NEPAL BAGMATI PROVINCE RAAB SURVEY | 2019

A SURVEY OF AVOIDABLE BLINDNESS & VISION IMPAIRMENT

Full Report

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BACKGROUND

EYE HEALTH IN NEPAL

The first nationwide blindness survey in Nepal was conducted in 1981 to estimate the prevalence and causes of blindness across the country. The survey was the first activity of the Nepal Blindness Prevention and Control Project, a joint initiative of the then Government of Nepal and the World Health Organization (WHO). The survey found a prevalence of bilateral blindness of 0.84%, a prevalence of unilateral blindness of 1.66%, and a prevalence of low vision of 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 a significant steppingstone for the development of a sophisticated eye health system, which was implemented in Nepal over the following decades. [2]

In 1995, a population-based, cross-sectional study of 5,112 people aged 45 years and older in Bheri and Lumbini zones of Nepal was carried out using stratified cluster sampling design. The main purpose of the study was to estimate prevalence and causes of blindness and vision impairment and to assess the impact of eye health interventions following the 1981 blindness survey. The study revealed that, among people aged 50 years and older, the prevalence of blindness had reduced from 5.45% in 1981 to 3.0%. Cataract surgical coverage among bilateral cataract blind people increased from 35.0% in 1981 to 58.0% in 1995. Nonetheless, almost 30.0% of the cataract operated cases were still experiencing blindness or severe vision impairment. [3]

Two population-based blindness surveys were then conducted between 2002 and 2006 in Gandaki, Lumbini, and Narayani zones of Nepal [4-5]. The study from the Gandaki zone found a prevalence of blindness of 2.6% among 5,863 people aged 45 years and above. Cataract was the leading cause of blindness (60.5%); cataract surgical coverage was found to be 59.5% among the cataract blind people. [4] The study in Lumbini and Narayani zones found the prevalence of blindness and vision impairment among 5,138 people aged 50 years to be 4.6% and 18.9%, respectively. The cataract surgical coverage was found to be 66.6% among the cataract blind people. [5]

Eleven Rapid Assessment of Avoidable Blindness surveys were conducted between 2006 and 2010 in different zones of Nepal. The main purpose of these surveys was to assess the prevalence of blindness and vision impairment, to evaluate the impact of eye care delivery system of Nepal after 1981 National Blindness Survey. The prevalence of blindness was found to be 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 was improved, but still did not meet the WHO recommendations. [6,13]

Towards Universal Eye Health: A Global Action Plan (GAP) 2014-2019 was endorsed and adopted by WHO Member States 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 is one of the signatories of the Global Action Plan 2014-2019 and has worked towards the operationalization of the global target of reducing prevalence of avoidable vision impairment by 25% by 2019 from the baseline of 2010. The Global Action Plan strongly recommends conducting population-based surveys to provide evidence on magnitude and causes of blindness and vision impairment for planning and evaluating impact of eye health programs.

More than 80% of the avoidable blindness and vision impairment occurs among people aged 50 years and above and is mainly caused by cataract and uncorrected refractive errors alone. [8] So, the greatest gains will be achieved through reduction of prevalence of avoidable vision impairment among the

population aged 50 years and above. Nonetheless, there is paucity of new evidence on the prevalence, trends, and causes of blindness and vision impairment in Nepal since completion of the population-based surveys in 2010. This evidence is needed to inform decision-making for formulating plans, policies, and strategies to ultimately reduce the burden of avoidable blindness and vision impairment in Nepal.

Bagmati Province 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 province consists of 13 districts with a total population of 5,529,452 (2,747,633 men and 2,781,819 women). The total number of people 50 years and above in this province is 832,208 (424,783 male and 406,425 female). Its total area is 20,300 square kilometres.

In the new political and administration system, health service delivery is the main responsibility of provincial government. A population-based survey was designed and conducted for assessing the prevalence and causes of blindness and vision impairment in this province in order to provide the evidence for monitoring the target set by the Global Health Plan 2014-2019.

AIMS AND OBJECTIVES

The main aims of this survey were:

- To assess the prevalence and main causes of avoidable blindness and vision impairment in people aged 50 years and older in Bagmati Province of Nepal;
- To assess the prevalence of diabetes and diabetic retinopathy in adults aged 50 years and older in Bagmati Province of Nepal.

The objectives of this survey were to assess:

- the prevalence of blindness, severe, moderate, and early vision impairment
- the proportion of blindness, severe, moderate, and early vision impairment that is avoidable
- the main causes of blindness, severe, moderate, and early vision impairment
- the cataract surgical coverage and effective surgical coverage
- the vision outcomes following cataract surgery
- the causes of poor outcomes following cataract surgery
- the barriers to receiving cataract surgery
- the main cataract surgery indicators – place, type, and cost
- the prevalence of uncorrected refractive errors
- the prevalence of diabetes
- the prevalence of diabetic retinopathy

METHODOLOGY

STUDY DESIGN

This was a cross-sectional, population-based survey of avoidable blindness in adults aged 50 years and older. The study used the well-established Rapid Assessment of Avoidable Blindness (RAAB) survey methodology. [9-10]

Participants and recruitment

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

Sample size

The total sample size required was 5,800 people, distributed across 166 clusters of 35 people aged 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 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 a sample size is 5,800 people. In order to enroll an adequately large sample in the survey, a total of 166 cluster were randomly selected from the sampling frame according to population proportionalte to size.

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 6,044 clusters were available for random selection in Bagmati Province; 166 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-to-door 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 vision and eye health was collected from relatives or neighbours. 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.

KEY 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.

Indicator	Abbreviation	Definition
Visual acuity	VA	The clarity of vision of an individual
Presenting visual acuity	PVA	VA with refraction correction that is available to participant
Best corrected visual acuity	BVA	VA with best available refraction correction –for the purpose of this study, this is pinhole vision
Blindness	n/a	VA <3/60 in the better eye
Severe vision impairment	SVI	VA <6/60 to ≥3/60
Moderate vision impairment	MVI	VA <6/18 to ≥6/60
Early vision impairment	EVI	VA <6/12 to ≥6/18
Severe vision impairment or worse	SVI+	VA <6/60
Moderate vision impairment or worse	MVI+	VA <6/18
Early vision impairment or worse	EVI+	VA <6/12
Functional low vision	FLV	BVA<6/18 to better than no light perception, not caused by cataract, refractive error, uncorrected aphakia or pseudophakia with posterior capsule opacification
Cataract surgical coverage	CSC	[(x+y)/(x+y+z)]*100 Where: x = individuals with unilateral pseudo/aphakia (i.e. operated cataract) and operable cataract in the other eye; y = individuals with bilateral pseudo/aphakia, regardless of visual acuity; z = individuals with bilateral operable cataract.
Effective cataract surgical coverage	eCSC	[(a+b)/(x+y+z)]*100 Where: a = individuals with unilateral pseudo/aphakia achieving presenting visual acuity of 6/18 or better in the operated eye and operable cataract in the other eye; b = individuals with bilateral pseudo/aphakia achieving presenting visual acuity of 6/18 or better in at least one eye; x, y and z as above for CSC.

