

# Visual status and ocular morbidity in older adults living in residential care

Mahesh Kumar Dev · Gauri Shankar Shrestha ·  
Nabin Paudel · Niraj Dev Joshi · Madhu Thapa ·  
Dev Narayan Shah

Received: 22 October 2011 / Revised: 19 April 2012 / Accepted: 24 April 2012 / Published online: 22 May 2012  
© Springer-Verlag 2012

## Abstract

**Background** The frequency of visual impairment and blindness increases with age and is more prevalent among older adults living in residential care centers. The main aim of this study was to assess the visual status and determine the prevalence and major causes of visual impairment and blindness among the older adults living in residential care centers of Kathmandu Valley, Nepal.

**Methods** A cross-sectional study was conducted on 385 residents of 60 years or older residing in seven residential care centers of Kathmandu Valley. Presenting distance visual acuity was assessed in each eye with a Snellen chart at 6-m distance in non-standardized outdoor illumination. Objective and subjective refractions were performed and the best-corrected distance visual acuity was considered in the better eye. Near acuity was assessed binocularly with The Lighthouse Near Acuity Card. Complete anterior and posterior segment examination was carried out.

**Results** The mean age of residents was  $74.34 \pm 8.19$  years. The majority was female residents (78.2 %). The prevalence of visual impairment and blindness was 43.70 %. Adequate refractive correction could alone reduce the prevalence of visual impairment and blindness by 15.40 %. Cataract was the leading cause of visual impairment and blindness, which was followed by age-related macular degeneration, corneal opacity, glaucoma, and macular scar.

**Conclusions** The prevalence of visual impairment and blindness is significant among the older adults living in residential care centers. The frequency of visual impairment and blindness can be prevented by adequate refractive correction, frequent eye examination, and appropriate high use of cataract surgery.

**Keywords** Residential care/old age home · Visual acuity · Visual impairment · Blindness · Low vision · Prevalence · Kathmandu

## Introduction

The older adults living in residential care centers have higher rates of visual impairment (VI) and blindness as compared to the same age from the same base population living outside residential care centers because they often do not have the same access to health care as do persons living at home [1–17].

The prevalence of visual impairment and blindness increases with age as a result of high prevalence of major causes of irreversible blindness such as retinal diseases, glaucoma, age-related macular degeneration (ARMD) as well as reversible causes (cataract) among the older adults living in residential care. It is vital that vision care not be ignored in this population [9, 18–20].

Much of the impairment may be due to correctable conditions, including refractive error and cataract. The high rate of near visual acuity impairment may be due to a lack of correction or under correction of presbyopia. Visual impairment can be avoided significantly by a simple change in refraction and provision of new spectacles and by cataract surgery [5, 9, 18, 20–22].

M. K. Dev (✉) · G. S. Shrestha · N. Paudel · N. D. Joshi ·  
M. Thapa · D. N. Shah  
B. P. Koirala Lions Center for Ophthalmic Studies,  
Department of Ophthalmology, Institute of Medicine,  
Tribhuvan University, Maharajgunj,  
Kathmandu, Nepal  
e-mail: maheshdev2002@yahoo.com

M. K. Dev  
e-mail: mahesh@iom.edu.np

Visual function is important for an optimal orientation in functional and social life and has an effect on both physical and emotional well-being [23]. Visual impairment and blindness are the major forms of disabilities in individuals living in residential care facilities and affects vision-specific functioning and socio-emotional aspects of daily living [1, 3, 5, 9].

There is a need to better understand the visual status, pattern of eye diseases, and the quality of life among the older adults living in residential care facilities and to provide eye care assessment [17, 19, 23]. Both the availability and the utilization of accessible eye-care services could potentially reduce their health care needs and the aged care service burden on the community. Little work has been done to document the magnitude and severity of such problems among the older adults living in residential care. There is a shortage of eye care professionals who routinely serve people living in residential care centers [5, 8, 14, 18, 24].

