Effectiveness of Ready2Clip Spectacles among Truck Drivers; Findings from National Truckers' Eye Health Programme

EssilorLuxottica

Sightsavers

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Foreword

Nearly 1.3 million people die globally each year due to road traffic accidents (WHO, 2022). Such road injuries account for 2.1% of global deaths. India has one of the highest numbers of road accidents in the world as well as highest number of deaths due to it. Every year 1, 30, 000 deaths are reported due to road travel accidents in India which accounts for 6% of the global burden (Shardha, 2015). Existing evidence suggests that vision impairment is associated with lower quality of life, defined as physical, emotional, and social well-being. Visual impairment is also linked to lower vision-related quality of life or daily visual function and the ability to perform visual tasks.

Over 9 million truck drivers live in India. They play an important role in transporting India's freight. However, the unorganised nature of work prevents them from taking their health seriously. Sightsavers recognises the importance of eye health in ensuring road safety for the overworked truckers' community. RAAHI is one of the country's largest eye health programmes for the truck driver community. Over the last five years, we have assessed the vision of more than 5, 00, 000 truck drivers across the country.

The present study attempted to assess the effectiveness of EssilorLuxottica's 2.5 NVG Ready2Clip™ Spectacles under RAAHI Programme. The findings of the study revealed that, with the introduction of Ready2Clip™ Spectacles, the overall program efficiency improved. Considering that the compliance with spectacle use improves significantly when it is dispensed immediately to the truck drivers at the vision centres. This study is demonstrating the significant cost-saving potential of Ready2Clip™ spectacles for uncorrected refractive errors. This has substantial economic benefits for implementing eye health programme in underserved communities.

RN Mohanty
Chief Executive Officer, Sightsavers India

Being safe on the roads begins with clear vision. While road safety is an important global sustainable development topic given its inclusion in the 2030 Agenda for Sustainable Development, there is much to be done to raise awareness about good vision and increase access to vision care for everyone, everywhere, especially those in underserved communities.

We are a partner of the United Nations Road Safety Fund and are always on the lookout to collaborate with like-minded organizations on inclusive vision care initiatives that will bring large-scale benefits and impact. That's also why we are heartened to partner with Sightsavers' RAAHI Program which brings vision care services to India's trucking community and help it tackle the key challenge of drivers not collecting their distance vision glasses after being screened. Our 2.5 NVG Ready2Clip™ range of glasses, which can be customized, prepared, and collected on the spot ensures drivers get the glasses on the screening day. This is but one of many steps we have to take collectively to bring good vision and safer roads to all – there is still a need for global consensus on good vision being imperative to road safety and policymakers to mandate regular eye-check-ups for all drivers.

As the leader in the eyewear space with a mission to help everyone in the world see more and be more, we must continue to create easy access to vision care and glasses for those who do not have it.

Milind Jadhav,
Senior Director-Sustainable Programming South Asia, EssilorLuxottica

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List of Abbreviations

CAPI	Computer-Assisted Personal Interviews
INR	Indian Rupees
GDP	Gross Domestic Product
MIS	Management Information System
NVG	New Vision Generation- EssilorLuxottica's inclusive business arm
RAAHI	A National Truckers Eye Health Program
R2C	Ready2Clip™
SPSS	Statistical Package for the Social Sciences
URE	Uncorrected Refractive Error
WHO	World Health Organization

Acknowledgments

This study was successfully completed due to the efforts and involvement of numerous individuals at different stages of the assessment. The report is an outcome of joint efforts and involvement of many experts representing varied disciplines and organisations. We would like to express our gratitude to everyone for their persistent and unstinted support in bringing out this document.

Our sincere and heartfelt thanks go to Mr RN Mohanty CEO, Sightsavers India and Mr Milind Jadhav, Senior Director-Sustainable Programming South Asia, EssilorLuxottica for facilitating and providing programmatic guidance to this study. We are thankful to Prasanna Kumar, Director Programme for his continuous support and guidance.

We would like to express profound sense of reverence and gratitude to Mr Prasanna Kumar, Director, Operation and Dr Sandeep Buttan, Global Technical Lead-Eye Health Policy and Programme Strategy, Sightsavers India for technical guidance, supervision and leadership in the formulation and finalisation of the present work. We appreciate the valuable and unwavering technical support provided throughout the project.

The expertise and support extended by Dr Ananta Basudev Sahu, Senior Manager, Programme Performance Research and Learning Sightsavers India and Mr Gaurav Chauhan, Sustainable Programming, EssilorLuxottica at all stages of the study and preparation of the report are gratefully acknowledged. It would not have been achieved without their critical review and invaluable feedback.

We would like to acknowledge Dr Prabhu Ponnusamy, Dr Deepali and Mr. Raj Kumar Pandey from Iotalytics Research and Analytics Solutions Pvt Ltd for their support in instrument development, data management, analysis, report writing and field operations.

We express our appreciation and gratitude to all the beneficiaries who participated in this study.

Last, but not the least, we are extremely grateful to technical and finance team of Sightsavers India and EssilorLuxottica's inclusive business arm 2.5 New Vision Generation (2.5 NVG), for their consistent efforts for this study.

Executive Summary

India has more than 5 million truck drivers. They are integral to the transport sector, but the dynamic nature of their work exposes them to a multitude of risk factors that affect their health, including eye health. Visual impairment makes driving challenging and elevates the risk of traffic crashes.

Recognizing the eye health need of the truckers in assuring road safety, Sightsavers in 2017, launched RAAHI – one of the largest eye health programs of the country. To ensure coverage and outreach, the program had set-up permanent vision centres and pop-up outreach camps in locations that cover the usual route of the drivers. The truckers were provided eye check-ups and corrective measures including free spectacles to address their vision issues. Free spectacles were given to the truckers suffering from refractive error. In the case of near correction, the spectacles were given on the spot, while in the case of distance correction, the drivers could collect custom made spectacles (that is, with the correction specifically required for that individual) after a week either from the screening site or from a location of their choice.

Due to the nature of the job and tight running schedules, many drivers fail to collect the spectacles. EssilorLuxottica's 2.5 NVG Ready2Clip™ (R2C) spectacles were introduced in RAAHI program as a strategy to improve program efficiency by increasing compliance with pick-up and use of spectacles and to reduce the program cost.

A cross-sectional study was conducted in five cities of Northern and Central India to assess the effectiveness of the R2C spectacles in the program. The information was collected using mixed-method approach. It comprised of quantitative component assessing compliance and cost-effectiveness; and qualitative component exploring the program outcome and challenges from the perspective of program implementing staff and beneficiaries.

The findings reveal that difficulty in the vision was the most frequently reported reason to seek eye care services of the RAAHI centre. Prior to this, only 7.3% sought any eye care service for their vision problem. The driving factors behind the decision to visit RAAHI eye care centre were mainly accessibility to the centre and free spectacle service. Immediate dispense of the spectacles has resulted in higher

compliance of wearing the spectacles. Almost three-fourth of the truckers who received R2C spectacles were using them. They wore it all day long or when necessary. The majority of the truckers agreed of significant to moderate improvement in the vision after wearing the spectacles; and were satisfied with the quality, design and physical comfort of the spectacles. Only a few discontinued, primarily because of physical damage/loss of spectacle or not being habituated to wear a spectacle.

The cost-benefit analysis of the R2C deployment indicates a positive net benefit from the intervention. Essentially, every R2C spectacle dispensed generates a net benefit of Rs. 97 for every custom-made spectacle dispensed in the program. This has significant implications when deployed at large scale, thereby providing considerable benefits for a larger set of beneficiaries. The introduction of R2C product also shows an additional lump sum benefit corresponding to a reduction of wastages due to the non-collection of custom-made spectacles by 55.3%. Besides, eliminating the need for a return trip to collect the spectacle would reduce the carbon footprint and contribute to a sustainable future.

The outcomes of the present outreach-based eye care program and cost-effectiveness indicate that it has the potential to be expanded on a nationwide scale. Furthermore, integration into national health care plans through engagement with national ministries of health and resource allocation would contribute to Universal Eye Health coverage.

1.1 Background

Vision, the most dominant of our senses, plays a critical role in every facet and stage of our lives. We take vision for granted, but without vision, we struggle to learn, to walk, to read, to participate in school, and to work. Vision impairment occurs when an eye condition affects the visual system and one or more of its visual functions. The World Health Organization (WHO) estimates that globally around 2.2 billion people live with some form of visual impairment (a near or distance visual impairment), of whom near about half (1 billion) have vision impairment which is yet to be addressed. This one billion people include those with moderate or severe distance vision impairment or blindness due to unaddressed refractive error (88.4 million), cataract (94 million), glaucoma (7.7 million), corneal opacities (4.2 million), diabetic retinopathy (3.9 million), and trachoma (2 million), as well as near vision impairment caused by unaddressed presbyopia (826 million). About 80% of all visual impairment is considered avoidable. The main causes are uncorrected refractive errors and cataract, which if not diagnosed in a timely manner, can lead to blindness. It has a significant impact on an individual's productivity, educational opportunities, and overall quality of life. Economically, the potential global productivity loss was estimated to be 411 bn international dollars (4, 5).

In response to enormous public health impact, the World Health Organization (WHO) outlined a global action plan 2014-2019 for 'Universal Eye Health'. It envisioned, "A world in which nobody is needlessly visually impaired, where those with unavoidable vision loss can achieve their full potential and where there is universal access to comprehensive eye care services". This plan follow-up to Vision 2020 initiative, which aimed to reduce the global prevalence of avoidable visual impairment through access to equitable services integrated into existing health care systems. The key factors to the realization of the vision were eye care services and their utilization (6-8).

