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Rapid assessment of avoidable blindness in South Sulawesi Indonesia

Abstract

AIM: Few data are available on the causes and prevalence of vision impairment and blindness in Indonesia. This survey was conducted to report the prevalence of blindness and its causes in South Sulawesi, Indonesia.

METHODS: The study design was a cross sectional study using the rapid assessment avoidable blindness (RAAB) international standard protocol. Four (4) teams were trained in August 2013 by an internationally accredited RAAB. Trainer for the survey in 4 District/City areas - Makassar, Gowa, Palopo and Luwu. Each team consisted of 1 ophthalmologist, 3 residents and 1 data entry person. 88 clusters were selected by a multi-stage random sampling protocol. Participants ≥ 50 years were examined. Visual acuity was tested using tumbling E chart and anterior segment examination by torch. Data were collected and analysed using RAAB version 5 software tool.

RESULTS: From the 4,399 respondents involved, 1,637 (37.2%) were male and 2,727 (61.9%) were female. The prevalence of bilateral blindness was 2.6 %. Based on visual acuity, there were 3 groups of blindness, blind (visual acuity $\leq 3/60$ in the better eye presenting or with best correction), severe visual impairment (visual acuity $>3/60 - \leq 6/60$) and moderate visual Impairment (visual acuity $> 6/60 - 6/18$). The most common causes of blindness are cataract (64.3%), non trachomatous corneal opacity (10.8%) and other posterior segment disease (7.1%). Untreated cataract was the leading cause of severe visual impairment (54.5%) and refractive error in those with moderate visual impairment (52.9%).

CONCLUSION: The prevalence of blindness in South Sulawesi of 2.6% is higher compared with other countries and a major social problem in Indonesia. The main cause of blindness in the province is cataract, thus needed a priority in planning and implementation of eye programs.

KEYWORDS: Rapid, assessment, avoidable, blindness

INTRODUCTION

The World Health Organization (WHO) estimated that vision loss caused 3.9% of the total global burden of disease measured as disability-adjusted life years in 2004.¹ A study in 2010 also updated that 39 million people were blind and 285 million were visually impaired.² In order to set planning and implementation program on eye care in a country it is important to have basic data about prevalence of blindness and visual impairment.

Rapid Assessment of avoidable blindness (RAAB) was developed by Hans Limburg at International Centre for Eye Health (ICEH) in London.³ The term was employed as "rapid" because it measures visual

impairment only in those ≥ 50 years, which blindness is most common in this age group and yet a relatively small proportion of the total population. RAAB is a new recommended method for sampling.^{3,4}

A study in Sumatera, Indonesia in 2003 reported that the age-adjusted prevalence rates for bilateral low vision and blindness were 5.8% and 2.2% respectively.⁵ There have been several other surveys of eye health in Southeast Asia but not in Indonesia. The lack of data from epidemiological studies in eye health in Indonesia was the main reason to conduct this study using RAAB methodology, to obtain reliable and trustable results.^{6,7}

SUBJECTS AND METHODS

South Sulawesi is a province in Indonesia located on the southern part of Sulawesi Island. The 2010 Indonesian census recorded the population of 8,032,551 placed this province as the sixth most populated province in Indonesia. 44% of the population in Indonesia is urban population. In this study we chose 4 districts as the survey area with a total population of 2,472,599. The four districts/city are Makassar, Gowa, Luwu and Palopo. Makassar and Gowa represent the southern part of South Sulawesi while Palopo and Luwu represent the northern part of the province. The total sample was calculated from the total population of 4 districts.

Compact segment sampling was used in these 4 districts with 88 clusters selected with probability proportionate to size, using data from the 2010 census as the sampling frame. One village from each cluster was then randomly selected to be visited for the survey.

On the day of the survey, the enumeration area was divided into segments. Each segment including approximately 50 people aged ≥ 50 years, and one segment was selected at random by drawing lots. All households within the selected segment were visited consecutively until 50 people aged ≥ 50 years were examined. If the segment did not include enough individuals, then a backup segment was visited. If an eligible person was absent, the survey teams returned at least once in an attempt to examine the individual. If the person still could not be examined, demographic information and perceived vision status (not blind, blind due to cataract, blind due to other causes, operated for cataract) were collected from neighbours or relatives.