The aim of this study was, therefore, to determine visual status and ocular morbidity among the older adults living in residential care, to document the prevalence of visual impairment and blindness, and identify their causes among the older adults living in residential care. To the best of our knowledge, no such study on visual status and ocular morbidity among the older adults living in residential care centers has been done in Nepal.

## Methods

This was a descriptive, cross-sectional, and community-based study conducted among the older adults living in seven different residential care centers of Kathmandu Valley, namely, the Social Welfare Centre (Pashupati Briddhashram), Nisahaya Sewa Sadan, Siddhi Shaligram Briddhashram, Old Age Management & Social Welfare Trust (OAMSWT): Aama ko Ghar, Matatirtha Briddhashram Samiti, Divine Service Home and Tapasthali Briddhashram.

There were a total of 437 residents among seven residential care centers of Kathmandu Valley, Nepal. However, we could enroll only 385 residents (88 %) as the remaining residents were absent during the time of examination. A total 385 residents of age 60 years or older were enrolled in this study. The institutional review board at the Institute Of Medicine, Tribhuvan University, approved the study protocol, and the study followed the tenets of the Declaration of Helsinki. Informed consent was obtained both from the administrator of the residential care centers and from residents themselves.

Enrollees' particulars including age, sex, and marital status were noted. Interviews about previous eye examination and previous use of glasses were also conducted. Presenting distance visual acuity (VA) was assessed with a Snellen chart at 6-m distance in non-standardized outdoor illumination and near acuity with The Lighthouse Near

Acuity Card. Refraction was performed by an optometrist and best-corrected distance visual acuity was considered in the better eye. Complete anterior and posterior segment examination was carried out in all the residents by a team of optometrists and ophthalmologists. Anterior segment evaluation was carried out with a torch light and a handheld portable slit lamp. Posterior segment evaluation was done with a direct ophthalmoscope as well as a head-mounted binocular indirect ophthalmoscope. Intraocular pressure was measured with a hand-held Perkins applanation tonometer.

Residents needing detailed examination (who needed specialized investigations) were referred to B.P Koirala Lions Center for Ophthalmic Studies (BPKLCOS), a tertiary-level eye care center of Nepal for further evaluation. Recorded data were analyzed by Statistical Package for Social Sciences (SPSS) version 17.0 and Microsoft Excel version 2010.

## Results

The vast majority (78.2 %, 301) were female residents. Marital status of only 94.3 % (363) residents out of total ( $N=385$ ) could be obtained and most were widows (69 %). Mean age of the residents was  $74.34 \pm 8.19$  years (range, 60–104 years). The majority of residents (44.4 %) were in the age range of 70–79 years. There was no statistically significant difference between the mean age of male ( $75.20 \pm 7.84$  years) and female residents ( $74.09 \pm 8.28$  years) ( $t$  test,  $p=0.263$ ).

We were able to interview 363 residents (94 %) out of total 385 residents regarding the history of eye examination and use of glasses. Among them, 35.26 % (128) residents had not had history of eye examination even once in life. Majority of the residents (246, 67.77 %) were not wearing glasses during the time of our examination.

### Ocular morbidity

The prevalence of ocular morbidity in our study population was 96.40 %. Among the sight-threatening ocular conditions, the majority were lens-related causes (71.60 %), followed by retinal causes (41.70 %), and corneal opacity (6.30 %) (Table 1). Among the non-sight-threatening ocular conditions, pinguecula/pterygia and arcus senilis were predominant (Table 1).

### Visual acuity

#### *Presenting distance visual acuity*

Quantification of visual acuity (VA) was followed as that established by the World Health Organization and used in the International Classification of Diseases [25]. Presenting

