A Report of Rapid Assessment of Avoidable Blineness survey-2019 Karnali Province, Nepal



	Humla
_	
	Mugu
	Kaliko • Jumla
	• Dolpa
	stophin laiarbat
	Daller Sajarkot
	Suna Rukum
	A NRCS Salyan
	Surkhet Eye Hospital

Blindness Scenario 2019

Overall Blindness	>1%
Cataract leading cause of blindness	61%
Cataract Backlog	0.5%
Refractive error	15.7%
Glaucoma	2.4
Retinal	12.2%
Any grade of diabetic retinopathy	5.2%
Other	14.6

Technical support



International Agency for Prevention of Blindness, IAPB - SEA

Financial support



The Eye Care Foundation Netherland helps to prevent and cure avoidable blindness and visual impairment in developing countries. It is established in Nepal since 1988. The Eye Care Foundation supports to eye care programs in Kalikot, Mugu, Jumla and Humla of Karnali province. Apart from this the project supports to Gandaki province and Province no 1. The country representative of the foundation is Mr. Anil Gorkhaly. The Foundation contributed Rs. 1.4 million for carrying out the RAAB Survey in Karnali.



Ministry of Social Development Karnali province

Ministry of Social Development - Karnali Pradesh (Nepali: सामाजिक विकास मन्त्रालय, कर्णाली प्रदेश) was established in 2018 (2074 BS) under the Provincial government of Nepal. Karnali Pradesh is one of seven provinces of Nepal which form the second layer of government, between the federal government and the local government. The provincial governments are established, and their structure defined, by Part 13 of the Constitution of Nepal (2015). The office of the Ministry of Social Development - Karnali Pradesh is located in the capital city of <u>Karnali Province</u>, Birendranagar Surkhet.

Areas of the Ministry of Social Development

- 1. Education
- 2. Health and population
- 3. Sanitation
- 4. Women, children, senior citizens, and social security
- 5. Youth and sports
- 6. Language, religion, and culture
- 7. Labor and employment

The RAAB survey was carried out in 10 districts of Karnali province in the leadership of ministry of Social development Karnali provincial Government through Nepal Red Cross Society Surkhet Eye Hospital. The ministry contributed Rs. 1 million for carrying out the RAAB Survey.



Swiss Red Cross (SRC) is long standing partner of Nepal Red Cross Society. SRC is providing continuous financial and technical support for eye care service development in Nepal since 1989 specially for Karnali province (Former Midwest Region). The SRC's core areas are an eye care, community health and disaster response and management. The SRC contributed Rs. 1.25 million for carrying out the RAAB Survey in Karnali province

Technical support for implementation



Nepal Eye Program was officially launched in July 1992 to support the prevention & control of blindness in Nepal and the region. Tilganga Institute of Ophthalmology (TIO) is the implementing body of the Nepal Eye Program, a not-for-profit, community-based organization. With an aim to act as a model for treatment, research and training, one of the active members of Apex Body for eye health, Ministry of Health (MoH), Nepal and working in co-operation with all other eye care centers in Nepal. The TIO facility was opened in 1994.

In the early years, working with The Fred Hollows Foundation (FHF), Australia, TIO played a key role to help refine and adapt a practical, safe, and affordable technique of intraocular lens implant for cataract surgery in developing countries. Another key achievement in the early days was the establishment of the country's first eye bank, in conjunction with Tissue Banks International in Baltimore, USA, and Lions International.

TIO has given valuable inputs during the implementation of RAAB Survey in Karnali province.

Nepal Netra Jyoti Sangh



NNJS was established in 1978 as a National Society for Comprehensive Eye Care under the Health Coordination Committee of the Social Services National Co-ordination Council. Later it was strengthened in 1980 as a full-fledged non-governmental social welfare organization dedicated to facilitating an easy approach to provide all the possible facilities in regard to the treatment of eye patients in Nepal. In regards to Karnali province RAAB survey, the NNJS Himalaya eye hospital, Rapti Eye Hospital and Fateh Bal hospital are branches of NNJS and they provide the eye care service through outreach and CECCs in Karnali province. The hospitals contributed technically a lot for implementation of the RAAB survey in this province.

A collaborative effort

The survey was implemented by Nepal Red Cross Society Surkhet Eye Hospital with the technical support of Himalaya Eye Hospital, Rapti Eye Hospital, Fateh Bal Eye Hospital. Ophthalmologist and Ophthalmic Assistant were involved from all eye hospital 4 eye hospitals in the survey. Field survey team:

Name of Team members	Designation	Organization	Adddress				
Nepal Red Cross Surkhet E	ye Hospital		_				
Dr. Shakti Prasad Subedi	Medical Director	NRCS Surkhet Eye Hospital	Birendranagar, surkhet				
Dr. Manish Khatiwada	Ophthalmologist	NRCS Surkhet Eye Hospital	Birendranagar, surkhet				
Mr. Prem Kumar Dixit	Senior Ophthalmic Officer	NRCS Surkhet Eye Hospital	Birendranagar, surkhet				
Mr. Shanta Kumar Sherpa	Ophthalmic Assistant	NRCS Surkhet Eye Hospital	Birendranagar, surkhet				
Mr. Dipak Koirala	Enumerator		Birendranagar, surkhet				
NNJS Himalaya Eye Hospital							
Dr. Hari Adhikari	Ophthalmologist	Himalaya Eye Hospital	Pokhara				
Mr.Dharmendra Kumar	Ophthalmic Assistant	Himalaya Eye Hospital	Pokhara				
Dhodasaini							
Mr. Om Bahadur Budha	Enumerator		Surkhet				
NNJS Rapti Eye Hospital							
Dr. Kaushal Kumar Pokhrel	Ophthalmologist	Rapti Eye Hospital	Dang				
Manju Bohara	Ophthalmic Assistant	Rapti Eye Hospital	Dang				
Shyam Bhandari	Enumerator		Surkhet				
NNJS Fateh Bal Eye Hospit	al						
Dr. Rajesh Sherestha	Ophthalmologist	Fateh Bal Eye Hospital	Nepalgunj				
Mr. Sunil Tharu	Ophthalmic Assistant	Fateh Bal Eye Hospital	Nepalgunj				
Khum Bhandari	Enumerator		Surkhet				

RAAB Consultant:

Mr. YD Sapkota

International Agency for Prevention of Blindness

South East Asia

The Principal investigator Mr. Brish Bahadur Shahi, Public Health Division Head Ministry of Social Development Karnali province

Survey Coordinator:

Mr. Ghan Bahadur Thapa

Nepal Red Cross Society

Surkhet Eye Hospital

I am pleased to know that the provincial "Rapid Assessment of Avoidable Blindness survey report (RAAB-2019) 2019" of Karnali province Nepal, come up in the form of a concise book published by Nepal Red Cross Society Surkhet Eye Hospital. This is the great achievement for provincial eye health care. I hope this report will help Ministry of Social Development Karnali province and eye care stakeholders to increase the eye care service coverage in rural and remote hilly districts. Certainly, it guides us to achieve national goal of vision 2020: Right to Sight and sustainable development goal.

Eye health is the one of the sectors that runs since 1980 by NGO and INGOs with partnership model in health sector in Nepal which is known model program in south Asia. NGo and INGO has contributed a lot for the prevention of blindness in Nepal and significantly reduced the blindness in last 3 decades. However, the prevalence of blindness in Karnali province is still high than other province so that Nepal government's public, private partnership model (PPP) will be the best model to combat against the blindness in this province. I would like to mention here, Ministry of Social Development has already started the model of eye care integration into general health care in public private partnership model.

I would like to thank Nepal Red Cross Society Surkhet Eye Hospital for their coordination among eye care stakeholders and leading role for implementation of survey. I look forward to see further commendable progress in eye care in coming days. At last but not least like to thank all stakeholders working in this provice, survey expert and preparing this report. I hope this report will provide evidence-based detaild fresh information for future planning of eye care service in Karnali province, Nepal.

Dal Bahadur Rawal Minister Ministry of Social Development Karnali Provice, Surkhet

It's my pleasure to know that the provincial "Rapid Assessment of Avoidable Blindness Survey report 2019" of Karnali Province Nepal is come up first time in the form of a concise book published by Nepal Red Cross Society Surkhet Eye Hospital.

