TRIBAL ODISHA EYE DISEASE STUDY

(Dongaria Kandha PVTG of Odisha)

By

Scheduled Castes and Scheduled Tribes Research and Training Institute (SCSTRTI)

ST & SC Development Department
Government of Odisha
&
LV Prasad Eye Institute (LVPEI)

With logistic support of :
OPELIP

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Mission for Vision
partners in eye health

NARAINDAS MORBAI BUDHRANI TRUST
"TO BE HAPPY, MAKE OTHERS HAPPY"

wen giving foundation

June 2022

Abbreviations

BCVA- Best-corrected visual acuity
BEST- Basic Eye Screening Test
BMI- Body Mass Index
BP- Blood Pressure
CHC- Community Health Center
CRP- Community resource person
DVA- Distance visual acuity
CHW- Community health worker
CREH-Center for Rural eye health
FoFo- Folding phoropter
GPR ICARE- Gullapalli Pratibha Rao International Center for Advancement of Rural Eyecare
HTN- Hypertension
IJO- Indian Journal of Ophthalmology
IOL- Intraocular Lens
JAAPOS-Journal of American Association of Pediatric Ophthalmic Surgeons
LVPEI- L V Prasad Eye Institute
MAM- Moderate acute Malnutrition
MOTA- Ministry of Tribal Affairs
MSL- Mid Sea level
MUMC- Mid-Upper Arm Circumference
MVI- Moderate Visual Impairment
NGO- Non-government organization
NPV- Negative predictive value
NVA- Near visual acuity
OPELIP- Odisha and PVTG Empowerment & Livelihood Improvement Program
OR- Odds ratio
PHC- Primary health center
PI- Principal investigator
PPV- Positive predictive value
PVTG- Particularly vulnerable tribal group
SAM- Severe Acute Malnutrition
SC- Secondary Center
SC & ST- Scheduled caste & Scheduled tribe
SCSTRTI- SC & ST Research Training Institute
SD- Standard Deviation
SSP- School sight program
SVI- Severe Visual Impairment
TC- Tertiary Center
TOES- Tribal Odisha eye health study
TVST- Translational Vision Science and Technology
UPHC- Urban Primary Health Center
URE- Uncorrected refractive error
WHO- World Health Organization
WRV- World Report on Vision
VAD- Vitamin A deficiency
VC- Vision Center
VI- Visual Acuity
VT- Vision Technician

Contents

Foreword

State Government is committed to the social, economic, and cultural development of its tribal communities. With sixty-two tribal communities, Odisha is home to about 10% of the total tribal population of the country, and 23% of its population is tribal. It has been the constant endeavour of the government to make all efforts through projects and programmes to support this important community. Thirteen of these sixty-two communities are recognised as Particularly Vulnerable Tribal Groups (PVTG); they are ethnographically very important in the world. With great sensitivity, it is ensured that they are protected, nurtured, and remain within their natural habitation. Preservation of the culture and health practices of PVTG communities and, at the same time facilitating their access to modern health care are both essential. Towards this goal, Tribal Odisha Eye Disease Study (TOES) project has done commendable service. Working in the Dongria tribal habitats in Parsali and Chatikana areas, the dedicated team of doctors and paramedics from the L V Prasad Eye Institute have braved difficult terrain to reach out to every household and have provided them with eye care, including secondary and tertiary level interventions. They were ably supported by the OPELIP teams, especially the Community Resource Persons, who have helped them penetrate the community. With technical support from SCSTRTI the project has provided succour to the ailing in these areas.

While congratulating all the programme partners, I would like to express gratitude to the entire team. This will become a sustainable model of equitable eye care, and the Department of ST and SC Development will scale it to the other PVTG and tribal areas in the state.

Smt. Ranjana Chopra, IAS
Principal Secretary
ST & SC Development,
Minorities & Backward Classes Welfare Department

Message

Reconciling “Excellence” with “Equity” is the founding vision of L V Prasad Eye Institute. “Equity” includes all those disadvantaged because of economic, social, and geographic factors. It was a conscious decision to serve the underserved population in remote and tribal areas with appropriate eye care through permanent eye care facilities without considerations of cost. The Institute has created an innovative eye care pyramid model, comprising a network of 263 centres spread over four states of India, primarily in Telangana, Andhra Pradesh, and Odisha. The LVPEI has been serving Odisha since 2006, with one tertiary care and one urban centre in Bhubaneswar; five secondary care centers in Balasore, Berhampur, Keonjhar, Rajgangpur, and Rayagada; and 31 primary care (Vision) centres.

Odisha has a large tribal population. The secondary eye care centers in Rajgangpur and Rayagada, and the 13 primary care vision centres linked to these centres serve the tribal population of Western Odisha. Earlier, we conducted two major population-based interventions in Rayagada: (1) The Rayagada School Eye health program in 2017, which examined all school children in public facilities and dispensed spectacles; and (2) Eye inclusive disability survey in 2018 that examined over 100,000 people, including the urban slums in Rayagada and provided free eye care. The third population-based survey is the *Dongria* “particularly vulnerable tribal group” (PVTG) survey.

The Dongria PVTG is a large community in the Rayagada district. It is very special to us because we have been serving the people in this district since 2015, and three of our nine primary care (Vision) centers are in proximity of the Dongria community habitats. The ground team for this unique project was led by our Bhubaneswar campus and supported by our public eye health team from Hyderabad. This report documents the current eye health of this community, famous for their special weaving skills. It was not easy. It required rigorous planning, training of human resources, and commitment to trek for miles in the jungle, to reach the people and earn their trust for them to accept the services that we offer such as spectacles and eye surgery.

The support from the tribal ministries of the Government of Odisha and India, and the three philanthropic organizations, Mission for Vision, New Hope Rural Leprosy Trust, and Naraindas Morbai Budhrani Trust was critical for this activity and we are indebted to them. We are optimistic that our effort would help to change the health-seeking behavior of the Dongria community and contribute to the sustainable development of this community. The Government of Odisha has always encouraged our efforts to serve the people of Odisha. With the successful completion of the Dongria PVTG survey and services provided to this one community, we are hopeful that the Government of Odisha will consider extending such a model to other PVTGs.

Dr Gullapalli N Rao
Founder and Chair Board of Trustees
L V Prasad Eye Institute

Preface

As Director of SCSTRTI (Scheduled Caste and Scheduled Tribal Research Institute, Odisha), the oldest Tribal Research Institute in the country, and an anthropologist involved with empirical research pertaining to tribal issues as well as the implementation of development programs for the tribal communities for over three decades, it was my dream to be able to take up a project that impacts the healthcare of Particularly Vulnerable Tribal Groups (PVTG) of the state. The Government of Odisha and the Ministry of Tribal Affairs (MOTA), Government of India, have always been keen and willing to take up any project aimed at upliftment of the tribal community. A beginning was made when an ICMR (RMRC, Odisha) – SCSTRTI collaborative study (with support of MOTA) in 2018-19 was conducted to map the health profile of all the PVTGs in Odisha. This study identified the health profile of all the 13 PVTG communities in the state. One of the study findings was that the Dongria indigenous PVTG, located in the Rayagada district of Odisha, has serious eyesight issues. The matter was deliberated with the Principal Secretary of the Department, and we identified a very reputed institution, the L V Prasad Eye Institute (LVPEI), an institute of international repute who have excelled in providing eye care services, as our partner in eye screening of all the individuals in the villages inhabited by the PVTG in Rayagada and also to provide necessary care for addressing the issues including operations.

LVPEI has been working relentlessly for the last 35 years to bring quality eye care to the remotest and underserved population of the State and country. It did not take many interactions with Dr. T.P Das, Vice-Chairman of LVPEI, to find that our purpose and hearts matched with the LVPEI. Quickly we could, with the help of the State Government, Principal Secretary, ST & SC Development Department, Government of Odisha, and OPELIP, pitch for PILOT, a project which is the first of its kind in the country "Tribal Odisha Eye Study (TOES)" that combines the eye disease identification and treatment. LVPEI eye health pyramid touches lives from the grassroots (primary level) to the centre of excellence (tertiary level). They had already made a conscious choice and ventured to serve the community through Rayagada Secondary Centre since 2015 and already had a significant presence and impact in the project area. LVPEI is an established organization with strong values and integrity and came up with the BEST protocol, which provided an integrated approach for the selected microproject in Rayagada/ Dongria community. The robust support of the District Administration, Collector, and along with OPELIP made this access to the community possible.

I am delighted to see that TOES was hugely successful and touched the lives of many of our Dongria brethren. In the Dongria community, TOES screened approximately 10,000 individuals and distributed about 1500 spectacles, and conducted 150 cataract surgeries in the project period of 2021 to 2022, all at no cost to the people and the community. TOES was possible because of the synergy between multiple stakeholders – MoTA, SCSTRTI, OPELIP, District administration, NGOs, and most importantly, the Dongria people.

This is a good demonstration of several groups working together at different stages of the project, from the RMRC general health profile study to eye-specific interventions by the collaborative initiative of LVPEI with the SCSTRTI, ST & SC Development Department with support from MoTA (Ministry of Tribal Affairs) and fieldwork support by the OPELIP through its Micro Projects and District administration.

This project gives me utmost satisfaction in my life which has brought smiles to thousands of Dongria tribal people who could get back their eyesight and lead a happy life. This project is an example of good practice in how action research can be grounded after identifying problem areas that can have a positive impact on thousands of families, even in remote pockets. This should be used as a Good Practice, and Government is seriously planning to take this successful pilot project forward to bring smiles to the faces of thousands of persons, families of all PVTG pockets, and the population of the State in a phased manner.

I take this opportunity to profusely extend my gratitude to Principal Secretary, ST & SC Development Department, Madam Ranjana Chopra, for taking the lead in this project. My profuse indebtedness to Dr. Taraprasad Das, Vice-Chairperson, LVPEI, a visionary who instantly had agreed to my request to take up this very difficult exercise and followed up meticulously till the end of the project and looking even beyond. My special thanks to Dr. Surysnata Rath and his able team comprising Dr. Debasmita Majhi, Mr. Debanananda Padhy, and Mr. Manav Jalan for contributing enormously to making this project successful. My sincere gratitude to the P.D OPELIP, Mr. Arthanary, who has lent all logistic support of OPELIP at the ground level for providing access and follow-up at the village level to make the entire exercise possible. The team of SCSTRTI with Dr. Bigyan Mohanty (Deputy Director) and Dr. Prachi Paramita Rout deserve special thanks for handling the project very aptly. I owe a lot to the Ministry of Tribal Affairs, Government of India, and in particular, to Dr. Navaljeet Kapoor, Joint Secretary, who was instrumental in getting this project approved and who has quoted in almost every meeting branding this project as a good practice for other States to replicate. Lastly, I owe sincere gratitude to all the PVTG persons who have contributed their valuable time and extended cooperation unconditionally, which could make this project a very successful one and an eye-opener for all of us.

Prof (Dr) A.B. Ota, IAS
Director & Spl. Secretary, SCSTRTI

Prologue

L V Prasad Eye Institute's (LVPEI) founder - Dr. Gullapalli Nageswar Rao's vision that we will deliver equitable eye care to the remotest regions came alive when the J K Centre for Tribal Eye Health was inaugurated alongside the Naraindas Morbhai Buddhrani Eye Center at Rayagada in August 2015. I had no inkling that we would embark on something so pathbreaking there, and I will get to see this so closely. With 461 Tribal communities in India, Odisha houses 8.2% of the tribal population, larger than any other country in the world. Odisha ranks third in the tribal population after Madhya Pradesh and Maharashtra.

The Making of TOES-PVTG: The first meeting in 2018 towards the genesis of the project was when Dr. Taraprasad Das, Vice-Chair and architect of the LVPEI Odisha network, introduced me to Professor Akhila Bihari Ota, Director at Scheduled Caste and Scheduled Tribe Research and Training (SCSTRTI) centre at Bhubaneswar. I was amazed to see how deeply Prof. Ota knew these communities. He shared that particularly vulnerable tribal groups (PVTG) would number about 138,000 (2011 census) in Odisha and live in small settlements spread across several districts in Odisha. He generously donated several books on PVTG, which adorn our library today. Professor Ota and Dr. Das talked about the need for a universal eye screening for PVTG in Odisha. I remember coming out of this meeting with mixed feelings. While I understood PVTG was marginalized, I wondered how multiple agencies – government and non-government, would achieve synergy for the purpose. After this meeting, not much happened on the project for over a year. COVID - 19 pandemic struck in March 2020. Health Care, especially non-COVID care, was paralyzed. For me, the lockdown, availability of time, and desire to use this period constructively helped strategize and accelerate the project plan. Multiple virtual meetings, a comprehensive SCSTRTI-ICMR study report, and several draft proposals later, I finally submitted the final proposal in October 2020 to SCSTRTI. We submitted the project proposal with the Dongria indigenous community chosen for the pilot in the Rayagada district for over six months and the entire PVTG community in Odisha for over three years.

Launch: SCSTRTI received the approval of the Ministry of Tribal Affairs (MOTA), Government of India, to work with the LVPEI TOES pilot project for Dongria indigenous community at Rayagada in December 2020. I remember traveling to Rayagada in February 2021 to map the project locations to get a "feel" of the Dongria people. I saw for myself the simple lifestyle of the Dongria people and realised that they have minimal access to health care. I realized that the foundational vision of LVPEI's pyramidal model laid 35 years ago would serve them well.

While I learned that the first wave of COVID-19 had passed without causing much harm to the Dongria community, I shuddered to think what might happen, given their remoteness and poor access to health, if the pandemic touched them. This foreboding remained deep in my thoughts through TOES.

I cannot thank my field team enough for the extra efforts they took to keep Dongria people safe from the clutches of the pandemic and the almighty that we could complete TOES uneventfully. We waited for the vaccination drive and ensured our team and much of the Dongria, especially the vulnerable ones, were vaccinated before we formally launched TOES on July 16, 2021.

Screening: The community health workers and vision technicians led by our optometrist Debananda Padhy did an amazing job in the community eye screening. Often, they would walk for miles to reach the community designated for the day. That the terrain was uphill, often through thick woods and vegetation with the constant scare of snakebites, made matters worse. Thanks to the intervention of LVPEI vice-chairs - Dr. Taraprasad Das and Mr. Atmakuri Ramam, all field team members were provided with walking shoes and stick. I had heard earlier of a 45-25 rule in project management. The rule says that work gets done when project leaders sitting in their air-conditioned offices at 25 degrees Celsius understand the plight of workers on the ground sweltering at 45 degrees Celsius. I got a practical demonstration of the rule doing wonders.

Outcomes: We managed to screen the eyes of 89% of the Dongria indigenous community between July 2021 and January 2022. In addition to the eye screening, our team used the opportunity to talk about relevant basic strategies for well-being – hand washing and the use of mosquito nets. The field team also measured the basic health parameters of Dongria people giving insights into their general health and lifestyle. We found 31% of Dongria had visual impairment (VI) with cataract and uncorrected refractive error as predominant causes of VI, 17% of children were malnourished and stunted for the age, 9.3% had vitamin A deficiency disorder, and 4% had essential hypertension. We dispensed 1484 spectacles and performed 134 cataract surgeries in this period. We have reason to believe that these interventions helped. The smiles and enablement said it all. Despite this, we know it could only be the beginning. We knew that fewer than 1% of the Dongria indigenous community wore glasses before TOES. We were told that only a handful of Dongria elders happened to have had cataract surgery but, unfortunately, had poor visual recovery. Indeed, the odds were stacked against us. Our interventions were not novel either – spectacles for uncorrected refractive error or cataract surgery for the blind are proven eye-care methods. Therefore, this was implementation research bridging the know-do gap for a marginalized community – Dongria. Only time will tell whether our findings and our interventions are transformational and eventually improve the health-seeking behaviour of Dongrias. Personally, this journey has reinforced my belief in the saying – if you have a good thought in mind, the heavens conspire to help you.

Dr Suryasnata Rath
Network Director, Operations
L V Prasad Eye Institute

Executive Summary

The tribal population of India constitutes 8.2% of the total population. It is larger than the tribal population of any other country in the world. India India is home to 461 tribal communities. The tribal population of Odisha at 9.59 million (2011 census). It is the third-highest percentage of tribal people in India. The tribal community constitutes 22.85% of the Odisha population.

PVTG

Particularly vulnerable tribal group (PVTG) is a particular section of the tribal community. These communities are primarily homogenous and small populations, relatively physically isolated, and do not have a written language. There are 75 PVTGs in India.

13 PVTGs live in 14 districts of Odisha. The total population is 138,125.

Dongria tribal community is one of 13 PVTG communities residing in the Rayagada district in the southwest hills of Odisha. The estimated population is 11,085 (2011 census: 8870), and they live in 2050 dwellings. They speak Kui, average literacy is 4%, and endemic malaria is their biggest health hazard. The Dongria women make colourful cotton shawls.

Dongria PVTG Eye health Study

The LVPEI, Bhubaneswar conducted the Dongria PVTG survey under the guidance of the Ministry of Tribal Affairs (MOTA), the Government of India, and two Government of Odisha organizations- OPELIP (Odisha and PVTG Empowerment & Livelihood Improvement Program) and SCSTRTI (SC & ST Research Training Institute). It was done between July 2021 to January 2022.

It involved community-level screening by the trained Community Health Workers (CHWs) and referred people were examined at the Vision (Primary care) center by Vision Technicians (VTs) and at the Rayagada-based community eye center (Secondary care) by optometrists and ophthalmologists.

Four LVPEI fixed eye care facilities were used- three Vision centers located at Muniguda, Sikhapai, and Therubali, and one secondary eye center located at Rayagada. The complete care was at no cost to people.

Key findings

9872 people (of 11,085; 89%) were examined and 3060 (31%) people had visual impairment

982 people had MVI (moderate visual impairment); Major causes: Cataract (50%), URE(35%), Corneal pathology (3.5%), Retinal pathology (3%)

245 people had SVI (severe visual impairment); Major causes: Cataract: 76%; URE: 4%, Corneal pathology: 6.5%; Retinal pathology: 3%.

744 (7.5%) had uncorrected refractive error; myopia was more common than hypermetropia

754 (7.6%) had senile cataract

924 (9.4%) people had uncorrected presbyopia

389 (4%) people had hypertension

916 (9.3%) had VAD (vitamin A deficiency), and conjunctival xerosis was the most common

234 of 1361 (17.2%) under-5 children had undernutrition

Key services

Cataract. 243 of 754 (32.2%) people identified with senile cataract attended for further examination, and 134 (17.7%) agreed to surgery.

Uncorrected refractive error. 572 of 744 (76.8%) people with URE agreed to correction, and all received correcting spectacles

Presbyopia. 912 of 924 (98.7%) people with presbyopia agreed to correction and all received correcting spectacles.

Four NGOs supported the LVPEI in providing services; these are Mission for Vision, Naraindas Morbai Budhrani Trust, New Hope Rural Leprosy Trust, and Wen Giving

Key Barriers

Poverty (93%), Distance to health facility (90%), Misplaced priority (75%), Ignorance (64%), and Fear (64%) were the key barriers

Suggestions

Providing fixed and mobile eye care and general health facilities closer to the community

Regularizing the services

Improved advocacy

T O E S

Tribal Odisha Eye Disease Study Publications

(2018 – 2022)

Odisha is home to 9.7% of the tribal population of the country. At 9.59 million people, the tribal population in Odisha is 22.1% of the total population in the 2011 census. It exceeds 50% of the total population in 4 of 30 districts of Odisha; they are Malkangiri (57.4%), Rayagada (55.8%), Nabrangpur (55%), and Mayurbhanj (56.6%). The Tribal Odisha Eye Disease Study (TOES) is the Indian Oil Centre for Rural Eye Health (LVPEI, Bhubaneswar) and Gullapalli Pratibha Rao International Centre for Advancement of Rural Eye care (GPR ICARE, LVPEI) initiative to study the various eye health aspects of tribal people in Odisha. The LVPEI Rayagada eye care network consists of one secondary level eye care center at Rayagada and nine vision (primary level) centers. The center at Rayagada- the NMB Eye Center, and JK Center for Tribal Eye health was established in 2015. It is mainly supported by the Naraindas and Morbai Budhrani trust (Mumbai- based NGO) and JK Papers (of Rayagada), respectively. The VCs are supported by the Mission for Vision (Mumbai-based NGO) and Wen Giving (Australia-based Foundation).