Indicator	Abbreviation	Definition
DIABETIC RETINOPATHY AND MACULOPATHY		
Diabetic retinopathy	DR	An eye condition that affects blood vessels in the retina and can cause vision loss in people with diabetes
Diabetic macular oedema	DME	Swelling in the macula due to fluid leaking from blood vessels
No visible retinopathy	R0	No DR anywhere
Mild retinopathy	R1	Background retinopathy, defined as the presence of at least any of the following: • dot haemorrhages • micro-aneurysms • hard exudates • cotton wool spots • blot haemorrhages • superficial or flame-shaped haemorrhages
Observable retinopathy	R2	Background retinopathy, defined as four or more blot haemorrhages in one hemi-field only (inferior and superior hemi-fields delineated by a line passing through the centre of the fovea and optic disc)
Referable retinopathy	R3	Background retinopathy, defined as the presence of any of the following features: • four or more blot haemorrhages in both inferior and superior hemi-fields • venous beading • intraretinal microvascular abnormalities (IRMA)
Proliferative retinopathy	R4	Proliferative DR, defined as any of the following features: • active new vessels • vitreous haemorrhage
Inadequate for retinopathy	R6	Retina not sufficiently visible for assessment
No maculopathy	M0	No features in ≤2 disc diameters from the centre of the fovea sufficient to qualify for M1 or M2 as defined below
Observable maculopathy	M1	Lesions as specified below within a radius of >1 but ≤2 disc diameters the centre of the fovea
Referrable maculopathy	M2	Lesions as specified below within a radius of ≤1 disc diameter of the centre of the fovea
Inadequate for maculopathy	M6	Macula not adequately visible for assessment
Sight threatening diabetic retinopathy	STDR	The presence of R4 and/or M2

DATA COLLECTION

Training of data collectors

Three teams each consisting of one ophthalmologist, one ophthalmic assistant, and one field coordinator or enumerator were trained for five days prior to data collection. The training covered the RAAB principles, the survey and eye examination protocol, and data entry into the data management system. During data collection, each team was also accompanied by a member of the local community, typically a female community health volunteer.

In order to measure inter-observer agreement, each of the teams examined 50 patients. These patients were recruited specifically and only for this purpose and were not included in the final study sample. Measurements for VA, lens examination results, and cause of blindness for each patient were compared between team members and the team leader. Team leaders were also compared against each other for agreement. Results were compared between the teams to ensure that they were of an acceptable standard (i.e., kappa ≥ 0.60). Each team was accompanied by a field supervisor at least one day per week.

Examination procedure

All participants were interviewed on whether they experienced any problems with their eyes and whether they used spectacles (distance and near). PVA was then checked in broad daylight using a tumbling E chart. BVA was checked using a pinhole if participants had a PVA of <6/12. All participants were directed into a shaded area or indoors for lens examination using a light torch. If BVA was <6/12 and no lens opacity was observed, the participant's pupils were dilated with tropicamide 0.5% solution and direct ophthalmoscopy was performed to determine the cause of reduced vision for each eye. The overall primary cause of VA <6/12 was determined to be the cause that was most easily treatable. For example, if one eye had vision impairment due to refractive error while the other had reduced VA due to significant cataract, refractive error was chosen to be the overall primary cause. Should the participant be noted to have had or to be in need of cataract surgery, details of the surgery or reasons for not having had surgery were recorded. Participants identified as requiring further eye care were referred to appropriate services.

In this survey we also included the Diabetic Retinopathy module of RAAB7. All eligible participants underwent a blood glucose test. A random blood glucose level of more than 200 mg/dl as assessed by finger prick glucometer testing was considered as diabetes positive. Participants with diabetes underwent a detailed fundus examiantion to assess for the presence of the DR using an indirect ophthalmoscope. The Scottish Classification was used to grade DR.

Data management and analysis

The data was collected on tablets using the mRAAB software. The data was imported to MS Excel 2010 by members of the research team at the Tilganga Institute of Ophthalmology and at the London School of Hygiene and Tropical Medicine.

The data were assessed regularly with the RAAB software's in-built consistency check function. Any discrepancies identified were immediately reported back to the survey teams for clarification. Data cleaning and analysis was conducted with RAAB Software (Version 7, London School of Hygiene & Tropical Medicine, UK).

ETHICAL AND OTHER APPROVALS OBTAINED

Approval for the implementation of this research study was granted by Institutional Review Committee of the Tilganga Institute of Ophthalmology and the Nepal Health Research Council. Additional permissions to carry out the study were obtained from the Federal Department of Health Service, as well as from the Provincial and Local Government of study clusters. Informed written consent was sought from all eligible subjects participating at the time of data collection. A fingerprint was provided in the presence of a witness from those who could not write.

RESULTS

The fieldwork was carried out between June and December 2019

RESPONSE RATE

The survey included 5,740 people aged 50 years and older, of whom 5,472 were examined. The coverage was 95.3%: 209 eligible individuals (3.6%) were absent, 31 (0.5%) refused to participate in the study, and 28 (0.5%) were unable to comply with the examination. (Table 1)

Table 1. Eligible persons, coverage, absentees, and refusals

	Total eligible		Examined		Not available		Refused		Not capable	
	n	%	n	%	n	%	n	%	n	%
Men	2,448	100.0	2,307	94.2	117	4.8	15	0.6	9	0.4
Women	3,292	100.0	3,165	96.1	92	2.8	16	0.5	19	0.6
Total	5,740	100.0	5,472	95.3	209	3.6	31	0.5	28	0.5

REPRESENTATIVENESS OF STUDY POPULATION

To check whether the study population is representative of the relevant Nepalese population aged 50 years and older, the age and sex composition of the sample was compared with that of the broader population of Bagmati Province (Table 2).

Ideally, the study population should have the same composition by age and by gender as the total population aged 50 years and older in the survey area. However, we found that men and women aged 70 years and older were over-represented, and men and women younger than 70 years were under-represented.

To account for these discrepancies, we have provided both crude (study population) and age- and sex-adjusted estimates where appropriate.