The literature demonstrates that 'visual functions' are among the crucial physical parameters in relation to safe driving performance and, include visual acuity, contrast sensitivity, color vision, stereo vision and visual fields. However, visual acuity is most commonly assessed during licensing (9, 10). Considering the dynamic environment of the road, impaired visual ability makes driving challenging and elevates the risk of traffic crashes. The critical driving components that are compromised include steering, lane position, traffic-gap judgement, speed, blindside detection and collision avoidance (10, 11). The driving performance has also been demonstrated to be associated with refractive blur and the time of day, signifying that correction of even low refractive error can help minimize adverse events, especially while driving at night (12, 13).

India has large and diverse transportation industry which generated about 6.8% to the nation's gross domestic product (GDP), with road transportation contributing the major share. Truck companies contribute three to ten million (Indian rupees, INR) annually to the 1.42 trillion (INR) road industry (14). Commercial truck-drivers are integral to the transport sector serving the need of over one billion people. It is estimated that there would be more than 5 million truck drivers in India. They have to travel long distances in their lifetime, on an extensive spread of National and State highways ranging from well-engineered roads to a complete absence of concrete roads. Their work environment exposes them to a multitude of risk factors including prolonged sitting, erratic schedules, disrupted sleep pattern, excess workload, time pressures, traffic congestion and reduced physical activity; all of which contribute to physical, psychological and behavioural issues (15,16). Refractive error was found to be prevalent in 17-47% percent of truck drivers screened for visual impairment, with the percentage varying by state (13, 17-21).

The refractive error can be corrected by use of spectacles, contact lenses, and performing kerato-refractive surgery. Of these, spectacles are the most affordable and easiest to dispense and distribute (4, 22). Despite being on the World Health Organization's essential medicine list, its coverage has varied from 2%-93% across the countries (22, 23) and 20%-54% within India (4, 24, 25). Spectacle coverage demonstrate the accessibility to cost-effective service for uncorrected refractive error (22, 23). The variation has also been attributed to under-utilization of eye care services by potential beneficiaries. Even when eye care services are available, a variety of socio-cultural factors including awareness regarding eye health, need-based demand, quality and cost of service, distance from service, perceived necessity, and poor communication from providers act as a barrier to their use (7, 26-28).

Besides, low procurement of corrective services has also been a challenge due to inadequate access to refractive facilities and lack of affordable corrections (29). An eye care program which provided spectacles for refractive errors to the truckers on subsidized rate, found that only 47.5% of them procured the spectacle. Presbyopic truck drivers were more likely to uptake them, which could be attributed to readily available spectacles for near vision than distance vision and bifocals, as well as its impact on quality of life. Young truck drivers were found to be less keen to use glasses (13). A cluster randomised control trial comparing different spectacle delivery models for general population depicted that procurement was higher if spectacle dispensing services were provided as part of the outreach services, either as on-site spectacle fitting or subsequent delivery, and were accessible at a reasonable price (29). A comprehensive program that offers refractive screening and spectacle provision have been demonstrated to be cost-effective, and immediate access to correction spectacles enable patients to comply with the prescription (29,31,32). Among truck drivers who work in an inherently risk-laden work environment, health

conditions often remain undiagnosed or worsen and, in many cases, limit their awareness of, and access to, proper health care services (30).

1.2. Scope of the study

Population based epidemiological data on the prevalence and causes of visual impairment, patterns of service utilization, and barriers to service uptake have now become a cornerstone for any eye care service delivery model. In India, the most common means of receiving refractive services is to approach either a hospital that provides ophthalmic care or an individual optician who dispenses spectacles. While outreach eye camps are now a well-accepted and widely adopted outreach strategy, their primary focus has been on cataract care, and prescription of spectacles to individuals in need of refractive correction (29).

Comprehensive programs that include refractive screening and spectacle distribution have been demonstrated to be more cost-effective than screening programs alone (31, 32), but only few have evaluated optimal model for delivering treatment services (29, 33). Service delivery models that address this public health challenge are needed, particularly with focus on nomadic truck drivers.

1.3. About the project

Project RAAHI
Sightsavers has been working in the country for decades to eliminate avoidable blindness. It ensures availability of affordable and quality eye health services, raises awareness on eye health, and strengthens the capacity of service providers/community members to bring equality for people with disabilities. With that vision, in 2015, it initiated a pilot project to assess the situation of eye health amongst truck drivers in India. This revealed that 1 in every 2 truck drivers across the country had vision-related issues.

Recognizing their eye health needs plays a significant role in assuring road safety, thus, Sightsavers in 2017, launched 'RAAHI' - one of the country's largest eye health programs. To ensure coverage and outreach, permanent vision centres and pop-up outreach camps were set up in locations that cover the usual route of the drivers. The truckers were provided eye check-ups and corrective measures to address their vision issues. All the centres and camps were connected as a network through a cloud-based system to ensure that drivers avail eye care services at multiple locations. A driver, for example, could be examined at one location and he could receive his spectacles at another location where he is heading next.

Challenge

Spectacles were provided to those suffering from uncorrected refractive error. Near vision correction spectacles were offered on the spot, but distant vision correction required drivers to collect the custom-made spectacles (which are specifically curated for the individual) after a week from either the screening sight or a site of their choice. Truckers' kinetic nature of the job and the tight running schedules emerged as a challenge in collecting the custom-made spectacles, thereby impacting their eye health as well as efficiency of the program.

Solution

Custom spectacles are required only for certain eye conditions like presence of Mypoia, astigmatism, etc and/or when the refractive error differs between eyes. In the case of mild astigmatism and/or when only myopia is present in both eyes, there is an innovative solution which is easier to dispense and can be provided on the spot. 2.5 New Vision Generation (2.5 NVG), EssilorLuxottica's inclusive business arm, launched Ready2Clip™ (R2C) that allows delivering eyeglasses adapted to their prescriptions, gender and face shape on the spot, saving them a return trip. R2C spectacles use symmetric pre-edged polycarbonate lenses that can be fitted in both the left and right sides of the frame. According to the individual's prescription, the lenses are clipped into the person's chosen frame. Lenses of different powers can be employed in each eye. This form of high-quality spectacles can be produced in large quantities and made available at the screening sites for on-the-spot dispensing. R2C spectacles benefit both providers and beneficiaries as a wide range of prescriptions and frame designs can be brought to eye screening project sites and dispensed immediately. Custom spectacles, on the other hand, have to be individually fabricated in optical laboratories and then delivered to the project sites and finally to the concerned patient.

1.4. Study Objectives

This evaluation study focusses on assessing the effectiveness of the program and compliance of truck drivers with R2C spectacles, provided by Sightsavers in collaboration with 2.5 NVG under RAAHI program.

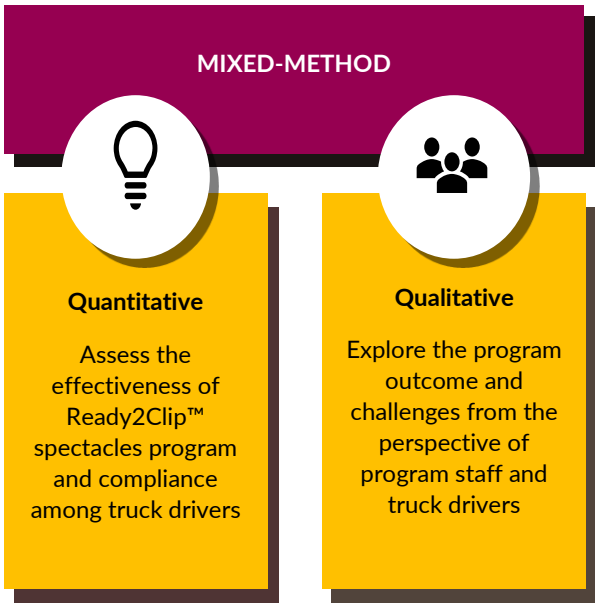
Specific objectives:

- Determine the effectiveness of the R2C spectacle in the program
- Assess the compliance of truck drivers with the use of R2C spectacles
- Evaluate the cost-effectiveness of the R2C spectacle in the program

2. Methodology

2.1. Evaluation Design

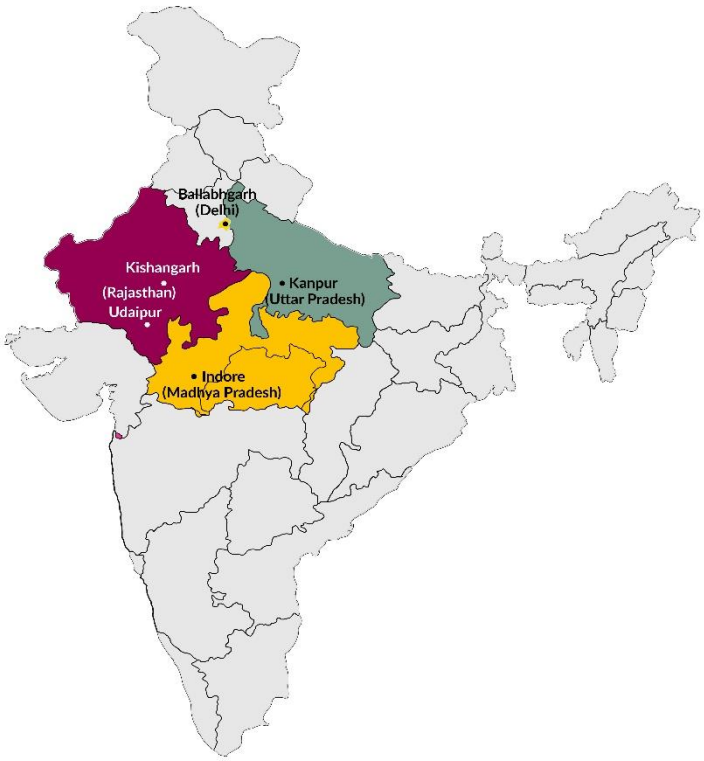
A cross-sectional study design was adopted to meet the evaluation objectives. The information was collected using **mixed-method approach**, comprising of quantitative component assessing the effectiveness of Ready2Clip™ (R2C) spectacles program and compliance among truck drivers; and qualitative component exploring the program outcome and challenges from the perspective of program staff and truck drivers.