**Table 1** Ocular morbidity

Parts		Frequency (%)	
		Percentage (%)	Total (%)
Lid related	Ectropion/entropion	2.9	15.9
	Blepharitis/MGD/chalazion/stye	2.4	
	Ptosis/blepharophimosis	0.8	
	Dermatochalasis/blepharochalasis/xanthelasma	7.9	
	Trichiasis/poliosis/distichiasis	0.6	
	External tumors/papilloma	1.3	
Conjunctiva/episclera/sclera	Pinguecula/pterygia	25.5	26.6
	Conjunctivitis	0.8	
	Episcleritis/scleritis	0.3	
Cornea	Arcus senilis	24.7	31.9
	Opacity	6.3	
	Micro-cornea	0.3	
	Corneal haze/edema	0.6	
Iris	PI/trabeculectomy	1.6	2.4
	Atrophy/sphincter loss	0.8	
Pupil	Corectopia	2.0	2.0
Lens	Aphakia	1.0	71.60
	Pseudophakia	20.3	
Vitreous	Cataract	50.3	3.1
	Degeneration	0.8	
	Hemorrhage/opacity	2.3	
Retina	Optic atrophy	6.3	41.7
	ARM D	8.9	
	Macular scar	15.3	
	Retinopathy (HTN/DM)	4.7	
	Retinal degeneration and dystrophy	3.8	
	Others	2.7	
Whole globe	Phthisis/atrophic bulbi	1.5	3.1
	Microphthalmos	0.3	
	Removal of eyeball	1.3	
Squint	Exotropia	0.3	2.5
	Esotropia	0.6	
	Alternate tropia	1.6	

*MGD* meibomian gland dysfunction; *PI* peripheral iridotomy; *ARM D* age-related macular degeneration; *HTN* hypertension; *DM* diabetes mellitus

distance VA could be assessed in 94.54 % (364) residents out of the total of 385 participating residents. We could not assess VA in 5.46 % (21) residents because of residents' uncooperative nature and presence of some forms of disabilities like intellectual disabilities, hearing impairment, unable to speak and listen, or bed ridden due to stroke. Among them, 40.9 % (149) had normal or near-normal VA and 59.10 % (215) had visual impairment (Table 2).

#### Near acuity

Mean presenting near acuity was 14N (SD 2.31) and the best near acuity after appropriate near correction was 8N

**Table 2** Presenting distance VA in the better eye

Acuity (Snellen notation)	Frequencies	
	Number	Percentage
≥6/18 (normal/near normal)	149	40.9
<6/18–6/60 (moderate visual impairment)	142	39.0
<6/60–3/60 (severe visual impairment)	27	7.4
<3/60-PL (legally blind)	36	9.9
NPL (totally blind)	10	2.7
Total	364	100

(SD 1.66). The difference was statistically significant (Wilcoxon signed-rank test,  $p < 0.05$ )

### Refractive error

Refraction test was carried out in all the residents. However, valid refraction could be obtained from only 218 (56 %) residents as the other 167 residents had dense media opacities, globe disorders, and other ocular abnormalities that prohibited us from achieving their refractive data. Among them, simple hyperopia (27.06 %) was the commonest type of refractive error, followed by simple myopia (22.01 %) and simple myopic astigmatism (18.80 %). Simple myopia was commonly associated with cataract, and pseudophakia, however, and simple hyperopia was commonly associated with aphakia and the normal lens.

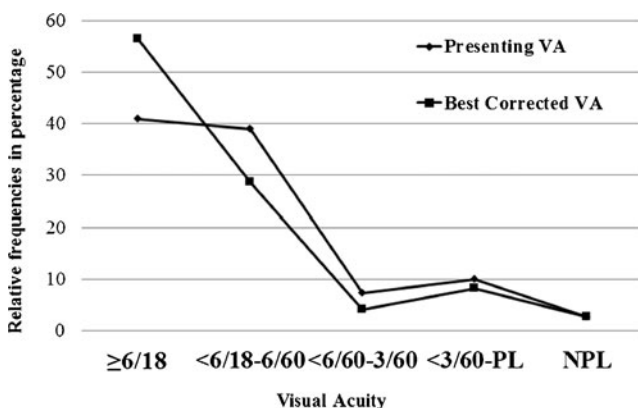
Refractive correction was prescribed in 91.28 % (199) residents out of 218 residents. Mean spherical equivalent refractive error was  $-0.35 \pm 2.86\text{D}$  (range,  $-18.00\text{ D}$  to  $+12.00\text{ D}$ ) in the right eye and  $-0.58 \pm 2.92\text{ D}$  (range,  $-22.00\text{D}$  to  $+12.00\text{D}$ ) in the left eye.

