

## Tribal Odisha Eye Disease Study # 11 - Particularly vulnerable tribal group eye health program. Program protocol and validation

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**Purpose:** To describe and validate the eye health program protocol of *Dongria* tribal community, a particularly vulnerable tribal group (PVTG) in Rayagada district, Odisha, India. **Methods:** The program would consist of three segments. At people's residences, trained community health workers (CHWs) will measure the vision and collect demographic data. In addition, vision technicians (VTs) will refract using a hand-held device and prescribe spectacles to people who improve to  $>6/12$ , N8. Others would be referred to the vision center (VC). At VC, the VT will perform a slit-lamp examination and re-refract. They would refer people with vision  $\leq 6/12$  to the secondary center (SC). At SC, referred people will receive a comprehensive eye examination and treatment. The ophthalmologist will assign the cause of blindness and visual impairment for people with visual acuity  $<6/12$ . The entire process was rehearsed in a pilot study. **Results:** The target population is approximately 10,000 people residing in 101 hutments on the hills of Rayagada district. The pilot study included 126 people. The mean age was  $44 \pm 18$  years; 70% of the people were illiterate, and in this cohort, 97.6% ( $n = 123$ ) had never worn spectacles. In the pilot study, 41% of the people had cataract, and 12% had pterygium. The agreements between optometrist versus VTs and between optometrist versus CHWs were good ( $k = \sim 0.8-1.0$ ) in all eye conditions except for strabismus ( $k = \sim 0.56-0.65$ ). **Conclusion:** The pilot study confirms the program modality, and when completed, it would help in the planning and resource allocation of Odisha PVTG eye care.

**Key words:** Eye health, India, Odisha, particularly vulnerable tribal group, Rayagada, tribal

Recently published Global Health Commission on eye health has indicated that despite a reduction in the age-standardized prevalence of blindness and visual impairment by 28.5% in the last three decades, inequity exists between high- and low-resource countries and between regions of a given county.<sup>[1]</sup> These differences are related to poverty, education, gender, ethnicity, social status, differential access to eye care, unequal treatment, out-of-pocket spending, and differential health policy.<sup>[2]</sup> One such deprived community is the indigenous (tribal) people. The tribal population of India constitutes 8.2% of the total population, which is larger than the tribal population of any other country in the world. India

is home to 461 tribal communities.<sup>[3]</sup> Per the census 2011, the Indian state of Odisha (eastern India) has a tribal population of 9.59 million; it is the third-highest percentage of tribal people of India. In Odisha, the tribal community constitutes 22.85% of the state's total population and contributes 9.17% to the total tribal population of India.<sup>[4]</sup> Based on the geographic location, language, and racial characteristics, the Indian tribal population is divided into four zones (North-eastern, Central, South, and Andamans), three languages (Sino-Tibetan, Austric, and Dravidian), and three races (Mongoloid, Australoid, and Negrito). The tribes of Odisha belong to the central zone by geography, Austric by language, and Australoid by race.<sup>[3]</sup>

The Government of India has categorized a section of the tribal community as a "particularly vulnerable tribal group" (PVTG). Some of the characteristics of PVTG are as follows: mostly homogenous and small population, relatively physically isolated, absence of written language, and a relatively slower rate of change. In India, there are

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75 such PVTGs, and Odisha is home to 13 PVTG communities spread over 13 districts of the state.<sup>[5]</sup> The PVTG population is approximately 2% of the total state tribal population.<sup>[4]</sup> *Dongria* tribal community is one of 13 PVTG communities residing in the Rayagada district in the southwest hills of Odisha.

Currently, no data is available on the eye health of this community. The primary objective of the current study is to perform a systematic eye health survey by door-to-door screening and treat all treatable eye diseases in the nearest primary and/or community eye center. We tested the study protocol by a simulated pilot study in the community (secondary) eye care facility located in the vicinity of the target PVTG community.

**Methods**

**Ethics committee approval**

The study is approved by the Institutional Ethics Committee (2021-76-BHR-39), the Ministry of Tribal Affairs [11031/18/2020-TRI (17736)], the Government of India, SC & ST Research Training Institute (SCSTRTI), Odisha, and the PVTG Empowerment & Livelihoods Improvement Programs (OPELIP), Government of Odisha.