2.2. Geographical coverage

The data was collected from RAAHI eye care camps set up in five cities of Northern and Central India:

- Ballabhgarh (Delhi),
- Kanpur (Uttar Pradesh),
- Indore (Madhya Pradesh),
- Kishangarh and Udaipur (Rajasthan).

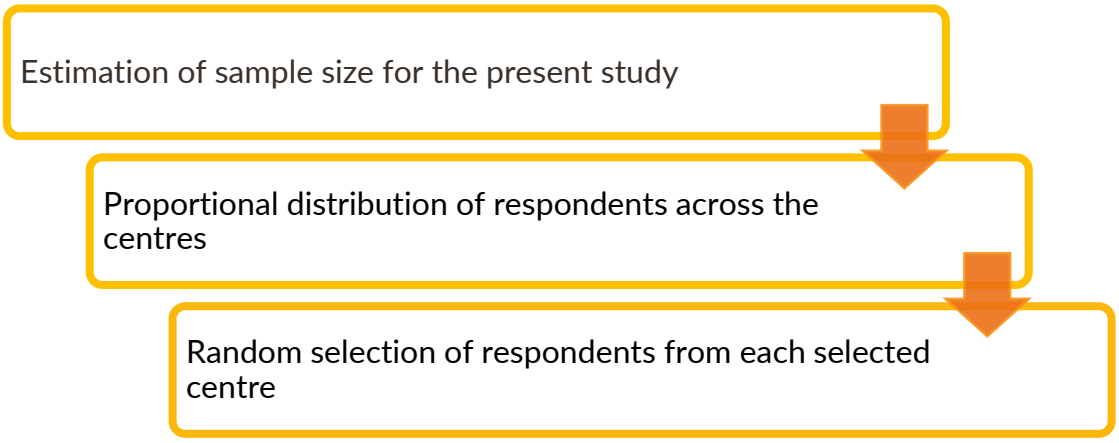


2.3. Study sample and distribution

Quantitative assessment

The study sample was selected using **cluster random sampling**. Here, cluster refers to the RAAHI eye care static centres where R2C spectacle services were provided. It involved the following steps:

75% of the estimated sample was approached telephonically and 25% was drawn from outpatient population. The sampling population and the selection of sample for the present study has been described in detail below.



The sampling frame comprised of

SAMPLE SIZE FORMULA AND ASSUMPTIONS

$$n = \frac{D\left[Z_{1-\alpha}\sqrt{2*.P(1-P)} + Z_{1-\beta}\sqrt{P_1(1-P_1)+.P_2(1-.P_2)}\right]^2}{(P_2 - P_1)^2}$$

Here,

P_1 = the proportion of outcome indicator expected at the start time of survey

P_2 = the proportion of outcome indicator expected at the end of survey

$P = (P_1 + P_2)/2$

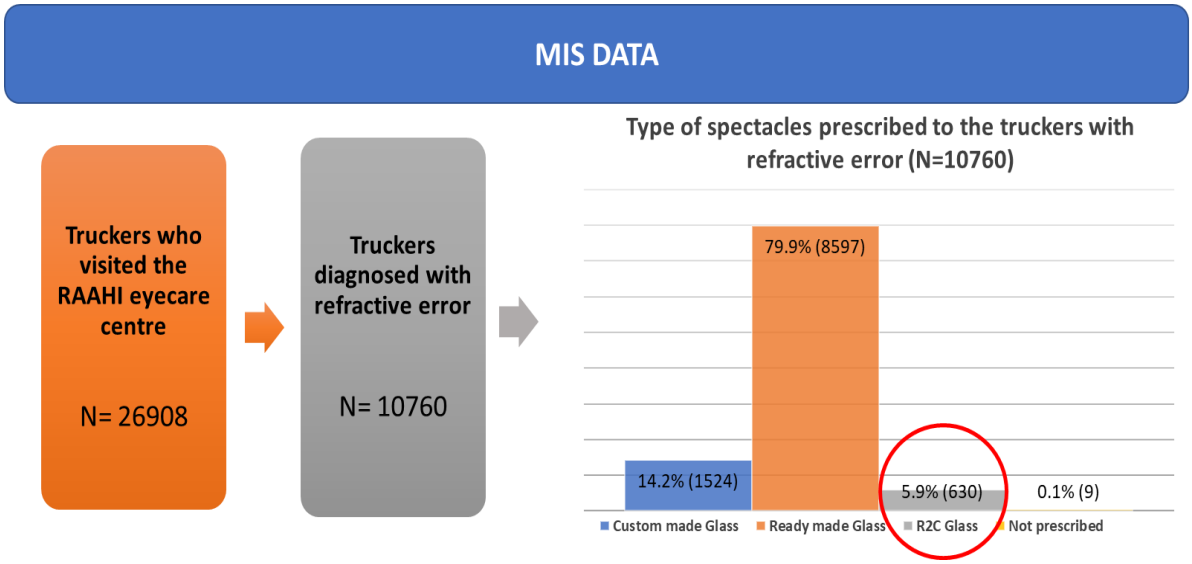
$Z_{1-\alpha}$ = is the standard normal deviate value for an α type I error (1.96 for 95% confidence level)

$Z_{1-\beta}$ is the standard normal deviate value for a type II error (0.84 for 80% of power to detect change over time)

D = is the design effect in case of multi-stage cluster sample design (1.2)

The sample size estimation was based on the assumption of 12% increment in the program related primary outcome and a 10% over sample.

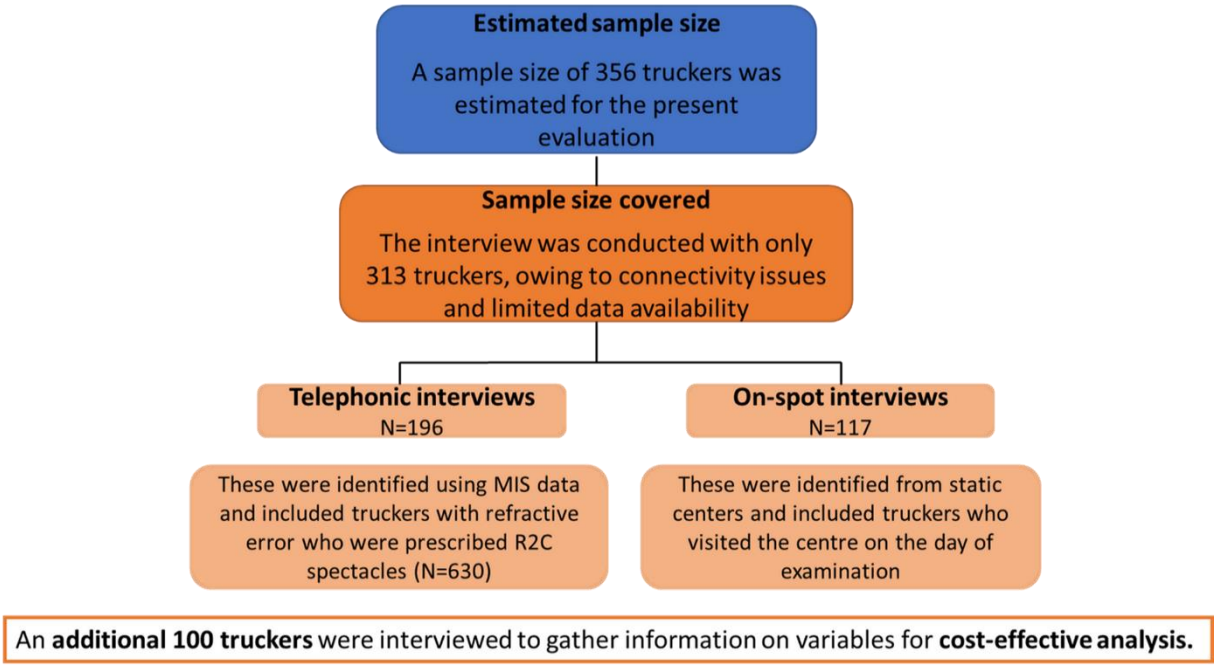
a. **TELEPHONIC INTERVIEWS: Truck employees who visited the selected RAAHI eye care camps during February 2022-May 2022**
Using the program Management Information System (MIS), truckers who were prescribed R2C spectacles for refractive error correction were identified (N=630). Then, following the steps outlined above, 196 of them were selected randomly for a telephonic interview.



Sightsavers

b. **ON-SITE INTERVIEWS: Trucker who visited the RAAHI eye care camps during data collection period, i.e., February-March 2022**

The information was gathered at the selected static centers through face-to-face interview with truckers who consented to participate.



An **additional 100 truckers** were interviewed to gather information on variables for **cost-effective analysis.**

The estimated sample size for the quantitative evaluation was 356 truckers. However, the survey was able to achieve only 88% of the targeted sample, i.e., 313 given the following reasons:

- Connectivity issues, i.e., incorrect phone number, out of coverage and others.
- Limited data availability at centres that were either under construction or where the program implementation was at an early stage.