### Presenting and best-corrected distance visual acuity

Best-corrected visual acuity was defined as the visual acuity of the better eye after adequate refractive correction. There was a significant improvement in VA after appropriate refractive correction. ( $\chi^2 = 1018.58$ ,  $df = 16$ ,  $p < 0.05$ ) (Fig. 1).

### Prevalence of visual impairment and blindness

Considering the presenting VA in the better eye, the prevalence of visual impairment and blindness was 59.10 % (215) but after appropriate refractive correction, the prevalence was reduced to 43.70 % (159). Refractive correction alone reduced the prevalence of visual impairment and blindness by 15.40 %, which was statistically significant (McNemar Test,  $p < 0.05$ ).



**Fig. 1** Presenting vs. best-corrected VA in the better eye

After refractive correction, the prevalence of low vision (VA  $< 6/18$  to  $\geq 3/60$  in the better eye) was 32.80 % (119); 28.6 % (104) had moderate visual impairment and 4.10 % (15) had severe visual impairment (Fig. 1). The prevalence of blindness was 10.90 %. Among them; 8 % (30) were legally blind and 3 % (10) were totally blind (Fig. 1).

### Causes of low vision and blindness

Cataract was the leading cause of non-refractive visual impairment and blindness (51.60 %) (aphakia and pseudophakia were also included in cataract). Cataract was followed by ARMD (8.80 %), corneal opacity (7.0 %), glaucoma (5.0 %), macular scar (5.0 %), retinal degeneration and dystrophy (4.4 %), and others (5.7 %). The others category included disc coloboma, vitreous opacity, microphthalmos, retinal detachment, etc. (Fig. 2).

Cataract also occurred in combination with macular degeneration or glaucoma. If more than one ocular condition causing visual impairment occurred simultaneously, the primary cause was determined considering the severity of the condition, which contributed more.

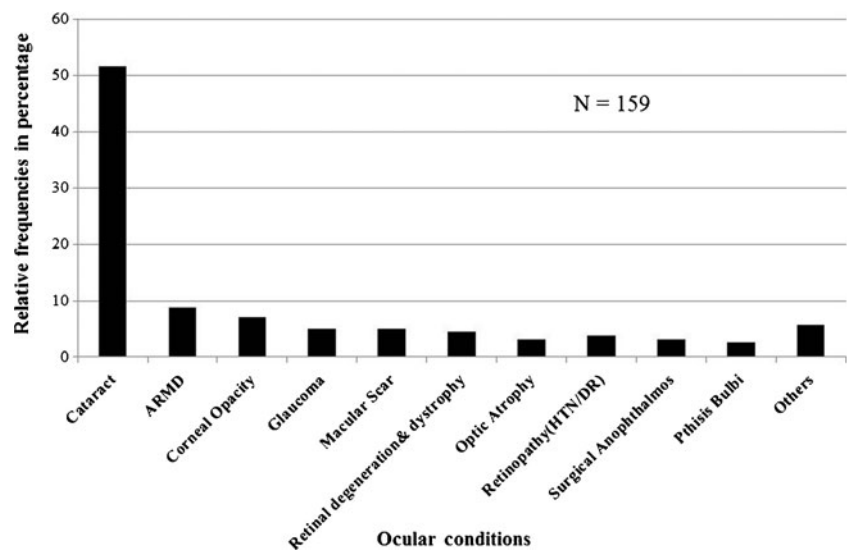
The prevalence of visual impairment in males was 42.17 % (35) while in females it was 44.13 % (124). There was no sex predilection regarding the prevalence of visual impairment and blindness as an almost equal portion of males and females were affected.