Table 2. Age and gender composition of Bagmati Province and study population

	Men		Women	
	Study	Bagmati Province	Study	Bagmati Province
Age group	n (% total 50+)	N (% total 50+)	n (% total 50+)	N (% total 50+)
50-59 years	825 (35.8)	197,280 (46.4)	1,242 (39.2)	184,435 (45.4)
60-69 years	689 (29.9)	138,206 (32.5)	959 (30.3)	135,753 (33.4)
70-79 years	540 (23.4)	67,591 (15.9)	680 (21.5)	63,704 (15.7)
80+ years	253 (11.0)	21,706 (5.1)	284 (9.0)	22,533 (5.5)

PREVALENCE OF BLINDNESS AND VISION IMPAIRMENT

Study population

The crude prevalence of blindness with available correction was 1.0% (95%CI: 0.8-1.3%). The crude prevalence of SVI, MVI, and EVI were 1.2% (95%CI 0.9-1.6%), 6.2% (95%CI 5.3-7.0%), and 9.8% (8.6-

11.0%), respectively. The crude prevalence of FLV was 1.3% (95%CI 0.9-1.6%). (Table 3). No significant differences were observed between men and women in the prevalence of blindness and vision impairment.

Table 3. Prevalence of blindness, SVI, MVI, EVI, and FLV in study population

	Men		Women		Total	
Bilateral PVA	**n**	**% (95%CI)**	**n**	**% (95%CI)**	**n**	**% (95%CI)**
Blindness (PVA<3/60)	20	0.9 (0.5-1.3)	37	1.2 (0.8-1.5)	57	1.0 (0.8-1.3)
SVI (PVA<6/60 – 3/60)	36	1.6 (1.0 -2.1)	32	1.0 (0.6-1.4)	68	1.2 (0.9-1.6)
MVI (PVA<6/18 – 6/60)	154	6.7 (5.3-8.0)	184	5.8 (4.8-6.8)	338	6.2 (5.3-7.0)
EVI (PVA<6/12 – 6/18)	239	10.4 (8.8-11.9)	297	9.4 (8.1-10.7)	536	9.8 (8.6-11.0)
FLV	34	1.5 (0.9-2.0)	35	1.1 (0.7-1.5)	69	1.3 (0.9-1.6)

Age- and sex-adjusted

The age- and sex-adjusted prevalence of blindness with available correction was 0.7% (95%CI 0.4-0.9%). The age- and sex-adjusted prevalence of SVI, MVI, and EVI were 0.9% (95%CI 0.6-1.3%), 4.8% (95%CI 3.9-5.6%), and 8.5% (95%CI 7.3-9.7%), respectively. The age- and sex-adjusted prevalence of FLV was 0.9% (95%CI 0.6-1.2%). No statistically significant differences were observed between men and women in the prevalence of blindness and vision impairment (Table 4); however, the number of women affected by blindness is larger than the number of men as there are more women aged 50 years and older than men in Nepal.

Based on the observed prevalence, an estimated 130,970 people aged 50 and older – 67,480 men and 63,490 women – have vision impairment in Bagmati Province. These numbers include 5,450 people aged 50 and older who are blind, and 7,580 who are affected by permanent low vision and who need low vision services.

Table 4. Age- and sex-adjusted prevalence of blindness, SVI, MVI, EVI and FLV in adults aged 50 years and older in Bagmati Province

	Men		Women		Total	
Bilateral PVA	**n**	**% (95%CI)**	**n**	**% (95%CI)**	**n**	**% (95%CI)**
Blindness (PVA<3/60)	1,954	0.5 (0.0 - 0.9)	3,499	0.9 (0.5 - 1.2)	5,451	0.7 (0.4-0.9)
SVI (PVA<6/60 – 3/60)	4,482	1.1 (0.5-1.6)	3,243	0.8 (0.4-1.2)	7,724	0.9 (0.6-1.3)
MVI (PVA<6/18 – 6/60)	20,744	4.9 (3.5-6.2)	18,810	4.6 (3.7-5.6)	39,546	4.8 (3.9-5.6)
EVI (PVA<6/12 – 6/18)	36,610	8.6 (7.1-10.2)	34,052	8.4 (7.1-9.7)	70,661	8.5 (7.3-9.7)
FLV	3,694	0.9 (0.3-1.4)	3,888	1.0 (0.6-1.3)	7,581	0.9 (0.6-1.2)

CAUSES OF BLINDNESS AND VISION IMPAIRMENT IN STUDY POPULATION

The main cause of bilateral blindness PVA<3/60 was cataract (61.4%) followed by other posterior segment diseases (12.3%), age related macular degeneration (ARMD) (10.5%) and glaucoma (7.0 %). Cataract was the leading cause SVI (67.6%) and MVI (61.4%) also. Uncorrected refractive error was the leading cause of EVI (58.4%) (Table 5).

Table 5. Main causes of blindness, SVI, MVI, and EVI in the study population

	Blindness		SVI		MVI		EVI	
	n	%	n	%	n	%	n	%
By cause								
Cataract, untreated	35	61.4	46	67.6	207	61.4	187	34.9
Other posterior segment disease	7	12.3	7	10.3	14	4.2	4	0.7
ARMD	6	10.5	6	8.8	10	3.0	12	2.2
Glaucoma	4	7.0	1	1.5	4	1.2	2	0.4
Non-trachomatous corneal opacity	2	3.5	1	1.5	4	1.2	3	0.6
Cataract surgical complications	1	1.8	2	2.9	16	4.7	7	1.3
Myopic Degeneration	1	1.8	1	1.5	6	1.8	4	0.7
Pterygium	1	1.8	0	0.0	0	0.0	0	0.0
All other globe/CNS abnormalities	0	0.0	1	1.5	2	0.6	1	0.2
Phthisis	0	0.0	0	0.0	0	0.0	1	0.2
Refractive error	0	0.0	3	4.4	73	21.7	313	58.4
Aphakia uncorrected	0	0.0	0	0.0	0	0.0	0	0.0
Diabetic retinopathy	0	0.0	0	0.0	1	0.3	2	0.4
By intervention category								
A. Treatable	35	61.4	49	72.1	280	83.1	500	93.3
B. Preventable (PHC/PEC services)	4	7.0	2	2.9	10	3.0	8	1.5
C. Preventable (Ophthalmic services)	5	8.8	3	4.4	21	6.2	11	2.1
D. Avoidable (A+B+C)	44	77.2	54	79.4	311	92.3	519	96.8
E. Posterior segment causes	18	31.6	15	22.1	35	10.4	24	4.5

The proportion of blindness due to glaucoma was 7.0%; however, it should be noted that with glaucoma the central vision remains unaffected until very late in the disease process. It is not possible to conduct reliable visual field analysis in this survey. The number of patients who have glaucoma and still have normal VA is likely to be higher.

Seventy-seven percent of all blindness in the study population was avoidable. Specifically, 61.4% of blindness was treatable, 7.0% was preventable with primary health care and/or primary eye care, and 8.8% was preventable through more advanced ophthalmic services. Posterior segment disease accounted for 31.6% of all bilateral blindness.

Untreated cataract was the lead cause of blindness in 67.6% of women and 50.0% of men who were blind. On the other hand, ARMD was the leading cause of blindness in 25.0% of men and in only 2.7% of women who were blind. The sample size, however, is too small to conclude whether these differences are significant. These findings warrant further investigation.