As of April 2022, TOES has 11 publications in peer-reviewed scientific journals, as follows:

11. Padhy D, Majhi D, Mamamula S, Mishro R, Rath S, Ota AB, Jalan M, Das T, Rout P. Tribal Odisha Eye Disease Study # 11 - Particularly vulnerable tribal group eye health program. Program protocol and validation. IJO. 2022; 70:1376-80.

    It described the protocol of PVTG screening after validating the process by a pilot study conducted at the Rayagada secondary center. In the pilot study, we measured the agreement between locally recruited and trained CHW, designated VTs, and optometrists. The agreement was good in measuring vision and detecting common eye disorders.

10. Rathi VM, Williams JD, Rajshekar V, Khanna RC, Das T. Tribal Odisha Eye Disease Study (TOES). Report # 10. Disability inclusive eye health survey in a tribal district (Rayagada) in Odisha, India. IJO. 2022;70: 976-81.

    In the first population-based disability-inclusive eye health survey in Rayagada, Odisha, we examined over 100,000 people. It showed a higher proportion of people with seeing and hearing disabilities in Rayagada. These disabilities were higher than the 2001 published state and national data.

9. Padhy SK, Akkulugari V, Kandagori M, Padhi TR, Rathi VM, Das T. Tribal Odisha Eye Disease Study (TOES) Report # 9. Eye diseases and retinal disorders in an adult and elderly tribal community in Odisha, India - A community hospital-based study. IJO. 2021;69: 1846-49.
    This hospital-based study compared the eye health profile of non-tribal and tribal communities visiting the eye hospital in Rayagada. In the non-tribal community, refractive error and diabetes

were higher; in the tribal community, cataract and retinitis pigmenotosa (night blindness) were higher. The health-seeking behavior of the tribal community was low.

8. Majhi D, Sachdeva V, Warkad VU, Kekunnaya R, Natarajan D, Karan S, Garg B. Tribal Odisha Eye Disease Study (TOES). Report # 8. Childhood cataract surgery and determinants of visual outcome in tribal districts. IJO. 2021;69: 2072-77.

   Childhood cataract is not uncommon in Odisha tribal community. These were idiopathic in etiology. The children from the tribal community presented late with poor presenting VA and had suboptimal visual outcomes with inconsistent follow-ups compared to the non-tribal community. We suggested greater advocacy, delivery of care closer to the place of residence, and financial support for follow-up care.

7. Panda L, Nayak S, Khanna RC, Das T. Tribal Odisha Eye Disease Study (TOES) # 7. Prevalence of refractive error in children in tribal Odisha (India) school screening. IJO. 2020; 68:1596-99.

   This SSP examined 153,107 children. The prevalence of refractive error was 9.7%. Myopia (4.9%) and astigmatism (5.4%) were common refractive errors. The quantum of refractive error was close to other similar studies in India, but the prevalence of myopia was relatively less.

6. Panda L, Nayak S, Das T. Tribal Odisha Eye Disease Study. Report # 6. Opportunistic screening of vitamin A deficiency through School Sight Program in tribal Odisha (India). IJO. 2020; 68:351-55

   In this opportunistic screening of under 5 children, VAD was detected in 4.3% of examined children. It was primarily conjunctival xerosis, Bitot's spot, corneal scar, and night blindness. An opportunistic screening through an SSP could be a cost-effective method that could complement the existing strategy of VAD detection.

5. Panda L, Nayak S, Warkad VU, Das T, Khanna R. Tribal Odisha Eye Disease Study (TOES) report # 5: Comparison of prevalence and causes of visual impairment among tribal children in native and urban schools of Odisha (India). IJO. 2019;67: 1012-15.

   We compared the blindness, VI, and ocular anomalies of tribal children of Rayagada in the native schools and the residential school in the city of Bhubaneswar. Mild and moderate VI was higher in the urban settings, but severe visual impairment and blindness were similar in both settings. There were more refractive error, amblyopia, and posterior segment anomaly in the urban school. In the rural native schools, the children had manifested VAD. We concluded that the location, urban or rural, did not influence the visual impairment profile of tribal children of Rayagada, but the food habit and environment impact the nutritional status.

4. Reddy S, Panda L, Kumar A, Nayak S, Das T. Tribal Odisha Eye Disease Study # 4: Accuracy and utility of photorefraction for refractive error correction in tribal Odisha (India) school screening. IJO. 2018; 66: 929-33.

   We used the objective refraction value for subjective correction based on the previous work (TOES # 3). We found a good correlation between photorefraction and subjective correction in the tested range. We concluded that photorefraction might be recommended for autorefraction in school screening with reasonable accuracy. The added advantages

included its speed, need for less expensive eye care personnel, ability to refract both eyes together, and examination possibility in the native surrounding.

3. Panda L, Barik U, Nayak S, Barik B, Behera G, Kekunnaya R, Das T. Performance of photo screener in the detection of refractive error in all age groups and amblyopia risk factors in children in a tribal district of Odisha: the Tribal Odisha Eye Disease Study (TOES) # 3. TVST. 2018; 7 (3):12, HTTPS:// doi.org/10.1167/tvst.7.3.12

   In evaluating the new autorefraction device, the Spot photo screener, it was 87% accurate in refracting children. We concluded that its value could be used for subjective correction tests.

2. Panda L, Das T, Nayak S, Barik U, Mohanta BC, Williams J, Warkad V, Kumar GPT, Khanna RC. Tribal Odisha Eye Disease Study. TOES # 2. Rayagada School Screening Program- Effectiveness of multistage screening and accuracy of schoolteachers in vision screening and other ocular anomalies. Clinical Ophthalmology. 2018; 12: 1181-87.

   Multistage screening in school eye health included: stage I: screening for vision and other ocular anomalies by schoolteachers in the school; stage II: photorefraction, subjective correction, and other ocular anomaly confirmation by optometrists in the school; stage III: comprehensive ophthalmologist examination in secondary eye center; and stage IV: pediatric ophthalmologist examination in tertiary eye center. The sensitivity and PPV of teachers for vision screening were high, but specificity and NPV were low. We concluded that multistage school screening is rapid and comprehensive in a resource-limited community.

1. Warkard VU, Panda L, Behera P, Das T, Mohant BC, Khanna R. Tribal Odisha Eye Disease Study (TOES): 1. Prevalence and causes of visual impairment among tribal children in an urban school in Eastern Odisha. JAAPOS. 2018; 22: 145.e1-145.e6

   We examined 10,038 children. Refractive error was the most common cause of visual impairment, followed by amblyopia and posterior segment anomaly (14.88%; 95% CI, 10.2-21.0). The prevalence of blindness was 0.03%. We concluded that visual impairment among tribal children in this residential school was uncommon but an important disability.

Dr Taraprasad Das
Vice-Chair Emeritus
L V Prasad Eye Institute

The TOES research articles are published in:

Clinical Ophthalmology | ijo Indian Journal of Ophthalmology | jaapos | tvst translational vision science & technology an ARVO journal

Chapter 1

1.1. Particularly Vulnerable Tribal Group (PVTG) of Odisha

Thirteen of 62 Scheduled Tribes (STs) of Odisha are designated as Particularly Vulnerable Tribal Groups (PVTGs). The PVTGs are more primitive than other tribal communities. They live on their chosen hill in isolation which helps them protect their cultural identities, personal adornments, livelihood activities, religious beliefs, arts, crafts, songs, and dance. But, on the flip side, because of this isolated living, their overall development has remained stagnant.

Each PVTG has special characteristic features in terms of social, economic, and religious beliefs. The PVTGs earn their livelihood through shifting cultivation, collecting forest produce, hunting, fishing, handicrafts, agricultural and non-agricultural labour, etc.

PVTGs in Odisha (Table 1.1.1 and Figure 1.1.1)

Odisha has 13 PVTGs. The estimated population is 2,49,609 spread over 14 districts of the state.

Table 1.1.1: PVTGs in the districts of Odisha

#	PVTG Community	Estimated population	Odisha districts
1	Bonda	10,308	Malkangiri
2	Birhor	341	Mayurbhanj&Jajpur
3	Chuktia Bhunjia	3,086	Nuapada
4	Didayi	9,120	Malkangiri
5	Dongria Kandha	9,659	Rayagada (2011 census: 8,870)
6	Hill Kharia	673	Mayurbhanj
7	Juang	36,261	Dhenkanal,Jajpur& Keonjhar
8	Kutia Kandha	39,761	Kalahandi,Kondhamal
9	Lanjia Soura	40,913	Gajapati,Rayagada
10	Lodha	6,371	Mayurbhanj
11	Mankirdia	279	Mayurbhanj
12	Paudi Bhuyan	61,303	Angul,Deogarh,Sundargarh&Keonjhar
13	Soura	29,407	Ganjam, Gajpati
	Total	2,49,609	

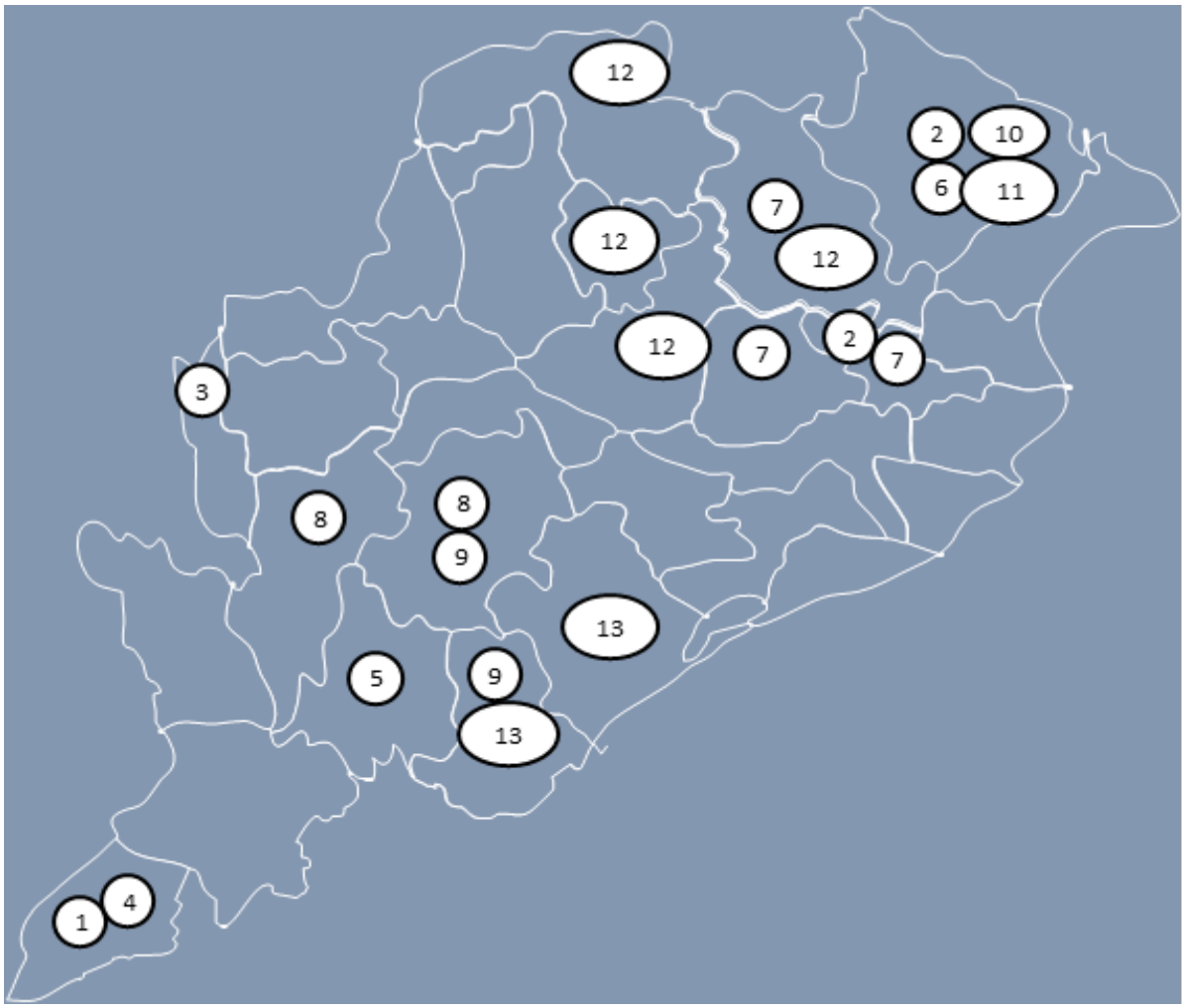


Figure 1.1.1. Distribution of PVTG in Odisha districts

Characteristic Features of PVTGs

1. Bonda

Residence- Bondo hills, Malkangiri district.
Spoken language- Remo

Traditional Attire- The Bonda men wear a slim strip of loin cloth (gosi), grow long hair, and wear various ornaments surrounding the neck. Women wear a small hand-woven bark fibre cloth (ringa or nadi), use bead necklaces and adornments covering the neck, and usually shave their heads. The men are armed with an axe, bow, and arrow; they are known for skilled hunting, shifting cultivators, and streamed rice growers.
Population - 10,308 in 2,698 households.
Literacy- average- 36.75 %; male: 44.05% and female: 28.86%.
Common diseases- endemic malaria, tooth decay, skin diseases, and tuberculosis.

2. Birhor

Residence- Simil*ipal hills, Mayurbhanja district.*
Spoken language- Munda

Traditional Attire- The Birhor man wears a traditional colourful *gamucha*[1] with banians. The Bihor woman wears traditional saris. The woman adorns themselves with glass, beads, and metal ornaments. They are semi-nomadic hunting and gathering communities.
Population (2011 census)- 596 in 171 households.
Literacy- average- 37 %; male: 35.6% and female: 38.9%.
Common diseases- malnutrition, endemic malaria, tooth decay, and skin diseases

3. Chuktia Bhunjia

Residence- Sonabeda Plateau, Nuapada district.
Spoken language- Gondi

Traditional Attire- The men mainly wear cotton clothes. The woman wears saris. The woman uses a necklace made of beads, brass, coil, glass bangles, anklets, and earrings of either silver or aluminium. The women usually dress the hair into a massive bun at the back of the head by using a bulky tassel and attaching pins to it to keep the bun in place. Women tattoo their hands and arms.
Population - 3086 in 938 households.
Literacy- average- 25.54 %; male: 29.14% and female: 20.00%.
Common diseases- Malnutrition.

4. Didayi

Residence- Eastern ghats, Malkangiri district.
Spoken language- Gata

Traditional Attire- A few decades ago, bark thread was used to prepare traditional cloth (Kisalu) to cover the body's private parts and modesty. Recently, cotton clothes have been used by both men and women. The Didayi women wear white or red coloured saree with a blouse; men wear a narrow strip of cloth or long cotton cloth. The Didayi women use necklaces of aluminium, brass or silver aluminium anklets, brass rings in fingers and toes, brass nostril rings, nosegays, brass rings in ear helix and lower lobes, aluminium and glass bangles, along with colourful beads garlanded through strings.
Population - 9,120 in 2,204 households.
Literacy- average- 8.83 %; male: 11.19% and female:5.77%.
Common diseases- Endemic malaria, tooth decay, and skin diseases.

[1]*Gamucha* is a traditional thin, coarse cotton towel, often with a checked design. Children wear gamucha until adolescence.

5. Dongria

Residence- Niyamgiri hill ranges, Rayagada district.
Spoken language- Kui

Traditional Attire- The Dongria man puts on a long and narrow piece of loincloth(*Drili*). It has a particular style; the two embroidered ends hang in the front and the back. Dongria women use two pieces of clothes, 3-4 feet in length and one-and-half feet in width, the first piece of cloth is wrapped around the waist with a knot in the front. The second piece covers the upper part of the body. The Dongria man grows long hair and makes braided locks. Both gender use wooden comb to keep their hair tight. Both genders wear nose and earrings, aluminium neck rings, bead, coin necklaces, and finger rings.
Population - 9,659 in 2,377 households.
Literacy- average- 7.4 %; male: 8.53% and female: 6.67%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and malnutrition.

6. Hill-Kharia

Residence- Similipal hills, Mayurbhanj district.

Spoken language- Kharia
Traditional Attire- Men wear dhoti and gamucha. The adult women wear saree and jhula.[2] Kharia women wear ornaments made up of brass, bronze, nickel, shell, beads, thread, seeds, silver, imitation gold, and silver. They use glass or metal bangles, anklets, armlets, ears, nose, toes, finger rings, hairpins, beads, or metal necklaces. The older women beautify their bodies with tattoo marks, especially on their foreheads, eye corners, hands, and legs.
Population - 2,053 in 627 households.
Literacy- average- 41.7%; male: 44.5% and female: 39.2%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and malnutrition.

7. Juang

Residence- Gonasika hills, Keonjhar district.

Spoken language- Juang
Traditional Attire- Men wear dhoti, banyan, and gamucha.The women wear saree and jhula. Juang women use glass or metal bangles, anklets, nose and toe, finger rings, hairpins, beads, or metal necklaces.
Population - 24,355 in 4,586 households.
Literacy- average- 34.68%; male: 40.20% and female: 29.08%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and tuberculosis.

[2]Jhula is a traditional ear ring made up of metals like silver, brass or aluminium.

8. Kutia

Residence- Belghar area of Kandhamal and Lanjigarh area of Kalahandi district

Spoken language- Kui
Traditional Attire- Men and women's attire is similar to the Dongria community- Drili for men and two pieces of cloth for women. The Kutia woman wears nose and earrings, aluminium neck rings, bead and coin necklaces, and finger rings. The women beautify their bodies with tattoos on their foreheads, eye corners, hands, and legs.
Population - 39,761 in 9,154 households.
Literacy- average- 35.27%; male: 44.54% and female: 26.33%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and tuberculosis.

9. LanjiaSoura

Residence- highlands of Rayagada, Gajapati, and Ganjam district

Spoken language- Sora
Traditional Attire- The man wears a long and narrow strip of loincloth so that the red embroidered ends hang down Infront and back like a tale (*Lanja*= tail). The Lanjiasoura men occasionally wear a bead necklace. Soura women wear coarse waistcloth with red/grey border, 3 feet in length and 2 feet in breadth women wear bead necklaces, round wooded plugs in ear lobes, metal neck rings, and spiral rings made of brass, bell metal, or aluminium in the fingers or toes. Women expand their ear lobes to put on rounded wooden pegs and have a distinctive tattoo mark down the middle of the forehead.
Population - 40,913 in 9,308 households.
Literacy- average- 35.35%; male: 42.20% and female: 28.75%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and tuberculosis.

10. Lodha

Residence- Mayurbhanj district

Spoken language- Lodha
Traditional Attire-The Lodha men wear dhotis, vests, and shirts. Women wear saree, skirts, and blouses. Children up to seven years of age of either gender usually remain naked. Old adults wear a loincloth tied to a cord around the waist on both ends.
Population - 6,731 in 1,935 households.
Literacy- average- 31.46%; male: 35.08% and female:27.91%.
Common diseases- Endemic malaria, tooth decay, and skin diseases.

11. Mankirdia

Residence- Similipal hills of Mayubhanj district

Spoken language- Birhor
Traditional Attire- The men wear a traditional gamucha with white banyans, and the women wear saree. The woman adorns themselves with glass, beads, and metal ornaments during the festivals.
Population - 186 in 90 households.
Literacy- average- 41.7%; male: 44.5% and female:39.2%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and malnutrition.

12. Paudi Bhuyan

Residence- BhuyanPirhas of Keonjhar, Sundargarh, Deogarh, and Angul districts

Spoken language- Odia
Traditional Attire- The Men wear dhoti, banyan, and gamucha. The women wear saree, skirt, and blouse. Women use glass or metal bangles, anklets, nose and toe rings, finger rings, hairpins, beads, or metal necklaces.
Population - 61,303 in 14,718 households.
Literacy- average- 33.1%; male: 34.1% and female: 31.3%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and malnutrition.

13. Soura

Residence- Highlands of Gajapati and Ganjam district
Spoken language- Sora

Traditional Attire- It is similar to the LanjiaSoura community.
Population - 29,407 in 6,592 households.
Literacy- average- 36.1%; male: 40% and female:30.2%.
Common diseases- Endemic malaria, tooth decay, skin diseases, and tuberculosis.