As age increased, the prevalence of visual impairment and blindness increased. The prevalence of visual impairment and blindness was strongly associated with age ( $\chi^2 = 13.93$ ,  $df = 4$ ,  $p < 0.05$ )

### Discussion

The vast majority of our study population were female residents (78.2 %). Our finding was similar to the study conducted by Ecosse et al., Elliott AF et al., Owsley et al., and Eichenbaum et al. [1, 2, 5, 18]. The important factor for female predominance was due to the number of residential care centers where only females resided. The other reason may be the lack of appropriate care by their family members after their husbands' demise, which compels them to stay in residential care. In contrast to our study, males were more predominant in the study conducted by Vu CN et al. [19].

About 35 % of the residents had no history of eye examination during their life time. This reflects poor eye-care services to this deserving population. The majority of the residents (67.77 %) responded that they were not wearing glasses at present. They reported variable reasons like their glasses were broken or lost, they could not get used to them, their glasses did not help them or did not fit them, or they could not afford glasses.

**Fig. 2** Causes of low vision and blindness

The most common type of refractive error was simple myopia followed by simple hyperopia. The higher prevalence of myopia may have been due to the higher prevalence of cataract and pseudophakia. Simple hyperopia was the second commonest type of refractive error as it was associated with residents having aphakia and residents with the normal lens.

The prevalence of visual impairment and blindness (59.10 %) at the presenting VA and even after refractive correction (43.70 %) was significantly higher in comparison to the Tielsch et al., Vu CN et al., and Waked et al. studies [9, 19, 20] (Table 3). A study conducted by Thapa SS et al. among non-residential care residents in Bhaktapur district of Nepal found the prevalence of VI at presentation to be 18.57 % and after best-correction reduced to 4.4 %, which was considerably lower than in our study [26]. The reasons for this may be that residents often do not have the same access to health care as do persons living at their own homes and there may be shortage of eye care professionals who routinely serve the older adults living in residential care centers. It may be also due to that residents do not wear spectacles, even though they have them and they believe that aged people do not personally benefit from treatment to improve vision. We accept that our result might have been

biased somehow towards higher prevalence of VI and blindness because some of the residents who were absent during the vision assessments could have better visual acuity.

Our study resulted in slightly lower estimates of the prevalence of visual impairment and blindness in contrast to Owsley et al.'s study [5] (Table 3).

Cataract was the leading cause of non-refractive visual impairment and blindness (51.60 %) followed by ARMD (8.80 %), corneal opacity (7.0 %), glaucoma (5.0 %), and macular scar (5.0 %). This was inconsistent with the studies of Tielsch et al. (1995), Normalina et al. (1998), Eichenbaum et al. (1999), Vu CN et al. (1995), and Waked et al. (2007) [9, 13, 18–20]. The reasons for cataract to be the leading cause may be inadequate eye care services and high prevalence of mature cataract and inappropriately low use of cataract surgery. Although most of the residents (64.74 %) had a history of eye examination, there may not be frequent eye examination and adequate eye care service available. The other reasons may be the presence of posterior capsular opacity after cataract surgery and uncorrected induced astigmatism after surgery.

We judged that adequate refractive correction alone can reduce the prevalence of visual impairment and blindness by 15.40 %. This was similar to West et al.'s study who

**Table 3** Comparison of prevalence of VI and blindness from various studies

SN	Study	Sample size	Visual Impairment (%)	Blindness (%)
1	Present study (2011)	385	43.70	10.90
2	Owsley et al. (2007) [5]	380	46.00	10.00
3	Waked et al. (2007) [20]	298	36.00	NA
4	West et al. (2003) [14]	1,305	38.00	NA
5	Eichenbaum et al. (1999) [18]	732	35.8	NA
6	Vu CN et al. (1995) [19]	39	30.80	10.30
7	Normalina et al. (1998) [13]	204	47.5	19.10
8	Tielsch et al. (1995) [9]	499	30.50	8.03

reported that refractive correction can prevent visual impairment and blindness by 19.00 % [14]. This was in contrast to Tielsch et al.'s study in which refractive correction reduced visual impairment by 37 % and blindness by 20 % [9]. Most of the residents had cataract, which induces refractive error and in cases where cataract surgery was done astigmatism was more prevalent. This finding advocates the vital role of optometrists and ophthalmologists in the prevention of visual impairment and blindness. Community optometrists and ophthalmologists provide a wide range of quality eye-care services like community-based vision screening, refraction and eye examinations, and refer the needed ones to an eye hospital and by doing so they often relieve the burden of a hospital visit.