In last 3 decades, the eye care service in Nepal, has been run by NGO and contributed to government a lot for prevention of blindness. The effort of eye care service providers is commendable contribution for their service delivery.

This report will provide evidence-based information of present Blindness scenario of karnali province for future planning of eye care service. The report also explores the possibilities to work together among existing stakeholders with integrated comprehensive eye care plan for reducing the avoidable blindness in Karnali province.

All this has been possible with initiation and effort of all stakeholders. I would like to thank all stakeholders for contribution and accomplishment of provincial Survey. At last but not least, we thank Mr. Yudhdhadhoj Sapkota from IAPB, Mr. Ian Mc Cormick, Ophthalmologist, Ophthalmic Officer, Ophthalmic Assistant from SEH, REH, HEH and FBEH for their contribution as a RAAB survey expert and filed work respectively.

Bishnu Prasad Adhikari Secretary Ministry of Social Development Karnali province, Surkhet

It's a great pleasure to know that the provincial "The Rapid Assessment of Avoidable Blindness Survey report (RAAB-2019) 2019 of Karnali province Nepal" is being published as a book by Nepal Red Cross Society Surkhet Eye Hospital.

Last 3 decades, the NGOs has been giving priority for fighting against the prevention of blindness and reduced significant blindness through hospital and outreach program. This is a successful example of successful public private partnership in eye care.

To achieve national goal of Vision 2020: "Right to Sight" and Sustainable development goal, the eye care service need to be further expanded beyond the district headquarter throughout the Karnali province. For this purpose, Ministry of Social Development Karnali province has already started the expansion of eye care service into general health care in partnership model.

This report provides evidence-based information on present situation of blindness and outcome of existing eye care service in Karnali province. I hope this information will be useful in planning future eye care service and fighting against the blindness of Karnali province. I hope, based on the survey report will guide us to achieve the universal eye health coverage in province.

I would like to thank Nepal Red Cross Surkhet Eye Hospital for their initiation and coordination to all stakeholders for implementation of the Survey. Similarly, I would like to thank all stakeholders for their contribution in implementation of survey.

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Brish Bahadur Shahi Public Health Division Head Ministry of Social Development Karnali province, Surkhet

It's my pleasure to know that the provincial "Rapid Assessment of Avoidable Blindness Survey report 2019" of Karnali Province Nepal is come up first time in the form of a concise book published by Nepal Red Cross Society Surkhet Eye Hospital.

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Bishnu Prasad Adhikari Secretary Ministry of Social Development Karnali province, Surkhet

Nepal Red Cross Society सुर्खेत आँखा अस्पताल कर्णाली प्रदेश वीरेन्द्रनगर-६, सुर्खेत

The provincial level "Rapid Assessment of Avoidable Blindness Survey Report 2019" of Karnali Pradesh has come up first time as a concise book published by Nepal Red Cross Society Surkhet Eye Hospital with the leadership of Ministry of Social Development, Karnali province and collective efforts of all existing eye care stakeholders.

We are greatly indebted to Ophthalmologist, Ophthalmic Officers, Ophthalmic assistant and enumerators who directly involved in the field work reaching household to household in difficult geographic districts. This was not possible without their commitment, dedication and ownership to achieve the objectives of the survey. The survey team did field work in the leadership of 4 different hospital in different district and covered 10 districts of karnali pradesh with 117 clusters. During that period examined 3,983 (97.9%) persons of age 50 years and above.

We also thank the survey consultant Mr. YD Sapkota from IAPB South Asia Coordinator, Survey Principal Investigator Mr. Brish Bahadur Shahi from Public Health Division Head Ministry of Social development Karnali province, Dr. Mohan Krishna Shrestha from Tilganga Institute of Ophthalmologist and Survey program Coordinator Mr. Ghan Bahadur Thapa from Surkhet Eye Hospital for a lot of contribution for completion the survey.

I am grateful to Himalaya Eye hospital, Rapti Eye Hospital and Fateh Bal Eye Hospital for their significant support deputing Ophthalmologist and paramedics in field level.

On behalf of Surkhet Eye Hospital, I express our gratitude to Ministry of Social Development Karnali province, Eye Care Foundation, Swiss Red Cross who provided financial assistance for carrying out the provincial level Rapid Assessment of avoidable blindness survey.

Finally, I would like to thank all respondents who provided valuable information during the field operation and appreciate all those who had helped to make the provincial survey a grand success.

(Lilaram Subedi) Chairman

Abbreviations

RAAB	Rapid Assessment of Avoidable Blindness
Blind	VA<3/60 with available correction
VA	Visual Acuity
PVA	Presenting Visual Acuity
MVI	Moderate Visual Impairment VA <6/18 to 6/60
SVI	Severe Visual Impairment VA <6/60 to 3/60
BCVA	Best Corrected Visual Acuity
Phaco	Cataract surgery with Phaco-emulsification and aspiration techniques
SICS	Small Incision Cataract Surgery
IOL	Intraocular Lens
ARMD	Age Related Macular Degeneration
CSC	Cataract Surgical Coverage
CSR	Cataract Surgical Rate (Number of cataract operations per million population per year
DR	Diabetic Retinopathy
GoN	Government of Nepal
NGO	Non-Governmental organization
NRCS	Nepal Red Cross
NNJS	Nepal Netra Jyoti Sangh
WHO	World Health Organization

EXECUTIVE SUMMARY

Background

The main objective of the Rapid Assessment of Avoidable Blindness (RAAB) survey 2019 was to assess the magnitude of blindness and visual impairment, its causes and impact of existing eye care services in Karnali Province, Nepal.

Results:

Prevalence of Blindness and Visual Impairment

The survey achieved a 97.9 % response rate. The sample prevalence of bilateral blindness among people aged 50 years and above was 1.0 % (95% CI 0.7-1.4). The age and sex adjusted prevalence of bilateral blindness based on the presenting visual acuity <3/60 in the better eye was 0.9% (95% CI 0.6 to 1.3). The prevalence of blindness in male was found relatively more 1.1% (95% CI 0.6 to 1.6) compared to that of female 0.8% (95% CI 0.3 to 1.2). A total of 1,738 people aged 50 years and above were estimated to be bilaterally blind in the survey province.

Age and sex adjusted prevalence of severe visual impairment, moderate visual impairment and early visual impairment were estimated to be 1.3 % (95% CI 0.9-1.8), 8.1 % (95% CI 6.8-9.4) and 10.0 % (95% CI 8.7-11.4) respectively.

The survey also estimated a total 2,564 people with bilateral severe visual impairment, 15,400 people with bilateral moderate visual impairment and 19,088 people with bilateral early visual impairment. It is estimated that total 14,441 eyes were blind due to various causes in this province.

The age and sex adjusted prevalence of bilateral cataract blindness (BCVA <3/60 in the better eye) in the province was found to be 0.3% (95% CI 0.2-0.5). Similarly, bilateral severe visual impairment, moderate visual impairment and early visual impairment due to cataract were found to be 0.5% (95% CI 0.2-0.8), 2.3% (95% CI 1.7- 3.0) and 1.8 (95% CI 1.0-2.6) respectively.

The prevalence of operable cataract (BCVA<6/60) was found to be 0.8 % (95 % CI 0.5 - 1.2). There were a total 639 people aged 50 years and above with bilateral cataract blindness in the province. Prevalence of total visual impairment due to cataract (BCVA<6/12 in better eye) was found 6.8 % (95 % CI 5.7-7.8). Total number of people with bilateral visual impairment due to cataract was estimated to be 12,828. The survey estimated a total of 38,559 eyes with visual impairment due to cataract in this province.

Causes of Blindness and Visual Impairment

Cataract was found to be the leading cause of bilateral blindness (61.0%) in this survey. The remaining causes were other posterior segment diseases (12.2%), other globe/CNS abnormalities (7.3%), phthisis (4.9%), glaucoma (2.4%) and uncorrected refractive errors (2.4%) respectively.

Cataract was still found to the leading cause for severe visual impairment and moderate visual impairment as 80.3% and 58.9% respectively. Uncorrected refractive error accounted for the leading cause of early visual impairment as 78.5% and second leading cause of moderate visual impairment as 28.3%. A total of 80.5% of causes of blindness, 93.9% of SVI, 95.4% of MVI and 99.3% of EVI were avoidable either treatable or preventable.