1.2. Dongria Community in Rayagada

The Dongria community is the largest among the 13 PVTG communities of Odisha. They stand special from other tribes for their well-known meria festival, prowess in horticulture, discrete spoken language, colourful dress, ornamentations, and lifestyle. The name Dongria means hill-dwelling (dongar = high hill land). Dongria community occupies the Niyamgiri hill ranges spread across three blocks (Bissamcuttack, Kalyansinghpur, and Muniguda) in the Rayagada district of Odisha. (Figure 1.2.1) Alongside Odisha, they also live in the adjoining Indian state of Andhra Pradesh. They inhabit hills ranging from 1000 feet to nearly 5000 feet above the mid-sea level. [3] The estimated population is approximately 11,000 and is dispersed over 120 settlements with a gender ratio of 1352 females for 1000 males. A typical Dongria house is small with a low thatched ceiling at about 2-3 feet above the ground. These houses are rectangular, usually with two rooms.

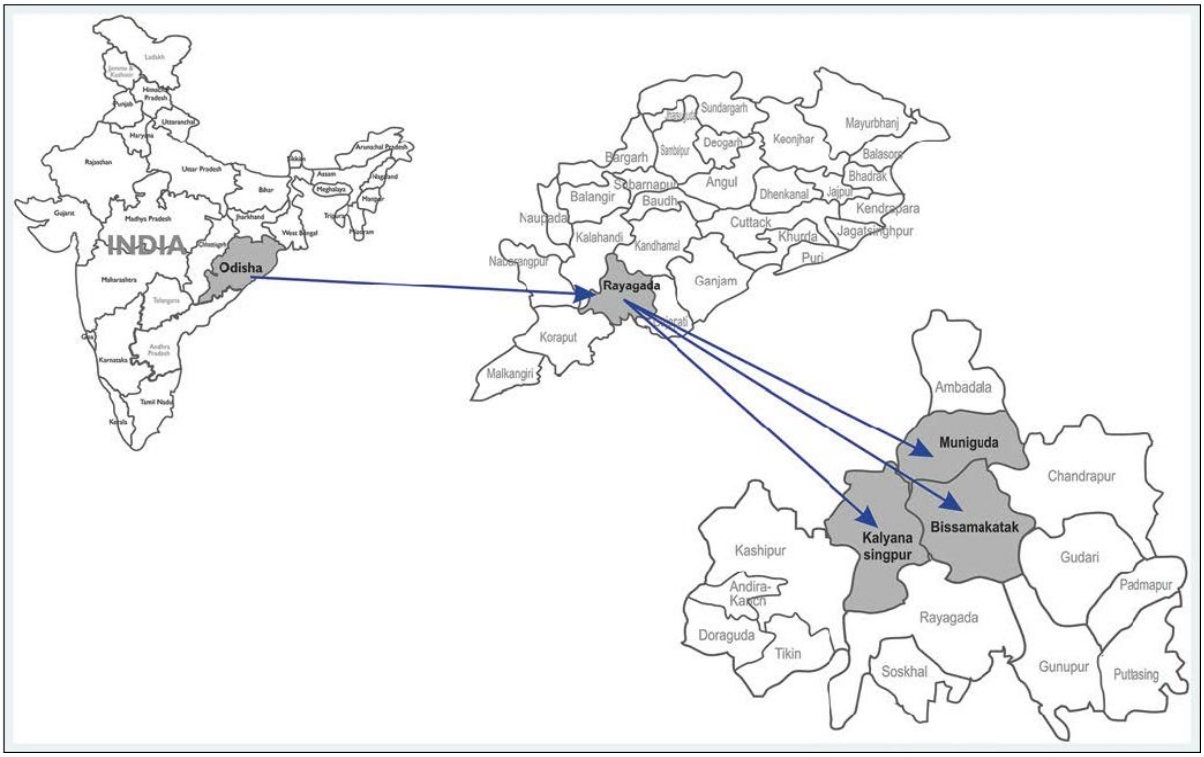


Figure 1.2.1 Geographical map of Odisha showing the three blocks of Dongria community of Rayagada district.

The Dongria community lives in hill slopes or valleys in thickly wooded hill ranges. They select the site based on the availability of ample lands for shifting cultivation and a continual source of water. Rice is their staple food along with vegetarian (millet, maize, Kandul, Keating, cereals, roots, seasonal fruits) and non-vegetarian (fish, chicken, mutton, steak, beef, etc.) side dishes. They are also fond of dried and salt-preserved fish. They brew their alcohol from sago and date palm and mahua (*Madhuca*

[3]Bulliyya G. Ethnographic and health profile of the Dongria Kondhs: A primitive tribal group of Niyamgiri hills in Eastern Ghats of Orissa. Afro Asian Journal of Anthropology and Social Policy. 2010;1(1):11-25.

longifolia) flowers. The Dongria women make beautiful shawls. Usually, the Dongria women work more than men.

Dancing is a regular pastime and celebration for them. In all villages, there is a village leader and community resource person. They solve all the critical matters.

The health condition of Dongria is suboptimal due to extreme poverty, illiteracy, poor environmental sanitation and hygiene, unawareness of health care facilities, and social taboos.

Malnutrition is common in children and women.[4] The primary health centers (PHCs) are located in Bissamcuttack, Muniguda, and Kalyansinghpur blocks, but the community hardly frequents these due to lack of road and regular transport facilities, illiteracy, and poor health-seeking behaviour.

1.3 LVPEI Eye Health Pyramid with relation to Rayagada

The LVPEI pyramidal model for eye care delivery is a tiered structure developed through a top-down approach. It encompasses all levels, from community to advanced tertiary (quaternary). (Figure-1.3.1) It is divided by the population it serves and the eye care it provides. (Table 1.3.1)

Figure 1.3.1. L V Prasad Eye Institute pyramid

[4]Bulliyya G. (2003). Habitat, health and nutritional problems of kondhs: the major scheduled tribal community of Orissa. Oriental anthropologist. 1. 326-356.

Table 1.3.1. The structure and function of the 5-level integrated eye care system. [5]

Structure	Suggested population coverage	Technical personnel	Level of care	Quantum of care
Community	5,000	Vision guardian	Advocacy. Health promotion; Prescription of simple near vision glasses	10% of visual impairment (simple single-vision reading glasses)
Primary	50,000	Vision technician	Eye screening. Refraction. Dispensing spectacles; Referral	49% of visual impairment cases (URE)
Secondary	500,000	Ophthalmologists. Vision technicians. Surgery assistants	Comprehensive eye exam. Community care; Surgery for common disorders	75% of visual impairment cases (URE + cataract surgery)
Tertiary	5 million	Ophthalmologists. Optometrists. Nurses. Rehabilitation personnel. Microbiology. Pathology. Eye banking	Secondary level care + all eye surgeries; Corneal transplants. Rehabilitation for low vision & blindness. Training. Clinical research	90% of visual impairment cases (URE+ surgery + care for glaucoma and DR)
Advanced Tertiary	50 million	Tertiary level personnel + Basic scientists; Policymakers	Tertiary level care + Translational research. Policy & Planning	100% of visual impairment cases; Policy execution

The World Report on Vision (2019) recommended integrated people-centered eye care (IPEC). The IPEC covers four-tier service delivery from the community to tertiary levels and includes all four dimensions of promotion, prevention, treatment, and rehabilitation, of healthcare. The four cardinal strategies of IPEC are: engage and empower people and community; reorient service delivery, coordinate within and between services; and create an enabling environment. The WHO IPEC model is nearly similar to the LVPEI eye health pyramid (Figure 1.3.2) [6]

[5]Rao GN. The Barrie jones lecture-eye care for the neglected population: Challenges and solutions. Eye (London) 2015; 29:30-45.

[6]Das T, Keeffe J, Sivaprasad S, Rao GN. Capacity building for universal eye health coverage in South East Asia beyond 2020. Eye(London) 2020; 34: 1262-70.

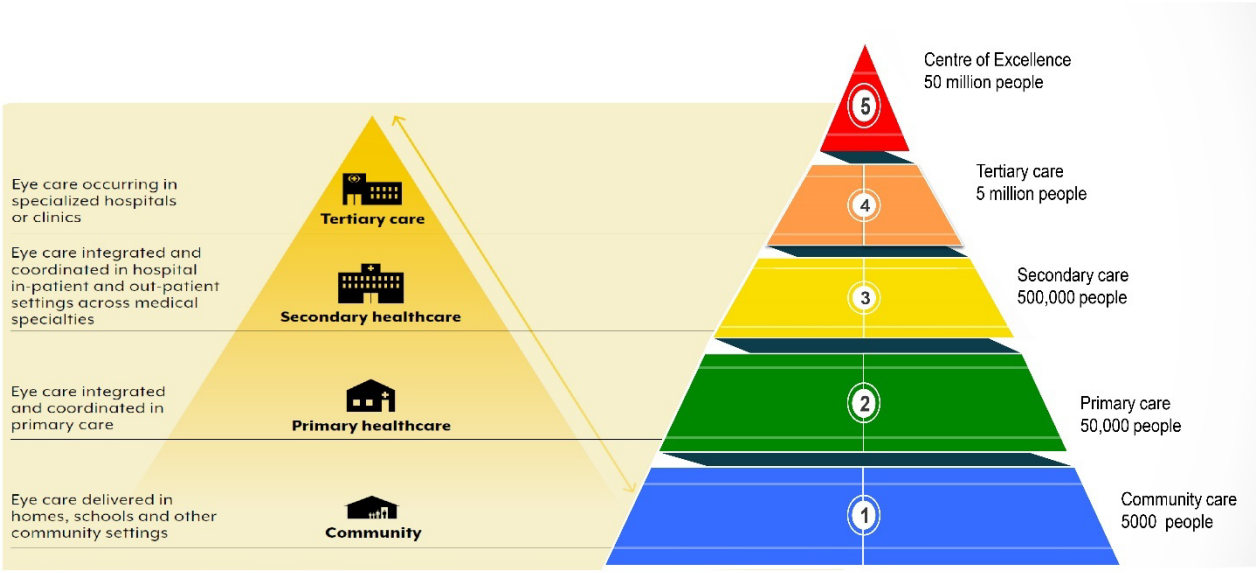


Figure 1.3.2. Comparison of WHO IPEC and LVPEI eye health pyramid

LVPEI network

As of March 2022,

Network. 223 Vision Centres, 22 Secondary Eye Care Centres spread across semi-urban areas in 3 states, 2 Urban City Centres at Hyderabad and Bhubaneswar, 3 Tertiary Centres at Vijayawada, Vishakhapatnam, and Bhubaneswar, and its apex Centre of Excellence at Hyderabad. (Figure-1.3.3)

Odisha. 1 tertiary center (Bhubaneswar), 5 Secondary centers (Balasore, Berhampur, Keonjhar, Rajgangpur, and Rayagada), and 1 urban city centers (Bhubaneswar), and 32 Vision Centres. (Figure-1.3.4)

Rayagada, Odisha. 1 secondary center (Naraindas & Morbai Budhrani Eye Center and JK Center for Tribal Eye Health) and 9 Vision Centers. (Figure-1.3.5)

Figure 1.3.3. LVPEI eye care network in three states of India.

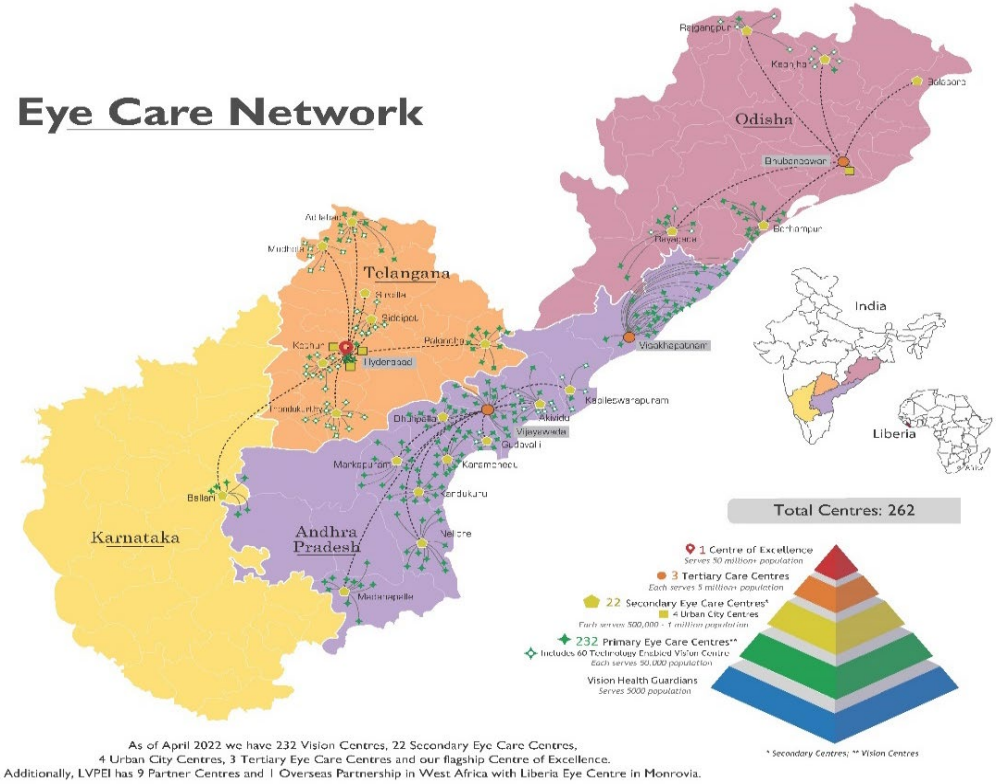
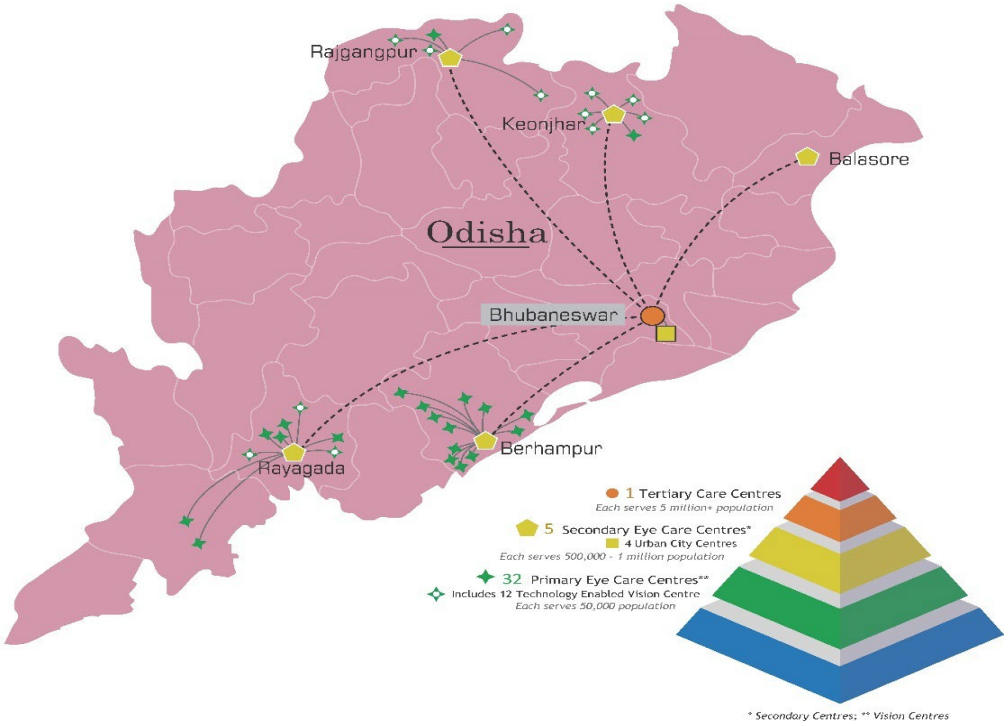


Figure 1.3.4. LVPEI Odisha



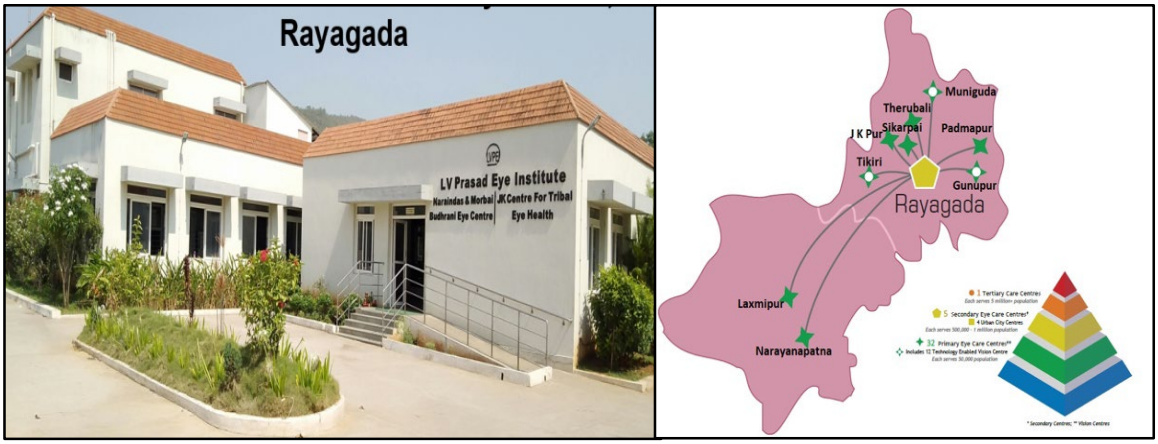


Figure 1.3.5. LVPEI Rayagada. Left- SC; Right- Distribution of VCs

1.4. Classification of visual impairment

Definitions

The International Classification of Diseases 11 (2018) classifies vision impairment into two groups, distance and near presenting vision impairment.

Distance vision impairment (VI):

- Mild –visual acuity worse than 6/12 to 6/18
- Moderate –visual acuity worse than 6/18 to 6/60
- Severe –visual acuity worse than 6/60 to 3/60
- Blindness –visual acuity worse than 3/60

Near vision impairment:

- Near visual acuity worse than N6 or M.08 at 40cm.

Traditionally, the definitions of blindness have fallen into two categories: functional definitions based on disability and definitions based on the measurement and quantification of VI, VA (visual acuity), and visual field.[7]In 1948, the WHO Expert Committee on Health Statistics endorsed two definitions of blindness. The measurement-based definition was a central VA of 6/60 or worse with the best correcting lens or a field defect, in which the widest diameter of the visual field subtends an angular distance no more than 20°.

[7]. Leat SJ, Legge GE, Bullimore MA. What is low vision? A re-evaluation of definitions. Optom Vis Sci 1999;76:198-211

The disability-based functional definition alluded to "economic blindness," which meant the inability to do any kind of work, industrial or otherwise, for which sight is essential. These definitions were included in the first Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. The assembly of the World Council for the Welfare of the Blind adopted a functional definition of blindness in 1954.[8] The definitions utilized common terminologies such as total blindness, economic blindness, and social blindness.

Total blindness is no perception of light. *Economic blindness* is the inability to do any kind of work, industrial or otherwise, for which sight is essential. Individuals who need welfare and legal protective measures have been classified as *legally blind* based on the impairment criterion (VA 6/60 or less in the better eye with correction). *Social blindness* refers to a degree of visual disability that hampers an individual from socially interacting with family and peer groups satisfactorily and may be associated with a severe impediment in education, personality, and development.