The main intervention strategies to reduce avoidable blindness in Bagmati Province are shown in Figure 1. Cataract surgery should be the main priority. Because blindness and vision impairment due to posterior segment diseases like glaucoma and ARMD might be prevented through regular control and timely intervention, targeted health education and the development of specialist ophthalmic services might contribute to reducing avoidable blindness and vision impairment further.

Low vision training and services are required for the remaining 22.8% of all blindness that is permanent and untreatable.

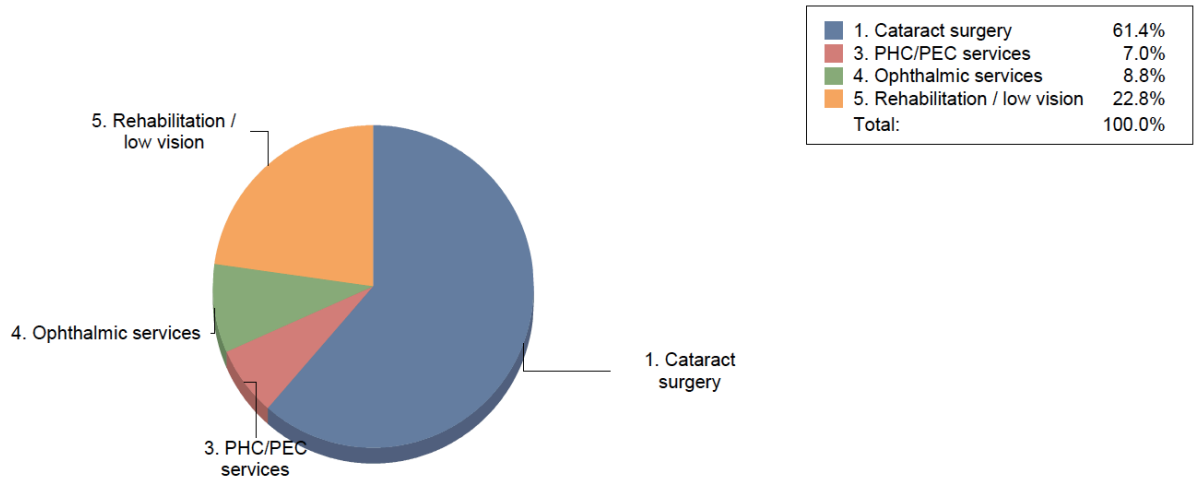

Figure 1. Action required to reduce blindness

PREVALENCE OF CATARACT BY BEST CORRECTED VISUAL ACUITY

Study population

The crude prevalence of blindness due to bilateral cataract among people aged 50 years and older was 0.4% (CI95%: 0.2-0.6%); the crude prevalence of eyes that are blind from cataract was 1.4% (95%CI 0.9-1.3%) (Table 6).

The crude prevalence of SVI or worse due to bilateral cataract was 0.9% (95%CI 0.6-1.1%); the crude prevalence of eyes affected by SVI or worse due to cataract was 2.2% (95%CI 1.9-2.6%) (Table 6).

The crude prevalence of MVI or worse due to bilateral cataract was 3.0% (95%CI 2.5-3.6%); the crude prevalence of eyes that are affected by MVI or worse due to cataract was 5.5% (95%CI 4.8-6.2%) (Table 6).

The crude prevalence of EVI or worse due to bilateral cataract was 7.2% (95%CI 6.2-8.2%); the crude prevalence of eyes that are affected by EVI or worse due to cataract was 11.2% (95%CI 10.0-12.4%) (Table 6).

Although not significantly different, the survey suggests that the prevalence of bilateral blindness is greater among women than men.

Table 6. Prevalence of cataract and BVA<3/60, <6/60, <6/18, and <6/12 in the study population

	Men		Women		Total	
	n	% (95%CI)	n	% (95%CI)	n	% (95%CI)
Blind (BVA<3/60)						
Bilateral cataract	5	0.2 (0.0-0.4)	17	0.5 (0.3-0.8)	22	0.4 (0.2-0.6)
Unilateral cataract	50	2.2 (1.6-2.8)	63	2.0 (1.5-2.5)	113	2.1 (1.7-2.5)
Cataract eyes	60	1.3 (0.7-1.2)	97	1.5 (0.9-1.5)	157	1.4 (0.9-1.3)
SVI+ (BVA<6/60)						
Bilateral cataract	14	0.6 (0.3-0.9)	34	1.1 (0.7-1.4)	48	0.9 (0.6-1.1)
Unilateral cataract	67	2.9 (1.4-2.7)	81	2.6 (1.8-2.8)	148	2.7 (1.8-2.6)
Cataract eyes	95	2.1 (1.6-2.5)	149	2.4 (1.9-2.8)	244	2.2 (1.9-2.6)
MVI+ (BVA<6/18)						
Bilateral cataract	62	2.7 (2.0-3.4)	104	3.3 (2.6-4.0)	166	3.0 (2.5-3.6)
Unilateral cataract	130	5.6 (4.5-6.7)	140	4.4 (3.7-5.1)	270	4.9 (4.2-5.6)
Cataract eyes	254	5.5 (4.6-6.4)	348	5.5 (4.7-6.3)	602	5.5 (4.8-6.2)
EVI+ (BVA<6/12)						
Bilateral cataract	157	6.8 (5.5-8.1)	235	7.4 (6.3-8.6)	392	7.2 (6.2-8.2)
Unilateral cataract	206	8.9 (7.7-10.2)	236	7.5 (6.4-8.5)	442	8.1 (7.2-8.9)
Cataract eyes	520	11.3 (9.8-12.8)	706	11.2 (9.8-12.5)	1,226	11.2 (10.0-12.4)

Age- and sex-adjusted

The age- and sex-adjusted prevalence of blindness due to bilateral cataract among people aged 50 years and older was 0.3% (CI95%: 0.1-0.4%). We therefore estimated that that 2,161 people aged 50 years and older are blind due to cataract in Bagmati Province (Table 7). This includes 548 men and 1,613 women. Although not significantly different, the survey suggests that the prevalence of bilateral blindness is greater among women than men. The age- and sex-adjusted prevalence of eyes that are blind from cataract was 1.6% (95%CI 0.8-1.3%); we therefore estimate that 17,700 eyes are blind due to cataract among people aged 50 years and older in Bagmati Province of Nepal (Table 7).

The age- and sex-adjusted prevalence of SVI or worse due to bilateral cataract was 0.3% also (95%CI 0.2-0.5), corresponding to an estimated 2,822 people aged 50 years and older in Bagmati Province. We also estimated that 9,440 eyes (prevalence 0.6%) are affected by SVI or worse due to cataract.

The age- and sex-adjusted prevalence of MVI or worse due to bilateral cataract was 1.6% (95%CI 61.1-2.0), corresponding to an estimated 12,895 people aged 50 years and older in Bagmati Province. We also estimated that 41,003 eyes (prevalence 2.5%) are affected by MVI or worse due to cataract.