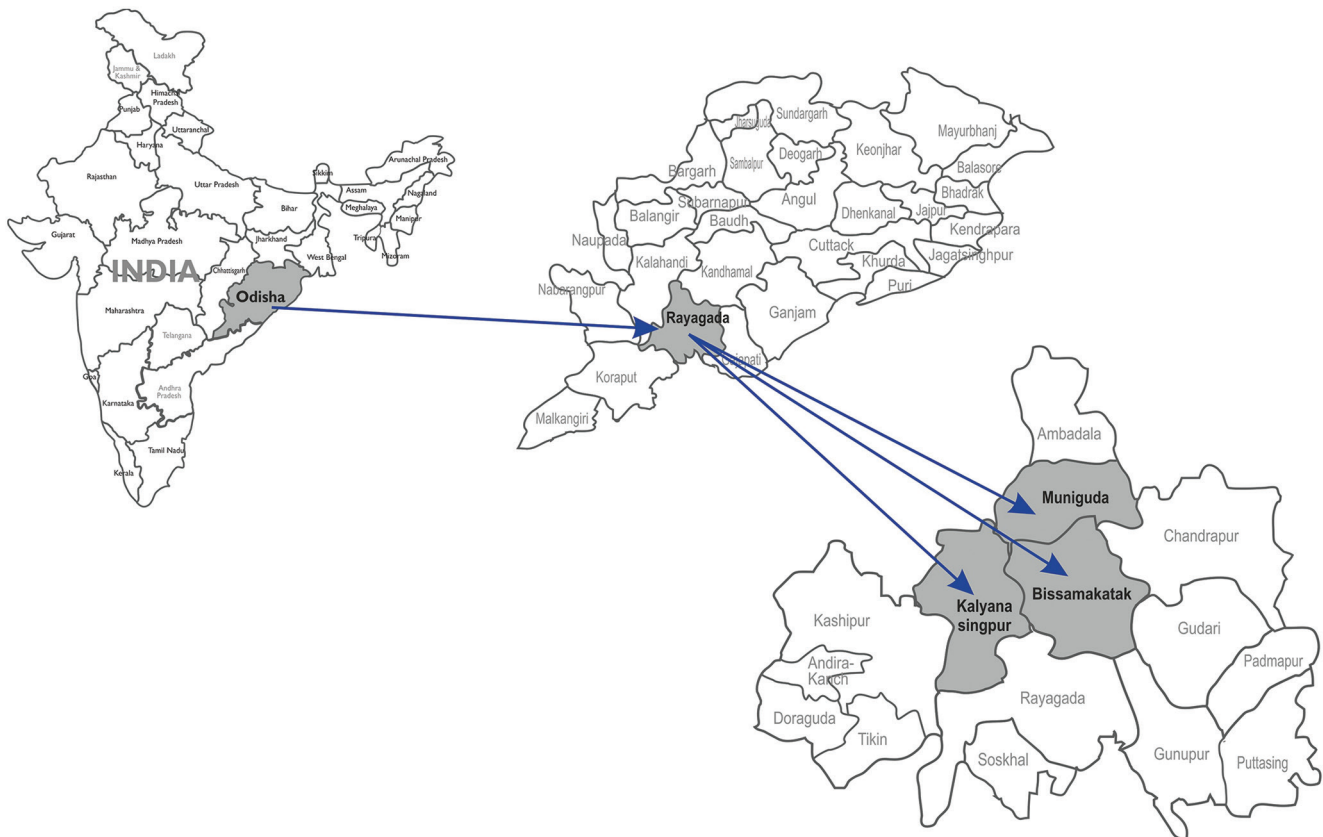
**Study design**

The Dongria community resides in three blocks (Bissamcuttack, Kalyansinghpur, and Muniguda; blocks are administrative units of a district) of the Rayagada district [Fig. 1]. The total