Evolution of WHO Definition of Blindness

For the first time, an international standard definition of blindness was developed and included in the ICD-9 in 1975 (Table 1.4.1). Under this classification, the best-corrected VA (BCVA) in the better eye was used to classify VI in five categories: Categories 1 and 2: low vision and Categories 3–5: blindness. The criteria for blindness were BCVA less than 3/60 in the better eye or visual field < 10 degrees around central fixation.[9]

It was recommended that VA be measured with both eyes open with presenting correction if any. The cut-off level for defining blindness was retained, and patients with VA of less than 3/60 or a visual field of no more than 10° in a radius around the central point of fixation in the better eye were placed under blindness Category 3. Under this revision, the term "low vision" was replaced by two categories (1 and 2) of VI. Category 1 referred to the presenting VA <6/18-6/60 in the better eye (moderate VI), and category 2 referred to the presenting VA < 6/60 -3/60 in the better eye (severe VI) [10]

[8]World Health Assembly 25. Prevention of Blindness: Report by the Director-General. Geneva: WHO; 1972

[9]Vashist p, Senjam SS, Gupta V, Gupta N, Kumar A. Definition of blindness under National Programme for Control of Blindness, Indian J Ophthalmol 2017; 65: 92-96

[10] World Health Organization. List of Official ICD-10 Updates Ratified October 2006. Geneva: WHO; 2006. Available from: http:// www.who.int/classifications/icd/2006Updates

Table-1.4.1. Categories of Visual impairment based on visual acuity criteria under World Health Organization International Classification of Disease (ICD) 9th revision and ICD-10 (2006 revision) and National Program for Control of Blindness (NPCB), India [3]

Visual Acuity	ICD 9	ICD 10 2006 rev.	NPCB			
(Best Corrected Visual Acuity)	(Presenting Distance Visual Acuity)	(Presenting distance visual acuity)				
Worse than Equal to or better than	Category Classified as	Category Classified as	Classified as			
-	6/18	-	-	0	Mild or no visual impairment	-
	3/10(0.3)					
	20/70					
6/18	6/60	1	Low vision	1	Moderate visual impairment	Visual impairment
3/10(0.3)	1/10(0.1)					
20/70	20/200					
6/60	3/60	2	Blindness	2	Severe visual impairment	Blindness
1/10 (0.10)	1/20(0.05)					
20/200	20/400					
3/60	1/60*	3	Blindness	3	Blindness	
1/20(0.05)	1/50(0.02)					
20/400	20/1200					
1/60*	Light perception	4		4		
1/50(0.02)						
5/300(20/1200)						
No light perception		5				
Undetermined or unspecified		9		9		

India

The percentage of vision loss based on best-corrected vision acuity (BCVA) and field of vision from the center of fixation is shown in Figures 1.4.1 and 1.4.2. The major advantage of this functional definition is that it enlarges the range of persons with low vision. As per this criterion, only people with no light perception (LP) are considered 'blind.' This revised definition focuses on 'functionality' and thereby increases the scope of planning low vision services to maximize the functional use of residual vision for day-to-day activities to the extent possible.

Left Eye Vision (Best Corrected Visual Acuity)

Right Eye Vision [Best Corrected Visual Acuity – BCVA]

	6/6 to 6/18	6/24	6/36	6/60	3/60	2/60	1/60	HMCF to PL-
6/6 to 6/18	0%	10%	10%	10%	20%	30%	30%	30%
6/24	10%	40%	40%	40%	50%	60%	60%	60%
6/36	10%	40%	40%	40%	50%	60%	60%	60%
6/60	10%	40%	40%	40%	50%	60%	60%	60%
3/60	20%	50%	50%	50%	70%	80%	80%	80%
2/60	30%	60%	60%	60%	80%	90%	90%	90%
1/60	30%	60%	60%	60%	80%	90%	90%	90%
HMCF to PL-	30%	60%	60%	60%	80%	90%	90%	100%

Figure 1.4.1: Percentage of visual disability based on the BCVA.
(Source: Ministry of Social Justice &Empowerment, India)

Left Eye

Right

	<40° to 20°	<20° to 10°	<10°
<40° to 20°	40%	50%	60%
<20° to 10°	50%	70%	80%
<10°	60%	80%	100%

Figure 1.4.2: Percentage of visual disability based on the field of vision
(Source: Ministry of Social Justice & Empowerment, India)

Chapter 2

2.1. Survey Design

The TOES is a public-private collaborative project between the Ministry of Tribal Affairs [MOTA, 11031/18/2020-TRI (17736)], the Government of India, SC & ST Research Training Institute (SCSTRTI), Odisha, and the PVTG Empowerment & Livelihoods Improvement Programmes (OPELIP), Government of Odisha, the L V Prasad Eye Institute, Bhubaneswar, and non-government organizations. It aims to reach the PVTG community clustered in 14 districts of Odisha, India. The Dongria PVTG eye health project was the first one in the series. The study was approved by the Institutional Ethics Committee (2021-76-BHR-39). Informed consent was obtained from all study participants verbally (not signed because most were illiterate), and the study adhered to the tenets of the Declaration of Helsinki on human subjects' participation. The study was conducted from 16th July 2021 to 31ST January 2022.

Main objectives:

1. To evaluate the prevalence of major eye disorders in children and adults of the Dongria community.
2. To build a tribal eye health delivery model (with a particular reference to PVTG) in a sustainable public-private partnership. The model could be extended to other PVTGs across the state and the country.

Before the field survey, we conducted a pilot study.

We recruited four CHWs from the PVTG community with a secondary school qualification and two trained vision technicians (VTs). [11] An experienced optometrist trained the CHWs and VTs for 15 days. The training included measuring distance and near visual acuity, flashlight examination of the eye, undilated refraction using a handheld refraction device, and referring to the vision center and/or secondary center. (Figure 2.1.1) They were also trained to collect demographic data and history of systemic diseases, record blood pressure using digital equipment, and measure the arm circumference of under 5 children. All trainees were trained to use the BEST protocol.[12]

[11]Vision Technician are Allied Ophthalmic Personnel (AOP). Typically, they are trained to detect common eye disorders from an external eye examination using a slitlamp, recoding intraocular pressure using an applanation tonometer attached to the slitlamp, and obtaining the fundus photo using a non-mydriatic camera. They are trained to perform an objective and subjective refraction and dispense spectacles, and refer people not improving with refraction to the next level of eye care.

[12]Marmamula S. The Basic Eye Screening Test (BEST) for primary level eye screening by grassroot level workers in India. Indian J Ophthalmol. 2020 Feb;68(2):408-409. doi: 10.4103/ijo.IJO_1554_19. PMID: 31957740; PMCID: PMC7003602.

Figure 2.1.1. The BEST protocol training of CHWs and VTs

BEST

Protocol. (Figure 2.1.2)

The protocol is designed to measure the distance and near vision, external examination of the eye, and the basis for referral to the next level of eye care.

Tool kit.

It consists of (1) Screening cards, (2) Measuring tape (150 cms length), and (3) Flashlight. BEST screening cards screen people for distance and near vision. The distance card consists of two lines: 6/60 using three E optotypes and 6/12 using five E optotypes. Near vision contains five tumbling E optotypes corresponding to N8. The distance vision is measured at 3 meters, and near vision is measured at 40 centimeters. (Figure 2.1.3)

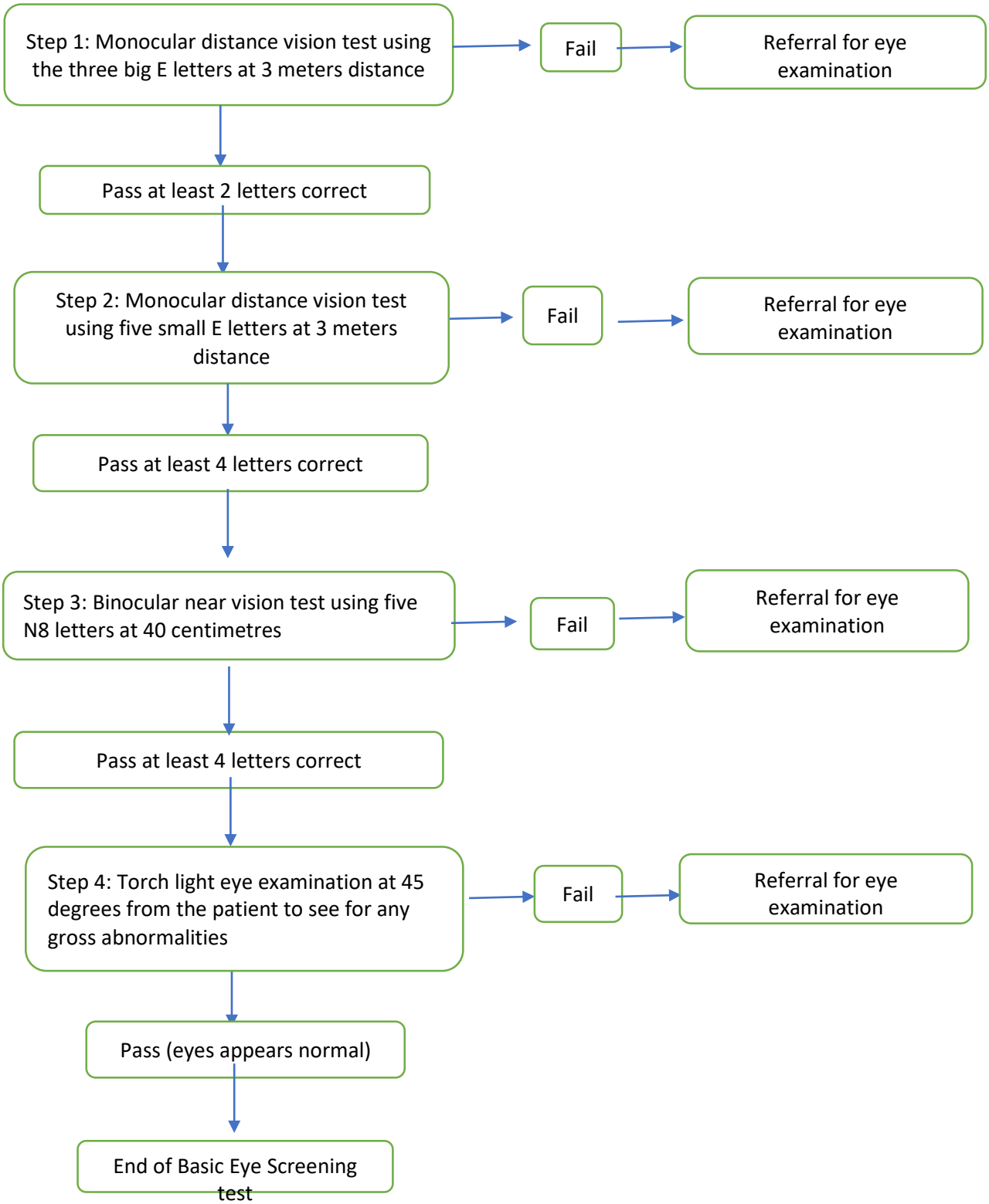


Figure 2.1.2. The steps of BEST

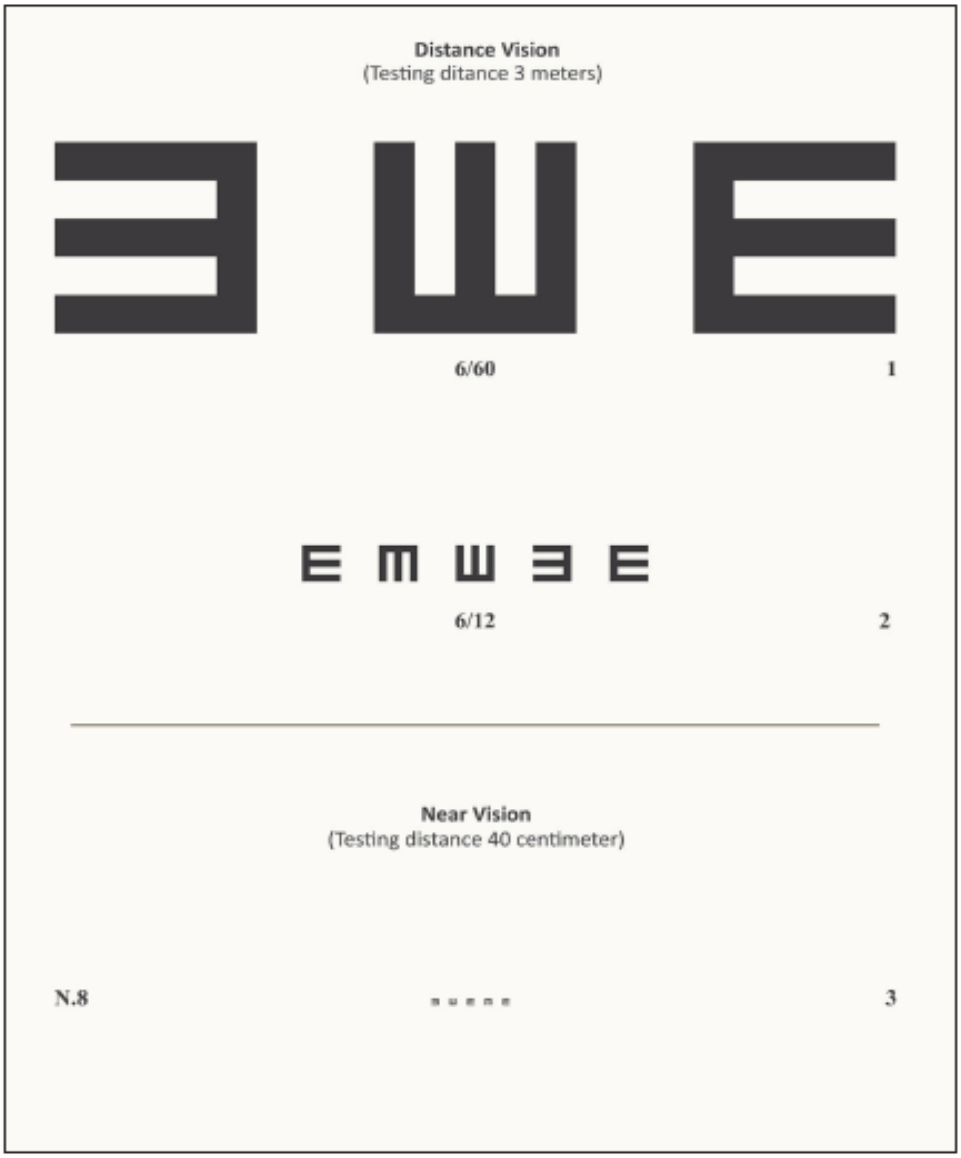


Figure 2.1.3. The basic eye screening test vision chart.

All team members were vaccinated and followed all SARS CoV2- appropriate measures because the screening was done during the waning stage of the pandemic. The trained CHWs collected the basic health data and demographic details during their door-to-door visit. The distance and near vision were recorded using the BEST protocol with and without spectacles correction. The VTs performed an external eye examination using a flashlight and recorded gross anomalies of the eye. VTs prescribed spectacles to people who improved distance vision to 6/12 or more monocularly using the FoFo. Age-appropriate near vision spectacles were prescribed who improved near vision to N8 or more at 40 centimeters binocularly. Those who failed the test and did not improve or had gross anterior segment anomalies were referred to the nearest fixed VC or SC.

At the VC, the VT measured vision, performed refraction, measured intraocular pressure, and completed an undilated eye examination using a slitlamp. A comprehensive eye examination evaluated complex eye problems at SC. When indicated, cataract, pterygium, and lacrimal surgery were

performed in the SC. Patients identified with hypertension and nutritional deficiency were referred to the nearest public health facility for further management during this survey. (Table 2.1.1)

Table 2.1.1. Screening components at various examination sites

Parameters		Community	Vision Centre	Secondary Center
Demography		✓	✓	✓
Eye examination	Distance vision	✓	✗	✓
	Near Vision	✓	✓	✓
	Refraction	✓	✓	✓
	External eye-flashlight	✓	✗	✗
	External eye- slitlamp	✗	✓	✓
	Comprehensive exam	✗	✗	✓
Systemic conditions	History	✓	✓	✓
	Blood pressure measure	✓	✓	✓
	Blood sugar measure	✗	✗	✓
Spectacles dispensing	Ready-made	✓	✓	✓
	Prescription	✗	✓	✓
Treatment	Medical & Surgical	✗	✗	✓
Referrals		to VC	to SC	District hospital- Systemic care Tertiary eye- advanced eye surgery

The benchmark for referral of people from the community to the VC and/or SC and VC to SC by the CHWs or VTs were at least one of the following:

1. Monocular distance visual acuity worse than 6/12,
2. Binocular near visual acuity worse than N8,
3. Anterior or posterior segment pathology detected in an external eye examination

2.2. Pilot study

A pilot study was conducted to familiarize the screening personnel with the study procedure. The pilot study was approved by the Institutional Ethics Committee (2021-76-BHR-39). Informed consent was obtained from all study participants, and the study adhered to the tenets of the Declaration of Helsinki on human subjects' participation. The study was conducted from 15th April 2021 to 30th April 2021. The study participants were the people from four villages adjacent to the SC at Rayagada (Naraindas Morbai Eye Hospital & JK Center for Tribal Eye Diseases, L V Prasad Eye Institute). We recruited four CHWs from the PVTG community with a minimum qualification of secondary school and two VTs from

the local communities. All CHWs and VTs received training for 15 days by an experienced optometrist. The training curricula included measuring distance visual acuity, near visual acuity, and flashlight examination of the external eye. The training comprised 4 hours of theory with PowerPoint presentation and another 4 hours of practical sessions in the outpatient department. The basic documentation included essential demographic and personal data (anthropometry, use of tobacco and alcohol, education, known systemic diseases, and disability other than seeing disability). The VTs were trained on basic comprehensive eye examinations routinely performed at the VC, such as slit-lamp examination of the external eye, applanation tonometry in adults (30 years or older), refraction and subjective correction for distance and near, writing spectacles prescription, and telescreening or referral to the secondary eye center. The training followed three basic steps, simulating the actual study.

Study design

Inclusion: adults from four villages surrounding the Rayagada-based secondary eye center, with signed informed consent. These villages were Pitamahal, Umarbali, Manikajhol and Bishnuguda.

Exclusion: people from other villages and those who did not agree to the examination.

Examination Protocol: The examination protocol included measurement of uncorrected/ corrected distance visual acuity with the Snellen vision chart, near visual acuity, flashlight light examination of the external eye (lids, conjunctiva, cornea, pupil, anterior segment depth), documenting the demographic characteristics, history of eye diseases, eye trauma, diabetes mellitus, high blood pressure. (Figures 2.1.1 and 2.1.2)

Sample size: For the accuracy and validation of parameters, we screened 126 subjects.

Figure 2.2.1. A CHW examines a pilot study participant in the village

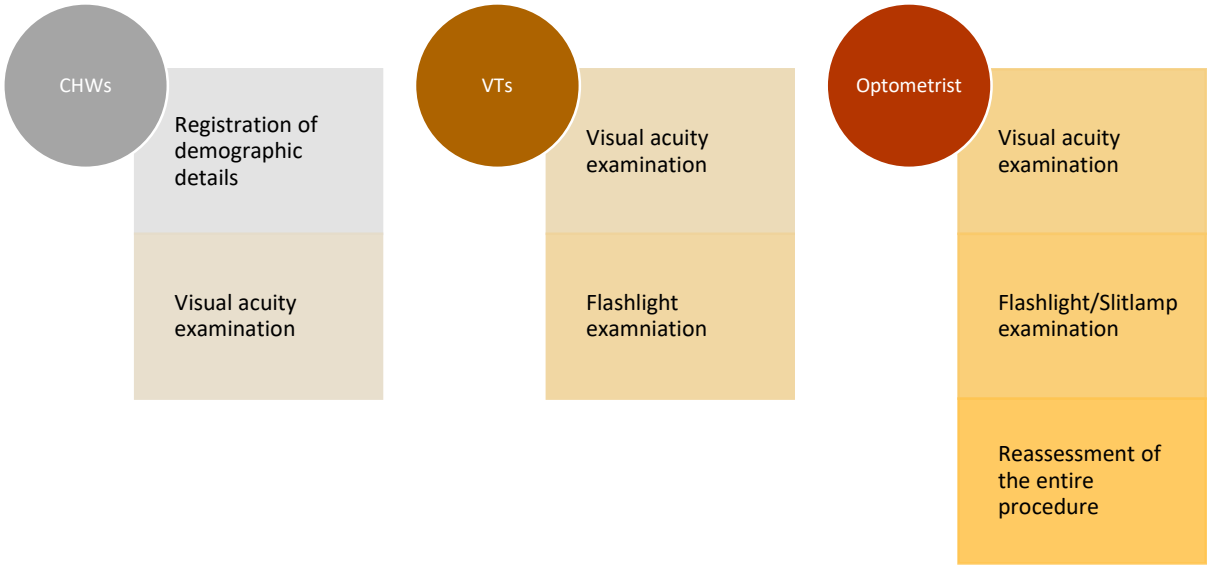


Figure 2.2.2. Eye health personnel-specific use of BEST protocol.

Step 1. Left. The CHWs screened the subjects and collected all basic information and the presenting vision without and with (if any) spectacles.

