14]	Frequency and pattern of 173 retina cases from 7,164 total cases in outpatient department of the 250 bed General Hospital, Jamalpur.	25.9%	
Conjunctivitis	Sutradhar et al.[8]	Population based study among 1,320 households in slums of Dhaka city.	17.1%	Most common type identified was allergic conjunctivitis which was highly prevalent in young children.
Age related macular degeneration	Dineen et al.[10]	Population based study among 12,782 adults aged 30 years and older (National Blindness and Low Vision Survey of Bangladesh).	12.03%	Higher in male, elderly people of 55 years or more. This is strongly correlated with smoking and hypertension.

4. Discussion

In Bangladesh, refractive error, cataract, glaucoma, diabetic retinopathy, conjunctivitis, age related macular degeneration have been identified by previous studies as the major causes of ocular diseases. The incidence and prevalence of these eye diseases in Bangladesh varied by geographic location and were found to have association with several demographic factors like sex and age of the population, socioeconomic conditions, urban and rural dwelling, educational status and occupational profile.

The causes of blindness and visual impairment vary according to socioeconomic situations and the availability of health and eye care facilities in underdeveloped nations like Bangladesh. Gender is a biological variable that can influence the efficiency of biological processes in both men and women, as well as how they respond to medications used for eye disease. In underdeveloped countries, women are more likely than men to acquire visual impairment or a serious eye disorder (such as age-related macular degeneration, thyroid eye disease, or chronic dry eye disease).[17] With the passage of time, many benign changes occur in eyes, leading to the development of age-related eye disorders such as age-related macular degeneration, cataract, diabetic eye disease, and glaucoma.[18] Income status of a country posed variation in eye difficulties in LMIC compared with HIC. Female in LMIC have less access to low financial resources and are lowly empowered, which are essential to access eye care and to lead a healthy life, than female in HIC. Educational attainment which could be an important epidemiological factor in explaining eye care utilization is less helpful if one does not have access to eye care services as might be the case in many LMIC.[19]

Refractive error was found as the most prevalent eye disease in several studies conducted in Bangladesh i.e., urban slum population of Dhaka[8] and National Blindness and Low Vision Survey of Bangladesh.[10] The prevalence of refractive error were reported to be 5.46% and 6.41% by Khandekar et al.[20] and Triveni C. et al[21] respectively which is higher than our reviewed study.[12] Prior studies showed that the prevalence of refractive error is increased linearly with age. In addition, females are sustained by refractive errors more than male population which is consistent to previous author.[22] In addition, refractive error was found to be more prevalent among income generating workforce.[8] Besides refractive error was also spotted to be increased with positive family history and socio-economic classes[11], extended near work activities such as reading, writing watching television. Playing computer games or using other electronic gadgets etc.[11,12] However, there is no association observed in between place of residence with refractive error. So, future studies should be carried out in regards to understand the association between place of residence and refractive error.

Cataract is another highly prevalent eye disorder in Bangladesh. The prevalence of cataract was featured high (73.39%) in National Blindness and Low Vision Survey of Bangladesh.[10] on the other hand, Study conducted in Asian continent i.e., India (Population aged ≥40),[23] Indonesia (Population aged ≥21),[24] Taiwan (Population aged ≥65)[25], and Singapore (Population aged ≥40),[26] revealed that the prevalence of cataract was 61.9%, 23.0%, 59.2% and 34.7% respectively which is found much higher than several reviewed study[8,9]. Cataract is observed to increase with age and poor socio-economic condition (low-income groups)[9,12] In addition, cataract was found more prevalent in females than males.[8] Besides cataract was also spotted to be increased among rural population than urban groups.[10] This might be because people living in rural areas frequently have less access to healthcare facilities, are more likely to be exposed to environmental elements including sunlight, pollution, and agricultural pesticides, are less aware of the importance of eye health, and wait longer to get their cataracts diagnosed and treated. Family history, on the other hand, does not appear to be linked to cataracts. As a result, extensive research into the family history of cataracts is recommended.