Refractive Error, Presbyopia and Functional Low Vision

The prevalence of refractive errors among the people at aged 50 years and above was found to be 15.7%. A total of 71.1% of them were not wearing spectacles for distance correction.

Based on the assumption that all the people 50 years and over need near vision correction, the survey found that only 87.1% of them were not having near correction.

The prevalence of functional low vision (not due to cataract or refractive error) was found to be 1.0% among people aged 50 years and above in this survey.

Cataract Surgical Coverage

The cataract surgical coverage (at least one eye operated) among the bilaterally blind persons was found to be 95.3%. Similarly, the coverage was found 89.0 % and 71.5 % in vision category of <6/60 and < 6/18 respectively.

Among the cataract affected eyes, the surgical coverage was 84.9%, 76.7% and 57.5% in the vision category of <3/60 <6/60 and <6/18 respectively.

Visual Outcome of Cataract Surgery

A great majority (71.9%) of the cataract surgeries were performed in community eye camps with 25.4% of the surgeries conducted in NGO run eye hospitals.

Good visual outcome of cataract surgery (PVA 6/18 or better) according to the WHO standard was found among 69.1 % of the operated eyes from the eye camps. This was further improved to 83.3% after best correction. Poor outcome (PVA <6/60) was found among 11.2 % of the cataract operated eyes.

The major causes of poor visual outcome were ocular comorbidities as 29.0%, sequelae or long-term surgical complications as 28.6%. Inadequate optical correction/wearing no spectacles as 25.2% and immediate surgical complications as 16.8% were other causes for poor visual outcome of cataract surgery found in this province.

Barriers to Cataract Surgery

Affordability (39.7%) and accessibility (38.1%) were the most prominent reasons among the people with bilateral operable cataract (BCVA <6/60 in the better eye) for not seeking cataract surgical services.

Diabetes and Diabetes Retinopathy

The total prevalence of diabetes among the people aged 50 years and above in this survey was 1.9 %. The prevalence of any grade of diabetic retinopathy was found 5.2 % among the people with diabetes.

Conclusion

Blindness and Visual Impairment still remains as a major public health problem among the people aged 50 years and above in Karnali Province, of Nepal. The evidence that more than two third of cataract surgeries performed in community eye camps clearly shows the inadequacy of eye care infrastructures in this province. The visual outcome of cataract surgery below the WHO standards suggests further improvement in quality of surgical services. Persistent back log of vision impairing cataract can further be explained by the prominent barriers related to affordability and accessibility prevailing among the people. Along with cataract and posterior segment diseases as leading causes of blindness and visual impairment, other problems such as uncorrected refractive error, diabetic retinopathy and functional low vision are major issues to be resolved by the eye care system in the province.

To conclude, this survey provides evidence of public health significance regarding the magnitude of blindness and visual impairment, its causes and performance evaluation of ongoing eye care programs in the province. The information from this survey will help the concerned decision makers to formulate appropriate strategies to combat this needless burden of avoidable blindness and visual impairment.

CHAPTER-I: INTRODUCTION

1.1 Eye Care in Karnali Province

Karnali is one of the richest provinces by natural resources however, least developed by multiple development indicators among 7 provinces. The main hinderence of Karnali Province to development is poverty, difficult terrain, social discrimination and unequal distribution of resources, lack of awareness and lack of means of transportation. Dolpa and Humla districts are still not accessible by road. The total population of the province is 1.7 Million with the average HDI is 0.469 (HDI 2015).

The eye care services in Karnali Province are mainly provided by NRCS and NNJS with the support of SRC and Eye Care Foundation (ECF) - a Dutch INGO. There is only one Eye Hospital run by Nepal Red Cross Society in Birendranagar Surkhet capital of Karnali province with 11 eye care centres in different districts of this province. Out of 7 eye care centres are run by NNJS. These institutions treat approx. 100,000 cases and carry out about 5,000 surgeries per annum. Providing eye care service in this province is very costly due to geographic difficulties.

Eye care services are covered under government insurance policy. The Government has addressed the "Eye, ENT and Oral Health" in health policy. Provincial government has given priority for eye care service development however province has no separate eye care policy. Integration of eye care service within the government health care system is going on in collaboration with provincial and local government.

To identify the prevalence of blindness of this province, RAAB survey was carried out in the leadership of Karnali province Ministry of Social Development through Surkhet Eye Hospital. Provincial government of Karnali, Eye Care Foundation and Swiss Red Cross have contributed significance finance for implementation of the Survey. The RAAB survey was successfully completed with collaboration and technical support of NNJS, Himalaya Eye Hospital, Rapti Eye Hospital and Fateh Bal Eye Hospital. The International Agency for the Prevention of Blindness has supported with external RAAB expert for this survey.

1.2 Background

The first nationwide epidemiological blindness survey was conducted in 1981 to estimate the prevalence and causes of blindness in Nepal. The survey was the first activity of the Nepal Blindness Prevention and Control Project, a joint initiative of the then Government of Nepal and World Health Organization. The survey estimated prevalence of bilateral blindness 0.84%, unilateral blindness 1.66% and low vision 1.85% in the Nepalese population. Cataract was found to be the leading cause of blindness accounting for 80% of all avoidable blindness⁽¹⁾. The findings of the first blindness survey were enormous milestones for the development of one of the efficient and elaborate eye health systems that exists in Nepal after more than 3 decades⁽²⁾.

In 1995, a population based cross sectional study was done among 5112 people aged 45 years and above in Bheri and Lumbini zones of Nepal by using stratified cluster sampling design. The main purpose of the study was to estimate prevalence and causes of blindness and visual impairment and to assess the impact after 1981 blindness survey. The study revealed the prevalence of blindness reduced from 5.45% (in 50 years and above) in 1981 to 3.0% in population aged 45 years and above. Cataract surgical coverage among bilateral cataract blind people increased from 35.0% in 1981 to 58.0% in 1995. But, almost 30% of the cataract operated cases were still blind or with severe visual impairment⁽³⁾.

Two customized population-based blindness surveys were conducted between 2002 and 2006 in Gandaki, Lumbini and Narayani zones of Nepal by using stratified cluster sampling and multi stage cluster sampling techniques respectively^(4, 5). The study from the Gandaki zone among 5863 people aged 45 years and above found the prevalence of blindness 2.6% and cataract as the leading cause of blindness in 60.5%. Cataract surgical coverage was found to be improved reaching to 59.5% among the cataract blind people⁽⁴⁾.

Another population based cross sectional study conducted among 5138 people aged 50 years and above in Lumbini and Narayani zones of Nepal found the age and sex adjusted prevalence of Blindness and Visual Impairment to be 4.6% and 18.9% respectively. The overall cataract surgical coverage was found to be 66.6% among the cataract blind people⁽⁵⁾.

Eleven Rapid Assessment of Avoidable Blindness (RAAB) surveys were conducted from 2006-2010 in different zones of Nepal. The main purpose of these surveys was to assess the prevalence of blindness and visual impairment, to evaluate the impact of eye care delivery system of Nepal after 1981 National Blindness Survey. The prevalence of blindness was found reduced from 0.84% in 1981 to an estimated 0.35% in 2011, a 58% reduction. Cataract was still found to be the leading cause of blindness and quality of cataract surgery improved but still did not meet the WHO standard⁽⁶⁾.

Towards Universal Eye Health: A Global Action Plan (GAP) 2014-2019 was endorsed and adopted by its member countries at the Sixty Sixth World Health Assembly in 2013 in Geneva, Switzerland. The vision of the global action plan is 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⁽⁷⁾.

Nepal has already been one of the signatories of the Global Action Plan 2014-2019 at the World Health Assembly in 2013 and has complied to operationalize the global target of reducing prevalence of avoidable visual impairment by 25% from the baseline of 2010 by 2019. It strongly recommends conducting populationbased surveys to provide evidences on magnitude and causes of blindness and visual impairment for planning and evaluating impact of eye health programs.

More than 80% of the avoidable blindness and visual impairment resides among the people aged 50 years and above mainly caused by cataract and uncorrected refractive errors alone⁽⁸⁾.So, the greatest gains will be achieved through reduction of prevalence of avoidable visual impairment among the population aged 50 years and above.

1.3 Problem Statement

There is paucity of current evidence on the prevalence, trend and causes of visual impairment in Nepal since the completion of population surveys in 2010 to inform the evidence based decision making for formulating plans, policies and strategies to accomplish the unfinished agenda of The Vision 2020: The Right to Sight, a global initiative of the World Health Organization (WHO) and International Agency for Prevention of Avoidable Blindness (IAPB).