Step 2. The VT performed a comprehensive external eye examination, including objective and subjective refraction.

Step 3. The optometrist re-examined the subject to verify all findings obtained by the CHW and VT. Additionally, the ophthalmologist of the secondary center examined the subject, including dilated fundus examination, and identified the cause of visual impairment or blindness for people with visual acuity less than 6/12.

Statistical Analysis

Mean, standard deviation, and percentages were calculated using descriptive statistics. The weighted kappa statistics computed agreement among CHWs, VTs, and an experienced optometrist. All statistical analyses were performed using IBM SPSS (version 23.0; IBM Corp., Armonk, NY). A p-value < 0.05 was considered statistically significant.

Results [13]

Agreement

Table 2.2.1- The overall kappa (k) agreement, sensitivity, and specificity for different eye conditions between the optometrist and first VT.

Table 2.2.2- The overall k agreement, sensitivity, and specificity for different ocular conditions between the optometrist and second VT.

[13]Padhy D, Majhi D, Marmamula S, Mishro R, Rath S, Ota AB, Jalan M, Das T, Rout PP. Tribal Odisha Eye Disease Study # 11 - Particularly vulnerable tribal group eye health program. Program protocol and validation. Indian J Ophthalmol. 2022 Apr;70(4):1376-1380. doi: 10.4103/ijo.IJO_2082_21. PMID: 35326058.

Table 2.2.3- The overall k agreement, sensitivity, and specificity for different ocular conditions between the optometrist and CHWs.

There was a satisfactory agreement for diagnosing emmetropia, refractive error, cataract, pterygium, presbyopia, and corneal pathology, but not for glaucoma and strabismus. The overall κ agreement for distance and near visual acuity, flashlight examination, and referral was less between Optometrist vs. CHWs than Optometrist vs. VTs. The sensitivity for diagnosing emmetropia, refractive error, cataract, pterygium, presbyopia, and corneal diseases was good. It was comparatively less in strabismus and glaucoma suspects.

Table 2.2.1. Agreement between the optometrist and first vision technician.

Ocular Diseases	Kappa (95% CI)	P-Value	Sensitivity (%)	Specificity(%)
Emmetropia	0.932 (0.83-1.0)	<0.0001	100	96.9
Refractive Error	0.943(0.79-1.0)	<0.0001	90	100
Cataract	1.0(1.0-1.0)	<0.0001	100	100
Pterygium	1.0(1.0-1.0)	<0.0001	100	100
Presbyopia	1.0(1.0-1.0)	<0.0001	100	100
Glaucoma	0.901(0.71-1.0)	<0.0001	83.3	100
Corneal Pathology	1.0(1.0-1.0)	<0.0001	100	100
Strabismus	0.853(0.0-1.0)	<0.0001	75%	100

Table 2.2.2. Agreement between the optometrist and second vision technician.

Ocular Diseases	Kappa (95% CI)	P-Value	Sensitivity (%)	Specificity (%)
Emmetropia	0.932 (0.84-1.0)	<0.0001	96.9	100
Refractive Error	1.0(1.0-1.0)	<0.0001	100	100
Cataract	0.955(0.87-1.0)	<0.0001	97.9	100
Pterygium	1.0(1.0-1.0)	<0.0001	100	100
Presbyopia	1.0(1.0-1.0)	<0.0001	100	100
Glaucoma	0.742(0.0-1.0)	<0.0001	60	100
Corneal Pathology	1.0(1.0-1.0)	<0.0001	100	100
Strabismus	0.958(0.85-1.0)	<0.0001	92.9	100

Table 2.2.3. Agreement between the optometrist vs. community health workers and Optometrist vs. Vision Technicians in assessing distance visual acuity, near visual acuity, torchlight examination, and referral to vision center and secondary center.

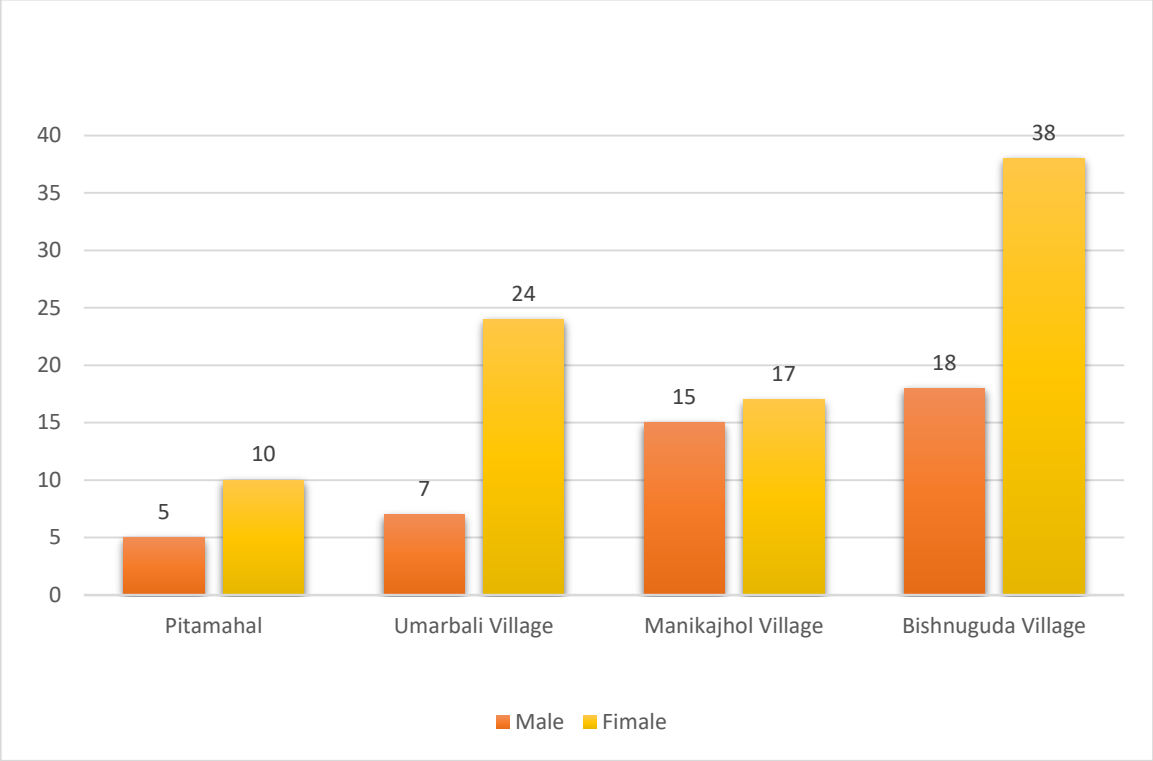
Eye Health workforce	Distance Visual Acuity Kappa 95% CI	Near Visual Acuity Kappa 95% CI	Torchlight Examination Kappa 95% CI	Referral Kappa 95% CI
CHW1 vs. Optometrist	0.932(0.84-1.0)	0.889(0.87-0.98)	0.792(0.68-0.88)	0.871(0.76-0.95)
CHW2 vs Optometrist	0.849(0.73-0.95)	0.873(0.77-0.95)	0.776(0.66-0.88)	0.837(0.71-0.93)
CHW3 vs Optometrist	0.869(0.75-0.96)	0.920(0.84-0.98)	0.760(0.64-0.86)	0.80(0.68-0.90)
CHW4 vs Optometrist	0.829(0.69-0.93)	0.905(0.823-0.968)	0.744(0.63-0.85)	0.756(0.62-0.85)
VT1 vs Optometrist	0.954(0.87-1.0)	0.952(0.88-1.0)	0.952(0.88-1.0)	0.943(0.86-1.0)
VT2 vs Optometrist	0.955(0.88-1.0)	0.936(0.87-0.98)	0.962(0.91-1.0)	0.962(0.89-1.0)

Outcome

One hundred twenty-six patients were examined from the four villages.
The mean age was 44 ±18 years. There were 81 females and 45 males (Figure 2.2.3). In this pilot cohort, 123 of 126 people never wore spectacles. Nearly 70 % of the study population had zero literacy. (Table 2.2.4). Cataract was the major cause of visual impairment (41%).

Table 2.2.4.Demographic details of the screened patients

Parameter	Number and Percentage
Patients screened	126
Male	45 (36%)
Female	81 (64%)
Mean Age	44±18
Education	
No school education	86 (68%)
Up to class 10th	29 (23%)
Higher education	11 (9%)
Spectacles	
Not wearing spectacles	123 (98%)
Wearing spectacles	3 (2%)
Ocular Conditions	
Emmetropia	25 (20%)
Refractive Error	10 (8%)
Cataract	52 (41%)
Pterygium	15 (12%)
Presbyopia	15 (12%)
Glaucoma	5(4%)
Corneal Pathology	2(1.5%)
Strabismus	2(1.5%)



2.2.3. Population distribution across the screening area in the pilot study.

2.3 Preparation for the study and Fieldwork

In February 2021, the LVPEI team made their first Visit to map the different regions to screen the Dongria community in the Niyamgiri hill ranges. (Figure 2.3.1) The team spent 3 days in two blocks of the Rayagada district. The team discussed the need and eye screening procedure with the villagers and the village head. They spent minimum 2 hour in each village, visited 10 villages- Khambesi, Kurli, Gartali, Mundabali, Sakata, Merkabodili, Radanga, Kadaraguma, Khajuri and Batiguma. A community resource person accompanied the team. The team cleared all their doubts in their local Kui language and allied all fears. We also mentioned that all the first-level screening would be conducted in their locality; it would be non-invasive and at no cost. We also explained that the people needing further care would be transported in groups to the nearest VC or the Rayagada-based SC. It was also stated that the participation was voluntary and that all care, be it a pair of spectacles or eye surgery, would be done at no cost or inconvenience.

Figure. 2.3.1. Mapping of the region by team LVPEI, the CRP, and the OPELIP team. 18 February 2021. The site elevation: 854.14 meters (2803 feet) above MSL.

This visit helped the team understand the people, their culture, and the importance of early morning screening as most villages go to their *donger* (hill) for work in the early morning. The villages also gained confidence as they understood the benefits of good eye health. The team also selected the CHWs during this time.

Selection criteria for CHWs:

1. Speaking and understanding the local Kui language
2. Ability to translate Odia to Kui and translate back to Odia
3. Education- Class 10th Pass
4. Familiarity with people and region
5. Culture and people sensitive

We selected three male and one female CHWs.
We also selected two VTs- One male and one female

Selection criteria for VTs

1. Education: 10+2 pass or equivalent with mathematics or biology
2. Willing to conduct door-to-door visits and screening using BEST
   Professional capabilities in basic eye examinations: History-taking, VA measurement, refraction, Slit lamp examination, Applanation tonometry, IOL power calculation, and prescribing glasses.

We constituted two teams, each team of two CHWs and one VT.
Each team of eye health workers was assigned one village. The study was supposed to start in April 2021, but the second wave of SARS-Cov-2 infection delayed it until July 2021. By that time, most of the older adults from the Dongria community had been vaccinated. We also ensured that the entire field team was vaccinated, including the vehicle driver.

The constitution of the TOES PVTG team for the eye health survey of the Dongria community consisted of people from different units of the LVPEI and Government of Odisha SCST RTI (Figure 2.3.2)

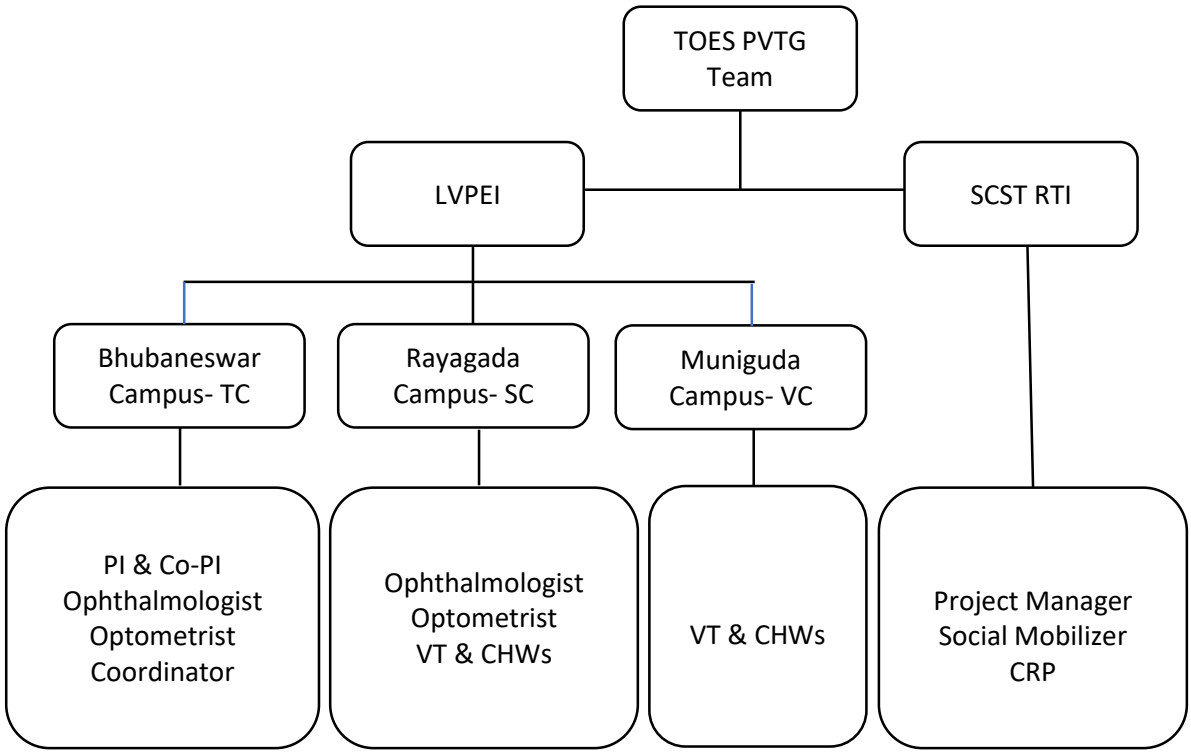


Figure 2.3.2. TOES PVTG Eye health survey team

Fieldwork

The study finally started on 16th July 2021. The team will travel each day early morning from Rayagada, LVPEI NMB Eye Center, and JK Center for Tribal Eye Health. Each team would carry three BEST vision charts, six measuring tapes, four pen torchlights, two weighing machines, three registers, and two BP measuring instruments. They will also carry hiking sticks, enough water bottles, and some dry food. The CHWs will get into the vehicle on the way to the screening sites.

The CHWs and the CRPs would have informed the village people two days before. After reaching the village, each team divided their work, such as one CHW would enter the family's details in the register, and the other CHW would examine the people using the BEST protocol. (Figure 2.3.3) The VT would supervise and examine the external eye using a pen torchlight and refract using the FoFo. The VT would explain the need for further examination, and the CRP would explain the travel details to those referred to VC or SC. A similar procedure would be performed in an adjacent village. While one team usually examined one village, two teams were deployed in larger villages (e.g., Khambesi in the Bissamcuttack block).

On average, each team would examine 75 people every day. The team used maps to visit each village and complete a household listing of all residents. At each house, the aim of the study was explained verbally to the household head or an adult key informant about the screening procedure and its potential benefits. If the house head or adult key informant agreed to participate, the CHW would record the demographic and contact details before examining the eye.

Two VTs would enter the data into an excel sheet in the evening after returning to the Rayagada base hospital. The study PI continued to observe the teams regularly throughout screening, data collection, and data entry to ensure no major deviation from the study protocol.

Figure 2.3.3 A CHW examines a Dongria woman using the BEST chart. Location: Parsali village, Kalyansinghpur block.

It was a new experience for most members of the team. Unused to track in uneven mountainous high, altitude areas, many would be exhausted before reaching the screening site. There was no motorable road, and it was required to walk several kilometers; the team members would rest in the deep jungle (Figure 2.3.4). But in a fortnight or so, it became a habit for all team members, and no one complained of physical exhaustion.

Figure 2.3.4. A VT was worn out midway to Tanda village of Bissamcuttack block.

Each month one ophthalmologist or public eye health specialist from LVPEI Bhubaneswar or Hyderabad participated in the screening program. (Figure 2.3.5) It boosted the team's morale and improved the screening methodology manifold. Each visiting faculty travelled to the screening site on two consecutive days and scrutinized the data in the evening.

People with URE, not improving with the FoFo, and people with anterior segment pathology were referred to VC. In VC, a skilled VT would perform an undilated comprehensive examination, including visual acuity measurement, refraction, slit lamp examination, and intraocular pressure measurement. People who improved distance and near vision were prescribed glasses; those with anterior segment pathology were tele consulted by the ophthalmologist from Rayagada SC. The people were referred to the SC as per the ophthalmologist's advice.

In SC, all referred people received a dilated comprehensive examination. In preparation for the surgery, additional tests such as IOL power measurement and basic systemic examinations were done on people diagnosed with cataract.

The team visited each PVTG village three times to screen the missing patients. The screening was completed on 31ST January 2022.

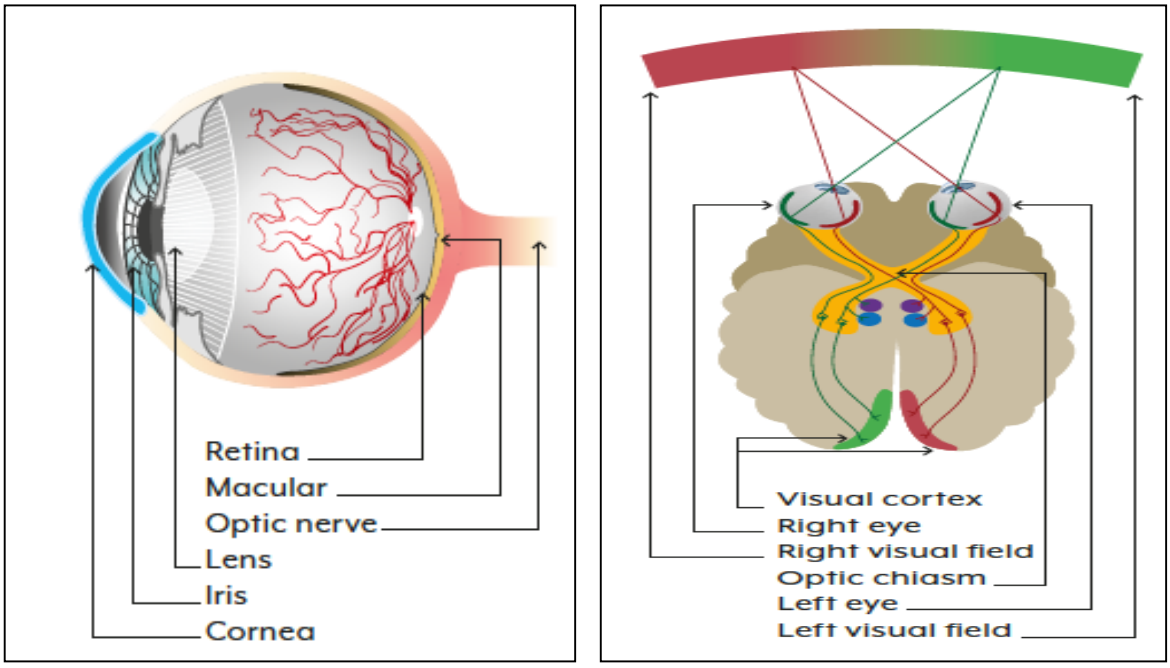
Figure 2.3.5. Ophthalmologists (Upper panel) and public Health specialists (Lower panel) participate in the screening program.

Chapter 3

3.1. Spectrum of Eye Diseases

The structures of the eye from front to rear include the lids, conjunctiva, cornea, iris, pupil, crystalline lens, vitreous, retina, and optic nerve. (Figure 3.1.1) The light entering the eye onto the retina through a clear cornea, pupil, crystalline lens, and vitreous are converted into nerve impulses. It travels through the optic nerves and pathways to the visual cortex to enable the person to see. These impulses are also transmitted to many other parts of the brain, where these integrate with other inputs, such as hearing and memory, for a person to correlate the vision with the surrounding environment.

Figure 3.1.1. Structures of the eye and visual system (Source: World Report on Vision, 2019)



The TOES PVTG survey enumerated the ocular disease burden and some of the systemic disorders. All eye disorders were treated where treatment was available. People identified with diabetes, hypertension, anaemia, and nutritional deficiency were referred to the nearest public health facility for further management. The definition and classification of anterior and posterior segment ophthalmic disorders used in the screening and care of the Dongria community are described in Table-3.1.1.