Distribution of the study participants across the static centres

States	Static centres	Telephonic Interviews	On-spot interviews	Total
Rajasthan	Kishangarh	111	41	152
	Udaipur	38	21	60
Delhi	Ballabhgarh	31	55	86
Uttar Pradesh	Kanpur	13	-	13
Madhya Pradesh	Indore	3	-	3
Total		**196**	**117**	**313**

Qualitative assessment

Purposive sampling was used to gather qualitative information from program staff and truck drivers.

2.4. Data collection and analysis

2.4.1. Data collection tools

The survey tool was designed using a systematic approach. To begin with, a desk review was performed to develop an in-depth understanding of the proposed program, explore thematic areas and identify the key indicators. The information was then used to develop a close-ended structured questionnaire aiming to gather data against identified indicators. The qualitative tools, on the other hand, were guided by the objectives of the study and explored the program through the lens of effectiveness and challenges. The tools were then shared with the wider team and necessary changes were done based on the feedback.

Originally, the tools were developed in English and were translated in the local languages, i.e., Forward translation. The quality of translation was validated through 'Back translation' that is re-translation of the tool back into source language. The back-translated version was then compared with original tools to ensure equivalence and that no information has been lost or distorted during the process of translation.

A pilot study of the tools was conducted to check the flow of the questions, ease in understanding of the questions by the respondents, ease in administering the tool, length and time required in administering the tool, comprehensiveness in terms of information coverage, skip rules and additional instructions for field investigators, and

testing the language used and appropriateness of translations. Necessary changes were made in the tools, wherever required.

2.4.2. Data collection application

The data was collected through an online mobile-based application CAPI. It was programmed to capture multiple responses, enter open-ended responses, automated skips and also range checks to prevent missing data and entering impossible or implausible information. Mobile-based data collection ensured check on the quality of data collected on daily basis. After submission, the data was stored in the server.

2.4.3. Quality assurance

The data quality was monitored through supportive supervision and back-checks. Any discrepancies were resolved through discussion with the respective field investigators. Regular debriefing sessions by the supervisor/site coordinator allowed identifying and resolving any emerging issue(s) in data collection.

2.4.4. Ethical considerations

The following points were taken care of while conducting the surveys:

- The purpose and nature of the survey was clearly explained to the respondents. The first few minutes were spent building rapport with the respondents and addressing their concerns about the data requirements.
- The anticipated duration of the interview and the expected responsibilities of the participant were clearly stated and agreed upon by the participants.
- Confidentiality of the information shared was ensured and the same was conveyed to the respondents.
- All COVID-19 related precautionary measures were taken by the field team during data collection phase, including maintaining distance from the respondents, wearing mask and sanitization of hands regularly.

2.4.5. Data analysis

Quantitative

The quantitative information presented in the report was obtained from the following datasets:

MIS data

This data set provided program-related indicators as well as background information on truckers who visited the RAAHI eye care centers over the last year. To begin with, a preliminary analysis was performed to select the study sample for present evaluation. Later, during the phase of analysis, the data was explored further to assess if there has been a change in the proportion of prescribed spectacles picked-up before and after R2C was introduced.

Field data

The field data collected using the quantitative survey application CAPI was downloaded from the server and exported to SPSS for cleaning and analysis. Two-step approach was adopted for data cleaning, which included *detection* and then *correction* of errors in a data set.

The analytical approach adopted for specified objectives are described below:

i. Program effectiveness and compliance

A descriptive analysis was performed using SPSS to assess the program effectiveness and compliance. The findings have been presented in graphical format, which were generated in excel.

ii. Program cost-effectiveness

Approach

The overall approach implemented in this study draws from the framework of cost-benefit analysis as proposed by Ananthapavan et al. (2021) in their paper titled "A cost-benefit analysis framework for preventive health interventions to aid

decision-making in Australian governments" (34). The model is repurposed to fit the requirements of the cost-benefit analysis for R2C spectacles. Essentially, financial costs associated with the project are subtracted from financial benefits to arrive at net benefit.

Ananthapavan et al. recommended a well-defined status quo as a comparator to conduct cost-benefit analysis for preventive health interventions. This status quo is defined as the "base case" which can be compared to the outcomes post-implementation of the intervention in question.

The base case, therefore, for the RAAHI – National Truckers' Eye Health Programme is the scenario where R2C was not in use. In such a situation, truck drivers were required to collect their custom-made spectacles, thereby incurring a direct cost to this activity. This includes both the cost of traveling to the site from where the drivers could collect their custom-made spectacles, and also the income which they lose due to the time they spend on travelling extra distance to collect their spectacles. It is assumed that the truck drivers would have lost half a day's income for the extra travel required to collect their spectacles. Additionally, the direct costs incurred for producing and distributing the custom-made spectacles by the programme implementation unit are also considered in the base case.
Now, the expenses incurred in the base case scenario correspond to the benefits

$$Net\ Benefit = Expenses\ under\ the\ base\ case - Expenses\ under\ R2C$$

$$Net\ Benefit = Exp_c + I + Exp_p - Exp_r \qquad \textit{Equation 1}$$

under the R2C intervention. This is because once spectacles are produced and distributed using R2C, the expenses under the base case are no longer needed to be incurred. Similarly, the direct costs corresponding to the intervention can be defined as the fixed and operating expenses incurred under R2C spectacles. This involves manufacturing cost of spectacles under R2C, operational expenditures, fitting charges, and other logistic and overhead costs. Therefore, considering the scenarios described above, the cost-benefit analysis can be depicted using the following model:

Here, Exp_c is the average direct expense incurred by truck drivers to collect their custom-made spectacles. The average income forgone by truck drivers due to spending time for travel to collect their custom-made spectacles is represented by I. Exp_p is the average expense incurred by the RAAHI programme team for production and distribution per custom-made spectacle. Exp_r is the average cost of producing each spectacle using R2C. Therefore, using the above equation, we can arrive at the Net Benefits under R2C per spectacle.

To calculate I, the following formula is used:

$$I = \left(\frac{\sum_1^g \left(\frac{(l_g + u_g)}{2} \times n_g \right)}{(\sum_1^g n_g) \times (30 \times 8)} \right) \times h \qquad \textit{Equation 2}$$

Here, l_g and u_g are the lower bound and upper bound of the income range in the income group g. The number of truck drivers for whom custom-made spectacles were produced in each of the income group is represented by n_g. Finally, the average monthly income is divided by 30 to get daily average income, which is then divided by 8 to arrive at the income of truck drivers for 1 hour (assuming a day's income corresponds to work for 8 hours). The resulting quantity is then multiplied by h which is equal to the average number of hours which the drivers spent on collecting their custom-made spectacles. The average net benefit is multiplied by the number of beneficiaries of custom-made spectacles to arrive at the total net benefits from using R2C.

A limitation of the approach described above is that it does not consider indirect and intangible benefits and costs. Some of the indirect/intangible benefits are – increased life expectancy of truck drivers due to reduced probability of accidents, and improved quality of life etc. Thus, the outcomes measured in this model include only direct financial benefits and costs.

Data

Data corresponding to the approach described above has been taken from both the programme MIS database and through primary data collection from the truck drivers who obtained custom-made spectacles under the programme. Information on the direct costs incurred for producing and distributing custom-made spectacles and the spectacles under R2C were collected from the programme database.

Additionally, the programme database also provided the income of the truck drivers which was used to estimate the forgone income by drivers while traveling to collect their spectacles. The total number of observations after considering only those truck drivers who were to receive custom-made spectacles was found to be 2,626. Out of these, data for those truck drivers were dropped who either did not report their income or reported their monthly income as "greater than Rs. 10,000" (as a point estimate of income is not feasible for such cases). After removing these data points, the total number of observations considered for the analysis was 1,342.

Data on the average cost incurred by the truck drivers to collect their custom-made spectacles were collected through a telephonic interview of 101 beneficiaries. Information collected through this survey are as follows:

1. Distance travelled extra for collecting custom-made spectacle (in Km).
2. Mode of travel (Own vehicle/Truck/Public Transport/Walking).
3. Expenses if the mode of travel was public transport.
4. Type of fuel and mileage of the vehicle, if travelled by own vehicle/truck.
5. Any other expenses incurred.
6. Number of hours spent for collecting the custom-made spectacles.

Using data points collected on the above characteristics, and fuel prices as of April 27th, 2022, the total travel expenses were calculated. Total travel expense for one observation was dropped to remove outliers (this observation had 3 times the expense of the next-highest expense).

Qualitative

The data was analysed thematically using a combination of inductive and deductive approaches using NVivo. The transcripts were coded line-by-line and then these codes will be organized into themes and sub-themes. To ensure consistency and transparency in the coding process, coding memos and field notes was referred consistently. A framework matrix was prepared to identify links between the data and to illustrate concepts for discussion and publication.

3. Results

The findings of the study are organised into the following sections:

- Educational and occupational characteristic of the truckers
- Visit to the RAAHI eye care centers
- Compliance with spectacle pick-up and use
- Feedback on spectacles and program services
- Program cost-effectiveness

3.1 Educational and Occupational Characteristics of the Truckers

The majority of truck drivers had completed their education up to secondary school (31.3%), followed by high school (28.1%) and primary school (18.5%). Only a small proportion of them were graduates (6.1%). Nearly 7% truckers were found to be literate but lacked formal education. 8.6% of them were illiterate (Fig 1).