The age- and sex-adjusted prevalence of EVI or worse due to bilateral cataract was 1.6% (95%CI 0.9-2.3), corresponding to an estimated 26,386 people aged 50 years and older in Bagmati Province. We also estimated that 74,584 eyes (prevalence 4.5%) are affected by MVI or worse due to cataract.

Table 7. Age- and sex-adjusted results for cataract and B VA<3/60, <6/60 and <6/18 among people aged 50 years and older in Bagmati Province

	Men		Women		Total	
	n	% (95%CI)	n	% (95%CI)	n	% (95%CI)
Blind (BVA<3/60)						
Bilateral cataract	548	0.1 (-0.1-0.3)	1,613	0.4 (0.1-0.7)	2,161	0.3 (0.1-0.4)
Unilateral cataract	7,026	1.7 (1.2-2.1)	6,352	1.6 (1.2-1.9)	13,778	1.6 (1.3-1.9)
Cataract eyes	8,120	1.0 (0.6-1.3)	9,580	1.2 (0.8-1.5)	17,700	1.6 (0.8-1.3)
SVI+ (BVA<6/60)						
Bilateral cataract	1,235	0.3 (0.0-0.5)	1,587	0.4 (0.1-0.6)	2,822	0.3 (0.2-0.5)
Unilateral cataract	2,149	0.5 (0.1-0.9)	1,645	0.4 (0.2-0.6)	3,794	0.5 (0.2-0.7)
Cataract eyes	4,619	0.5 (0.3-0.8)	4,821	0.6 (0.3-0.9)	9,440	0.6 (0.4-0.8)
MVI+ (BVA<6/18)						
Bilateral cataract	6,288	1.5 (0.8-2.1)	6,607	1.6 (1.1-2.2)	12,895	1.6 (1.1-2.0)
Unilateral cataract	9,026	2.1 (1.6-2.7)	6,182	1.5 (1.1-1.9)	15,208	1.8 (1.8-2.1)
Cataract eyes	21,603	2.5 (1.8-3.3)	19,400	2.4 (1.8-3.0)	41,003	2.5 (2.0-3.0)
EVI+ (BVA<6/12)						
Bilateral cataract	12,868	1.5 (0.6-2.5)	13,518	1.7 (0.9-2.5)	26,386	1.6 (0.9-2.3)
Unilateral cataract	10,893	1.3 (0.5-2.0)	10,917	1.3 (0.6-2.1)	21,810	1.3 (0.7-1.9)
Cataract eyes	36,631	4.3 (3.4-5.2)	37,953	4.7 (3.8-5.5)	74,584	4.5 (4.5-5.2)

CATARACT SURGICAL COVERAGE AND EFFECTIVE CATARACT SURGICAL COVERAGE

The CSC in persons indicates which proportion of people with cataract and a predefined VA have been operated in one or both eyes (Table 8). This indicator measures the coverage of cataract surgical services. At 95.9%, the age- and sex-adjusted CSC among people who are blind (PVA<3/60) is higher than the target of at least 80% recommended by the International Agency for the Prevention of Blindness (IAPB) [11]. The age- and sex-adjusted CSC was slightly higher in men (97.7%) compared with women (94.4%).

The age- and sex-adjusted CSC among people with a VA of <6/60 and <6/18 are 91.3% and 76.4%, respectively. This suggests that fewer people who have cataract receive surgery if they are not blind (Table 8).

The age- and sex-adjusted CSC for eyes with cataract (as opposed to individuals with cataract) and a VA of <3/60 indicates the coverage of the total workload of operable cataract. This is 88.4%, with similar coverage in men (88.8%) and women (88.2%) (Table 8).

The eCSC combines coverage and outcome of cataract surgery and indicates what proportion of the people with bilateral operable cataract have been operated upon in one or both eyes *and* can see 6/18 or better after surgery. [12]

The eCSC among people who are blind was 84.0%. The eCSC among people with a VA of <6/60 and <6/18 are 78.6% and 64.5%, respectively (Table 8).

Table 8. Age- and sex-adjusted CSC and eCSC in the study population

VA category	Men %	Women %	Total %
CSC ^ – Persons			
VA < 3/60	97.7	94.4	95.9
VA < 6/60	93.2	89.7	91.3
VA < 6/18	77.0	75.9	76.4
CSC ^ – Eyes			
VA < 3/60	88.8	88.2	88.4
VA < 6/60	83.4	83.2	83.3
VA < 6/18	65.1	67.9	66.5
eCSC – Persons			
VA < 3/60	84.3	83.9	84.0
VA < 6/60	78.4	78.8	78.6
VA < 6/18	64.0	64.9	64.5

^ *Age- and sex-adjusted*

VISUAL OUTCOME OF CATARACT SURGERY

In this study 1,173 eyes had cataract surgery; 1,161 (99.0%) eyes had an intraocular lens (IOL) implemented and 12 eyes did not have an IOL (Table 9). Overall good visual outcome by WHO definition [13] was seen in 79.4% (PVA ≥6/18) and 85.2% (BVA ≥6/18). Overall poor outcome was seen in 9.5% (PVA<6/60) and 8.4% (BVA <6/60). The difference between PVA and BVA can be minimised by adequate biometry, good surgical technique, individually adjusted IOLs, and optical correction after cataract surgery. Most aphakic eyes today are actually planned IOL surgery with complications like vitreous loss or capsular tear, whereby IOL implantation could not be done.

Table 9. Visual outcome after cataract surgery in the study population

Visual outcome	VA	Non-IOL		IOL		Total	
		n	%	n	%	n	%
Very good: can see 6/12	PVA	2	16.7	752	64.8	754	64.3
	BVA	2	16.7	891	76.7	893	76.1
Good: ≥ 6/18	PVA	0	0.0	177	15.2	177	15.1
	BVA	0	0.0	107	9.2	107	9.1
Borderline: <6/18 to 6/60	PVA	1	8.3	130	11.2	131	11.2
	BVA	2	16.7	73	6.3	75	6.4
Poor: < 6/60	PVA	9	75.0	102	8.8	111	9.5
	BVA	8	66.7	90	7.8	98	8.4

Most patients were operated upon in charitable hospitals (54.4%), whilst others received surgery in eye camps (26.8%), government hospitals (11.3%), and private hospitals (7.5%). The proportion of surgeries with a very good or good outcome was highest in private hospitals (90.9%), followed by charitable hospitals (81.8%), government hospitals (80.4%, and eye camps (70.7%). As expected, the

proportion of very good or good outcome is highest among those who are up three years postop (85.3%) and lowest among those who are sever years or more postop (72.6%). The main causes of poor visual outcomes following cataract surgery were case selection (65.8%) and long-term complications (17.1%), whilst 12.6% were caused by surgery-related complications.

