Mobile Eye Clinics: A Crucial Strategy to Prevent Vision Impairment in Developing Countries

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Introduction

Vision impairment remains a critical public health challenge in developing countries, where access to eye care is often severely limited. Poverty, poor healthcare infrastructure, and lack of resources exacerbate preventable vision problems, leading to significant psychological, social, and economic consequences. Globally, 45% of vision impairment can either be prevented or treated if caught early. The leading causes of vision impairment and blindness worldwide are refractive errors and cataracts. Only 36% of people with a distance vision impairment due to refractive error and only 17% of people with vision impairment due to cataracts have received access to an appropriate intervention (World Health Organization (WHO), 2023). This presents a tremendous opportunity for action. Mobile eye clinics represent a cost-effective, innovative solution to this problem, offering vital eye care to underserved populations. This article examines the impact and effectiveness of mobile eye clinics in addressing vision impairment in developing countries, highlighting real-world success stories and empirical research.

The Burden of Vision Impairment

Globally, approximately 1 billion people suffer from vision impairment that could have been prevented or is yet to be addressed, with a majority (89%) residing in developing countries (WHO, 2019; Haileamlak A. et al., 2022). Individuals in lower socioeconomic brackets face higher risks due to factors such as inadequate nutrition, limited access to clean water, lack of education, and limited access to healthcare services (IAPB, 2017). Bourne et al. (2017) note that the cyclical relationship between poverty and vision loss creates substantial economic and social development barriers.

Vision loss exists broadly, ranging from mild impairment to total blindness. The majority of individuals with vision loss who fall within this range are categorized as having "low vision" or being "legally blind." While many vision issues can be corrected with prescription eyeglasses, *low vision* refers to impairment that cannot be improved through glasses, medication, surgery, or other treatments. This is why timely diagnosis and treatment, especially in regions with deficient healthcare infrastructures, is critical to prevent the worsening of vision loss.

Vision loss affects nearly every aspect of life, including personal independence, mental and physical health, and economic well-being, and can lead to mounting problems discussed below.

Psychosocial impact of vision loss

The psychosocial effects of visual impairment reach far beyond the individual, influencing both personal relationships and broader social dynamics. Increased dependence on family members for everyday tasks can heighten tension and stress, potentially straining relationships over time (Subramanian, 2018). Families of individuals with visual impairments often face substantial challenges, as caregiving duties can become physically, emotionally, and financially demanding. This added responsibility can lead to

caregiver burnout, reduced quality of life, and emotional distress for family members (Shahin et al., 2017).

Social isolation is a frequent consequence of visual impairment. The challenges associated with vision loss can lead individuals to withdraw from social interactions, exacerbating feelings of loneliness and isolation (Van Landingham et al., 2015). The condition often results in a significant loss of independence, as even routine tasks become difficult to manage. This loss of autonomy can deeply affect one's self-esteem and overall quality of life (Jackson, 2019). Consequently, individuals with visual impairments are at a heightened risk of experiencing psychological distress, including depression and anxiety (Hayman, 2020).

General health impact of vision loss

Vision problems are also closely linked to overall health. Individuals with visual impairment often face difficulties in managing chronic conditions, such as diabetes and hypertension, which can further complicate their health status (Bourne et al., 2013). Additionally, visual impairment can result in an increased risk of injury and reduced physical activity, further contributing to poor health outcomes.

Economic impact of vision loss

Vision impairment has a profound economic impact on both individuals and society. Studies consistently show higher unemployment rates among individuals with visual impairments, as the condition can significantly limit the type and amount of work they can perform, or in some cases, prevent them from working altogether (Visual Impairments | Health Policy Institute | Georgetown University; Fricke et al., 2018). This loss of income can create a ripple effect, leading to long-term economic instability.

Moreover, vision impairment is both a cause and a consequence of poverty (The World Bank, 2016). Individuals with vision problems often struggle to engage in productive work, resulting in diminished household income and an increased risk of falling into poverty. This, in turn, perpetuates a cycle of economic hardship and limits opportunities for upward mobility. The economic toll is particularly severe for older workers, who already face significant barriers in the labor market. In fact, the percentage of workers unable to work due to medical conditions is five times higher for those with visual impairments compared to those without (Visual Impairments | Health Policy Institute | Georgetown University).

Healthcare systems, especially in developing countries, also face the economic strain of vision-related conditions. The rising costs of treating preventable blindness add further pressure on already overstretched healthcare resources (Buch et al., 2018).

Common eye conditions in Southeast Asia

In Southeast Asia, the leading causes of vision loss are primarily age-related diseases such as cataracts, glaucoma, macular degeneration, diabetic retinopathy, and refractive errors. Early diagnosis and intervention are critical to preventing severe damage, but access to care is often limited, especially in rural areas. The below highlights the most common eye conditions in Southeast Asia.