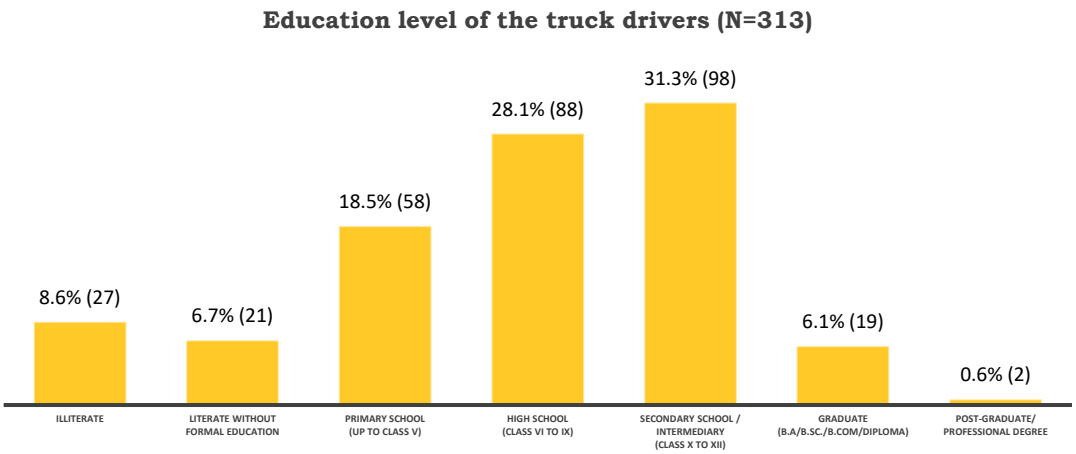


Figure 1: Education level of the truckers

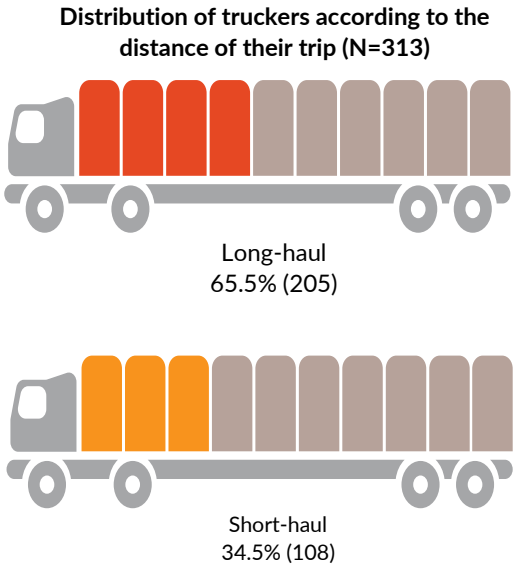


Figure 2: Distribution of tuckers according to the distance of their trip

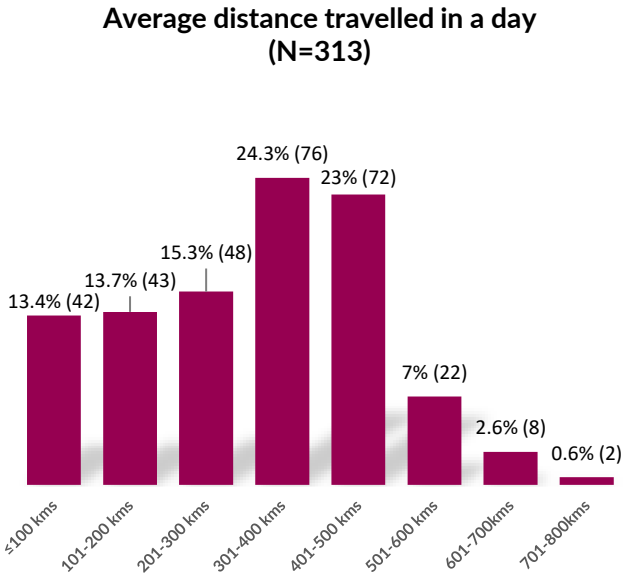


Figure 3: Average distance travelled by truckers in a day

Two-third of the truckers (65.5%) were long-haul drivers, with majority of them travelling distances of 301-400kms (24.3%) and 401-500kms (23.0%) on a trip. Only around 10% of them drove the truck for more than 500kms. Among the remaining truck drivers, 15.3% travelled 201-300kms, 13.7% 101-200kms and 13.4% for ≤100kms during a trip (Fig 2 & 3).

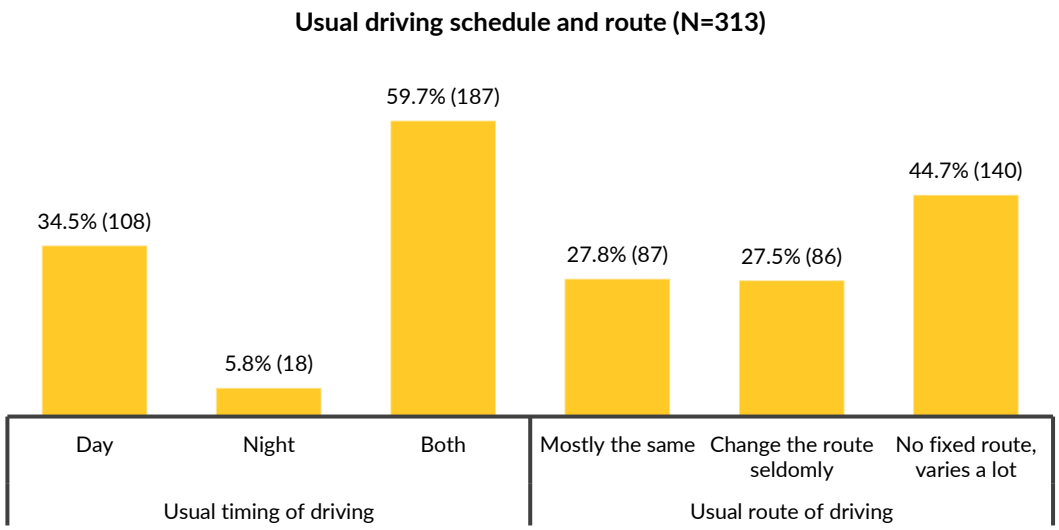


Figure 4: Usual driving schedule and route of the truckers

Nearly two-third of the truckers (59.7%) mentioned that they drive at all hours of the day and night, while a significant proportion of the remaining truckers (34.5%) drove during the day (Fig 4). 27.8% of them mostly travelled the same route, while the rest changed it seldomly (27.5%) or frequently (44.7%).

It is evident that dynamic driving schedule was disrupting their sleep, though the proportion accounted for 26.5% truckers who could sleep only for ≤ 5 hours a day (Fig 5).

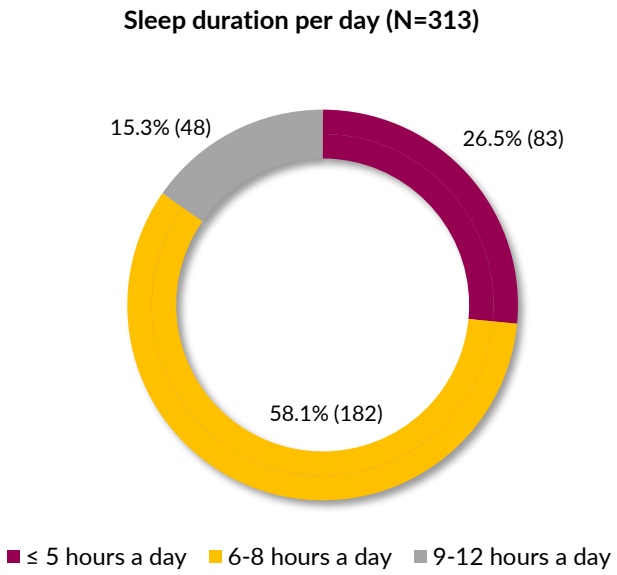


Figure 5: Sleep duration the truckers in a day

3.2 Visit to the Raahi centre

85.6% of the truckers have visited the RAAHI eye care camp in the last six months and 80.5% of them have visited only once (Fig 6). Three-fourth of them learned about these camps from their company staff or other drivers (34.5% and 39.6% respectively) while nearly one-fourth of them made the decision after noticing the camp in their vicinity.

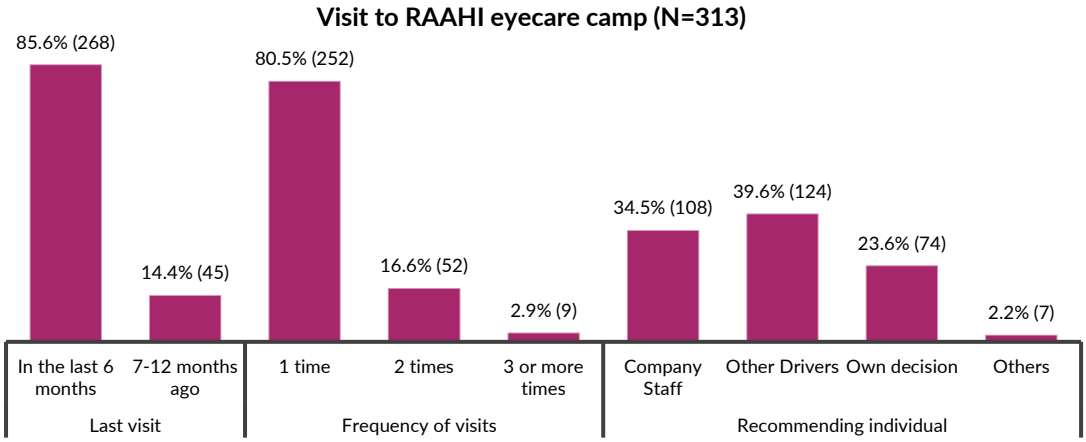


Figure 6: Distribution of truckers according to their visit at the centre and the individuals who recommended them to the centre

Almost 83% of the truckers who visited the centre complained of difficulty in vision and nearly a quarter of them suffered watery eyes (Fig 7). Some of them also reported tiredness in eyes, headaches and red eye among others but the frequency for each was lower than 15%.