Table 3.1.1. Definitions of different ocular conditions.

Emmetropia	No any ocular abnormality with both distance visual acuity (DVA) and near visual acuity (NVA)6/6 uniocular
Refractive error	Visual acuity (VA) less than 6/6 but improved with pinhole
Cataract	Reduced VA with obvious opacity in the pupillary region
Pterygium	A fleshy growth of the conjunctiva
Presbyopia	NVA worse than N8 binocularly
Glaucoma Suspect	Shallow AC with/without redness and digitally hard eye pressure
Corneal Pathology	Opacity in the cornea causing reduced VA
Strabismus	One eye is moved in a direction that is different from the other eye

Description of common eye disorders

Refractive Error occurs when the eye cannot focus on the images from the outside world. The result of refractive errors is blurred vision, which is sometimes severe enough to cause visual impairment and blindness.
The three most common refractive errors are:

- Myopia (nearsightedness): difficulty in seeing distant objects clearly
- Hyperopia (farsightedness): difficulty in seeing close objects clearly
- Astigmatism: distorted vision resulting from an irregularly curved cornea

Presbyopia is the gradual loss of the eye's ability to focus on nearby objects. It's a natural, often annoying part of aging. Presbyopia usually becomes noticeable in the early to mid-40s and continues to worsen until around age 65.

Cataract is a clouding of the normally transparent crystalline lens of the eye. People with cataract see through cloudy lenses, like looking through a frosty or fogged-up window.
Pterygium is a triangular or wedge-shaped growth that develops on the conjunctiva of the eye and grows onto the cornea.
Strabismus is the abnormal alignment of the eyes

Specific eye diseases in children

Vitamin A deficiency (VAD) usually occurs in children. The WHO has classified VAD into several grades (Table 3.1.2)

Table 3.1.2. WHO classification of VAD[14]

Notation	Anomaly	Description
XN	Night Blindness	Inability to see well at night or in poor light. This can affect children and pregnant/ lactating women. It is a common manifestation of VAD
X1A	Conjunctival xerosis	This presents as dryness of the conjunctiva and occurs due to long-standing VAD. It could be quite difficult to detect, and therefore, it is not a very reliable sign
X1B	Bitot's spot	It is very characteristic of VAD. Any other condition does not cause it. The slightly elevated, white foamy lesion is usually seen on the bulbar conjunctiva near the limbus at 3 and 9 o'clock.
X2	Corneal xerosis	This is drying of the cornea and is a sign of sudden, acute VAD. The cornea becomes dry because glands in the conjunctiva no longer function normally.
X3A	Corneal ulcer covering < 1/3 of the cornea	If the acute deficiency is not reversed as a matter of urgency, the cornea can become ulcerated and melt away. X3B, also called Keratomalacia, is the most severe form of VAD. In this condition, the cornea may become oedematous and thickened and then melt away
X3B	Corneal ulcer covering ≥ 1/3 of the cornea	
Xs	Corneal xerosis	This is drying of the cornea and is a sign of sudden, acute deficiency. The cornea becomes dry because glands in the conjunctiva no longer function normally.

Nutrition (Table 3.1.3)

Malnutrition refers to deficiencies, excesses, or imbalances in a person's energy intake and/or nutrients. The term malnutrition addresses 3 broad groups of conditions:

- undernutrition: includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age);
- micronutrient-related malnutrition includes micronutrient deficiencies (a lack of important vitamins and minerals) or micronutrient excess;
- Overweight, obesity, and diet-related non-communicable diseases: heart disease, stroke, diabetes, and some cancers.

[14]WHO. Global prevalence of vitamin A deficiency in populations at risk 1995-2005. WHO global database on vitamin A deficiency. Geneva: World Health Organization; 2009 (http://whqlibdoc.who.int/publications/2009/9789241598019_eng.pdf)

Undernutrition

There are 4 broad sub-forms of undernutrition: wasting, stunting, underweight, and deficiencies in vitamins and minerals. Undernutrition makes children more vulnerable to disease and death.

Low weight-for-height is known as wasting. It usually indicates recent and severe weight loss because a person has not had enough food to eat and/or lost due to infectious diseases, such as diarrhea. A young child who is moderately or severely wasted has an increased risk of death, but treatment is possible.

Low height-for-age is known as stunting. It results from chronic or recurrent undernutrition, usually associated with poor socioeconomic conditions, poor maternal health and nutrition, frequent illness, and/or inappropriate feeding and care of infants and young children in early life. As a result, stunting holds children back from reaching their physical and cognitive potential.

Children with low weight for age are known as underweight. An underweight child may be stunted, wasted, or both.

Global acute malnutrition (GAM) is the presence of both MAM (moderate acute malnutrition- for children aged 6-59 months), MUAC (mid-upper arm circumference <125 mm and ≥ 115 mm), and SAM (severe acute malnutrition for children aged 6-59 months MUAC <115 mm) in a population. All Dongria children under 5 underwent MUAC examination during screening.[15]
Stunting for age is defined for under 5 children whose z-score falls below 2 standard deviations from the median height-for-age of the WHO Child Growth Standards.

All Dongria under 5 children had their weight and height measured using standard equipment and methods.

Table-3.1.3. WHO classification of nutritional status of infants and children

Nutritional status	Age: Birth to 5 years. The indicator and cut-off value compared to the median of the WHO Child growth standards. [a]
Obese	Weight-for-length/height [b] or BMI-for-age >3SD of the median
Overweight	Weight-for-length/height [b] or BMI-for-age >2SD and <3SD of the median
Moderately underweight	Weight-for-age <-2SD and ≥ -3SD of the median
Severely underweight	Weight-for-age > -3SD of the median

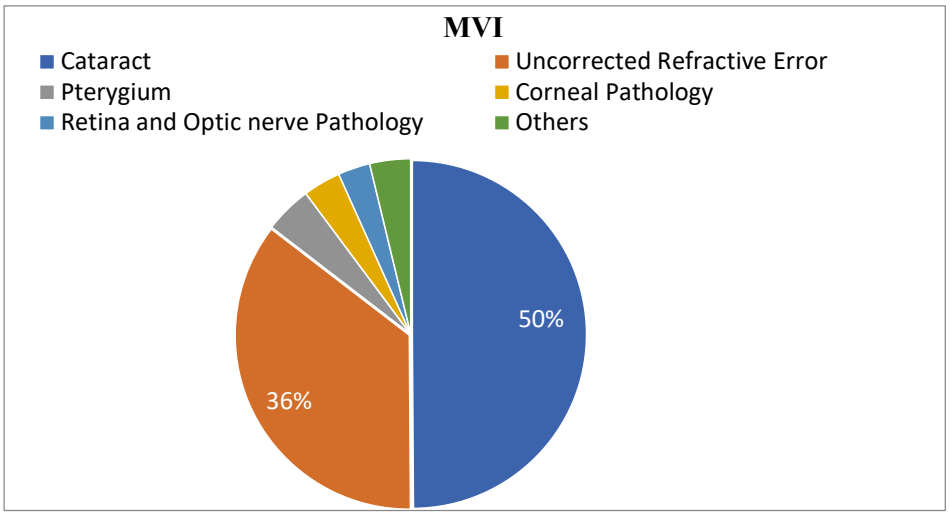
[15] World Health Organization; United Nations Children's Fund. WHO Child Growth Standards and the Identification of Severe Acute Malnutrition in Infants and Children: a Joint Statement. Geneva: World Health Organization; 2009.

Moderate acute malnutrition	Weight-for-length/height [b] or BMI-for-age ≤ -2SD and ≥−3 SD of the median, or mid-upper arm circumference ≥115 mm and <125 mm
Severe acute malnutrition	Weight-for-length/height [b]or BMI-for-age <− 3 SD of the median or mid-upper arm circumference <115 mm, or bilateral pitting oedema
Moderately stunted (moderate chronic malnutrition)	Length/height-for-age [b]≤−2 SD and ≥−3 SD of the median
Severely stunted (severe chronic malnutrition)	Length/height-for-age [b] <−3 SD of the median
Moderately wasted	Weight-for-length/height ≤−2 SD and ≥−3 SD of the median
Severely wasted	Weight-for-length/height <−3 SD of the median

a. WHO child growth standards: methods and development. Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age. Geneva: World Health Organization; 2006 (http://www.who.int/nutrition/publications/childgrowthstandards_technical_report_1/en/).
b. Weight-for-length used in infants and young children aged 0–23 months, and weight-for-height used for children aged 24 months and older.

Visual Impairment, The prevalence of visual impairment among the Dongria tribal community, was 31%. Cataract was the most common cause (50%) of MVI, followed by refractive error (35%). SVI was seen in 2.5% (n=245) of the screened population. Cataract was the most common cause of SVI (n=187; 76%), followed by refractive error.

(Figure 3.1.2; Table 3.1.4)



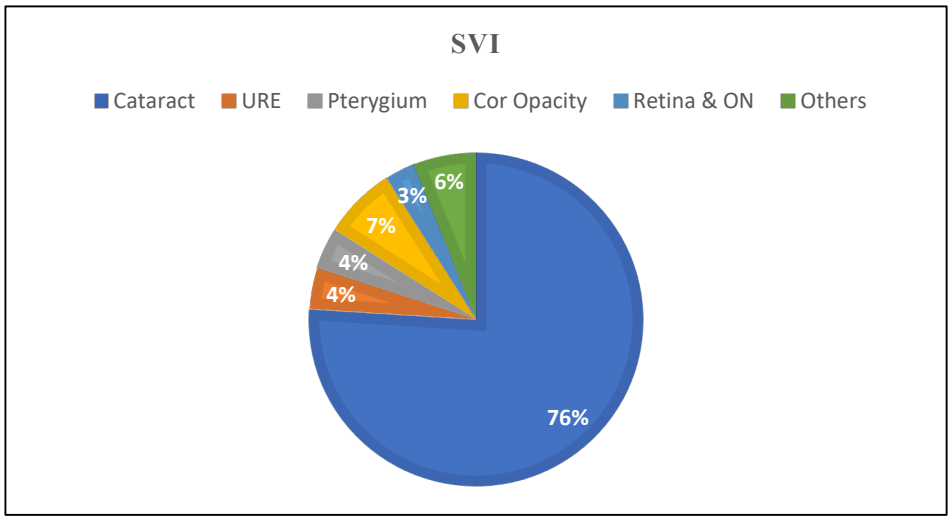


Figure 3.1.2. Visual impairment in the Dongria community

Table- 3.1.4 Causes of visual impairment

Causes of Visual impairment	MVI n=982	SVI n=245
Cataract	490(50%)	187(76%)
Uncorrected refractive error	349(35%)	10(4%)
Pterygium		11(4.4%)
Corneal pathology	34(3.4%)	16(6.5%)
Retina and optic nerve	29(3%)	7(3%)
Others	37(3.7%)	14(6%)

Systemic disorders

Hypertension

Blood pressure can be classified into normal and elevated, and different grades of hypertension (Table 3.1.5) [16]

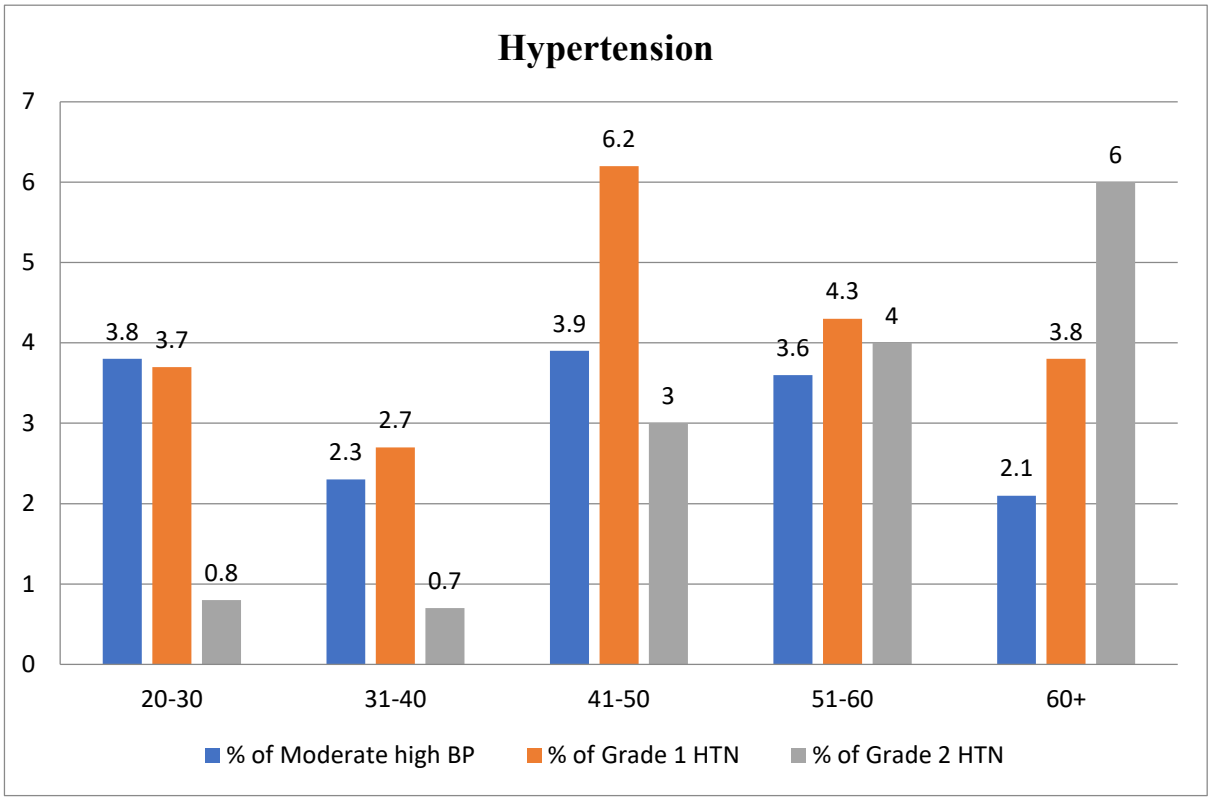
Table 3.1.5. Classification of hypertension

Grades of BP	Systolic BP(mm Hg)	Diastolic BP(mm Hg)
Moderate-High BP	120-129	>80
Grade 1 HTN	130-139	80-89
Grade 2 HTN	>140	>90
Malignant HTN	>180	>120

[16]Kaneko H, Yano Y, Itoh H, Morita K, Kiriyama H, Kamon T, et al. Association of blood pressure classification using the 2017 American College of Cardiology/American Heart Association blood pressure guideline with risk of heart failure and atrial fibrillation. Circulation. 2021 Jun 8;143(23):2244-53.

In the screened population, 4% (n=389) people had hypertension, and most were unaware.It was grade I hypertension in 64.2% (n= 250) people. Older people above 60 years had higher systolic and diastolic blood pressure. Among the young populations (20-30 years), 3.8% had moderate-high hypertension, and among the older population(>60 years), 6% had grade-2 hypertension. (Figure 3.1.3)

Figure -3.1.3. Prevalence of Hypertension in the different age groups



Behavioral Issues

Alcohol use

In this cohort 62% (n= 6144) admitted to consuming alcohol on a regular basis ; 56.3% (n= 3461)) of them were females and 19% (n=1158)of them were under 16 years.

3.2. Common Eye Disorders

Uncorrected Refractive Error

The vision was recorded with the Snellen chart as prescribed in the BEST protocol. Pinhole vision was recorded for people who had vision less than 6/12. The people who improved their vision with the pinhole were diagnosed with having the URE. On the spot, refraction was done using the FoFo - described later in detail. Those who did not improve with FoFo, but had improved with pinhole were referred to the VC. In the VC, the VT remeasured the vision, refracted in the conventional method using a streak retinoscope, and prescribed glasses to those who improved beyond 6/12. At the VC, the VT also examined the undilated eye in a slit lamp. The VT referred people to the SC when people did not improve on refraction, there was a suspicion of an eye disorder, and those needed further examinations.

We identified 744 people with URE. But only 572 (76.8%) people agreed to refraction using one of the above methods. FoFo refraction was good to prescribe the spectacles in 94 (12.6%) people, 354 (47.5%) people who attended the VC, and 124 (16.6%) people who attended the SC (Figure 3.2.1)

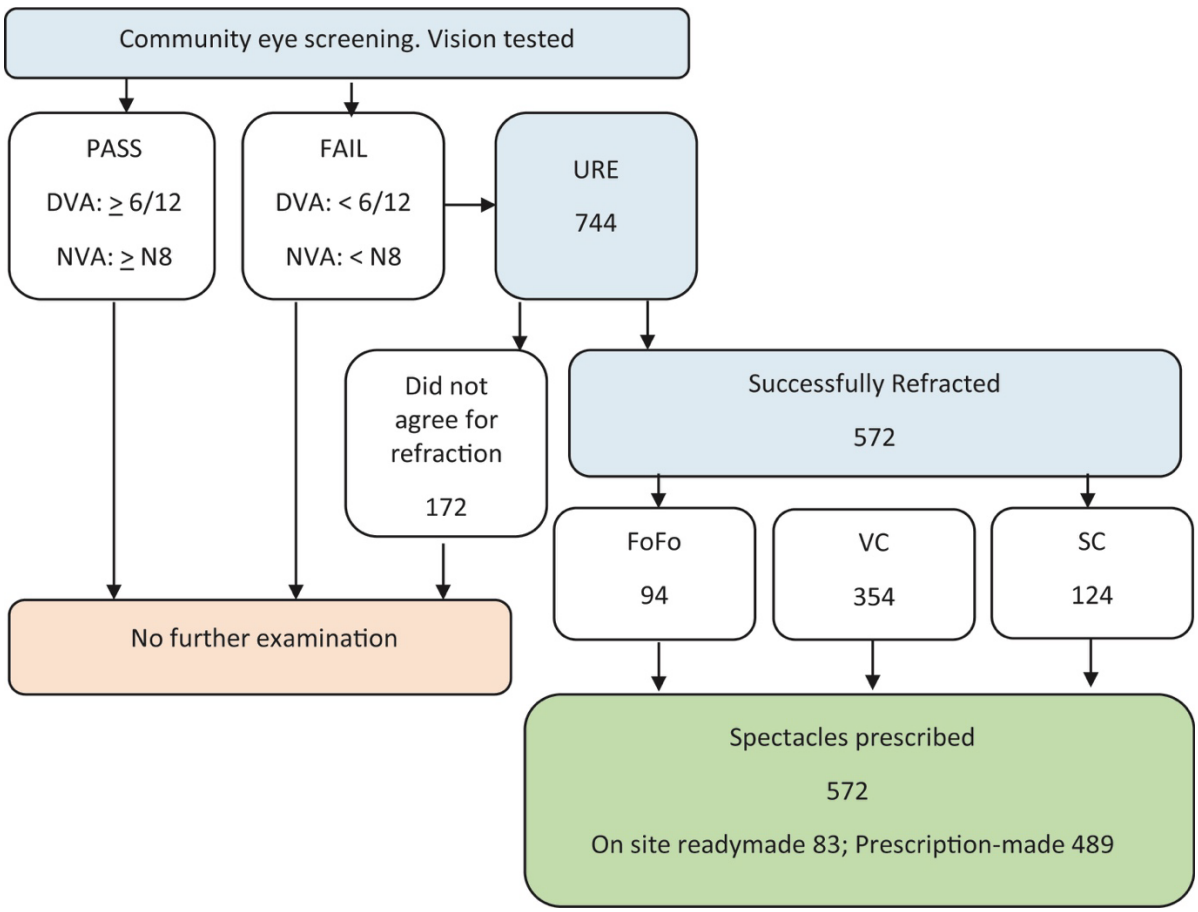


Figure. 3.2.1. URE Correction

There was an increased incidence of URE with age. The prevalence was higher in females. (Table 3.2.1) Simple hyperopic refractive error and compound myopic astigmatism were significantly higher in females. (Table 3.2.2) On multiple logistic regression, the females had a 1.5 times higher risk of URE than males. (Table 3.2.3)

Table 3.2.1. Distribution of Uncorrected refractive error

Parameters	Total Sample, n (%)	URE, n (%)
Age (Years)		
0-9	2,599(26.3%)	5(0.1%)
10-19	1,798(18.2%)	41(2.2%)
20-29	1,889(19.1%)	72(3.8%)
30-39	1,147(11.6%)	90(7.8%)
40-49	990(10%)	158(15.9%)
50-59	792(8.02%)	211(26.6%)
60 and above	657(6.6%)	167(25.4%)
Gender		
Male	4,481(45.39%)	274(6.1%)
Female	5,391(54.60%)	470(8.7%)
Education		
Illiterate	8,515(86.2%)	647(7.5%)
Primary education	968 (9.8%)	75 (7.7%)
Secondary education	389 (3.9%)	22 (5.6%)
Area (Block wise)		
Bissamcuttack	4,292(43.4%)	401(9.3%)
Muniguda	3,401(34.4%)	241(7.08%)
Kalyansinghpur	2,179(22.07%)	102 (4.6%)

Table 3.2.2. Gender-specific uncorrected refractive error.

