Impact and cost-benefit of community-based Vision Centres in treating eye injuries:

A retrospective study across eight South Indian districts

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Introduction

- Ocular trauma is a major cause of **monocular visual impairment** (**VI**) and **blindness**, particularly affecting the **working-age population**.
- Beyond personal disability, eye injuries carry significant **socioeconomic consequences**, impacting families, productivity, and national economies.
- In India, the **prevalence of eye injuries ranges from 2.4% to 10.6%**, with **younger individuals, males, rural residents, and labourers** being most at risk.
- Despite medical advancements, preventable and treatable injuries often lead to long-term disability due to **delays in treatment and limited access to care**.
- While most data on ocular trauma come from high-income countries, **India lacks recent, community-based evidence**, particularly in South India, where existing studies are outdated.

Purpose

- To **evaluate the annual incidence of eye injuries** in the catchment areas of primary eye care centres (Vision Centres (VC)) in South India
- To assess the **effectiveness of VCs** in managing ocular trauma, and analyse their **cost-benefit impact** on the community.

Methods

Study design

- A **retrospective analysis** of patient data was conducted using the **Vision Center Electronic Medical Record** (**VC-EMR**) system.

Study setting & participants

- **Time Frame**: July 2021 – June 2022
- **Setting**: **35** VCs across **8 districts in South India**, affiliated with a tertiary eye hospital in Madurai
- **Coverage**: ~100,000 individuals per VC; total catchment population of **3.5 million**
- **Inclusion**: All patients presenting with **eye injuries** during the study period

Aravind's VC Model

- **Permanent, community-based facilities** in rural/semi-urban areas
- **Operational hours:** 9:00 AM to 5:00 PM, six days a week
- **Staffing:**
  - **VC Coordinator:** Manages registration, counselling, and dispensing
  - **Vision Technician (VT):** Performs comprehensive eye exams
- **Tele-Ophthalmology:** Live video consultation with ophthalmologists at the base hospital
- **Referral System:** Patients needing surgery or specialty care are referred

Study Procedure

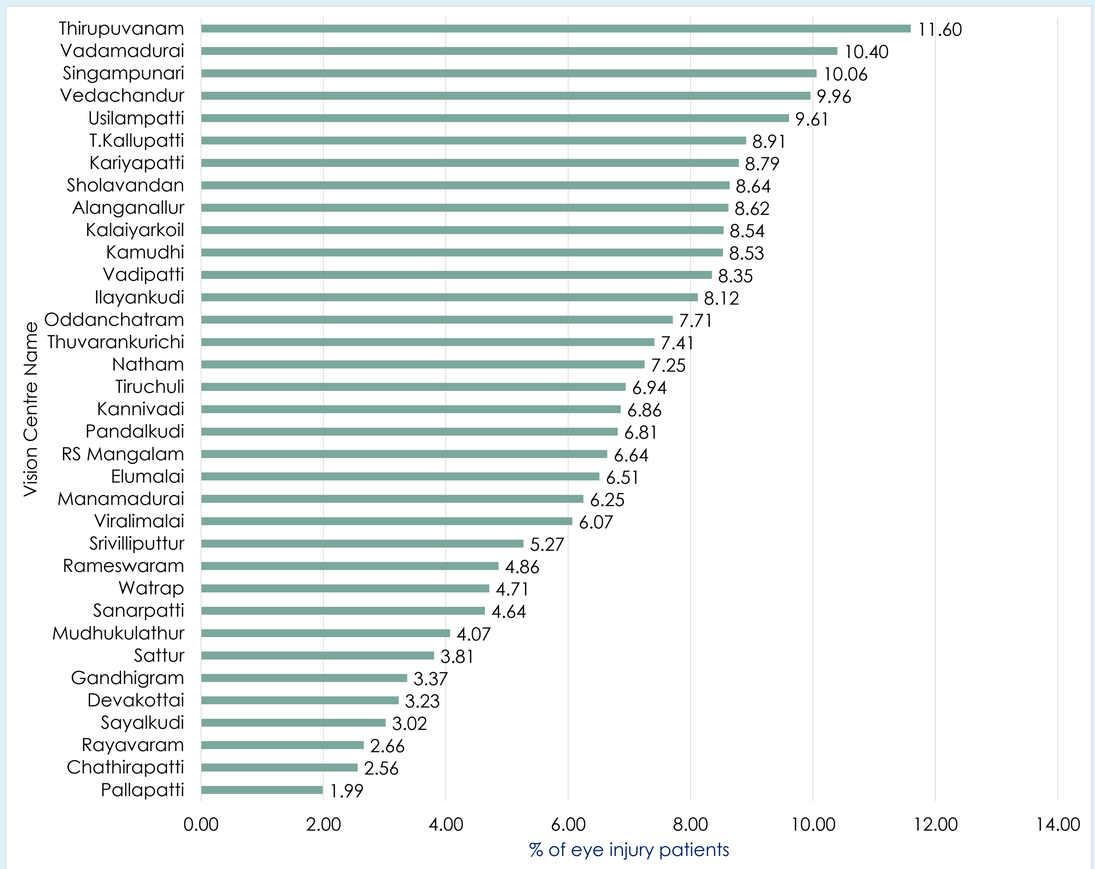
- **Data Extracted:**
  - **Demographics:** Age, sex
  - **Clinical Information:** Injury type, treatment, referral status
  - **Cost Estimation:** Based on **travel distance** from VC to base hospital
- **Injury Classification:** Modified **Birmingham Eye Trauma Terminology (BETT)** system
- **Travel Time Proxy:** Travel data based on VC-to-hospital distance; **daily wage assumed ₹300 (US$3.57)** for productivity loss estimation