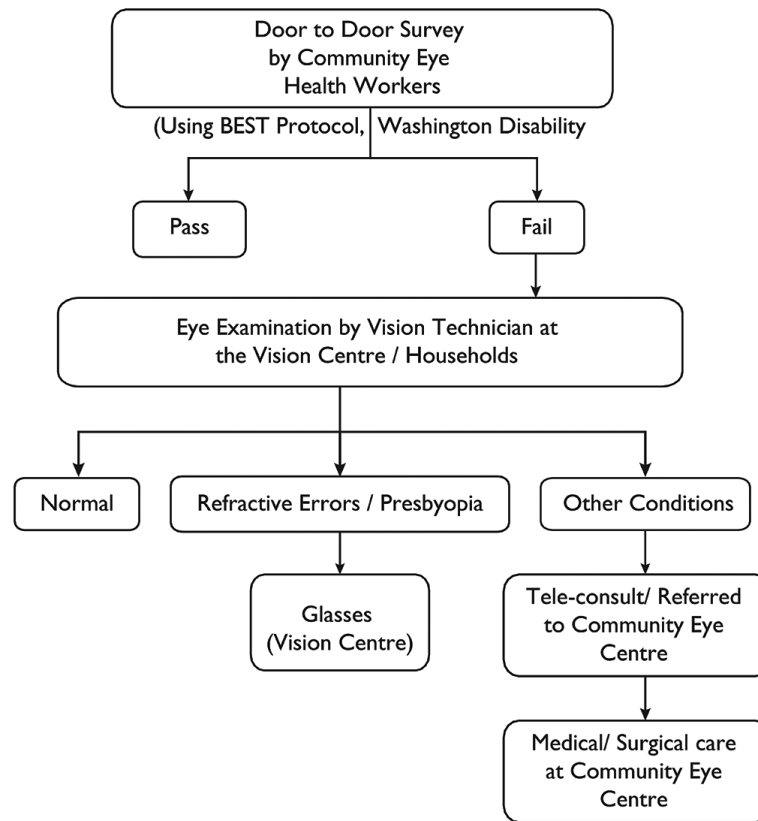
population of this community is approximately 10,000, spread over 101 hutments at an altitude up to 1524 m (5,000 feet) above the mid-sea level.<sup>[6]</sup>

The Dongria community PVTG eye health survey would broadly consist of three segments: (1) door-to-door vision screening by a community health worker (CHW) to identify people with vision loss and/or ocular morbidity, and prescription of distance and/or near vision glasses by vision technician (VT) when vision improves to >6/12, N8; (2) referral of people with vision ≤6/12 for eye examination at the vision centers (VC) by the VT, and prescription of spectacles; and (3) referral of people deemed necessary by the VT for a comprehensive eye examination and further management at the secondary (community) eye care centers [Fig. 2].

The trained CHWs will visit every household to collect the basic health data and demographic details. The CHWs will record the distance and near vision by using the basic eye screening test (BEST) protocol with and without spectacles correction, if any.<sup>[7]</sup> The VT would perform a flashlight examination of the external part of the eye to record any gross anomalies and refract using a hand-held device and prescribe spectacles to people who improve >6/12, N8. The people who do not improve or have gross anterior segment anomalies would be referred to the VC. A trained VT will examine the people at the VC. These will include re-measurement of vision and refraction. The VT will also perform a comprehensive undilated eye examination by using a slit lamp. The VT will



**Figure 1:** Geographical map of Odisha showing the three blocks of the particularly vulnerable tribal group (PVTG) population of Rayagada



**Figure 2:** Examination and referral flowchart of the PVTG eye health survey and service

prescribe glasses that would improve up to at least 6/9, N8 and refer others to the secondary eye center (SC). Eye care at the SC is delivered by an ophthalmologist, supported by an optometrist. The team will provide detailed and comprehensive medical and surgical care (chiefly, cataract) of the referred people. The ophthalmologist will also assign a cause of visual impairment for people with visual acuity worse than 6/12. The complete care from screening to dispensing spectacles to eye surgery would be done at no cost to the patients. During this survey, patients identified with diabetes, hypertension, anemia, and nutritional deficiency will be referred to the nearest public health facility for further management.

The definitions of anterior and posterior segment pathology are listed in Table 1.