Refractive Error	Male (n=310 eyes)	Female (n= 579 eyes)	P
Simple Hyperopia	60(19.3%)	147(25.3%)	0.04*
Simple Myopia	59(19%)	101(17.4%)	0.55
Simple Hyperopic Astigmatism	15(4.8%)	7(6.3%)	0.34
Simple Myopic astigmatism	37(11.9%)	73(12.6%)	0.77
Compound hyperopic astigmatism	33(10.6%)	66(11.3%)	0.73
Compound myopic astigmatism	85(27.4%)	117(20.2%)	0.01*
Mixed Astigmatism	21(6.7%)	38(6.5%)	0.90

*Significant

Table 3.2.3. Risk factors of refractive errors based on gender and education

Characteristics	Odds ratio (95% CI) for URE	P value
Gender		
Male	Reference	
Female	1.5(1.29-1.76)	<0.0001
Education level		
Illiterate	Reference	
Literate	0.9(0.75-1.16)	0.5

Between the three blocks, more people were refracted in the Bissamcuttack block. A large amount of URE was within +3.00D to -3.00D and occurred in people mostly over 30 years of age in either gender. (Figure 3.2.2). The children and young adults had the least amount of URE than people older than 30 years. This could be partly related to more outdoor activities and sunlight exposure of the younger people.

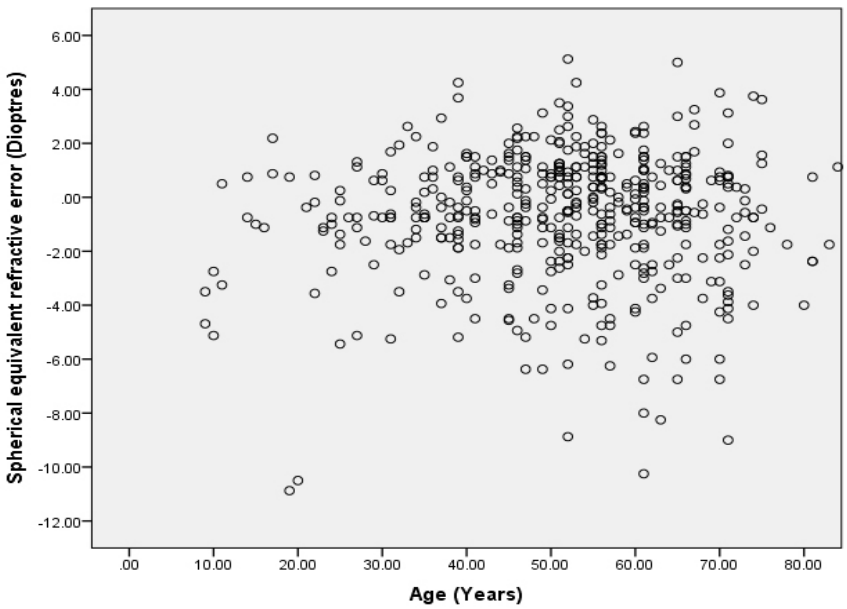


Figure 3.2.2 Scatter plot shows the distribution of spherical equivalent refractive error against age in years.

Folding Phoropter

A phoropter is an ophthalmic device used for measuring the refractive error of the eyes. It incorporates a lens used for refraction of the eye. It is large and is housed in an eye examination room. A folding phoropter (popularly known, FoFo; https://lvpmitra.com ›phoropter) is a handheld, lightweight (32 grams) ophthalmic tool. It helps estimate the refractive error that could be measured by the patient, one eye at a time. (Figure 3.2.3) To estimate the distance vision refractive error at the screening site and on-site

dispersing of monofocal spectacles, we used the FoFo to correct and dispense spectacles on the day of screening in the community.

Figure 3.2.3. Top- A Dongria lady trying the FoFo. Right- Mr. Sikaka benefitted from the spectacles based on the FoFo refraction. This readymade spectacle was dispensed on the site soon after refraction.

The mean age of people accepting FoFo was 33.21±11.25 years (range 15-70; median 33). 94 (of 744; 12.63%) were corrected with the FoFo.The acceptance of FoFo was higher in females (n= 67; 71.27%). Two-thirds of people with accepted FoFo refraction were myope (n= 65; 69.1%). The mean refractive error was -0.39D±1.02D. 66.3% of patients had received primary education, and 9.7% had received secondary education. The FoFo acceptance was higher in people from the Bissamcuttack block (22.6%) than in Muniguda (8.1%) and Kalyansinghpur (6.3%) blocks. (Table 3.2.4).

Table 3.2.4. Demographic details of FoFo acceptance

Demographic Variables	Number(%)
Total refractive error	744
Total Fofo acceptance	94(12.63%)
Mean Age	33.21±11.25(15-70)
Male: Female	27:67
Mean refractive error acceptance	-0.39±1.02
Education	
No education	22(23.91%)
Primary education	62(66.30%)
Secondary education	10(9.78%)
Block-wise, FoFo acceptance (%)	
Bissamcuttack(261)	59(22.6%)
Muniguda(246)	20(8.1%)
Kalyansinghpur(237)	15(6.3%)

The FoFo acceptance was highest in younger males (11-20 years; 37.5%)and older adult females (30-40 years; 50%). It was low in people 51 years or older in either gender. (Figure 3.2.4)

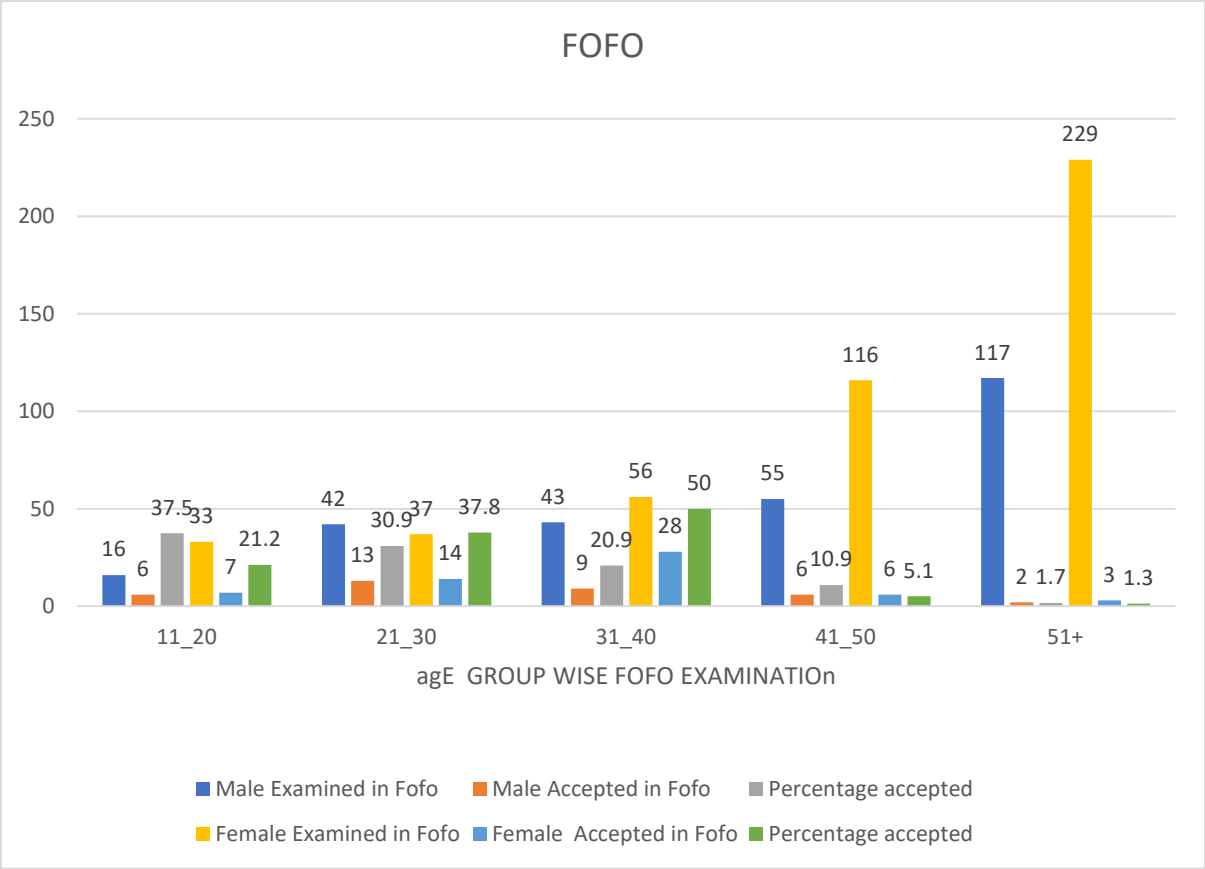


Figure 3.2.4. FoFo examined versus acceptance in refractive error patients.

Presbyopia

The Dongria people usually have a long working day, and the older people above 40 are more engaged in livelihood earning. The females make beautifully embroidered shawls that need needlework. The younger girls learn this needlework from their elders. This work is a major source of their income which is also hindered by uncorrected presbyopia in the elderly. Of the people surveyed, 924 people were detected to have presbyopia. 486 people received age-appropriate presbyopia correction, 12 refused spectacles, and the remaining people were examined and glasses prescribed in VC or SC. (Figure 3.2.5)

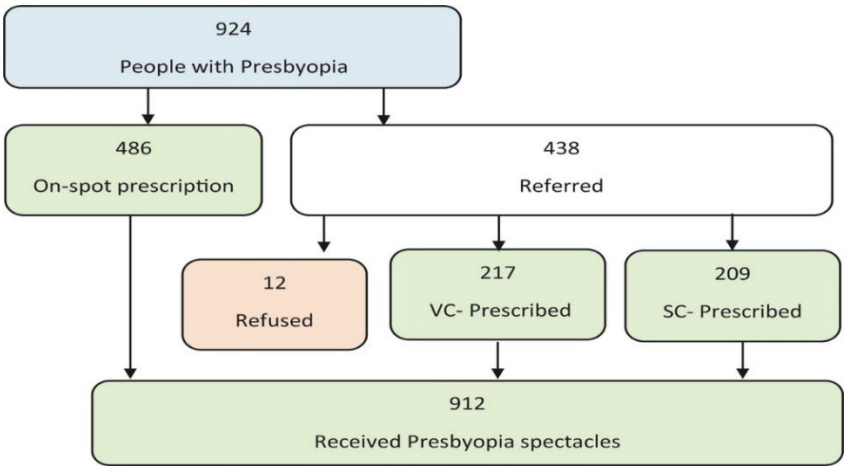


Figure 3.2.5.Presbyopia correction

The prevalence of presbyopia in DC was high in between 40 to 64 age (Figure 3.2.6), and it decreased slowly because of the development of age-related cataract. Presbyopia was higher in males than females (34.7% vs. 28.9%). There was a higher proportion of people with presbyopia in Kalyansinghpur than in the other two blocks. (Table 3.2.5) Unlike age and gender, literacy did not impact the need for presbyopia correction. (Table 3.2.6)

Table 3.2.5. Demographic details of people with presbyopia.

	Total Sample, n (%)	Presbyopia, n (%)	Significance (p)
Age (Years)			
35-39	538(5.4%)	83(15.4%)	
40-44	475(4.8%)	161(33.8%)	
45-49	515(5.2%)	199(38.6%)	
50-54	428(4.3%)	166(38.7%)	
55-59	364(3.6%)	130(35.7%)	
60-64	271(2.7%)	102(37.6%)	
65 and above	385(3.8%)	79(20.5%)	
Gender			
Male	1084(36.4%)	377(34.7%)	<0.001
Female	1892(63.5%)	547(28.9%)	
Education level			
Illiterate	2866(96.3%)	892(31.1%)	
Primary education	75(2.5%)	22 (29.3%)	
Secondary education	35(1.1%)	10 (28.5%)	0.65
Area (Block wise)			
Bissamcuttack	1733(58.2%)	502(28.9%)	
Muniguda	770(25.8%)	203(26.3%)	
Kalyansinghpur	473(15.8%)	219 (46.3%)	<0.001

Table 3.2.6. Multivariate Model of Risk Factors for Presbyopia

Characteristics	Odds ratio(95% CI)	*p* value
Age (years)		
35-49	Reference	
50 and above	1.2(1.043-1.423)	0.01
Male vs Female	1.3(1.118-1.538)	0.001
Literate vs illiterate	0.9(0.597-1.380)	0.65

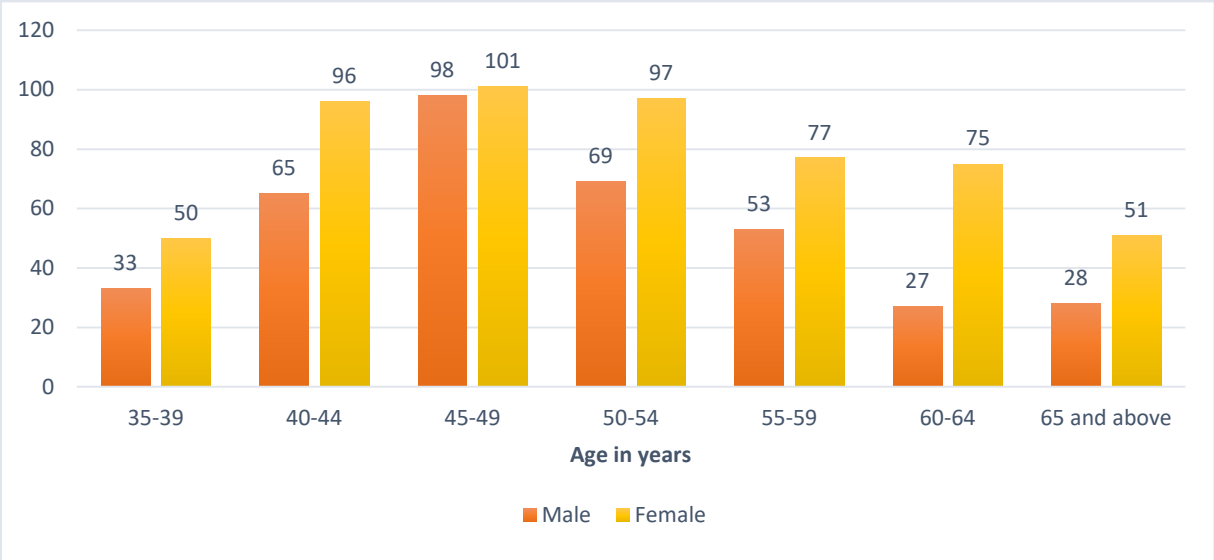


Figure 3.2.6. Prevalence of presbyopia by age and gender.

Cataract

Senile cataract was detected in 7.6% (n=754) of people in the examined *Dongria* community. The prevalence of cataract over the age of 40 years is 30.3%. (n=740) There were more females (n=560, 74.3%). Among the people with cataract, 482(64%) had moderate visual impairment, and 188(25%) had severe visual impairment.670 (89%) patients presented with bilateral cataract. Only 32.2% (243 of 754) people referred for cataract attended the SC, including 57 from the VCs. The mean age was 64.06 ± 8.41 years

Unfortunately, many cataract patients did not agree to surgery. The surgeries were performed in Rayagada-based SC by a fellowship-trained ophthalmologist for those who agreed. Before surgery, every patient received a detailed, comprehensive eye examination, including measuring the IOL power and essential systemic evaluation such as measurement of blood pressure, random blood sugar, and complete blood picture with special reference to anaemia. The clinical characteristics are shown in Table 3.2.7.

Table-3.2.7 Clinical characteristics of adult operated cataract

Total Number	134	-	-	-
Gender	Male- 29	Female- 105	-	-
Age	41-50: 5	51-60: 33	61-70: 65	>71: 31
Blocks	Bissamcuttack: 61	Muniguda: 47	Kalyansinghpur: 30	-
VI	MVI: 82	SVI: 16	Blind: 36	-
Morphology	Senile: 98	Total: 36	Bilateral 116	-

The first cataract surgery was performed on 2nd August 2021. The main challenge was convincing the patient for surgery. Unfamiliar environment, fear, and language were the principal barriers. (Figure 3.2.7) However, many patients turned ambassadors when they regained good vision after cataract surgery.

We operated 134 people (at the time of this report making). Among them,32% (n= 36) had total cataract. All received an appropriate powered IOL. The BCVA was ≥ 6/12 on the first post-operative day in 66.4% (n=89) eyes post-operatively. Most people did not return to the hospital for post-operative follow-up. So a team from the SC went to their villages, examined them at their home, and provided the spectacle power. At the time of writing this report, 81.3% (n=109) of operated people have completed a one-month follow-up; in 88 (80.7%) eyes had BCVA was ≥ 6/12 with a mean spherical equivalent of -1.27±1.4 dioptre. (Figure 3.2.8) Average astigmatism was -1.46± 0.87 dioptre.

Figure 3.2.7. Top left- Examination at SC; Top Right- Returning home after cataract surgery.

Figure 3.2.7 (Continuing) Bottom Left- Postoperative refraction at home; Bottom Right- Able to return to daily homework after cataract surgery.

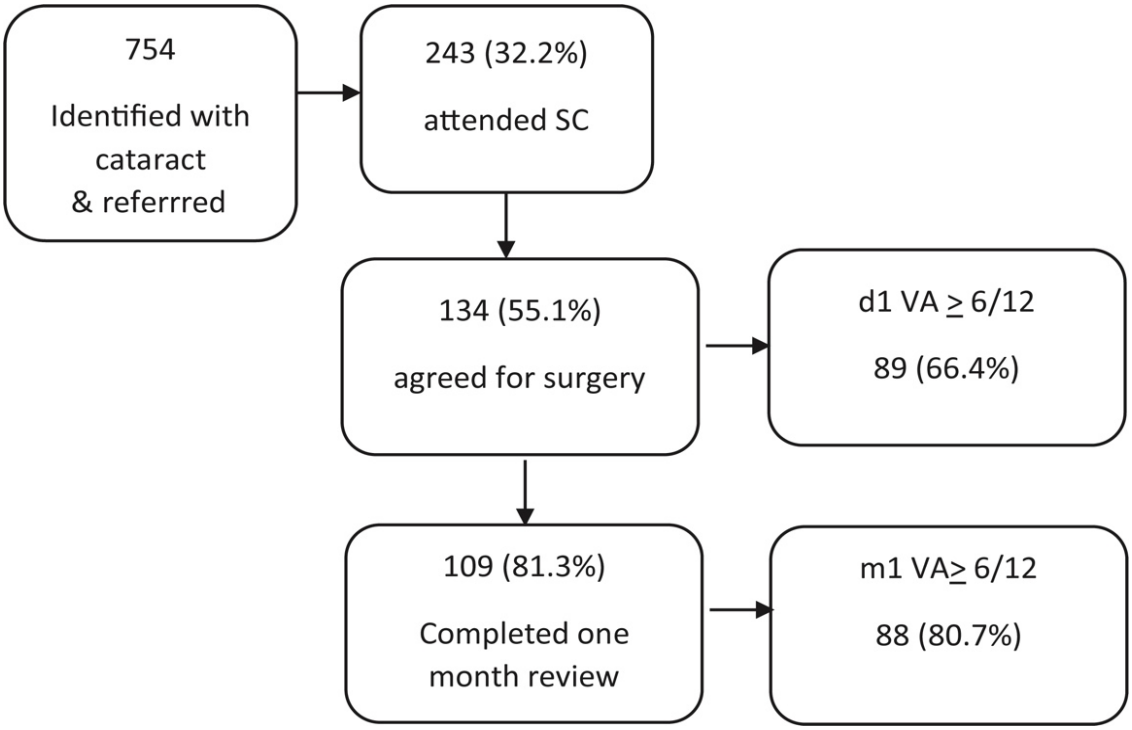


Figure 3.2.8. Cataract detection to surgery to the outcome

Pediatric eye disease

All children up to 16 years were examined, with a special emphasis on the under 5 children. The protocol of eye screening in the community and later in the fixed facilities was similar to the adults' examination. In brief, it was the measurement of the distance vision using BEST chart, external eye examination with a flashlight, quick on-site refraction with FoFo in cooperative children, and dispensing spectacles where possible. All Dongria children below 5 years had their weight and height measured using standard equipment and methods. These children also underwent MUAC examination during screening.