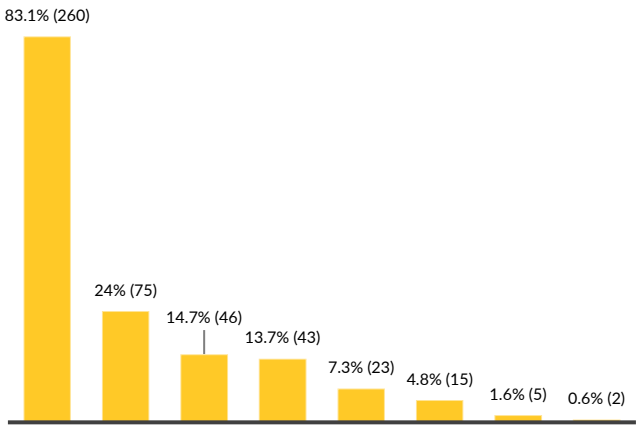


Figure 7: Truckers' reasons for visiting the RAAHI eye care camp

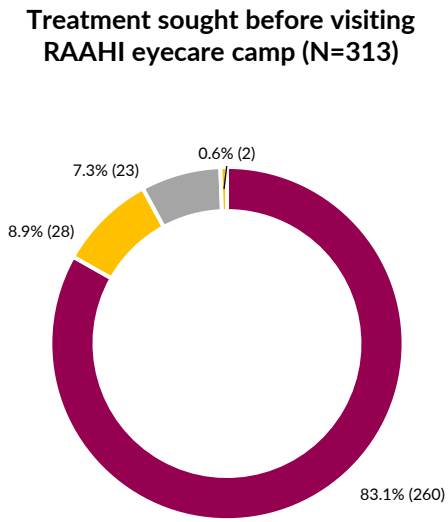


Figure 8: Treatment sought by truckers before visiting the RAAHI eye care camp

Sightsavers

Despite having a vision problem, only 7.3% had sought eye care service before their visit to the RAAHI centre (Fig 8). Majority of them (83.1%) did not seek any corrective measure or treatment and 8.9% relied on home remedies.

DECISION-MAKING TO VISIT THE RAAHI CENTRE

Qualitative findings reveal that the driving factors behind the decision to visit RAAHI eye care centre were - accessibility to the centre, free spectacle service and in some cases, awareness about eye check-ups every six months and the requirement for renewal of driving licence. Also, those who had vision problem didn't miss out on the opportunity when they noticed the camp in their vicinity.

Accessibility

Since the vision centers were set up at locations that are hubs of drivers, accessibility was not an issue for them.

> *"It was organized within [company name] premises so was easy to locate. We were pre-informed that a camp like this has been set up here."*
>
> **-Trucker**

> *"Organizing camps at the transportation facility was a great idea. They load the goods from there and travel back and forth. It [eye centre within the vicinity] saves them time and also, they have a poor financial background. So, they visit the [RAAHI eye] centre. But after an eye examination and diagnosis, they feel good about the program..... that they have benefitted from the program."*
>
> **-RAAHI staff member, Udaipur**

Free eye care service

> *"I'm a driver and also have low income. I save about 8000 to 9000 per month. I have two sons and one daughter. I have a lot of problem at home. The doctor's consultation fee is Rs. 600 to 700. In the given circumstances, I was not able to visit a doctor. My second spectacle was also free."* **-Trucker**

Vision problem

> *"A staff member came to us and asked us to visit the centre and get the spectacle. We were having tea and snack there. He came [and said so]. So, I thought, '[I] do have a problem, so should go and have it examined."*
>
> ***-Trucker***

Renewal of the driving licence

> *"I am from Uttarakhand. There [in that state], a medical check-up is required for the renewal of [driving] license. ..... The office [eyecare centre] was near my place. I contacted there and got the spectacle."*
>
> ***-Trucker***

3.3 Compliance with the R2C spectacles

The following two aspects have been considered in the evaluation of compliance for R2C spectacles:

- Pick-up of the spectacle from the centre
- Long-term use of the spectacle

Later in this section, we have discussed the socio-occupational factors that might influence the compliance with wearing the spectacle.

i. Pick-up of the spectacle from the centre

It has been evaluated using MIS data and by comparing the pick-up status of R2C glasses to those of other prescribed spectacles.

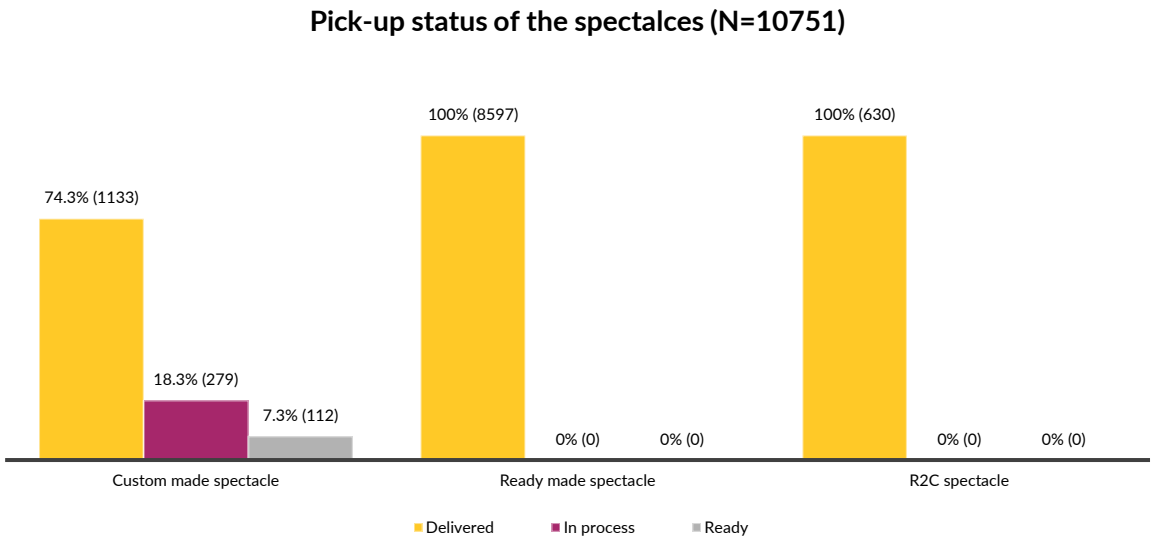


Figure 9: Comparison of of prescribed spectacles for their pick-up status

A comparison of pick-up status of prescribed spectacles reveals that only 74.3% of the customised spectacles were picked-up by the truckers, compared to all readymade and R2C spectacles (Fig 9). Survey data also indicate 99% compliance in pick-up of R2C spectacles.

"The minimum time this process [spectacle with standard frame] used to take was 9 days. We also observed that sometimes it takes more days. This was leading to a reduction in the number of spectacles being picked up. So, the delivery [of spectacles] had reduced. Once R2C was introduced.... the first that happened was that a lot of the spherical glasses that we could provide them on the spot, post-training, were provided on the spot. That increased the compliance substantially. 50% of the prescription glasses.... approximately half if not...right now half.... at least half of those glasses have been provided on the spot. In that sense, we were able to increase our compliance by nearly 50% for these [R2C] spectacles and overall, by about 10-12%, which is substantial in terms of being able to provide.....increase the compliance of glasses." **RAAHI Program Head**

ii. Long-term use of the spectacle

Only the responses of the truckers interviewed telephonically have been considered for this. Because they had been using the R2C spectacle for a period of time than on-site interviewees who would have received them recently, they would provide a more realistic insight on spectacle use. However, the responses here are 'word of mouth' and couldn't be verified.

According to the survey data, R2C glasses were provided to 187 out of 196 truckers (95.4%) interviewed telephonically.At that time, nearly 30% of them said that they wore the spectacle, whereas 21.4% had their spectacles but were not wearing them. Almost half of them (48.7%) denied of it (Fig 10a).

