

CSR Proposal Template

Title of Project : Portable devices as a solution to preventable blindness in remote and rural India : an interdisciplinary study

Introduction/Background

India is home to 20% of the 2 billion people with vision loss worldwide (World Vision Report 2019). This causes a huge disease burden to the country, and also impairs the ability of people to lead good quality lives. Though many studies have been conducted to estimate extent of vision loss, they are limited by the focus on statistical information and attention to broad causal factors, such as poverty or preexisting co-morbidities. This project takes a unique approach, combining qualitative techniques to unearth social barriers that affect understanding of vision loss .A portable solution to detect preventable blindness and provide point of care solutions especially in remote areas is targeted .

Portable diagnostics and treatment strategies based on imaging are crucial to health care delivery. However , widespread use of such devices which could detect preventable conditions leading to 80% of vision loss cases is absent in India. Developing tools to evaluate such technology from a social perspective is the catalyst for this project. Regular follow ups are most important to detect progression and prevent visual loss. Follow-ups require regular visits to tertiary care hospitals that involve huge out-of-pocket expenditure which make the process unaffordable and care inaccessible for poor, rural populace (majority of preventable blindness NFHS 2016).

A set of portable diagnostic & imaging devices can be used to address this problem especially in remote areas. But any device ,if not accepted by the end users is a failed public health initiative ab-initio. This project embarks on that transdisciplinary route where social science, innovation and medicine collaborate to find a plausible and effective solution.

Objectives of the project :

-To understand social and cultural factors that influence access to and use of portable devices for health care, in this context, specifically related to blindness through qualitative research

-To develop a portable microscope based imaging method and 3D printed biochip that can assist regular costlier/expensive investigations (OCT,DFA) of diabetic retinopathy

-To acquire fundus & other images of eyes by the peripheral health workers in rural areas and share over mobile applications (telemedicine) to get advice from experts in medical colleges in urban areas.

Brief Methodology

This is a mixed method study with two broad methodological components- one, *qualitative*, and another, *experimental*.

Year I:

As a first step, a *qualitative* study will be undertaken in year 1. Study population will be both from remote populations and patients visiting eye OPD of hospitals. The qualitative component of the project will involve collecting primary data from people diagnosed with vision loss. A basic survey with demographic details and specific questions related to attitudes toward diagnostic devices will be obtained. At the same time, we plan to create an awareness on the usefulness of the diagnostic devices. Attention will be paid to intersectional factors that influence access to healthcare for vision loss - such as economic status, gender, and place of residence.

Microfluidics structures Fabrication : On the technology front, we plan to build an autocad design of the microfluidics chip that can be used in conjunction with a handheld portable microscope. Secondly, we plan to build a micro-bead based technology for detection of biomarkers/proteins using minimum blood/serum samples in the microfluidic chip. The imaging devices will be fabricated using 3D printing based on fused deposition modeling.

Year II:

Validation of the method based on portable imaging devices : Patients with visual acuity less than 6/18 (WHO criteria for blindness) from the defined population will be recruited after getting informed consent. The microfluidics device will be used to measure the biomarkers and further, the method will be validated by comparing the proposed method with established conventional methods. In order to correlate the fundus & other images of eyes as well as the biomarker level, we plan to create a small database that can be used as the basis for disease diagnostic methods. The same recruited population will be subjected to qualitative study regarding acceptance, effectivity and impact of the devices tested .

Development of image analysis software : We also plan to focus on development of a foolproof software based on AI/ML that can be used for analyzing the biomarker imaging and classification of fundus images obtained from the portable microscopes in a mobile application.

Qualitative study: The responses to the qualitative study conducted in Year I will be analysed during this period. Special attention will be paid to elicit important variables that affect access to health care, and attitudes to using diagnostic devices.

Year III :

Experimental study: Microfluidics device will be used on a larger population to test different biomarkers for preventable blindness. Imaging device will be trained with more data to get better predictability. An android application will be developed to make the device truly portable and connected.

Qualitative study: A one-day conference will be organised in IIT Hyderabad with scholars doing research on vision loss, both from academic and medical fields. Results of our study will be shared in this forum.

Publications from this study will be aimed at both lay audience, through op-eds written in newspapers widely circulated in India and brochures published in the form of brochures in regional language (Bengali) and English in order to be accessible to the people in remote/rural areas, and to raise awareness about issues that lead to vision loss but which can be avoided with timely intervention.

In addition we will also bring out academic outputs in high impact factor journals such as *Social Science and Medicine* and *Sociology of Health and Illness*.

Target population/ Beneficiaries : Population from remote and rural areas, semi urban areas as well as patients visiting tertiary care hospitals.

Expected Outcome :

A strategy for fabrication of low cost chip using 3D printing that is compatible with portable microscope.

A protocol for performing on chip serum based immunoassay and validation of the method for biomarker detection.

A protocol for diagnosis from fundus images acquired remotely. A portable imaging device that can be used by peripheral health workers to capture and sent over smartphone to get advice from specialists in the tertiary care hospitals

Dissemination of the findings from the study will be in the form of a one-day conference as well as publications.

Time Line and Budget :

	Year 1	Year 2	Year3
Budget (in Rs lakhs)	Rs.9.3 lakhs	21.4 lakhs	Rs. 8 lakhs
Milestone (if any)	Qualitative and quantitative data about blindness and interventions possible	Design and validation of point of care devices for blindness	Re-evaluation of target population after use of device(s) and creation of larger conscience through conference, 1 patent, 1 publication

Contact person/Proposer :

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Project valid until: March,2025

(Kindly provide simple basic information of the proposal for brief understanding of the project to the corporates)

Budget proposal

Experimental Component:

Items	Estimated cost(Rupees)
Fundus Imaging device (portable)	3.7 lakhs
Portable handheld microscope	1.4 lakhs
Antibodies	1 lakh
Purified human proteins (VEGF etc)	1 lakh
Macbook	1.2 lakh
I- Phone (for telemedicine)	1 lakh
Autocad modeling (PDMS, reagents)	1 lakh
Other consumables	3 lakhs
ELISA machine	6 lakhs
RA (qualification- M.Tech or M.Sc)- Rs. 25,000 per month X 6 months x 1	1.5 lakhs
TA & DA for RA- Rs.10,000 per month x 6 months x 1	0.6 lakhs
Total	21.4 lakhs

Qualitative component

Year I to 3 (2022-2025) -

Items	Estimated cost(Rupees)
First Year	
RA (qualification- M.Phil or MA)- Rs. 25,000 per month X 6 months x 3	4.5 lakhs
TA & DA for RA- Rs.10,000 per month x 6 months x 3 (total 3 RA -1 for urban and 2 for rural)	1.8 lakhs
One RA for transcription (translation, typing up of data and thematic analysis) - Rs.25,000/- per month x 12 months	3.00 lakhs
Second year : experimental part	21.4 lakhs
Third Year :	
One RA for transcription (translation, typing up of data and thematic analysis) - Rs.25,000/- per month x 12 months	3.00 lakhs
Total	12.3 lakhs

Documentary to be made on experience of blindness :5 lakhs