Compared to refractive error and cataract, glaucoma was found to be significantly lower in our reviewed study.[8,9,12] The prevalence of glaucoma was reported to be 5.0%, 3.8%, 2.6% in Japan, Thailand and India respectively of habitats aged over 40 years.[27–29] In contrast, the findings of the reviewed study revealed there was less prevalence of glaucoma across Bangladesh.[9,10,13] Glaucoma was featured to be higher in male compared to female.[9] Higher intraocular pressure (IOP) and lower levels of estrogen in males could contribute to their higher susceptibility to glaucoma. In addition, it is also found that older people and positive family history was found more affected with glaucoma disorder.[10,13] However, glaucoma does not appear to be associated to socioeconomic level or residence of the respondents. As a consequence, considerable research is needed to envisage with glaucoma patients' in regards to socioeconomic status and place of residence.

Diabetic retinopathy (DR) is becoming a more significant consequence of diabetes and a leading cause of blindness in the elderly. Study conducted by Goh et al[30] and Wong et al[31] revealed that prevalence of DR in Malaysia and Singapore was 36.8% and 35% respectively. In India, the prevalence of diabetic retinopathy was found 26.2% (aged 50 years or more) and 10.5% (aged 40 years or more) in 2002[32] and 2004[33] respectively. In contrast, the prevalence of DR in Bangladesh is discovered very low in the reviewed study.[9,10,15] The prevalence of diabetic retinopathy is significantly gets higher with increasing age in both males and females that peaks at older age group (over 55 years).[9,10,14] In addition, people resides in rural area had more retinopathy than urban people[15,16] as they

cannot visit the centre regularly and miss follow-up often as they have to travel a long distance.[16] Furthermore, no association between socioeconomic level and family history of diabetic retinopathy has been identified. As a result, detailed research on socioeconomic status and family history of diabetic retinopathy are expected to be conducted.

Conjunctivitis is an inflammation or infection of the transparent membrane (conjunctiva) that lines eyelid and covers the white part of the eyeball. According to various literature, it is assumed that there are three types of conjunctivitis such as viral and bacterial conjunctivitis, allergic conjunctivitis and conjunctivitis resulting from irritation.[33] In general, conjunctivitis accounts for 1% of all primary care and emergency room visits.[34] However, viral conjunctivitis commonly affects adults, and bacterial conjunctivitis commonly affects children. The incidence of infective conjunctivitis is higher in children <1-year-old (8,000 cases per 100,000 patient) than in children >4 years of age (1,200 cases per 100,000 patient).[35] But the infective conjunctivitis occurs equally in males and females.[36] The present reviewed article found only one study in Bangladesh that has mentioned the magnitude of allergic conjunctivitis among young children. No other studies were found indicating the prevalence of conjunctivitis in respect to its types as well as the epidemiology. Therefore, epidemiological study on conjunctivitis is strongly advised to carry out.

About AMD, in the Aravind Eye Study, early AMD was diagnosed clinically in 2.7% and late AMD in 0.6% of the 4917 Indian participants 40 years and older.[37] In contrast our reviewed study is reported that AMD was higher in population of Bangladesh.[10] Through the review of previous study, it is illustrated that AMD was higher in male than female, elderly people of 55 years or more.[10] This is strongly correlated with smoking and hypertension.[10] On the other hand, no correlation is observed with macular degeneration patient with economic status, family history and living areas. So, it can be suggested to make further investigation on macular degeneration patient with respect to economic status, family history and living areas.

5. Conclusions

Eye health and vision have widespread and profound implications for many aspects of life, health, sustainable development, and the economy. Information on the epidemiology of eye diseases helps in identify the risk factors associated with eye diseases, planning and management of eye care facility, thereby decreasing the burden of blindness from Bangladesh.

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None.

7. Conflict of Interest

None.

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