KarnaliProvince is one of seven provinces of the Federal Democratic Republic of Nepal as provisioned by the new constitution which came on effect on September 2015. The total area of the province is 27,984 square kilometers making it the largest province in Nepal. According to the 2011 Nepal census, the population of the province was 1,570,418 (male 767,923 and female 802,495), making it the least populous province in Nepal. The total number of people 50 years and above in this province was 190,016 (male 96,844 and female 93,172).

In the new political and administration system, health service delivery is the main responsibility of provincial government. Hence, a population based RAAB survey was conducted for assessing the prevalence and causes of blindness and visual impairment in this province in order to provide the evidence for monitoring the target set by the WHO GAP 2014-2019.

1.4 Rationale of the Survey

The survey aimed to assess the prevalence of blindness and visual impairment among the selected participants of aged 50 years and above in the Karnali Provinceof Nepal by using RAAB survey methodology. The findings from this survey will inform the decision makers to plan universal, equitable and sustainable eye care policies and programs for the future.

1.5 General Objective

The main objective of the survey was to assess the magnitude and causes of blindness and visual impairment among people 50 years and above, impact of eye care services, in Karnali Provinceof Nepal by using epidemiologically sound survey methodology.

1.6 Specific Objectives

The specific objectives of the survey were to assess:

- Prevalence of blindness and visual impairment from all causes
- Prevalence of blindness and visual impairment from avoidable causes
- Prevalence of blindness and visual impairment from cataract
- Main causes of blindness and visual impairment
- Cataract surgical coverages
- Visual outcomes of cataract surgery
- Causeofpooroutcome after surgery
- Barriers to cataract surgical services
- Prevalence of uncorrected refractive errors, presbyopia and low vision
- Prevalence of diabetic retinopathy

CHAPTER-II: METHODOLOGY

This cross-sectionalpopulation-based blindness survey was conducted in Karnali Provinceof Nepal by using standardized RAAB methodology in 2019 by Nepal Red Cross Society Surkhet Eye Hospital under the aegis of the SwissRed Cross. It was accomplished with the technical support from the International Agency for Prevention of Avoidable Blindness, South East Asia.

2.1 Study Population

The study population was adults living in Karnali Province who were aged 50 years or older at the time of data collection

2.2 Sampling Frame

The national census data of 2011 was used for creating the sampling frame. Based on the census data, ward level population was used as population unit/cluster. Thus, a total of 3,118 population units were created which formed the sampling frame for this survey.

2.3 Sample Size

The total sample size required was 4,067 people, distributed across 166 clusters of 35 people 50 years or older in each. Sample size calculations were perfomed using the RAAB7 software. We assumed a prevelance of bilateral blindndess of 2.5% (P). This was based on the observed prevalence of blindess in Nepal in the previous RAAB survey, a worst tolerable alfa error consideration of 20% (D), 95% cofidence level (Z=1.96), and 10% non-reponse rate. The formula used for the sample size calcuation was N = $(1.96)^2(P(1-P))/D^*D$. As we used cluster sampling, adjusting cluster design effect of 1.4 for the cluster size of 35 people with 10% non-response rate required sample size was4,067people. In order to enroll adequate sample in the survey, a total of 117 clusters were randomly selected from the sampling frame according to population proportionate to size.

2.4 Recruitment Approach

The sampling frame for the survey was a list of wards, obtained from the 2011 census data. Each ward was considered a cluster. A total of 3,118 clusters were available for random selection in Karnali Province; 117 clusters were randomly selected using a probability proportional to size approach based on the clusters' population size.

The survey teams, accompanied by a local guide, visited all households in the selected clusters door-todoor until 35 people aged 50 years or older were identified. The purposes of the study and examination procedure were explained to the subjects and informed consent was sought before data collection.

In cases where an eligible person lived in one of the visited households but was not present at the time of data collection, the survey team returned to their household once again on the same day to examine them. If they still could not be examined, information about their visual status was collected from relatives or neighbors. If the data collection team visited all households in a cluster but failed to identify 35 eligible residents, then the team continued recruitment in the closest cluster

2.5 Data Collection Process

Three teams were trained for data collection in this survey. In the selected clusters, the team led by an Ophthalmologist visited house to house to enroll the eligible survey participants. After informed written consent, the eligible survey participants underwent visual acuity assessment, anterior segment examination with torch light and media and fundus examination with direct ophthalmoscope. The data collection was done in tablelts with mRAAB7 data collection software installed.

In this survey, we also included the Diabetic Retinopathy module of RAAB7. All eligible participants also underwent for blood glucose test. Participants with random blood glucose 200 mg/dl and known daibetic participants also underwent detail fundus examiantion to assess the Diabetic Retinopathy.

2.6 Ethical Consideration

The survey confirms to the tenets of the Declaration of Helsinki. The survey protocol was reviewed and approved by Nepal Health Research Council under the Ministry of Health, Government of Nepal. Before enrollment and examination, all eligible participants were explained about the purpose and procedures of the survey. Written informed consent was taken from each respondent to voluntarilly participate in data collection and examination procedures. Appropriate remedial actions were taken to address any eye and other health related problems if found among the participants.

2.7 Operational Definitions

We will refer to key indicators of eye health throughout the remainder of this report. In this section, we provide a list of abbreviations as well as the definition of key indicators used.

Blindness : A study participant having presenting visual acuity (PVA) < 3/60 in the better was considered as blind.

Presenting Visual Acuity(PVA) : Visual Acuity measured with available correction if any.

Bset Corrected Visual Acuity(BCVA) : Visual Acuity measured and recorded after pinhole correction. Blindness and Visual Impairment due to cataract in this survey were based on the BCVA.

Severe Visual Impairment(SVI) : Ptresenting Visual Acuity of < 6/60 – 3/60 in the better eye was considered as SVI.

Modewrate Visual Impairment(MVI): Presenting Visual Acuity of < 6/18 – 6/60 in the better eye was considered as MVI.

Early Visual Impairment(EVI) : Mild visual impairment with presenting visual acuity of <6/12 – 6/18 in the better eye was considered as EVI.

Functional Low Vision (FLV): Best corrected visual acuity of < 6/18 - PL+ in the better eye (not due to cataract or refractive error) was considered as FLV.

CHAPTER-III: FINDINGS

3.1 Response Rate

Out of the total 4,067 enrolled participants, 3,983 were included in the survey for data collection and analysis yielding response rate of 97.9 %. Among the enrolled participants, 68(1.7%)people were absent during home visits, 2 people refused to be examined and 14(0.3%) were unable to communicate. So they were excluded for the survey purpose (Table 1).

Study Participants	Examined		Not Available		Refused		Not Capable		Total Enrolled	
	n	%	n	%	n	%	n	%	n	%
Male	1869	97.8	38	2.0	0	0.0	4	0.2	1911	100.0
Female	2114	98.1	30	1.4	2	0.1	10	0.5	2156	100.0
Total	3983	97.9	68	1.7	2	0.0	14	0.3	4067	100.0

Table 1: Eligible Participants, Coverage and Refusals

3.2 Age and Sex Distribution of the Study Participants

The age distribution comprises of 50 years and above in which most of the participants 1818(45.5%) were from age group 50-59 years with successive decreasing rate being lowest 168(4.2%) at 80 years and above(Table 2).

Table 2: Age and	Sex Distribution	of the Stud	y Participants
------------------	-------------------------	-------------	----------------

Age Group (in	Ма	ale	Fen	nale	Total		
years)	n	%	n	%	n	%	
50-59	804	43.0	1014	48.0	1818	45.5	
60-69	620	33.2	632	29.9	1252	31.4	
70-79	362	19.4	383	18.1	745	18.7	
80 above 83 4.4		85	4.0	168	4.2		
Total	1869	100.0	2114	100.0	3983	100.0	

3.3 Age and Sex Distribution of People 50 years and above in the Survey Area

According to the national census 2011 conducted by the National Bureau of Statistics, there were 190016 (male 96844 and female 93172) people aged 50 years and above in the province. There were highest

number of people92739 (48.8%) aged 50-59 years with successive decreasing rate being lowest 6123 (3.2%) aged 80 years and above. So, the sample distribution was true representative of the total population in this survey (Table 3).