Results

Table 1: Age and sex distribution of patients with eye injuries presenting to Vision Centres

Age category	Male n (%)	Female n (%)	Total n (%)	P-value*
Mean (±SD) age, in years	38.6 (±18.8)	40.6 (±19.4)	39.0 (±19.1)	
Below 20	1,750 (17.9)	937 (16.9)	2,687 (17.5)	<0.001
20 – 39	3,311 (33.9)	1,488 (26.9)	4,799 (31.4)	
40– 59	3,286 (33.6)	2,079 (37.6)	5,365(35.1)	
60 and above	1,428 (14.6)	1,023 (18.5)	2,451 (16.0)	
Total	9,775 (63.9)	5,527 (36.1)	15,302 (100)	
All percentages refer to column %. *Chi-Square test.				

Figure 1: Prevalence of eye injuries across 35 Vision Centre



Injury classification:

- **Globe Injuries:** 85.3%
  - **Closed Globe:** 99.5%
  - **Open Globe:** 0.5%
- **Periocular Injuries:** 14.7%
  - **With Foreign Bodies:** 71.1%
  - **Without Foreign Bodies:** 28.9%

Care Delivery & Referrals

- **Managed at VCs:** 85.8%
- **Referred to Base Hospital:** 14.2%
  → Indicates strong **local management capacity**

Table 2: Cost and time savings for patients treated at VCs compared to Base Hospitals

		Travel cost saved (US $)	Travel time saved (in hours)	Travel distance avoided (in kilometre)	Total cost savings (US $)
Mean (SD) per patient		**1.92 (0.73)**	**4.44 (1.71)**	**147.6 (63.4)**	
Range		0.83 - 4.29	2 - 9.2	37.4 - 340	
Total injury patients (n=15,302)		26,095	59,505	19,47,382	
Total cost savings	**USD**	**26,095**	**26,565**		**52,660**
Note: Total travel time converted to manpower working days: (59,505 hours/8 hours work per day)*Rs.300 wages per day					

Conclusion

- Eye injuries constitute a **significant burden** on primary eye care services in South India, especially among **working-age males** and **children**.
- The **VC model** proved highly effective in managing **over 85% of cases locally**, demonstrating its **clinical capacity** and **cost-effectiveness**.
- The **wide variation** in injury prevalence across centers highlights the need for **region-specific preventive strategies** and **targeted awareness programs**.
- VCs not only improved **access to timely care** but also delivered substantial **economic benefits** to the community through **savings in travel costs, time, and registration fees**.
- These findings support **scaling and strengthening** the VC model as a sustainable solution for managing ocular trauma in **resource-limited settings**.

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