BARRIERS TO UPTAKE CATARACT SURGICAL SERVICES

The main barriers to reasons why people who needed surgery had not yet received it were: 'Fear of surgery' (27.9%), 'Cost' (21.3%), and 'Need not felt' (16.4%) (Table 10).

Table 10. Barriers to cataract surgery in study population (bilateral BCVA<6/60 due to cataract)

	Men		Women		Total	
	n	%	n	%	n	%
Fear of surgery	4	22.2	13	30.2	17	27.9
Cost	4	22.2	9	20.9	13	21.3
Need not felt	3	16.7	7	16.3	10	16.4
Cannot access treatment	0	0	6	14	6	9.8
Lack of accompanying person	3	16.7	3	7	6	9.8
Treatment denied by provider	1	5.6	4	9.3	5	8.2
Unaware treatment is possible	3	16.7	1	2.3	4	6.6

REFRACTIVE ERROR IN PEOPLE AGED 50 YEARS AND OLDER

The prevalence of refractive error was 24.2%, and 29.3% of people aged 50 years and older who had a refractive error did not have glasses. On the other hand, only 24.6% of the study population had corrected presbyopia. The prevalence of refractive error (corrected and uncorrected) was similar between men and women.

FUNCTIONAL LOW VISION REQUIRING LOW VISION SERVICES

The age- and sex-adjusted prevalence of FLV requiring low vision services in people aged 50 years and older in Bagmati Province was 0.9% (95%CI: 0.6-1.2), an estimated 7,581 people: 3,694 men (0.9%) and 3,888 women (1.2%). Out of the estimated 39,546 people aged 50 and older with PVA <6/18, 19.2% (7,582) require low vision services or training.

The most common cause of FLV was other posterior segment disease (36.2%), followed by ARMD (29.0%), and glaucoma (8.7%).

DIABETES AND DIABETIC RETINOPATHY

A total of 5,435 participants underwent random blood glucose testing. Of these, 7.3% had been previously diagnosed with diabetes and a further 2.2% were found to have high blood glucose levels (>200 mg/dl). (Table 11)

Table 11. Prevalence of diabetes and DR in the study population

Diabetes Prevalence	Male		Female		Total	
	n	%	n	%	n	%
Previously diagnosed with diabetes	172	7.5%	226	7.2%	398	7.3%
High blood sugar levels (>200 mg/dl)	50	2.2%	68	2.2%	118	2.2%
No diabetes	2067	90.3%	2853	90.7%	4919	90.5%

Among those with diabetes, 15.9% has had some degree of retinopathy and 7.4% had maculopathy. Overall, 16.9% of study participants with diabetes had some degree of retinopathy and/or maculopathy. (Table 12)

Table 12. Prevalence of DR and maculopathy among participants with diabetes and overall study population

	n	Study participants with diabetes % (95% CI)	Study population % (95 % CI)
Retinopathy Grade			
No retinopathy(R0)	289	56.0 (51.2-60.8)	5.3 (4.4-6.1)
Background DR- Mild (R1)	50	9.7 (7.2-12.2)	0.9 (0.7-1.2)
Background DR- Observable (R2)	20	3.9 (2.1-5.6)	0.4 (0.2-0.5)
Background DR- Referable (R3)	10	1.9 (0.7-3.2)	0.2 (0.1-0.3)
Proliferative DR(R4)	2	0.4 (0.0-0.9)	0.0 (0.0-0.1)
Ungradable DR(R6)	9	1.7 (0.5-3.0)	0.2 (0.0-0.3)
Any Retinopathy	82	15.9 (12.7-19.1)	1.5 (1.2-1.8)
Maculopathy grade			
No maculopathy(M0)	326	63.2 (58.3-68.0)	6.0 (5.1-6.9)
Maculopathy-observable (M1)	25	4.8 (3.1-6.6)	0.5 (0.3-0.6)
Maculopathy-referable (M2)	13	2.5 (1.2-3.8)	0.2 (0.1-0.4)
Un gradable Maculopathy(M6)	9	1.7 (0.5-3.0)	0.2 (0.0-0.3)
Any Maculopathy	38	7.4 (5.2-9.6)	0.7 (0.5-0.9)
Any retinopathy and/or maculopathy	87	16.9 (13.5-20.2)	1.6 (1.2-1.9)
Sight threatening DR (R4 and or M2)	13	2.5 (1.2-3.8)	0.2 (0.1-0.4)
Any laser scars	7	1.4 (0.4-2.3)	0.1 (0.0-0.2)

DISCUSSION

This study aimed to determine the prevalence and main causes of blindness and vision impairment among people aged 50 years and older in the Bagmati Province of Nepal. The survey also assessed the prevalence of diabetes and DR in the province. The total sample size was 5,472 participants; the response rate was 95.3%.

The survey found an age- and sex-adjusted prevalence of bilateral blindness of 0.7% (95% CI 0.4-0.9%); based on this, we estimated that there are approximately 5,500 people who are blind in Bagmati Province. The cumulative prevalence of vision impairment (PVA<6/12 in the better eye) was 14.8% (95% CI 13.0-16.7%); this means that there are approximately 123,400 people who are visually impaired in the province.

The prevalence of blindness in this survey is lower than the regional estimates. [17] However, these findings cannot be directly compared to those from RAAB surveys conducted in Nepal in 2010. [6] This is because of the administrative geography changes that were enforced after Nepal was restructured into seven federal provinces in 2015. Nonetheless, the 2010 surveys found an age- and sex-adjusted prevalence of blindness among people aged 50 years or older in the then Bagmati Zone of 0.6% (95% CI 0.2-1.1%), with an estimated 2,380 people who were blind. In 2010, the national prevalence of blindness in people aged 50 years or older was found to be 2.4% (95% CI 2.2-2.5%).

This study revealed that more than 80% of blindness and visual impairment among people aged 50 years and older in Bagmati Province is avoidable – that is, it is either treatable or preventable. Cataract was found to be the leading cause of blindness, SVI, and MVI. Posterior segment diseases including glaucoma, ARMD, and other vitreo-retinal diseases accounted for nearly one third of the total burden of blindness and vision impairment. Uncorrected refractive error was the leading cause of EVI and was the second leading cause of MVI.

The age- and sex-adjusted prevalence of blindness due to cataract in people aged 50 years and older was 0.3% (95 % CI 0.1-0.4). The RAAB surveys from 2010 reported a prevalence of cataract blindness in Bagmati of 0.19% (95 % CI 0.1-0.4), and a national prevalence of 1.28% (95% CI 1.2-1.4%). The higher prevalence of cataract blindness found in this survey may be attributable to the inclusion of districts from inner Terai Region that have a high prevalence cataract and which were not included in the Bagmati Zone.