Cataracts

Affecting over 12 million people globally, cataracts are the leading cause of preventable blindness, especially in underserved populations. Cataracts are caused by a build-up of protein that clouds the eye's lens. As cataracts grow, vision will worsen, causing blurred, dim, and double vision. They could also exacerbate glaucoma by increasing pressure inside the eye. This condition is treatable through cataract surgery, which removes the cloudy eye lens and replaces it with an artificial lens.

Refractive error

Nearly half of visual impairments worldwide are caused by refractive error, including long-sightedness, short-sightedness, and astigmatism. These irregularities in the shape of the eyeball can cause blurred vision and worse if left untreated. Uncorrected refractive errors are a leading cause of visual impairment and blindness across many countries. Refractive errors that are not corrected during the critical period of visual system development may lead to serious conditions, such as amblyopia. The largest burden of refractive error is myopia which significantly increases the risk of blinding conditions such as myopic macular degeneration, glaucoma, and cataracts. Early intervention with eyeglasses is critical in developing countries to avert such public health problems (Lanca C, et.al., 2023).

Glaucoma

Worldwide projections for 2020, showed 80 million people would have glaucoma, of which 11 million will be bilaterally blind. Glaucoma is caused when pressure builds up inside the eye, damaging the optic nerve that connects the eye to the brain. This is a major contributor to vision impairment and blindness, particularly among aging populations with limited access to healthcare. The ultimate goal of treatment is to slow disease progression to prevent a vision-related decrease in quality of life. Glaucoma treatment in developing countries should consider clinical, laser, and surgical approaches (Leite MT, et.al., 2011).

Diabetic retinopathy

Diabetic retinopathy is a major contributor to vision impairment and blindness, particularly among aging and underserved populations. Worldwide prevalence is 22.3% (Teo ZL, et.al., 2021). This is caused by high blood sugar (diabetes) and high blood pressure and can damage the blood vessels in the eye. A major risk factor is diabetes duration, but glycemic control and blood pressure control are powerful modifiable risk factors. Screening programs and access to better treatments such as laser photocoagulation and intravitreal therapy, were effective in reducing diabetic retinopathy-related blindness in many countries.

Mobile Eye Clinics: A Proven Solution

Mobile eye clinics are an effective strategy for overcoming the barriers to eye care in developing countries. These clinics bring accessible services directly to remote and underserved areas, providing free or low-cost treatment for preventable vision problems. By offering comprehensive care, including vision screenings, corrective lenses, and even cataract surgeries, mobile eye clinics can address a range of eye health needs early, preventing further deterioration and improving quality of life (Kring et al., 2020).

Mobile eye clinics play a crucial role in raising community awareness about eye health and encouraging proactive management of vision issues. This model empowers individuals to seek timely care, improving outcomes and reducing the overall burden of vision impairment (Vela & Ladner, 2019).

Mobile eye clinics offer a cost-effective approach to addressing vision impairment. By reducing the need for transportation and centralized healthcare infrastructure, these clinics can deliver high-quality care at a fraction of the cost of traditional methods (Shin et al., 2017). Such clinics also provide access to needed eye care services for those who otherwise cannot travel to ophthalmology facilities.

Success stories

The Aravind Eye Care System in India operates mobile eye clinics that serve rural areas with limited access to eye care. The initiative has significantly reduced the prevalence of cataract-induced blindness in comprehensive eye examinations, corrective lenses, and surgical services (Murthy & Raman, 2009).

Orbis International's Flying Eye Hospital is another successful example. This converted aircraft functions as a mobile eye clinic, providing advanced eye care to various developing countries. The Flying Eye Hospital delivers training to eye care professionals around the world, ensuring sustainable eye care solutions (Orbis International, 2021).

A Mobile Eye Clinic drive in the central west of Bangladesh, in Chuadanga district, showcases another success story. This clinic started its first yearly drive in 1988 since then it has served a total of over 15,000 residents. The success of such a project highlights the critical role of mobile eye clinics in developing countries.

Mobile Eye Drive in Chuadanga District, Bangladesh

Bangladesh is experiencing a critical shortage of eye care professionals, with only one eye doctor available for every 162,494 individuals in need. This shortage is even more pronounced in rural areas, where 80% of those suffering from vision impairment reside, facing limited access to treatment facilities. Most doctors are concentrated in urban areas, exacerbating the disparity in healthcare availability. Despite cataract surgeries being among the most cost-effective health interventions, the country reports a cataract surgical rate of only 1,475 per one million residents, according to 2014 data. Research by Wang KM et al. (2022) indicates that increasing the number of eye care clinicians could significantly reduce the prevalence of visual impairment, highlighting the urgent need for action.