The prevalence of total blindness was 2.7 % due to the fact that some of the residents had their eyes enucleated and some had anterior staphyloma and phthisical eyes.

The prevalence of visual impairment and blindness was strongly associated with age [2, 9, 20]. As age increased, the rate of visual impairment and blindness also increased, which was similar to the studies conducted by Elliott et al. and Waked et al. [2, 20].

There was no significant difference regarding gender in the prevalence of visual impairment and blindness. This was similar to Eichenbaum et al.'s study [18]. This was inconsistent with Tielsch et al.'s study where females had higher rates of both visual impairment and blindness [9].

## Conclusions

The prevalence of visual impairment and blindness is significant among the older adults living in residential care centers. A large proportion of residential care residents are unnecessarily living with visual impairment that can easily be corrected. Much of the impairment is due to correctable conditions including refractive error and cataract. Adequate refractive correction and timely utilization of cataract surgery can reduce the prevalence of visual impairment and blindness.

Our study concludes that inadequate eye-care services are the problem in residential care centers. There is a lack of awareness about the visual status among the residential care residents. There is a need to understand its causes and to evaluate intervention to address this public health challenge.

The results of our study strongly advocate a need for routine comprehensive eye care examination among the residential care residents because the ocular diseases causing visual impairment and blindness usually have a gradual onset and ultimately be devastating to vision. Finally, the staff of the residential care centers should also be trained to recognize and suspect visual conditions and their impact on daily functioning.

The study recommends that all new residents undergo vision screening and an eye examination before they are admitted to a residential care facility.

Future research should be directed towards assessing the vision-related quality of life among the older adults living in residential care facilities.

## References

- Ecosse L, Eva F, Kirsten M, Klaic M, Borschmann K, Hill K (2009) Impact of the severity of distance and near-vision impairment on depression and vision-specific quality of life in older people living in residential care. *Invest Ophthalmol Vis Sci* 50(9):4103–4109
- Elliott AF, McGwin G Jr, Owsley C (2009) Health-related quality of life and visual and cognitive impairment among nursing-home residents. *Br J Ophthalmol* 93:240–243
- Horowitz A (1994) Vision impairment and functional disability among nursing home residents. *Gerontologist* 34(3):316–323
- Mitchell P, Hayes P, Wang JJ (1997) Visual impairment in nursing home residents: the Blue Mountains Eye Study. *Med J Aust* 166(2):73–76
- Owsley C, McGwin G, Scilley K, Meek GC, Dyer A, Seker D (2007) The visual status of older persons residing in nursing homes. *Arch Ophthalmol* 125(7):925–930
- Owsley C, McGwin G, Scilley K, Meek GC, Seker D, Dyer A (2007) Effect of refractive error correction on health related quality of life and depression in older nursing home residents. *Arch Ophthalmol* 125(11):1471–1477
- Owsley C, McGwin G, Scilley K, Meek GC, Seker D, Dyer A (2007) Impact of cataract surgery on health-related quality of life in nursing home residents. *Br J Ophthalmol* 91:1359–1363
- Wang JJ, Mitchell P, Cumming RG, Smith W (2003) Visual impairment and nursing home placement in older Australians: the Blue Mountains Eye Study. *Ophthalmic Epidemiol* 10(1):3–13
- Tielsch JM, Javitt JC, Coleman A, Katz J, Sommer A (1995) The prevalence of blindness and visual impairment among nursing home residents in Baltimore. *N Engl J Med* 332:1205–1209
- Taiel-Sartral M, Nounou P, Rea C, el Alamy A, Bendeddouche K, Boumezzag M, Milcamps R, Cohen D (1999) Visual acuity and ocular disease in geriatric nursing homes: study in 219 nursing people in France. *J Fr Ophthalmol* 22(4):431–437
- Nottle HR, McCarty CA, Hassell JB, Keefe JE (2000) Detection of vision impairment in people admitted to aged care assessment centers. *Clin Exp Ophthalmol* 28(3):162–164
- Swanson MW, McGwin G Jr, Elliott AF, Owsley C (2009) Association between the nursing home minimum data set for vision and vision-targeted health-related quality of life in nursing home residents as assessed by certified nursing assistants. *J Optom* 2:148–154
- Normalina M, Zainal M (1998) The dimensions of ocular morbidity amongst the nursing home geriatrics population. *Med J Malaysia* 53(3):239–244
- West SK, Friedman D, Munoz B, Roche KB, Park W, Deremeik J, Massof R, Frick KD, Broman A, McGill W, Gilbert D, German P (2003) A randomized trial of visual impairment interventions for nursing home residents: study design, baseline characteristics and visual loss. *Ophthalmic Epidemiol* 10(3):193–209
- Munoz B, West SK, Rubin GS, Schein OD, Quigley HA, Bressler HB, Bandeen-Roche K, the SEE Study Team (2000) Causes of blindness and visual impairment in a population of older Americans: the Salisbury Eye Evaluation Study. *Arch Ophthalmol* 118(6):819–825