### Pilot study

In preparation for the survey of the PVTG community, we conducted a pilot study in four villages around the secondary (community) eye center at Rayagada. It included training of four school graduates as CHWs, and two of them belonged to the PVTG (Dongria) community. These four CHWs and two VTs received a 15-day focused training by an optometrist with prior experience in community work. The CHWs were trained for basic communication and home-based examination skills. The examination skills included measuring near and distance visual acuity by using portable vision charts, flashlight examination of the external eye (particularly in children- white spot in the pupillary area, and/or sclera, and in adults- fleshy growth). The basic documentation included essential demographic and personal data (anthropometry, smoking, harmful alcohol consumption, education, known

systemic diseases, and disability other than seeing disability). The VTs were trained on basic comprehensive eye examinations routinely performed at the VC. This training comprised slit-lamp examination of the external eye, applanation tonometry in adults aged  $\geq 30$  years, refraction and subjective correction for distance and near, writing spectacles prescription, and telescreening or referral to the secondary eye center.

The pilot study was conducted entirely in the secondary eye center after written informed consent and followed three basic steps. These steps simulated the actual study.

Step 1. 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. Agreement among CHWs, VTs, and optometrists was computed using the weighted kappa statistics. All statistical analyses were performed using IBM SPSS (version 23.0; IBM Corp., Armonk, NY).  $P < 0.05$  was considered statistically significant.

## Results

### Dongria community

By the current estimate, the Dongria community population is 10,983. It consists of 5,033 males (45.82%); the community lives in 101-hutments.

### Agreement

The kappa (k) agreement was measured between the optometrist and the first VT, between the optometrist and the second VT, between the optometrist and the CHWs, between the two VTs, and between VT and CHWs [Table 2]. The agreement between optometrists and VTs was good in all areas except for strabismus. The agreement between the two VTs was good in all areas tested. The agreement between the optometrist and the CHWs was also good, except for strabismus, but not as good as the agreement between the optometrist and the VTs. The agreement between the VTs and CHWs was nearly as good as between the optometrist and the CHWs [Table 2].

In the pilot study, 126 people were examined from the four villages. The mean age was 44 ± 18 years. In this population, 69% (n = 87) were above 40 years, and 16 subjects were between 5 to 20 years. There were more females (64.3%; n = 81). In these examined people, 97.6% (n = 123) had never worn spectacles; 70% people were illiterate; 41% people had cataract, and 12% people had pterygium [Supplementary Table 1].

**Table 1: Definition of anterior and posterior segment eye pathology**

Emmetropia	Both distance and near visual acuity (DVA, NVA) (monocular) 6/12 or better in the absence of any ocular abnormality
Vision impairment	Presenting visual acuity worse than 6/12 in the better eye
Refractive error	Visual acuity (VA) worse 6/12 but improving with pinhole
Cataract	Reduced VA (<6/12) with apparent opacity in pupillary region
Pterygium	A fleshy growth of the conjunctiva
Presbyopia	NVA worse than N8 binocularly
Glaucoma Suspect	Shallow AC with/without redness and digitally high eye pressure
Corneal Pathology	Opacity in the cornea causing reduced VA (<6/12)
Strabismus	Both eyeballs are not parallel to each other

DVA- distance visual acuity; NVA- near visual acuity; VA- visual acuity

## Discussion

The indigenous people are usually neglected. The United Nations (UN) has urged the Member States to help them in economic development and health care through many resolutions under the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).<sup>[8]</sup> The United Nations (UN) has recognized that eye care services are an integral part of universal health coverage health relevant to achieving sustainable development goal 3 (SDG 3) through the resolution adopted in July 2021 (UNGA A/75/L.108).<sup>[9]</sup> A healthy eye contributes directly or indirectly to the 2030 sustainable development goals.<sup>[11]</sup> Often, it is not accounted for. For example, an earlier Indian Council of Medical Research- Scheduled Caste and Scheduled Tribe Research and Training Institute (ICMR- SCSTRTI) study in India (unpublished) reported poor general health (over 50% wasting for height-for-age and weight-for-height), poor nutrition (higher stunting in girls than boys, 75% people with anemia), and approximately 30% prevalence of hypertension though, it did not include eye health. Our pilot study indicated a high prevalence of refractive error, presence of cataract, pterygium, and corneal opacity in the PVTG community [Supplement Table 1], similar to our larger hospital-based study of tribal (not PVTG) people in the same district.<sup>[10]</sup> It is expected that the prevalence of blindness and cataract-related blindness and visual impairment could be higher in the PVTG group; additionally, the cataract could be more advanced.