Age Group	Ma	ale	Fen	nale	Total		
(in years)	n	%	n	%	n	%	
50 –59	48409	50.0	44330	47.6	92739	48.8	
60 - 69	33444	34.5	34862	37.4	68306	35.9	
70 – 79	11958	12.3	10890	11.7	22848	12.0	
80 above	3033	3.1	3090	3.3	6123	3.2	
Total	96844	100.0	93172	100.0	190016	100.0	

Table 3: Age and	Sex Distribution of Peo	ole 50 years and ab	pove in the Survey Area
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Figure 1: Distribution of male and female in sample and survey area



3.4 Crude Prevalence of Blindness and Visual Impairment

In this survey, overall prevalence of bilateral blindness based on presenting visual acuity <3/60 in better eye, in the sample population was found to be 1.0% (95% CI 0.7- 1.4). The prevalence of bilateral severe visual impairment, moderate visual impairment and early visual impairment were 1.7%, 9.2% and 10.7% respectively (Table 4).

Vision Category	Male, % (95% CI)	Female,% (95% CI)	All,% (95% Cl)
Blindness	1.2(0.7- 1.7)	0.9 (0.4 - 1.4)	1.0 (0.7 - 1.4)
Severe Visual impairment	1.6(0.9 - 2.3)	1.7(1.0 - 2.4)	1.7(1.2 – 2.1)
Moderate Visual Impairment	7.9(6.4 - 9.4)	10.4(8.7 – 12.0)	9.2(7.9 - 10.5)
Early Visual impairment	10.9(9.3 - 12.5)	10.4(8.8 – 12.0)	10.7(9.3 – 12.0)

Table 4: Crude Prevalence of Blindness and Visual Impairment









3.4.1 Age and Sex Adjusted Prevalence for All Causes of Blindness and Visual Impairment

The age and sex adjusted prevalence of bilateral blindness based on the presenting visual acuity <3/60 in the better eye was 0.9% (95% CI 0.6 - 1.3). The prevalence of blindness in male was found relatively more 1.1% (95% CI 0.6- 1.6) compared to that of female 0.8% (95% CI 0.3-1.2). Similarly, age and sex adjusted prevalence of severe visual impairment, moderate visual impairment and early visual impairment were estimated to be 1.4% (95%CI 0.9-1.8), 8.1% (95%CI 6.8-9.4) and 10.0% (95%CI 8.7-11.4) respectively.

The survey estimated a total 1,738 people aged 50 years and above with both eyes blind in the same age group total population of the survey province. The survey also estimated a total 2,564 people with bilateral severe visual impairment, 15,400 people with bilateral moderate visual impairment and 19,088 people with bilateral early visual impairment. It is estimated that total 14,441 eyes were blind due to various causes in this province (Table 5).

Table 5: Age and Sex Adjusted Prevalence for All Causes of Blindness and Visual Impairm

	Male			Female			All			
	n	%	95%CI	n	%	95%CI	n	%	95%CI	
Blindness – PVA < 3/60 in the better eye										
Persons	1033	1.1	0.6-1.6	705	0.8	0.3-1.2	1738	0.9	0.6-1.3	
Eyes	7808	4.0	3.3-4.8	6633	3.6	2.9-4.3	14441	3.8	3.3-4.3	
Severe visual impairment (SVI) – PVA <6/60 – 3/60 in the better eye										
Persons	1313	1.4	0.7-2.0	1251	1.3	0.7-2.0	2564	1.4	0.9-1.8	
Eyes	4545	2.3	1.7-3.0	5021	2.7	2.0-3.4	9566	2.5	2.0-3.0	

Table 5: continued...

		Male	•		Femal	9		All			
	n	%	95%CI	n % 95		95%CI	n	%	95%CI		
Moderate Visual Impairment (MVI) – PVA < 6/18 – 6/60 in the better eye											
Persons	6324	6.5	5.1-8.0	9076	9.7	8.1-11.4	15400	8.1	6.8-9.4		
Eyes	16693	8.6	7.2-10.0	21674	11.6	10.1-13.2	38367	10.1	8.8-11.4		
Early Visua	ıl Impairı	nent (E	EVI) – PVA <	< 6/12 – 6 /1	8 in the	better eye					
Persons	9704	10.0	8.4011.6	9384	10.1	8.4-11.7	19088	10.0	8.7-11.4		
Eyes	20512	10.6	9.2-12.0	20797	11.2	9.7-12.6	41309	10.9	9.7-12.0		



Figure 4: Age and Sex Adjusted Prevalence for All Causes of Blindness and Visual Impairment

3.4.2 Age and Sex AdjustedCumulative Prevalence for All Causes of Blindness and Visual Impairment

The age and sex adjusted cumulative prevalencerates in persons and eyes were estimated based on different visual acuity cut off categories. The cumulative prevalence rates were 0.9 % (95% CI 0.6-1.3), 2.3% (95% CI 1.6-2.9), 10.4% (95% CI 8.9-11.9) and 20.4% (95% CI 18.4-22.4) with PVA cut off at <3/60, <6/60<6/18 and <6/12 respectively. The survey estimated a total of 38791 persons aged 50 years and above and103684 eyes with VA<6/12 in the province(Table 6).

Table 6: Age and Sex Adjusted Cumulative Prevalence for All Causes of Blindness and Visual Impairment

		Male			Fema	le		Total	
	n	%	95% CI	n	%	95% CI	n	%	95% CI
Blindness -	- PVA < 3/	60 in the	e better eye						
Persons	1033	1.1	0.6-1.6	705	0.8	0.3-1.2	1738	0.9	0.6-1.3
Eyes	7808	4.0	3.3-4.8	6633	3.6	2.9-4.3	14441	3.8	3.3-4.3
PVA < 6/60	in the bet	ter eye							
Persons	2347	2.4	1.6-3.2	1955	2.1	1.3-2.9	4302	2.3	1.6-2.9
Eyes	12353	6.4	5.3-7.4	11654	6.3	5.3-7.2	24007	6.3	5.6-7.1
PVA <6/18 i	n the bett	er eye							
Persons	8671	9.0	7.2-10.7	11032	11.8	10.0-13.7	19703	10.4	8.9-11.9
Eyes	29046	15.0	13.1-16.9	33330	17.9	15.9-19.8	62376	16.4	14.8-18.0
PVA < 6/12	in the bet	ter eye							
Persons	18375	19.0	16.6-21.3	20416	21.9	19.5-24.3	38791	20.4	18.4-22.4
Eyes	49558	25.6	23.3-27.9	54126	29.0	26.6-31.5	103684	27.3	25.2-29.4

Figure 5: Estimated burden of blindness in Karnali Province







3.4.3 Prevalence of Blindness According to Age Group

The prevalence of blindness among survey participants aged 50 years and above was 1.0%(95%CI 0.7-1.4) and increased with age. The prevalence of bilateral blindness was found maximum 4.8%(95%CI 1.6-7.9) among the participants aged 80 years and above (Table 7).

Prevalence of Bilateral Blindness according to age group – PVA < 3/60 in the better eye										
		Male			Femal	е	Total			
Age Group	n	%	95% CI	n	%	95% CI	n	%	95% CI	
50 – 59	6	0.8	0.2-1.3	4	0.4	0.0-0.8	10	0.6	0.2-0.9	
60 - 69	6	1.0	0.2-1.7	3	0.5	0.0-1.0	9	0.7	0.3-1.2	
70 – 79	5	1.4	0.2-2.6	9	2.4	0.9-3.8	14	1.9	0.9-2.9	
80 above	5	6.0	0.9-11.1	3	3.5	0.0-7.5	8	4.8	1.6-7.9	
Total	22	1.2	0.7-1.7	19	0.9	0.4-1.4	41	1.0	0.7-1.4	

Table 7: Prevalence of Blindness According to Age Group



Figure 7: Prevalence of Blindness According to Age Group

3.5 CrudePrevalence of Blindness and Visual Impairment due to Cataract

Prevalence of bilateral blindness due to cataract based on the best corrected visual acuity was 0.4% (95% CI 0.2-0.6) among the survey participants aged 50 years and above. Similarly prevalence rates of bilateral severe visual impairment, moderate visual impairment and early visual impairment due to cataract were 1.0 % (95% CI 0.7-1.3), 3.7 % (95% CI 3.0-4.4) and 7.8 % (95% CI 6.7-8.8) respectively (Table 8).