The mobile eye camp in Chuadanga district in Bangladesh has been playing a crucial role in addressing such challenges since 1988. Jotno Foundation teamed up with this mobile eye clinic in their 2024 camp drive to evaluate the effectiveness of their eye care drive and services.

Results

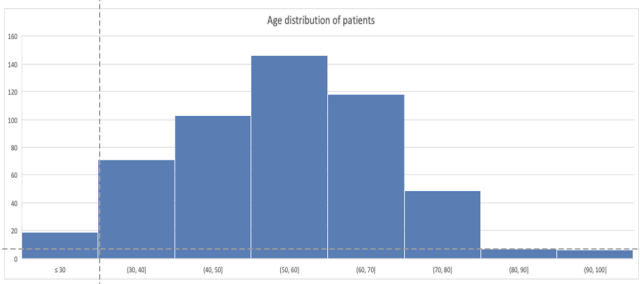
The data evaluation of the April 2024 mobile eye drive in Chuadanga district, Bangladesh unveiled significant outcomes, offering critical eye care services to 541 patients across 66 villages. The clinic

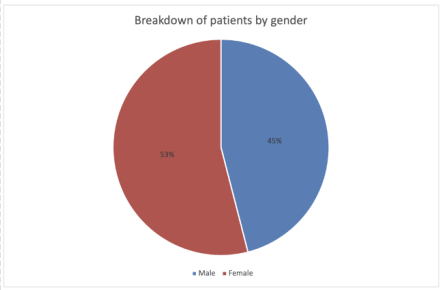
addressed various eye conditions, including providing prescription glasses to nearly half of the patients, performing cataract surgeries on 37%, and treating 13% for conditions such as amblyopia and chronic eye pain. The mobile clinic predominantly served an elderly demographic, with an average patient age of 56, underscoring the disproportionate impact of vision impairments on the aging population. The camp delivered much-needed medical support, ensuring access to specialized care for these vulnerable residents.

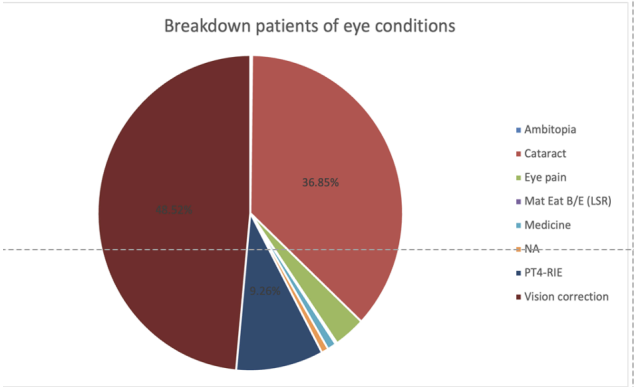
Demographic Summary

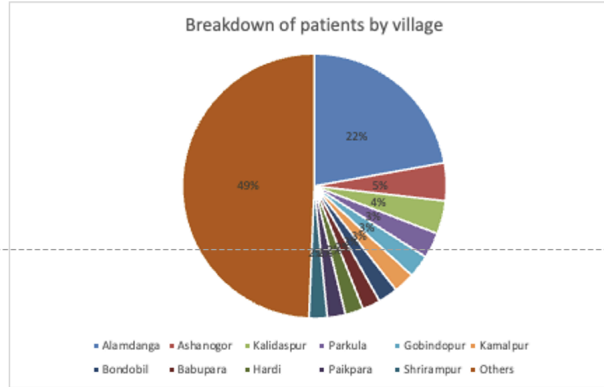
Summary statistics	
# Patients	541
Mean age	56
Male	45%
Female	53%
#Villages served*	66
Cataract surgeries	131

*Some duplication in names due to spelling mistakes









The most remarkable results were seen among patients who underwent cataract surgeries. Among the 131 patients with documented preoperative and postoperative data, all were legally blind before the procedure, as per the U.S. Government's definition. Notably, 22 individuals had only light perception before surgery. Following the surgical interventions, 97% achieved perfect 20/20 vision, while the remaining 3% improved to 20/30 vision. For these individuals, the surgeries were transformative,

restoring independence and significantly enhancing their quality of life. Many patients expressed profound gratitude, considering the intervention a second chance at a fully lived life. The mobile clinic's success highlights the immense potential of such initiatives to address healthcare disparities and improve outcomes for underprivileged populations.

Conclusion

The success of mobile eye clinics in developing countries has made a significant impact in preventing visual impairment by providing accessible, affordable eye care to underserved populations. These clinics help prevent the debilitating economic and psychosocial effects of vision loss. Continued investment in mobile eye clinic programs and their expansion to sustainable models is essential in the global fight against preventable vision problems among underserved populations.

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