Primary health care is based on methods and techniques that are pragmatic, scientifically safe, and accessible to the community. Primary eye care is an integral part of primary healthcare. While it is the fundamental approach in preventing blindness and visual impairment,<sup>[11]</sup> it is best delivered when the magnitude of the problem is known.

The magnitude of general health and eye health problem of the PVTGs are neither studied nor reported from India and Odisha. However, identifying the health problems but not treating the people does not benefit the community and might further reduce the confidence in the health delivery system. Precisely for this reason, we combined the eye health survey with treatment without any financial burden to the people and the community. These would be delivered through a combination of primary and secondary care closer to the community.<sup>[12]</sup>

Additionally, distributing eye care into three levels would reduce the treatment burden to any location and eye health personnel. We also imagine that the combination of screening and treatment (at no cost) would improve the health-seeking behavior of people, particularly to access eye care at the VC, and would make the door-to-door survey possibly redundant in the future.

**Table 2: Inter-person agreement (k) and 95% confidence interval**

	Emmetropia	Ref Error D	Ref Error N	Pterygium	Cataract	Strabismus
Opt vs. VT1	0.932 (0.84-1.0)	0.943 (0.78-1.0)	0.958 (0.84-1.0)	1.0 (1.0-1.0)	0.954 (0.88-1.0)	0.656 (0.00-1.0)
Opt vs. VT2	0.955 (0.87-1.0)	0.891 (0.71-1.0)	0.914 (0.77-1.0)	1.0 (1.0-1.0)	0.931 (0.84-1.0)	0.742 (0.00-1.0)
VT1 vs. VT2	0.977 (0.91-1.0)	0.948 (0.78-1.0)	0.958 (0.84-1.0)	1.0 (1.0-1.0)	0.977 (0.92-1.0)	0.885 (0.49-1.0)
Opt vs CHW	0.829 (0.69-0.93)	0.801 (0.56-0.95)	0.793 (0.60-0.95)	0.857 (0.68-1.0)	0.714 (0.57-0.84)	0.350 (0.00-0.64)
VT vs. CHW	0.829 (0.69-0.92)	0.857 (0.64-1.0)	0.816 (0.60-0.96)	0.857 (0.68-1.0)	0.757 (0.62-0.88)	0.564 (0.21-0.81)

CHW- Community Health Worker; D- Distance; N-Near; Opt- Optometrist; VT- Vision Technician

## Conclusion

One of the major challenges in addressing indigenous health deficits is the invisibility or obscured visibility of the issue from the national discourse in many countries.<sup>[8]</sup> India and Odisha are no exceptions. The systematic character of the health gap is related to the lack of general state capacity to provide health services to indigenous peoples. Our pyramidal structure of care is likely to overcome this deficit.<sup>[12]</sup> Moreover, systematic data on the current eye health and basic health issues of this PVTG community are likely to help the government and other involved stakeholders formulate a proper program for eye care under the available resources. Combining the service with the survey will improve treatment to people blind or visually impaired and improve their health-seeking behavior as they experience such benefits directly.

## Acknowledgements

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## Conflicts of interest

There are no conflicts of interest.

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**Supplementary Table 1: Demographic details of the screened patients in the pilot study**

Parameter		Number and (Percentage)
People screened		126
Male/Female		45 (35.7%); 81 (64.3%)
Mean Age		44±18 years
Education	No school	86 (68%)
	Up to class 10 <sup>th</sup>	29 (23%)
	Higher education	11 (9%)
Spectacles use	Wearing/Not wearing	3 (2.4%); 123 (97.6%)
Distant vision	Emmetropia	25 (20%)
Refractive Error		10 (8%)
Near Vision	<N8	37 (27%)
Cataract		52 (41.3%)
Pterygium		15 (11.9%)
Presbyopia		15 (12%)
Corneal Opacity		2 (1.6%)
Strabismus		2 (1.6%)