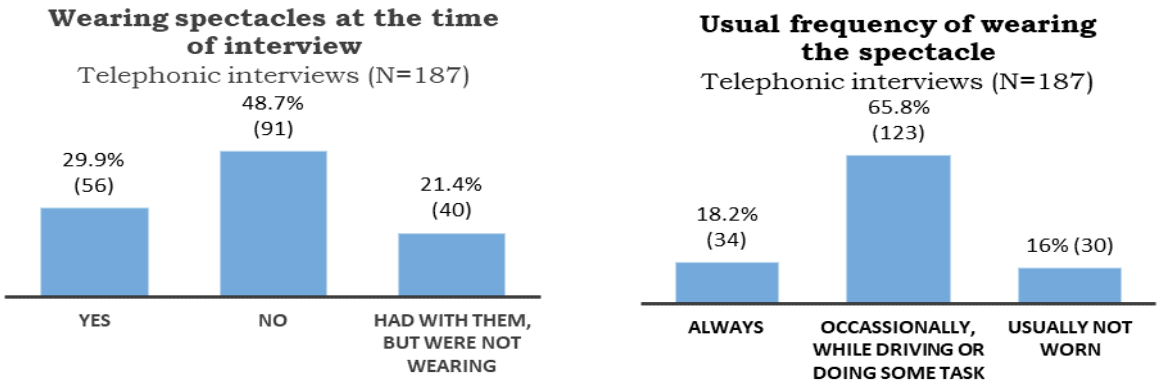


Figure 10: Long-term usage of prescribed R2C spectacles

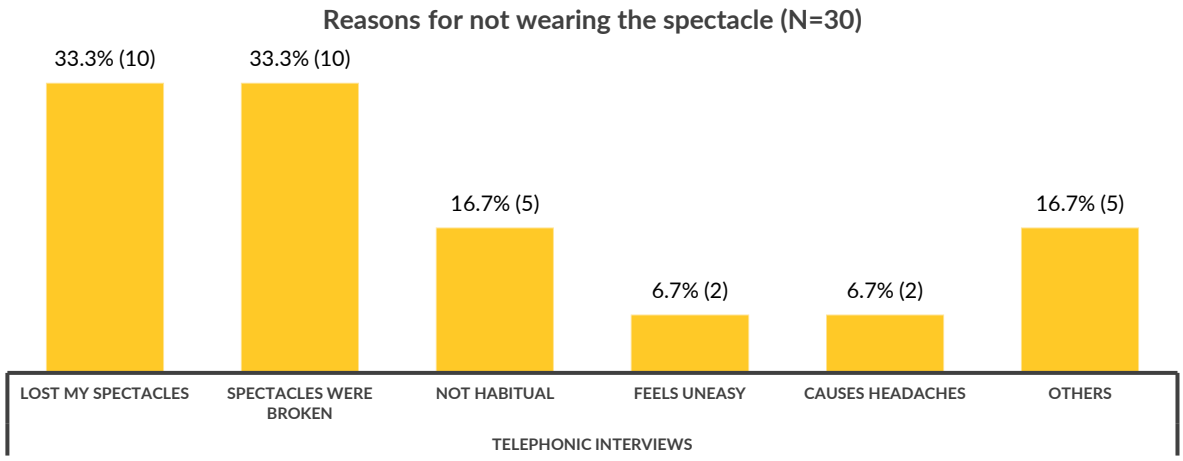


Figure 11: Truckers' reasons for not wearing the provided R2C spectacle

When queried how often do they generally wear the prescribed spectacle, 18.2% of them mentioned they always wear it and 65.8% reported wearing it occassionally, i.e.,

while driving or doing some task. 16.0% of them mentioned 'usually not worn' (Fig 10b). The three most common reasons for not wearing the spectacle were that they had lost them, that they were broken and that they were not habitual to wear them (Fig 11). A few of them mentioned that it made them feel uneasy or gave them a headache when they wore it.

Socio-occupational factors and compliance with wearing the spectacle

The survey findings reveal no evident association between compliance with wearing the spectacle and educational level of the truckers (Fig 12). However, a higher proportion of truckers wearing spectacle 'occasionally' could be observed across the different educational level. Among the truckers who wore the spectacle 'always', mostly were illiterate (27.3%), literate without any formal education (25.0%) or had studied up to primary level (24.2%).

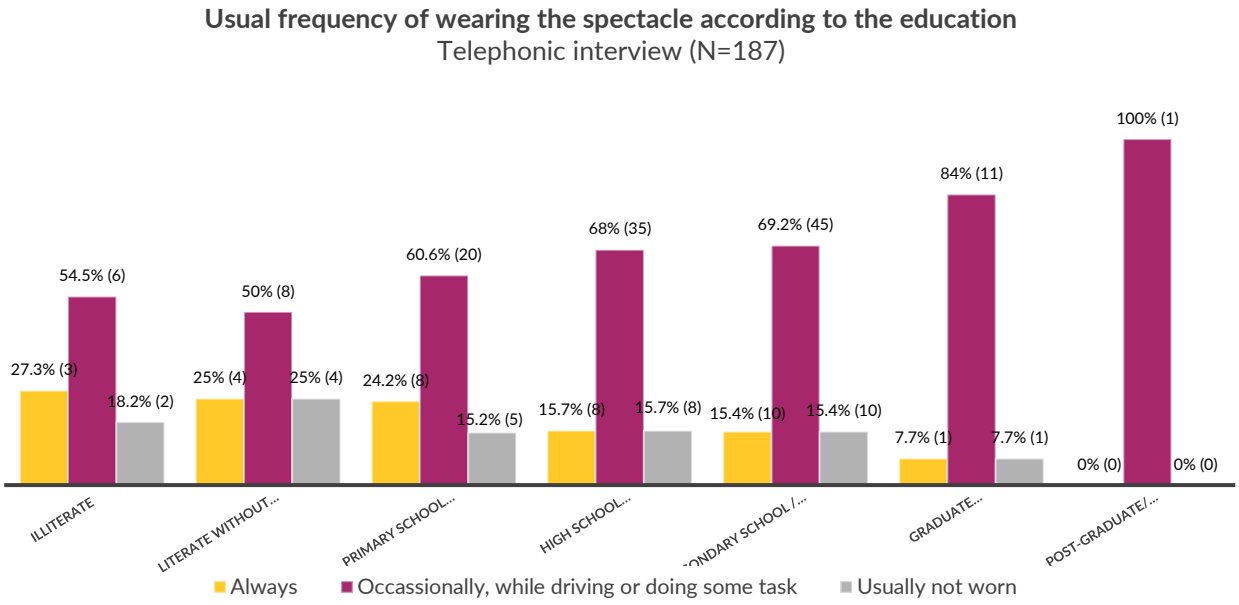


Figure 12: Usual frequency of wearing the spectacle among the truckers in relation to the education level

The compliance with wearing the spectacle was higher among short-haul drivers than long-haul driver, though the difference was not significant (Fig 13). Short-haul drivers were more likely to wear the spectacle always (22.0%) and occasionally (69.5%) than the long-haul drivers (16.4% and 64.1% respectively). The association is further demonstrated by higher proportion of long-haul driver (19.5%) than short-haul drivers (8.5%) reporting of usually not wearing the spectacle.

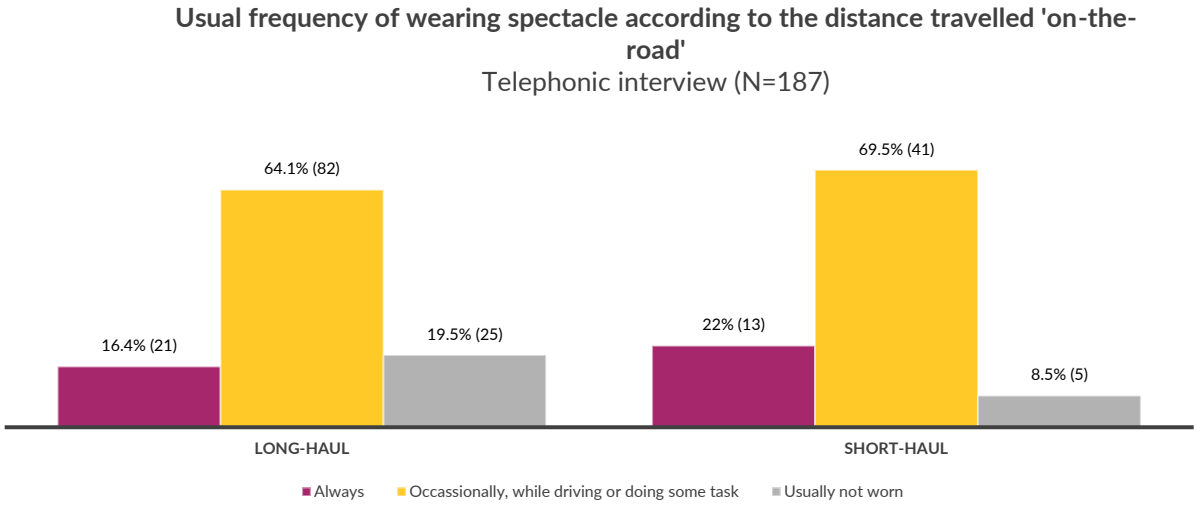


Figure 13: Usual frequency of wearing the spectacle among the truckers in relation to the distance travelled 'on-the-road'

3.4 Feedback on program services and spectacles

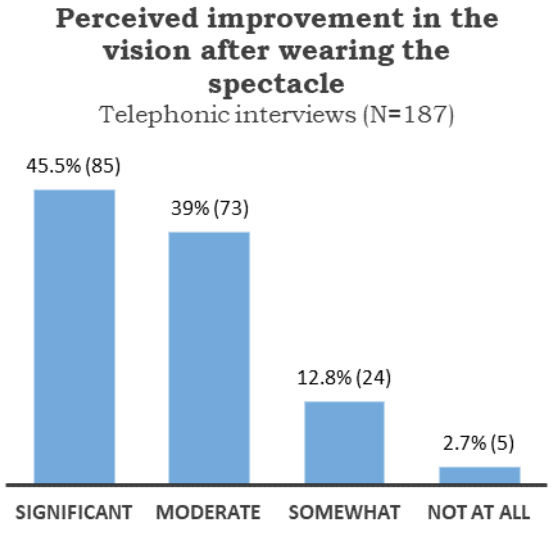


Figure 14: Perceived improvement in the vision a wearing the R2C spectacle

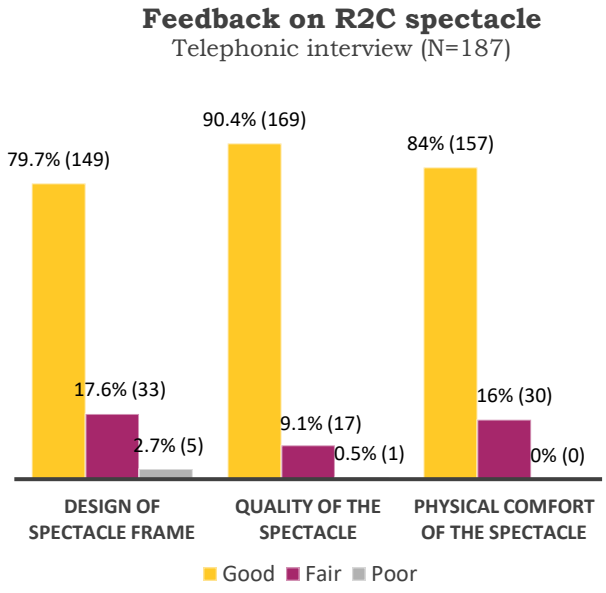


Figure 15: Feedback on the quality and fit of the spectacle

The majority of truckers mentioned that they had experienced significant (45.5%) to moderate (39.0%) improvement in their vision after wearing the prescribed spectacle (Fig 14). Mostly were satisfied with the quality, design and physical comfort of the spectacles, rating them as 'good' (≥80%) (Fig 15). Nearly 94% of all the truckers who visited the centre for eye care service appraised program services as 'good' (Fig 16).