Findings from this research suggest that there are approximately 2,200 people who are bilaterally blind and 17,700 eyes that are blind due to cataract in Bagmati Province. Although we didn't find a statistically significant difference between genders, the number of women who are blind from cataract in the province is estimated to be more than 1,600, compared with only less than 550 men. The higher prevalence of cataract blindness among women, and the fact that there are more women aged 50 years and over compared with men account for this difference.

We also estimated that there are approximately 17,900 people who have low vision because of cataract, and that there are more than 68,000 eyes in the province that have low vision because of this treatable condition.

Fear of surgery, cost, and not feeling a need for intervention were the most commonly cited barriers that prevented those in need from accessing cataract surgical services. These findings suggest cost-effective and free cataract surgeries as well as eye health education and behavior change communication approaches may enable people with operable cataract to access surgical services.

CSC and eCSC among bilaterally cataract blind people were 95.3% and 84.0%, respectively. This is a remarkable improvement compared with findings from the previous RAAB. Seventy-nine point four

percent of operated eyes achieved a good outcome (PVA ≥ 6/18); this further improved to 85.2 % after correction. Nonetheless, this is still just below WHO recommendations. [13] A further improvement in quality of outcomes is needed, with focus on pre-operative, operative, and post-operative care as well as optical services of adequate quality.

Uncorrected refractive errors for distant vision are a major cause of vision impairment in people aged 50 years and older. Nearly one third of those with refractive errors and two third of those with presbyopia in the study did not have adequate correction. This is comparable to findings from the 2010 RAAB surveys [6] in different zones of Nepal.

These findings provide the necessary evidence for the prioritization of eye care interventions that deal with persistent and emerging causes of blindness and vision impairment in Bagmati Province.

The prevalence of functional low vision from incurable causes was 1.3%, which is comparable to the national estimate from the 2010 RAAB surveys. Eye care programs should address this through appropriate rehabilitation services to enhance the quality of life as much as possible.

Almost one in ten survey participants were found to have diabetes. Among participants with diabetes 16.9% had retinopathy and/or maculopathy. A recent population-based cross-sectional survey [14] of non-communicable diseases in Nepal revealed that the prevalence of diabetes was as high as 13.7% among the elderly Nepalese population. DR is one of the modifiable risk factors [15-16] for blindness and vision impairment. Eye care programs should target multi sectoral action plans on prevention and control of visual impairment from non-communicable diseases like diabetes.

RECOMMENDATIONS

Blindness and vision impairment still remain a major public health problem among people aged 50 years and older in the Bagmati Province of Nepal. Cataract surgical coverage is adequate; however, cataract is still the leading cause of blindness and vision outcomes following cataract surgery remain just below WHO recommendations. In addition, almost three times as many women are estimated to be blind from cataract in the province, compared with men.

Posterior segment diseases were the second leading cause of blindness, including ARMD (10.5% of blindness) and glaucoma (7.0% of blindness).

Out of the estimated 39,546 people aged 50 and older with PVA <6/18, 19.2% (7,582) require low vision services or training. The most common cause of FLV was other posterior segment disease (36.2%), followed by ARMD (29.0%), and glaucoma (8.7%).

Based on these findings, it is recommended that:

1. IMPROVE CATARACT SURGERY OUTCOMES

Mobilise the necessary resources and focus efforts on continuing to improve quality of cataract surgery. An improvement could be achieved through:

- Analysis of current practice on intake and selection of cataract patients
- Analysis of surgical practices to reduce surgical complications
- Improved biometry and optical services after cataract surgery
- Stressing the importance of detailed pre-operative ophthalmic examinations

2. INCREASE CATARACT SURGICAL RATE AND UPTAKE OF SERVICES – ESPECIALLY AMONG WOMEN

Mobilise the necessary resources and focus efforts on increasing cataract surgical coverage – in particular among women. This could be achieved through:

- Public campaigns on the benefits of cataract surgery
- Public campaigns to reduce the fear for cataract surgery
- Reduce cost of cataract surgery
- Motivate ophthalmologists to do more cataract surgeries and to operate upon patients at earlier stages

3. INVEST IN PREVENTATIVE MEASURES

Place greater focus on prevention of blindness and visual impairment from emerging and increasing posterior segment diseases.

4. CONTINUE TO DEVELOP SPECIALISED OPHTHALMIC SERVICES FOR ARMD AND GLAUCOMA CARE

This could be done in a few centres, with a view to meet increasing demand and to prevent deterioration of vision due to complications.

5. CONTINUE TO DEVELOP REHABILITAITON SERVICES

Ensure that adequate vision rehabilitation services – ranging from magnifiers through to orientation and mobility training – are available and integrated with other services as appropriate. This should be done with a view to meet existing and increasing demand associated with increasing posterior segment diseases.

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APPENDIX. List of Bagmati Province clusters

No.	Name	Pop. size
1	Chitawan Ayodhyapuri 5	624
2	Chitawan Bagauda 9	1,966
3	Chitawan Bharatpur Municipality 1	6,329
4	Chitawan Bharatpur Municipality 5	6,149
5	Chitawan Bharatpur Municipality 9	9,159
6	Chitawan Bharatpur Municipality 10	21,036
7	Chitawan Birendranagar 8	2,092
8	Chitawan Darechok 3	3,612
9	Chitawan Gitanagar 4	2,118
10	Chitawan Jagatpur 9	2,470
11	Chitawan Kaule 5	373
12	Chitawan Kumroj 3	1,524
13	Chitawan Mangalpur 8	2,169
14	Chitawan Parbatipur 3	353
15	Chitawan Pithuwa 2	1,676
16	Chitawan Ratnanagar Municipality 6	1,777
17	Chitawan Saradanagar 9	1,467
18	Makwanpur Agara 3	984
19	Makwanpur Basamadi 6	842
20	Makwanpur Churiyamai 1	2,910
21	Makwanpur Fakhel 8	403
22	Makwanpur Handikhola 5	901
23	Makwanpur Hetauda Municipality 1	6,153
24	Makwanpur Hetauda Municipality 5	11,705
25	Makwanpur Hetauda Municipality 9	9,778
26	Makwanpur Kankada 7	1,202
27	Makwanpur Manahari 3	5,307
28	Makwanpur Nibuwatar 9	415
29	Makwanpur Raksirang 7	428
30	Makwanpur Shreepur Chhatiwan 7	1,918
31	Sindhuli Arunthakur 3	407