		Male	9		Femal	е	Total		
	n	%	95%CI	n	%	95%CI	n	%	95%CI
Cataract with BCVA <	3/60 in	better e	eye						
Bilateral cataract	5	0.4	0.1-0.7	7	0.3	0.1-0.6	15	0.4	0.2-0.6
Unilateral cataract	52	2.8	2.0-3.6	54	2.6	1.9-3.3	106	2.7	2.1-3.2
Cataract eyes	68	1.8	1.0-1.8	68	1.6	0.8-1.6	136	1.7	1.0-1.6
		Ma	e		Fer	nale		Tot	al
	n	%	95%CI	n	%	95%C	l n	%	95%CI
Cataract with BCVA <	6/60-3/	60 in be	etter eye						
Bilateral cataract	20	1.1	0.6-1.5	20	1.(0.5-1.	3 40	1.0	0.7-1.3
Unilateral cataract	67	3.6	2.1-3.9	86	4.1	2.5-4.	0 153	3.8	2.5-3.8
Cataract eyes	107	2.9	2.2-3.5	126	3.0) 2.4-3.	6 233	2.9	2.4-3.4

Table 8: Crud	e Prevalence o	f Blindness a	nd Visual Im	pairment du	le to Cataract

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Cataract with BCVA < 6/18 – 6/60 in better eye												
Bilateral cataract	62	3.3	2.4-4.2	85	4.0	2.9-5.1	147	3.7	3.0-4.4			
Unilateral cataract	112	6.0	4.9-7.1	160	7.6	6.4-8.7	272	6.8	6.0-7.7			
Cataract eyes 236 6.0 5.3-7.4 330 7.8 6.6-9.0 566 7.1 6.2-8.0												
Cataract with BCVA <	:6/ 12-6 /1	8 in bet	ter eye									
Bilateral cataract	129	6.9	5.6-8.2	180	8.5	7.0- 10.0	309	7.8	6.7-8.8			
Unilateral cataract	Unilateral cataract 130 7.0 5.7-8.2 170 8.0 6.7-9.3 300 7.5 6.6-8.5											
Cataract eyes	388	10.4	9.0-11.8	530	12.5	10.9- 14.2	918	11.5	10.3- 12.8			

Figure 8: Crude prevalence of blindness and visual impairment due to cataract







Crude prevalence of EVI due to cataract



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3.5.1 Age and SexAdjusted Prevalence of Blindness and Visual Impairment due to Cataract

The age and sex adjusted prevalence of bilateral blindness (BCVA <3/60 in the better eye) due to cataract in the province was estimated to be 0.3% (95% CI 0.2-0.5). The prevalence rates of bilateral severe visual impairment, moderate visual impairment and early visual impairment were 0.5% (95% CI 0.2-0.8), 2.3% (95% CI 1.7-3.0) and 1.8 (95% CI 1.0-2.6) respectively. By using these adjusted prevalence rates, there were 639 bilaterally blind people due to cataract in the province.

Similarly, the survey estimated a total 942 people with bilaterally severe visual impairment, 4423 people with moderate visual impairment and 6823 people with early visual impairment due to cataract among the population aged 50 years and above in the province.

The total number of cataracts affected blind eyes 5723, severely visual impaired eyes 3841, moderately visually impaired eyes 13764 and early visual impaired eyes 15231 were estimated in the population aged 50 years and above in the province (Table 9).

		Male			Femal	e		Total	
	n	%	95%CI	n	%	95%CI	n	%	95%CI
Cataract with BCVA	<3/60 in	the be	etter eye						
Bilateral Cataract	371	0.4	0.1-0.7	268	0.3	0.0-0.5	639	0.3	0.2-0.5
Unilateral Cataract	2295	2.4	1.7-3.1	2149	2.3	1.8-2.8	4444	2.3	1.9-2.8
Cataract Eyes	3036	1.6	1.1-2.0	2687	1.4	1.0-1.9	5723	1.5	1.2-1.8
Cataract with BCVA <6/60 – 3/60 in the better eye									-
Bilateral Cataract	533	0.6	0.2-0.9	409	0.4	0.1-0.8	942	0.5	0.2-0.8
Unilateral Cataract	661	0.7	0.4-1.0	1297	1.4	1.0-1.8	1958	1.0	0.8-1.3
Cataract Eyes	1725	0.9	0.5-1.3	2116	1.1	0.7-1.6	3841	1.0	0.7-1.3
Cataract with BCVA	<6/18 – 6	6/60 in	the bette	r eye					
Bilateral Cataract	1775	1.8	1.1-2.5	2648	2.8	1.8-3.8	4423	2.3	1.7-3.0
Unilateral Cataract	1919	2.0	1.3-2.6	2999	3.2	2.6-3.8	4918	2.6	2.1-3.0
Cataract Eyes	5467	2.8	2.0-3.6	8297	4.5	3.5-5.4	13764	3.6	2.9-4.3

Table 9: Age and Sex Adjusted Prevalence of Blindness and Visual Impairment due to Cataract

Table 9 Continued......

Cataract with BCVA <6/12 – 6/18 in the better eye											
Bilateral Cataract 2834 1.5 0.6-2.4 3989 2.1 1.1-3.2 6823 1.8 1.0-2.6											
Unilateral Cataract	1028	0.5	-0.2-1.3	555	0.3	-0.7-1.3	1583	0.4	-0.3-1.1		
Cataract Eyes	6696	3.5	2.6-4.3	8535	4.6	3.6-5.6	15231	4.0	3.2-4.8		



Figure 9: Age and Sex Adjusted Prevalence of Blindness and Visual Impairment due to Cataract

3.5.2 Age and Sex Adjusted Cumulative Prevalence of Blindness and Visual impairment due to Cataract

The cumulative prevalence rates of blindness and visual impairment due to cataract at each VA cut off <3/60, <6/60, <6/18 and <6/12 were estimated as shown in the Table 10. If we consider the cataract affected eye with BCVA <6/60 is operable, the survey estimates that the total backlog of people having bilateral operable cataract was 1580 and total number of operable eyes was 9562 in the province(Table 10).

Table 10: Age and Sex Adjusted Cumulative Prevalence of Cataract with VA cut off <3/60, <6/60, <6/18 and <6/12

		Male	•		Fema	e		Tota	I		
	n	%	95%CI	n	%	95%CI	n	%	95%CI		
Cataract with B	CVA <3/6	0 in th	ne better e	ye							
Bilateral	371	0.4	0.1-0.7	268	0.3	0.0-0.5	639	0.3	0.2-0.5		
Unilateral	2295	2.4	1.7-3.1	2149	2.3	1.8-2.8	4444	2.3	1.9-2.8		
Cataract Eyes	3036	1.6	1.1-2.0	2687	1.4	1.0-1.9	5723	1.5	1.2-1.8		
Cataract with BCVA <6/60 in the better eye											
Bilateral	903	0.9	0.5-1.4	677	0.7	0.3-1.1	1580	0.8	0.5-1.2		
Unilateral t	2957	3.1	2.3-3.8	3447	3.7	3.1-4.3	6404	3.4	2.9-3.9		
Cataract Eyes	4761	2.5	1.8-3.1	4801	2.6	2.0-3.2	9562	2.5	2.0-3.0		
Cataract with B	CVA <6/1	8 in th	ne better e	ye							
Bilateral	2678	2.8	1.9-3.6	3326	3.6	2.5-4.7	6004	3.2	2.4-3.9		
Unilateral	4875	5.0	4.0-6.1	6445	6.9	6.0-7.8	11320	6.0	5.3-6.7		
Cataract Eyes	10228	5.3	4.2-6.3	13097	7.0	5.8-8.2	23325	6.1	5.3-7.0		
Cataract with B	CVA <6/1	2 in th	ne better e	ye							
Bilateral	5512	5.7	4.4-7.0	7316	7.9	6.4-9.3	12828	6.8	5.7-7.8		
Unilateral	5903	6.1	4.9-7.3	7001	7.5	6.2-8.8	12904	6.8	5.8-7.7		
Cataract Eyes	16927	8.7	7.3-10.2	21632	11.6	10.0-13.2	38559	10.1	8.9-11.4		

Figure 10: Estimated backlog of cataract causing blindness and VI





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3.6 Cataract Surgical Coverage

The cataract surgical coverage (at least one eye operated) among the bilaterally blind persons was found to be 95.3% (male 94.2% and female 96.2%). Among the cataract blind eyes, the surgical coverage was 84.9% (male 82.8% and female 86.6%). Effective cataract surgical coverages (with good outcome VA 6/18 or better) among the bilaterally blind persons was77.7% and that of bilateral severe visual impairment was 70.9% (Table 11).