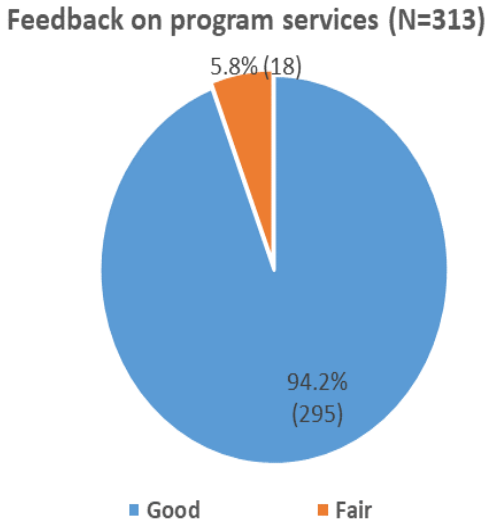


Figure 16: Feedback on the program services

3.5 Cost- effectiveness of the program

Using the data collected from truck drivers and the program team, components of *Equation 1* were calculated. Average direct expense incurred by truck drivers to collect their custom-made spectacles was calculated by using data collected from the survey of truck drivers. The average expense per spectacle was found to be Rs. 54.96. The distribution of the travel cost is shown through a density plot in Fig.17.

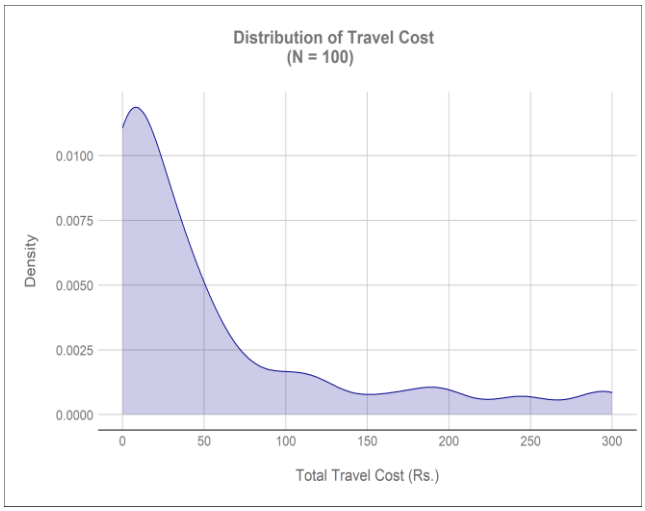


Figure 17: Density plot showcasing distribution of the travel cost

The data on income was obtained from the program database which collected information from truck drivers during registration into the program. Monthly income of truck drivers who were to receive custom-made spectacles were available in income ranges. The data was calculated to find the average income using the formula described in *Equation 2*. The average income was found to be Rs. 28.92 per-hour (Fig. 18) shows the distribution of income), and the average number of hours taken by truck drivers to collect their custom-made spectacles was found to be 1.72. Using these two pieces of information, the average income forgone by truck drivers while collecting their spectacles is Rs. 49.81.

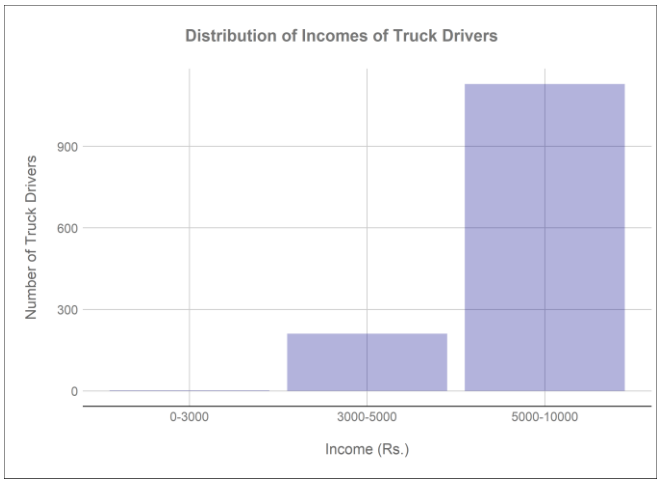


Figure 18: Distribution of truckers according to their income

The average expense incurred by the RAAHI program team for production and distribution of custom-made spectacles and R2C spectacles was Rs. 295 and Rs. 303 respectively. After plugging the values obtained above into *Equation 1*, the resulting estimate shows a net positive benefit. The net benefit is estimated to be Rs. 96.77 per R2C spectacle dispensed in place of custom-made. This has significant implications when deployed at large scale, thereby providing considerable benefits for a larger set of beneficiaries. *Figure 19* here depicts (future) net benefits from R2C for different scales of operation under the RAAHI program.

In addition to the net benefit calculated above, program data also shows that the number of custom-made spectacles not dispensed/not collected by drivers reduced from 660 to 295 after the introduction of R2C. Therefore, there is a 55.3% reduction in wastage on account of the non-collection of custom-made spectacles after the introduction of R2C. This difference of 365 is multiplied by Rs. 295, i.e., the cost of custom-made spectacles to arrive at an additional lump sum benefit of Rs. 1, 07, 675.

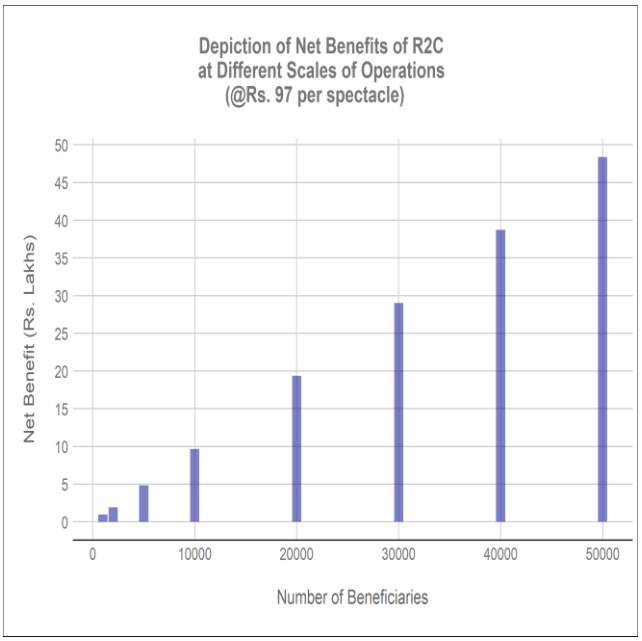


Figure 19: Net benefit from R2C spectacles for different scales of operation under RAAHI programme

Conclusion

The Ready2Clip™ (R2C) spectacles were introduced in RAAHI program as a strategy to reduce the program wastage due to non-collection of custom-made spectacles. On-the-spot dispensing was intended to contribute to improve the program efficiency through increased compliance with spectacle pick-up and use, as well as reduce the program cost. The present study was conducted to evaluate the program efficiency through assessment of associated indicators. Overall, the findings depict improved program efficiency. They have been broadly summarized as below:

Compliance

Immediate dispense of the spectacles has resulted in higher compliance with wearing the spectacles. Almost three-fourth of the truckers who received R2C spectacles were using them. They wore it all day long or when necessary. Only a few discontinued, primarily because of physical damage/loss of spectacle or not being habitual to wear a spectacle.

Cost-Effectiveness

The cost-benefit analysis of the R2C deployment indicates a positive net benefit from the intervention. The truck drivers had to spend extra time and resources to reach the centre from where they could collect their custom-made spectacles. This not only increases the cost for the drivers, but if they do not collect the spectacles, it increase wastages for the program implementation team as well.

With the introduction of R2C, it was expected that the beneficiaries face lower costs of receiving their spectacles. Additionally, wastages under the overall program were also expected to reduce. Essentially, a net benefit of Rs. 97 is realised for every R2C spectacle dispensed in place of custom-made spectacle. This has significant implications when deployed at large scale, thereby providing considerable benefits for a larger set of beneficiaries. In addition to this, the program also benefitted with an additional lump sum benefit corresponding to a reduction of 55.3% on account of reduced wastages due to the non-collection of custom-made spectacles. Besides, eliminating the need for a return trip to collect the spectacle would reduce the carbon footprint and contribute to a sustainable future.

Policy Recommendation

The findings suggest that the present eye care service delivery model is a cost-effective strategy for prevention and treatment of refractive error, particularly among population groups with dynamic work schedule. The outreach camp at locations where the trucking communities normally congregate has contributed to improved accessibility to the eye care services while immediate dispense of spectacle using Ready2Clip™ has promoted compliance with the spectacle use. This outreach-based spectacle delivery model has the potential to be scaled-up at national level as sustainable eye health program. Integration into national health care plans through engagement with national ministries of health and resource allocation would help in Universal Eye Health coverage.

> *"A world in which no one is needlessly visually impaired, where those with unavoidable vision loss can achieve their full potential and where there is universal access to comprehensive eye care services"*. A Global Action Plan 2014-19 (GAP) for Universal Eye Health, WHO.

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