16. Munoz B, West SK, Rodriguez J, Sanchez R, Broman AT, Snyder R, Klein R (2002) Blindness, visual impairment and the problem of uncorrected refractive error in a Mexican-American population. *Invest Ophthalmol Vis Sci* 43(3):608–614
17. VanNewkirk MR, Weih L, McCarty CA, Stanislavsky YL, Keefe JE, Taylor HR (2000) Visual impairment and eye diseases in nursing institutionalized Australians. *Ophthalmology* 107(12):2203–2208
18. Eichenbaum JW, Burton WB, Eichenbaum GM, Mulvihill M (1999) The prevalence of eye disease in nursing home and non-nursing home geriatric populations. *Arch Gerontol Geriatr* 28:191–204
19. Vu CN, Kirby J, Lovett S (1995) The visual status of the nursing home residents. *Clin Eye Vision Care* 7:203–209
20. Waked N, Saad A, Mehanna C, Sleilaty G, Kortbaoui R (2007) Prevalence causes and risk factors for blindness and visual impairment among nursing home residents in Lebanon. *J Fr Ophthalmol* 30(5):497–502
21. Sturges I, Rudd AG, Shilling J (1994) Unrecognized problems amongst residents of part III homes. *Age Ageing* 23(1):54–56
22. Friedman DS, West SK, Munoz B, Park W, Deremeik J, Massof R, Frick K, Broman A, McGill W, Gilbert D, German P (2004) Racial variations in causes of vision loss in nursing homes. *Arch Ophthalmol* 122(7):1019–1024
23. Holmes D, Kong J, Morse A, Ramirez M, Rosenthal B, Teresi J, Yatzkan ES (2005) Impact of a vision intervention on the functional status of nursing home residents. *J Vis Impair Blindness* 99:96–108
24. Friedman DS, Munoz B, Roche KB, Massof R, Broman A, West SK (2005) Poor uptake of cataract surgery in nursing home residents: the Salisbury Eye Evaluation in Nursing Home Groups Study. *Arch Ophthalmol* 123(11):1581–1587
25. Dandona L, Dandona R (2006) Revision of visual impairment definitions in the International Statistical Classification of Diseases. *BMC Med* 4:7
26. Thapa SS, Berg RVD, Khanal S, Paudyal I, Pandey P, Maharjan N, Twyana SN, Paudyal G, Gurung R, Ruit S, Rens Ger HMBV (2011) Prevalence of visual impairment, cataract surgery and awareness of cataract and glaucoma in Bhaktapur district of Nepal: The Bhaktapur Glaucoma Study. *BMC Ophthalmol* 11:2