Vision Category	Male	Female	Total	
Cataract Surgical Covera	ge (Persons) – percent	ages		
VA <3/60	94.2	96.2	95.3	
VA <6/60	87.3	90.3	89.0	
VA <6/18	71.7	71.3	71.5	
Cataract Surgical Covera				
VA <3/60	82.8	86.6	84.9	
VA <6/60	75.4	77.7	76.7	
VA <6/18	58.2	57.1	57.5	
Effective Cataract Surgic	al Coverage (persons) ·	 percentages 		
VA < 3/60	77.779.775.2			
VA < 6/60	70.973.068.2			
VA < 6/18	53.854.752.5			

Table 11: Cataract Surgical Coverage

Figure 11: Cataract surgical coverage and effective cataract surgical coverage





3.7 Causes of Blindness and Visual Impairment

The main cause of bilateral blindness PVA<3/60 was untreated cataract (61.0%) followed by other posterior segment diseases (12.2%), non-trachomatous corneal opacity and all other globe/CNS abnormalities as 7.3 % each. Phthisis as 4.9%, uncorrected refractive errors as 2.4%, glaucoma as 2.4% and cataract surgical complications as 2.4% were other causes of blindness.

Cataract was still the leading cause for severe visual impairment and moderate visual impairment as 80.3% and 58.9% respectively. Uncorrected refractive error accounted for the leading cause of early visual impairment as 78.5% and second leading cause of moderate visual impairment as 28.3% (Table 12).

	Blir	Idness	Se	vere VI	Mode	rate VI	Ea	rly VI
Causes	n	%	n	%	n	%	n	%
Refractive Error	1	2.4	4	6.1	104	28.3	333	78.5
Cataract untreated	25	61.0	53	80.3	216	58.9	82	19.3
Aphakia uncorrected	0	0.0	1	1.5	1	0.3	1	0.2
Cataract surgical complications	1	2.4	2	3.0	24	6.5	3	0.7
Pterygium	0	0.0	0	0.0	0	0.0	0	0.0
Non trachomatous corneal opacity	3	7.3	1	1.5	4	1.1	1	0.2
Phthisis	2	4.9	0	0.0	0	0.0	0	0.0
Onchocerciasis	0	0.0	0	0.0	0	0.0	1	0.2
Glaucoma	1	2.4	1	1.5	1	0.3	0	0.0
Diabetic retinopathy	0	0.0	0	0.0	0	0.0	0	0.0
ARMD	0	0.0	2	3.0	9	2.5	1	0.2
Other posterior segment diseases	5	12.2	1	1.5	5	1.4	1	0.2
All other globe/CNS abnormalities	3	7.3	1	1.5	3	0.8	1	0.2
Total	41	100.0	66	100.0	367	100.0	424	100.0

Table 12: Causes of Bilateral Blindness and Visual Impairment among the Sample Population

3.7.1 Causes of Blindness in Eyes

The leading causes of unilateral blindness in eyes were cataract (49.4%) followed by other posterior segment diseases (11.0%), non-trachomatous corneal opacities (10.4%), Phthisis (10.1% each), cataract surgical complications (4.2%) and glaucoma (3.0%) respectively (Table 13).

Table 13: Causes of Blindness in Eyes

Causes of Blindness	Ма	le	Fer	Female		Total	
Causes of Dimuness	n	%	n	%	n	%	
Refractive Error	1	0.6	1	0.6	2	0.6	
Cataract untreated	80	47.3	86	51.5	166	49.4	
Aphakia uncorrected	2	1.2	0	0.0	2	0.6	
cataract surgical complications	6	3.6	8	4.8	14	4.2	
Trachomatous Corneal Opacity	0	0.0	0	0.0	0	0.0	
Non trachomatous corneal opacity	15	8.9	20	12.0	35	10.4	
Phthisis	15	8.9	19	11.4	34	10.1	
Onchocerciasis	0	0.0	0	0.0	0	0.0	
Glaucoma	6	3.6	4	2.4	10	3.0	
Diabetic retinopathy	0	0.0	0	0.0	0	0.0	
ARMD	3	1.8	1	0.6	4	1.2	
Other posterior segment diseases	19	11.2	18	10.8	37	11.0	
All other globe/CNS abnormalities	22	13.0	10	6.0	32	9.5	
Total	169	100.0	167	100.0	336	100.0	

Figure 13: Causes of blindness and VI



3.8 Visual Outcome of Cataract Surgery

Good visual outcome of cataract surgery (PVA 6/18 or better) according to the WHO standard was found among 69.1 % of the operated eyes. This was further improved to 883.3% after best correction (Table 14).

Category of Presenting Visual	Non	- IOL	IO	L	Total		
Acuity (PVA)	n	%	n	%	n	%	
Very good: can see 6/12	8	26.7	414	56.0	422	54.9	
Good: can see 6/18	6	20.0	103	13.9	109	14.2	
Borderline: can see 6/60	8	26.7	144	19.5	152	19.8	
Poor: cannot see 6/60	8	26.7	78	10.6	86	11.2	
Total	30	100.0	739	100.0	769	100.0	
Visual Outcome in Cataract Op	perated Ey	yes with B	est Correcti	ion in the S	Sample (n=7	69)	
Category of Best Corrected	Non - IOL		IO	L	Total		
Visual Acuity (BCVA)	n	%	n	%	n	%	
Very good: can see 6/12	14	46.7	556	75.2	570	74.1	
Good: can see 6/18	2	6.7	69	9.3	71	9.2	
Borderline: can see 6/60	10	33.3	56	7.6	66	8.6	
Poor: cannot see 6/60	4	13.3	58	7.8	62	8.1	
Total	30	100.0	739	100.0	769	100.0	

Table 14: Visual Outcome in Cataract Operated Eyes in the Sample

Figure 13: Visual outcome of cataract surgery



3.8.1 Visual Outcome of Cataract Surgery According to Postoperative period

Good visual outcome was seen in 79.1% of the cataract operated eyes within 3 years of postoperative period compared to that of more than 3 years after surgery (Table 15).

Visual Outcome in Cataract Operated Eyes by years after surgery (n=769)											
Category of Presenting	0-3 years		4-6 y	ears	7+ y	ears	Total				
Visual Acuity (PVA)	n	%	n	%	n	%	n	%			
Very Good:Can see 6/12	212	65.0	123	50.6	87	43.5	422	54.9			
Good:Can see 6/18	46	14.1	35	14.4	28	14.0	109	14.2			
Borderline:Can see 6/60	50	15.3	52	21.4	50	25.0	152	19.8			
Poor:Cannot see 6/60	18	5.5	33	13.6	35	17.5	86	11.2			
Total	326	100.0	243	100.0	200	100.0	769	100.0			

Table 15: Visual Outcome of Cataract Surgery According to Postoperative period

Figure 14: Visual outcome according to post-operative period



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3.8.2 Visual Outcome of Cataract Surgery According to Place of Surgery

A great majority, 71.9% of the cataract surgeries were performed in community eye camps and 25.4 % of cataract surgeries were conducted by voluntary/charitable eye hospitals (Table 16).

Discos of Surgery	Ма	le	Fem	ale	Total		
Places of Surgery	n	%	n	%	n	%	
Government Hospital	6	1.8	12	2.7	18	2.3	
Voluntary/Charitable Hospital	82	24.8	113	25.7	195	25.4	
Private Hospital	1	0.3	2	0.5	3	0.4	
Eye Camp	241	73.0	312	71.1	553	71.9	
Total	330	100.0	439	100.0	769	100.0	

Table 16: Proportion of Cataract Surgeries Performed According to Places

Figure 15: Proportion of Cataract Surgeries Performed According to Places



Good visual outcome was found in 68.0 % of the cataract operated eyes performed in community eye camps(Table 17).