32	Sindhuli Bhimsthan 9	379
33	Sindhuli Hatpate 4	1,056
34	Sindhuli Kalpabrishykha 5	954
35	Sindhuli Kamalami Municipality 7	5,957
36	Sindhuli Kuseswor Dumja 6	701
37	Sindhuli Mahadevsthan 6	829
38	Sindhuli Ranibas 2	419
39	Sindhuli Swolpathana 4	154
40	Ramechap Bhaluwajor 3	194
41	Ramechap Deurali 9	485
42	Ramechap Gupteshwor 7	249
43	Ramechap Lakhanpur 9	454
44	Ramechap Pharpu 9	322
45	Ramechap Saipu 1	438
46	Dolakha Bhedpu 7	312
47	Dolakha Boach 8	258
48	Dolakha Jhyaku 4	392
49	Dolakha Laduk 4	288
50	Dolakha Mirge 6	329
51	Dolakha Sunkhani 8	257
52	Sindhupalchowk Barhabise 3	545
53	Sindhupalchowk Chautara 1	474
54	Sindhupalchowk Fulpingkatti 8	586
55	Sindhupalchowk Ichok 8	1,023
56	Sindhupalchowk Kunchok 6	320
57	Sindhupalchowk Melamchi 4	704
58	Sindhupalchowk Sangachok 8	1,087
59	Sindhupalchowk Tatopani 5	258
60	Sindhupalchowk Thumpakhar 6	358
61	Kavre Banepa Municipality 3	2,205
62	Kavre Boldefediche 3	140
63	Kavre Dewabhumi Baluwa 6	326
64	Kavre Falemetar 7	147
65	Kavre Kalati Bhumidanda 7	471

66	Kavre Kuruwas Chapakhori 9	240
67	Kavre Mathurapati Fulbari 2	182
68	Kavre Nayagaun Deupur 9	237
69	Kavre Panchkhal 4	1,337
70	Kavre Saldhara 9	257
71	Kavre Sipali Chilaune 2	469
72	Lalitpur Bhardev 9	326
73	Lalitpur Chhampi 2	514
74	Lalitpur Godamchaur 9	479
75	Lalitpur Imadol 4	2,140
76	Lalitpur Khokana 9	266
77	Lalitpur Lalitpur Sub-metropolitan City 2	19,542
78	Lalitpur Lalitpur Sub-metropolitan City 6	6,871
79	Lalitpur Lalitpur Sub-metropolitan City 9	13,271
80	Lalitpur Lalitpur Sub-metropolitan City 13	14,601
81	Lalitpur Lalitpur Sub-metropolitan City 14	21,145
82	Lalitpur Lalitpur Sub-metropolitan City 19	7,404
83	Lalitpur Lele 6	852
84	Lalitpur Sainbu 3	2,640
85	Lalitpur Thaiba 7	783
86	Bhaktapur Balkot 1	1,309
87	Bhaktapur Bhaktapur Municipality 3	3,429
88	Bhaktapur Bhaktapur Municipality 11	3,296
89	Bhaktapur Changunarayan 4	925
90	Bhaktapur Duwakot 2	1,434
91	Bhaktapur Kautunje 7	829
92	Bhaktapur Madhyapur Thimi Municipality 8	2,734
93	Bhaktapur Madhyapur Thimi Municipality 15	18,498
94	Bhaktapur Nankhel 5	677
95	Kathmandu Baad Bhanjyang 1	603
96	Kathmandu Budanilkantha 3	1,862
97	Kathmandu Chunikhel 5	527
98	Kathmandu Dhapasi 4	3,903
99	Kathmandu Futung 9	802

100	Kathmandu Gonggabu 2	2,243
101	Kathmandu Gonggabu 5	5,801
102	Kathmandu Gothatar 7	3,920
103	Kathmandu Ichang Narayan 8	974
104	Kathmandu Jorpati 1	5,516
105	Kathmandu Jorpati 4	12,462
106	Kathmandu Kabhresthali 4	613
107	Kathmandu Kapan 2	2,904
108	Kathmandu Kapan 6	1,167
109	Kathmandu Kapan 7	714
110	Kathmandu Kapan 8	2,037
111	Kathmandu Kapan 9	630
112	Kathmandu Kathmandu Metropolitan City 1	13,728
113	Kathmandu Kathmandu Metropolitan City 2	13,561
114	Kathmandu Kathmandu Metropolitan City 3	37,707
115	Kathmandu Kathmandu Metropolitan City 4	48,215
116	Kathmandu Kathmandu Metropolitan City 5	18,497
117	Kathmandu Kathmandu Metropolitan City 6	61,726
118	Kathmandu Kathmandu Metropolitan City 7	54,998
119	Kathmandu Kathmandu Metropolitan City 8	13,516
120	Kathmandu Kathmandu Metropolitan City 9	43,769
121	Kathmandu Kathmandu Metropolitan City 10	42,972
122	Kathmandu Kathmandu Metropolitan City 11	17,726
123	Kathmandu Kathmandu Metropolitan City 12	12,969
124	Kathmandu Kathmandu Metropolitan City 13	41,223
125	Kathmandu Kathmandu Metropolitan City 14	59,073
126	Kathmandu Kathmandu Metropolitan City 15	52,013
127	Kathmandu Kathmandu Metropolitan City 17	25,758
128	Kathmandu Kathmandu Metropolitan City 20	10,595
129	Kathmandu Kathmandu Metropolitan City 25	4,794
130	Kathmandu Kathmandu Metropolitan City 27	7,712
131	Kathmandu Kathmandu Metropolitan City 28	5,675
132	Kathmandu Kathmandu Metropolitan City 29	44,648
133	Kathmandu Kathmandu Metropolitan City 30	8,610

134	Kathmandu Kathmandu Metropolitan City 31	16,603
135	Kathmandu Kathmandu Metropolitan City 32	35,035
136	Kathmandu Kathmandu Metropolitan City 33	27,203
137	Kathmandu Kathmandu Metropolitan City 34	67,494
138	Kathmandu Khadka Bhadrakali 5	974
139	Kathmandu Kirtipur Municipality 6	1,681
140	Kathmandu Kirtipur Municipality 17	5,945
141	Kathmandu Mahankal 4	1,543
142	Kathmandu Manmaiju 4	858
143	Kathmandu Mulpani 6	415
144	Kathmandu Ramkot 1	962
145	Kathmandu Seuchatar 1	4,108
146	Kathmandu Suntol 7	498
147	Kathmandu Tokha Sarswoti 1	576
148	Nuwakot Bidur Municipality 1	1,551
149	Nuwakot Charghare 8	587
150	Nuwakot Ganeshthan 1	601
151	Nuwakot Kabilas 7	343
152	Nuwakot Kumari 1	787
153	Nuwakot Narjamandap 3	781
154	Nuwakot Samari 8	698
155	Nuwakot Thansing 4	459
156	Rasuwa Dhunche 7	125
157	Dhading Baireni 3	687
158	Dhading Bhumesthan 7	1,421
159	Dhading Dhusa 5	569
160	Dhading Jeewanpur 5	1,115
161	Dhading Katunje 2	811
162	Dhading Kumpur 6	1,075
163	Dhading Murali Bhanjyang 2	1,700
164	Dhading Nilkantha 4	1,091
165	Dhading Ree 6	797
166	Dhading Sertung 2	456