In the TOES PVTG Dongria community survey, 39.3% (n=3,884 of 9,872) were children (birth to 16 years), and 1,361 (13.8% of screened and 35% of children) were under 5. There were 1981 boys (51%) and 1903 girls (49.%). The common ophthalmic disorders in these children were URE, VAD, strabismus, corneal opacity, childhood cataract, nasolacrimal duct obstruction, ptosis, and malnutrition (Figure 3.2.9)

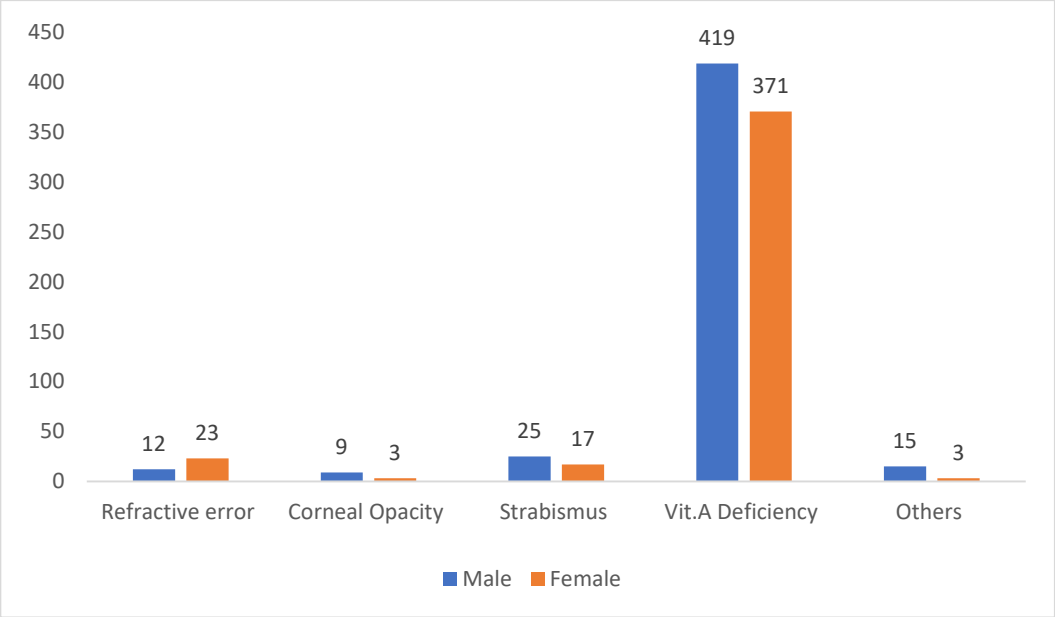


Figure-3.2.9- Eye diseases in the screened Dongria children

Three important conditions are described below.

URE. Thirty-five(1 %) children had a refractive error. Of them, 4 attended the VC, and 13 attended the SC. The mean spherical equivalent was -0.53±-0.7 D (-2.50 to+0.50). (Table 3.2.8)

Table 3.2.8. URE distributed by age.

Age (Years)	URE Male n	%	URE Female n	%	Total n	Prevalence (n=3884) %	Mean URE
0-5	0	0	0	0	0	0	0
6-10	4	33.3	6	26	10	0.2	Not attended
11-16	8	66.6	17	74	25	0.64	-0.53±0.7(-2.50 to+0.50)
Total	12	100	23	100	35	0.9	-0.53±0.7(-2.50 to+0.50)

VAD. The overall prevalence in the community was 9.27% (n=916). Ocular signs of vitamin A deficiency were detected in 20% (n= 790; one-third of them were under 5) of children, and mostly it was conjunctival xerosis (X1A). In our study, the prevalence of Bitot's spot and xerosis was 3.5% and 1.2%, respectively. VAD was higher in boys (53%%, n=419 of 790). (Table 3.2.9)

Table-3.2.9. Distribution of VAD ocular features (n=783)

VAD Features	Male		Female		Total	Prevalence % n=3297
	n	%	n	%		
Conjunctival Xerosis. **X1A**	401	100	367	100	768	23.2
Age (Years)						
0-5	167	41.6	203	55.3	370	11.2
6-10	175	43.6	128	34.8	303	9.1
11-15	59	14.7	36	9.8	95	2.8
Bitot's Spot **X1B**	3	100	1	100	4	0.12
Age (Years)						
0-5	0	0	0	0	0	0
6-10	1	33.3	0	0	1	0.03
11-15	2	66.6	1	100	3	0.09
Corneal Scar **Xs**	6	100	1	100	7	0.21
Age (Years)						
0-5	0	0	1	100	1	0.03
6-10	4	66.6	0	0	4	0.12
11-15	2	33.3	0	0	2	0.06
Night blindness. **XN**	4	100	0	0	4	0.12
Age (Years)						
0-5	0	0	0	0	0	0
6-10	1	25	0	0	1	0.03
11-15	3	75	0	0	3	0.09

Global acute malnutrition (GAM) and **Stunting**

Among under 5 *Dongria* children17.2% (n=234 of 1361) children were detected with global acute malnutrition, and 18% (n=244) of under 5 children were stunted for the age. They had a significant level of malnutrition that could affect their survival, overall growth, learning, performance in school, and productivity as adults.

3.3. Barriers to the utilisation of eye-care services

Several socio-cultural factors impact the utilization of health care services. These are categorized as personal, social, and economical. Barriers that are directly related to the subject are considered personal, barriers related to family members as social, and the barriers directly related to finance as economical.[17,18]

We could not screen 11% (n =1213) of the target people in the Dongria community. It was higher for people above 40 years and women. We interviewed 105 people to ascertain the barriers to the utilization of eye care services. These were ignorance, poverty, lack of time, distance, and fear of treatment, including surgery. (Table 3.3.1)

Table-3.3.1. Barriers to availing eye health services in the Dongria community

Reason	No(%)(n=105)
Unaware of the eye condition	68 (64.76%)
Lack of Money	98 (93%)
Busy at earning livelihoods	79 (75.23%)
Distance to the hospital is too long	95 (90.47%)
Fear of surgery	68 (64.76%)

The Dongria community resides in three blocks, Bissamcuttack, Kalyansinghpur, and Muniguda. The LVPEI has fixed eye care facilities- 3 VCs and one SC. VCs are located at Muniguda, Sikharpai, and Therubali; the SC is located at Rayagada. (Table3.3.2; Figure-3.3.1). The public health facilities in the Rayagada district, close to three blocks, are 40 PHCs (Primary health centers), 6 CHCs (community health centers), 2 UPHCs (urban primary health centers), and one District Head Quarter hospital is located in Rayagada. Only District Head Quarter Hospital at Rayagada provides eye care in public health care; other centers do not.

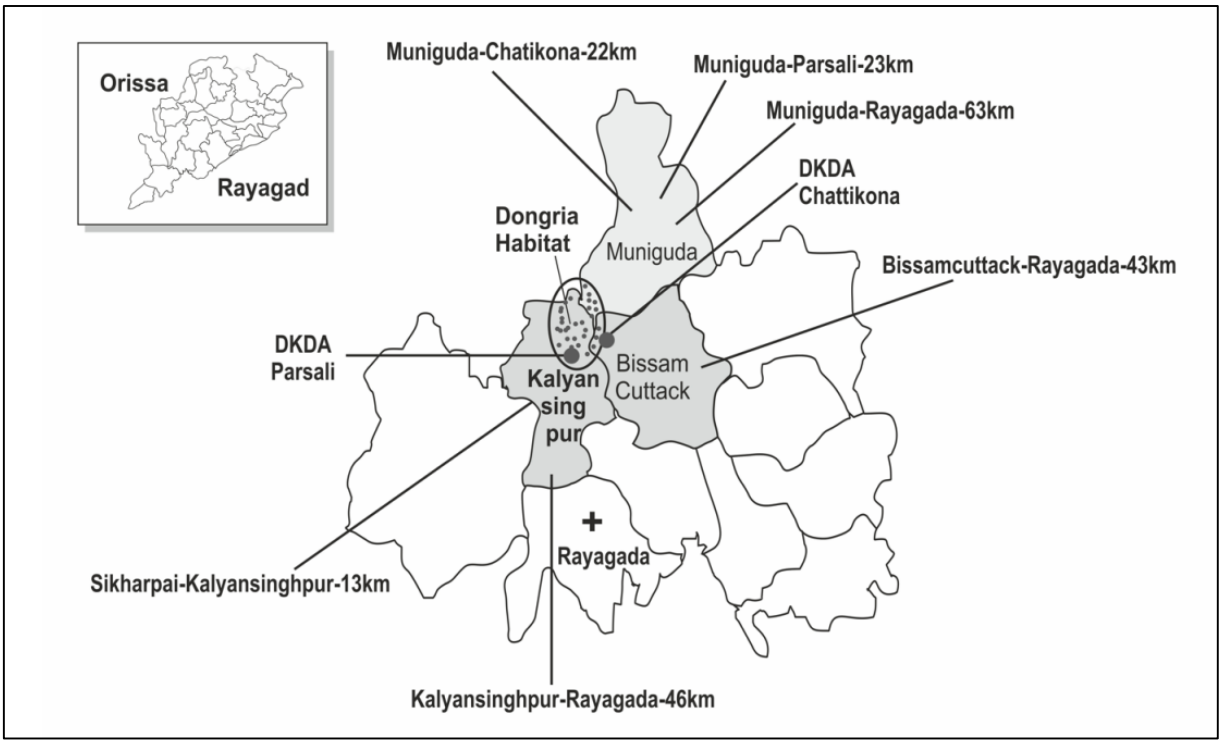
[17]Dandona R, Dandona L, Naduvilath TJ, McCarty CA, Rao GN. Utilisation of eye-care services in an urban population in southern India: The Andhra Pradesh Eye Disease Study. *Br J Ophthalmol* 2000;84:22-7

[18]Kovai V, Krishnaiah S, Shamanna BR, Thomas R, Rao GN. Barriers to accessing eye care services among visually impaired populations in rural Andhra Pradesh, South India. Indian J Ophthalmol. 2007 Sep-Oct;55(5):365-71. doi: 10.4103/0301-4738.33823. PMID: 17699946; PMCID: PMC2636013.

Table 3.3.2. Distance to the LVPEI eye care facilities

Locations	Vision Centres			SC/DHH
	Muniguda	Sikarpai	Therubali	Rayagada
Chati Kona	22 km	41 km	26 km	45 km
Parsali	23 km	13 km	34 km	46 km
Kalyansinhpur	23 km	13 km	34 km	46 km
Bissamcuttack	22 km	41km	26 km	45 km
Muniguda	25 km	41 km	26 km	63 km

Figure-3.3.1 Distance from primary and secondary eye care center



3.4. Transformational Stories

1

I am Nama Kadaraka and I am 23 years old. I am a resident of Kadaraguma village, Block Bissamcuttack, District Rayagada. We are a close-knit community here, and everybody knows each other. I studied till class V and discontinued my studies several years ago as the middle school was distant from my village. The main livelihood options are manual labor and seasonal farming. I love my village and help my mother in farming. *My widowed mother has been awarded for her weaving skills, but I think she lost mobility over the last few years due to her poor eyesight.*

In Feb 2021, we heard about some medical team coming / screening camp that was supposed to come to our village. This was shared with us by our community resource person (CRP) – Mr. NabaghanWadaka. He told us that a team from a reputed eye hospital - L V Prasad Eye Institute, would come to our village and check the eyes of all villagers. This sounded strange to us as nothing like this had ever happened in our village. For several months we did not hear much. Then there was this scare of the COVID 19 virus again; till that time, our community had never had an infection. District authorities told us that we must all get an injection – the COVID-19 vaccine. The COVID-19 vaccination program went on for several weeks.

In July 2021, we again heard about the eye screening camp. Our District Collector inaugurated it on July 16, 2021. Some kind-looking, smiling people arrived in a Bolero in a few days. Some of them wore white uniforms. The team put up large posters that showed that regular hand washing was important, especially before eating. Some of them talked about protection from malaria by regular use of mosquito nets in our village. Our CRP was busy calling all villagers and collecting them near the school for eye screening. When I arrived, I found one of my elders was sitting on a stool, and some members of the team were pointing to an alphabet board and asking questions. Many of the Doctor team members talked in Oriya, translated into the “Kui” language so that most elder people could understand. We were called to identify letters. Some people could not identify the letters or identify E on the chart. Some of my friends who could not read the illuminated chart were asked to look into a papercut cardboard box (FoFo) and look at a picture. When done, one team member gave him a paper and said he needed spectacles. They told him that he need not go to town for his glasses; instead, the glasses would be distributed in the village by our CRP. We knew that spectacles at the doorstep were impossible. Few of my elders, after torchlight examination, were given referral slips and were advised to go to the nearest vision center in Muniguda for further evaluation.

My mother was examined too. She has had difficulty recognizing faces for a long time. Even for daily chores, she needed our help. One team member who appeared to be their leader flashed a torchlight in my mother’s eyes. Then he asked his team members to explain that my mother needed an eye operation, but this could be done at the hospital at Pitamahal, Rayagada. Operation scared all of us. But our CRP explained that this was a good hospital, and he had heard they do free operations for poor people, and people operated there got back their sight. Team members tied an armband around our

arms and pressed a button on the machine. Suddenly the armband started squeezing our arms. They kept recording numbers from the device. He kept repeating that “BP” was high. As I was standing close to him, he asked me how much salt we took every day! I could not understand what connection our salt intake had with the eye! I mumbled but used my figures to show how much we measured. The team was also documenting the height and weight of all villagers, including the children.

Our CRP told me a few weeks later that I must accompany my mother for the eye operation. He told me the date when he would pick us up. He told me to get some clothes too as we would be able to return after 3-5 days. As scheduled, we were taken to Pitamahal, Rayagada. I saw the name outside the gate – LVPEI NMB Eye Center and JK Center for Tribal Eye Health. The hospital was clean and spacious. We were taken to a room and given food and blankets. The day was busy, and many hospital staff kept checking my mother’s eyes, BP and even drew blood for some tests. I noticed there were more didis; than bhai’s working in this hospital which gave me an idea that the girls also could do such respectful jobs. We met the doctor, wearing a white coat, and everybody talked to him with respect. Other hospital staff understood and even spoke in “Kui,” so communication was no problem. I was chosen to accompany my mother because I could write basic Odia and sign.

Finally, the day of the surgery came. I was scared for my mother. The nurse helped her change, have food, and took us to a room outside the operation theatre. When my mother went in, I kept praying to our local deity to be with her. At first, my mother was very reluctant for the operation, as this was new to us; we had never seen such hospitals inside out. After the nurse changed my mother’s dress to surgical attire, she was nervous. She refused the doctor for the surgery but later agreed after a few minutes of conversation with the doctor and other operating room staff. My mother came out with a white bandage covering her eye about one hour later. We went to our bed. I asked my mother, and she said she first felt an injection close to her eye. After that, she did not feel a thing, and the staff kept talking to her during the operation.

The following day was an eye-opener for my mother and me. Doctor himself helped to open the bandage. After some cleaning, they asked my mother if she could see me. My mother looked at me and told me she could see me clearly and smiled. We stayed for another day and were again taken to our village. The hospital staff were kind to us and explained that eye drops must be frequently instilled in her operated eye. We returned to our village to find that in our absence, our CRP had distributed glasses to many people in my village. Some were happy to see the shawl work much better and faster now. I thanked God for the angels he had sent to us. Our CRP later told me this project called Tribal Odisha Eye Disease Study (TOES) was supposed to check the eyes of all people of our community. My neighbouring ajja (elder) would be next, and I would bring many more to get their eyesight back. I hope this team will spread their good work in different parts of Odisha to communities deprived of health facilities.

Figure 3.4.1. Mrs. Kama Kadaraka (mother of Mr. Nama Kadaraka) Top panel- at Rayagada SC; Bottom left- back her daily work soon after surgery; Bottom right- her story in local vernacular daily.

2

I am Budu Sikaka and I am 53 years old. I am a resident of Khambesi village, Block Bissamcuttack, District Rayagada. I studied till class III, and years ago, I discontinued as the school was distant from my village. I am living with my wife and two daughters. I grow millets, pulses, a few vegetables, and seasonal fruits in my donger(hill). I have been doing manual labor and farming since my childhood, but last 2-3 years, I have been unable to do it because of my age. So, I have decided to open a small grocery shop with the little money borrowed from my elder brother and relatives. Although I opened the shop, I was having difficulty identifying the price rate in the goods such as soaps, oil, packaged food prices, etc. I also had trouble identifying money. I discussed this matter with my wife but decided to wait though my eyesight was progressively deteriorating. My elder brothers also had similar problems, but they did not complain as they never used their near vision. I thought of speaking to my village community resource person (CRP), but I did not get a chance to talk to him directly.

In July 2021, we heard about the eye screening camp and its inauguration on July 16, 2021, in Kadaraguma village. In a few days, a team of people came. Our CRP collected people from our village. My eye examination was performed on my veranda. I could read the distance letters but could not identify the near pictures drawn on a card. They shined the torch on each eye, asked my age, and said I needed spectacles. They told me I need not go to a hospital for my glasses and they gave me a pair of glasses with a very beautiful cover.

My wife and two daughters were examined too. My wife also had difficulty identifying insects from rice and millets also had trouble weaving shawls. She also underwent the same procedure and got a beautiful pair of spectacles. When I used the spectacle for the first time, I was able to see everything which I had had difficulty with before. Now I can recognize money and different price tags on goods. My wife looked at me and told me she could also weave the shawls without difficulty identifying insects from pulses, millets, and rice.

Whether at work, shop, or dongor, Budu says that having a clear, sharp vision, especially for near, has made a big difference in his life. He further said his eyes don’t get as tired now, allowing him to focus on many activities he loves.

Figure 3.4.2. Mr. Budu, of Dongria PVTG from Khambesi village of Bissamcuttack block) working in his small grocery shop by wearing spectacle.

3

I am DamaJakasika living in Mundabali village of Biisamcuttack block. I am 65 years old. I live with my wife and son's family (daughter-in-law and two grandchildren). I was doing farming and collecting forest produce since my teenager. For the last five years, I have been struggling to perform any of those activities because of my poor eyesight. I have never consulted any eye doctor but sought help from the witch crafting group near my village. After a few months, I was expecting to be alright, but nothing changed; instead, my vision worsened. Last year in July, I learned about visiting eye doctors.

On 6th August, our CRP informed villagers about the facility of eye check inside our village. I was excited and eagerly looked forward to their visit. On 9th August 2021, a team came, examining me in my house. After shining the torch into my eyes, I was told that I had Motiabindu (Cataract) in both eyes and needed eye surgery. Four days after this examination, a Bolero arrived in our village, and with two of my neighbors, we traveled to Rayagada eye hospital (L V Prasad eye hospital). The doctor told me that my right eye was far worse, so I decided only to have surgery done in that eye. After spending a day in the hospital when further examinations were done, including my blood tests, the day of the surgery came. I kept praying to our local deity to be with me. The nurse changed me to the surgery dress, I went to the surgery room, and an operation was performed on my right eye. About one hour later, I came out of the operation room with a white bandage covering my right eye. I went to my bed. The following day was an eye-opener for me. The doctor opened the bandage, and I could see everything clearly. I was delighted. I stayed for another day and then was driven back to my village. The hospital staff were kind to us and explained that eye drops must be frequently instilled in my operated eye.


Carl Zeiss


!!! EYES SPEAK !!!
FREE EYE CAMP OF DONGRIA KONDH COMMUNITY AT DOOR STEP
(Screening, Testing, Treatment, Surgery)
Supported by
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