Table17: Post-Operative Visual Outcome According to Place of Surgery

Post OP Presenting VA by	Post OP Presenting VA by Place of Surgery (n= no. of Eyes)											
Visual Outcome(PVA)	Government Char Hospital Hos		itable Private pital Hospital		Eye Camps		Total					
	n	%	n	%	n	%	n	%	n	%		
Very good: can see 6/12	13	72.2	113	57.9	3	100.0	293	53.0	422	54.9		
Good: can see 6/18	1	5.6	25	12.8	0	0.0	83	15.0	109	14.2		
Borderline: can see 6/60	2	11.1	32	16.4	0	0.0	118	21.3	152	19.8		
Poor: cannot see 6/60	2	11.1	25	12.8	0	0.0	59	10.7	86	11.2		
Total	18	100.0	195	100.0	3	100.0	553	100.0	769	100.0		

Figure 16: Visual Outcome of Cataract Surgery According to Place of Surgery



The major causes of poor visual outcome were ocular comorbidities as 29.0%, sequelae or long-term surgical complications as 28.6%. Inadequate optical correction/wearingno spectacles as 25.2% and immediate surgical complications as 16.8% were other causes for poor visual outcome of cataract surgery found in this province (Table 18).

Causes	Borderline Outcome		Poor O	utcome	Total		
Causes	n	%	n	%	n	%	
Comorbidity	26	17.1	43	50.0	69	29.0	
Surgery	20	13.1	20	23.0	40	16.8	
Spectacles	53	34.9	7	8.0	60	25.2	
Sequelae	53	34.9	16	19.0	68	28.6	
Total	152	100.0	86	100.0	238	100.0	

Table 18: Causes of Poor Outcome among Cataract Operated Eyes

Figure 17: Causes of poor outcome among cataract operated eyes



3.9 Barriers to Uptake Cataract Surgical Services

Among the people having bilateral cataract with BCVA <6/60, the most prominent barriers to uptake cataract surgery services were costs as 39.7% and inaccessibility as 38.1%. Lack of felt need was the only barrier perceived by the women (11.8%) that prevented them to uptake cataract surgical services (Table 19).

Bassana		Male		Female		Total	
Reasons	n	%	n	%	n	%	
Need not felt	0	0.0	4	11.8	4	6.3	
Fear of surgery	0	0.0	1	2.9	1	1.6	

Table 19: Barriers to Uptake Cataract Surgical Services among the Bilateral Cataract with BCVA <6/60

Table 19: continued...

Cost	14	48.3	11	32.4	25	39.7
Treatment denied by provider	1	3.4	1	2.9	2	3.2
Unaware treatment is possible	1	3.4	0	0.0	1	1.6
Cannot access treatment	12	41.4	12	35.3	24	38.1
Local reason	1	3.4	5	14.7	6	9.5
Total	29	100.0	34	100.0	63	100.0

Figure 18: Barriers to uptake cataract surgical services



3.10 Refractive Errors, Presbyopia and Functional Low Vision

The prevalence of refractive errors among the people at age 50 years and above was found to be 15.7%. Out of the total 626 people having refractive errors, 445 were uncorrected at the time of the survey. Thus, unmet need for refractive errors was found to be 71.1% in this age group. The spectacle coverage or the met need in this age group was 28.9%. Based on the assumption that all the people 50 years and over need near vision correction, the survey found that only 12.9% (male 19.6% and female 6.9%) of them were having near correction. The unmet need for presbyopia was found to be 87.1% (male 80.4.% and female 93.1%), (Table 21).

Uncorrected Refractive Error an	Uncorrected Refractive Error and Uncorrected Presbyopia										
Tunaa	М	ale	Fer	nale	Total						
Types	n	%	n	%	n	%					
Total Refractive Error	335	17.9	291	13.8	626	15.7					
Uncorrected Refractive Error	219	65.4	226	77.7	445	71.1					
Corrected Refractive Error	116	34.6	65	22.3	181	28.9					
Total Presbyopia	1869	46.9	2114	53.1	3983	100.0					
Uncorrected Presbyopia	1502	80.4	1968	93.1	3470	87.1					
Corrected Presbyopia	367	19.6	146	6.9	513	12.9					

Table 21: Prevalence of Uncorrected Refractive Error and Presbyopia

Out of the total 5472 people aged 50 years and above, the prevalence of functional low vision (not due to cataract and refractive error) was 1.0 % in this survey. The prevalence of functional low vision was found to be increased with age and was maximum (4.8%) in people of age 80 years and above(Table 22).

Table 22: Prevalence of Functional Low Vision

Persons with Functional Low Vision: BCVA <6/18 – PL+ in the Better Eye								
Age Group (in years)	Ма	ale	Fen	nale	То	Total		
	n	%	n	%	n	%		
50 – 59	3	0.4	7	0.7	10	0.6		
60 - 69	5	0.8	3	0.5	8	0.6		
70 – 79	5	1.4	7	1.8	12	1.6		
80+	5	6.0	3	3.5	8	4.8		
Total	18	1.0	20	1.0	38	1.0		



Figure 19: Uncorrected refractive error

Figure 20: Uncorrected presbyopia



3.11 Diabetes and Diabetic Retinopathy

Out of total 3983RAAB survey participants, Random Blood Glucose test was carried out in 3763(94.5%) people. Among them, 45(1.1%) people were Known Cases withdiabetes and 32(0.8%) were newly diagnosed cases with diabetes. So, the prevalence of diabetes among the survey participants was 1.9 % (Table 23).

Table 23: Prevalence of Diabetes among the Study Participants

Category	Male		Fem	ale	Total	
Category	n	%	n	%	n	%
RBG Taken	1784	95.5	1979	93.6	3763	94.5
RBG Refused	85	4.5	135	6.4	220	5.5

Figure 21: Functional low vision



Total	1869	100.0	2114	100.0	3983	100.0
Known Diabetes	29	1.6	16	0.8	45	1.1
Newly Diagnosed Diabetes	14	0.8	18	0.9	32	0.8
Total	43	2.4	34	1.7	77	1.9





Among the diabetic population 3.9% had some degree of retinopathy and 1.3% had maculopathy. In total 5.2% of people with diabetes had any grade of retinopathy and or maculopathy(Table 24).

Table 24: Prevalence of Diabetic Retinopathy

Retinopathy Grade	n	t Among f %) %	the Diabetic 95% CI)	Full Sample % (95 % Cl)		
No retinopathy(R0)	71	92.2	86.4-98.0	1.8	1.2-2.4	
Background DR- Mild	3	3.9	0.0-8.1	0.1	0.0-0.2	
Any Retinopathy	3	3.9	0.0-8.1	0.1	0.0-0.2	
Maculopathy grade						
No maculopathy(M0)	70	90.9	84.3-97.5	1.8	1.1-2.4	
Maculopathy-observable M1	1	1.3	0.0-3.9	0.0	0.0-0.1	
Any Maculopathy	1	1.3	0.0-3.9	0.0	0.0-0.1	
Any retinopathy and/or Maculopathy	4	5.2	0.3-10.1	0.1	0.0-0.2	

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Conclusion

Blindness and Visual Impairment still remains as a major public health problem among the people aged 50 years and above in Karnali Province, of Nepal. The evidence that more than two third of cataract surgeries performed in community eye camps clearly shows the inadequacy of eye care infrastructures in this province. The visual outcome of cataract surgery below the WHO standards suggests further improvement in quality of surgical services. Persistent back log of vision impairing cataract can further be explained by the prominent barriers related to affordability and accessibility prevailing among the people. Along with cataract and posterior segment diseases as leading causes of blindness and visual impairment, other problems such as uncorrected refractive error, diabetic retinopathy and functional low vision are major issues to be resolved by the eye care system in the province.

To conclude, this survey provides evidence of public health significance regarding the magnitude of blindness and visual impairment, its causes and performance evaluation of ongoing eye care programs in the province. The information from this survey will help the concerned decision makers to formulate appropriate strategies to combat this needless burden of avoidable blindness and visual impairment.

Annex: M7RAAB survey form (Electronic questionnaire)

Annex: Survey Team members

Annex: RAAB Survey Action photos



RAAB Training program inauguration by honorable Minister MrDalBahadur Rawal, MoSD



RAAB training at surkhet



Participants are practicing visual talking skill on mobile app



Participants are learning data entry in application in a group



All partcipants group photo before moving to field



Pilot survey in community







Door to door examination of eye

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