A sample size of 4399 people aged ≥ 50 years across the four districts in South Sulawesi Province was determined using RAAB software (Version 5). A standard protocol was used according to the rapid assessment of avoidable blindness (RAAB) method after an initial 1-week workshop.

The examination protocol included visual acuity assessment using a standard tumbling "E" chart without and with pinhole. The examination of crystalline lens was performed by both torch and distant direct ophthalmoscopy. A slit lamp examination was conducted if the subject's visual acuity was $< 6/18$ in either eye, then the fundus examined through a dilated pupil using a direct ophthalmoscope. The initial part of the eye examination was performed by paramedical ophthalmic personnel and the latter part

performed by an ophthalmologist or an ophthalmic clinical officer. All participants with VA <6/18 in either eye examined by an ophthalmologist. Participants with cataract were interviewed regarding surgical outcomes and barriers to surgery.

Blindness was defined using the WHO definitions VA in the better eye <3/60, severe visual impairment (SVI) VA ≥3/60 to <6/60 and moderate VI was defined as VA ≥6/60 to <6/18. The primary cause of visual impairment was defined according to the cause in the participant's better eye.

All staff received 1 week of training hosted at Hasanuddin University Hospital by Dr. S from India. The training consisted in formal classroom training and field-based practice. Inter-observer Variation (IOV) for VA measurement was assessed between teams to ensure it was of an acceptable standard (kappa ≥ 0.60).

Data Management and Statistical Analysis

After initial review by the lead ophthalmologist, the survey data were entered twice and validation checks completed in the RAAB software. The data were analysed using RAAB Version 5 (Netherlands) for pre-defined reports relating to both crude and age and gender adjusted results.

RESULTS

The population consisted of 4399 people with 4364 (99,2%) participants; 35 people were non-respondents, 24 refused, 8 people could not communicate with the survey team and 3 were not available. Of the total respondents, 1637 (37.5%) were male and 2727 (62.5%) were female. The age and sex-adjusted prevalence of blindness was 2.6% (95% CI : 2.1-3.2) with 2.2% of respondents blind (95% CI : 1.7 – 2.7) with best correction or pinhole. (Table 1). The leading cause of blindness was cataract (64.3%) followed by non trachomatous corneal opacity (10.8%), other posterior segment (7.1%), refractive error (5.0%) and cataract surgical complication (4.1%).

Table 1. Age And Sex-Adjusted Prevalence Of Bilateral Blindness, Severe Visual Impairment (SVI) and Moderate Visual Impairment (MVI), by Gender

Visual acuity	Male;
CI 95% (N)	Female;
CI 95% (N)	Total;
CI 95% (N)	

Blindness: Presenting VA<3/60 in the better eye, with available correction

2.4;1.6 - 3.3 (3,67)

2.8; 2.2 - 3.4 (4,85)

2.6; 2.1 - 3.2 (8,51)

Blindness: Best corrected VA<3/60 in the better eye, with best correction or pinhole

2.0; 1.2 - 2.8 (2,99)

2.4; 1.9 - 3.0 (4,20)

2.2; 1.7 - 2.7 (7,19)

SVI: Presenting VA<6/60 - 3/60 in the better eye, with available correction

3.3; 2.2 - 4.4 (4,96)

3.6; 2.7 - 4.4 (6,17)

3.4; 2,8 - 4.1 (11,13)

MVI: Presenting VA<6/18 - 6/60 in the better eye, with available correction

11.7; 9.9 - 13.5 (1,78)

14.6; 12.8 - 16.4 (2,52)

13.2; 11.8 - 14.7 (43,00)

The data expressed as percentage.

VA: visual acuity; SVI: severe visual impairment; MVI: moderate visual impairment

The lowest prevalence was found in the city of Makassar 1.7% (95% CI 1.1% - 2.3%), and was highest in Gowa 3.74% (95% CI 2.8 - 4.7%) with the differences significant (Table 2). Best corrected blindness and presenting SVI were also significantly different.

Among the examined population 3.4% (95% CI : 2.8-4.1) were severely visual impaired (SVI) and 13.2% (95% CI : 11.8-14.7) had moderate moderate visual impairment (MVI). The prevalence of blindness, SVI and MVI was higher in women compared to men but the difference was not significant. Causes of blindness, SVI and MVI were similar in men and women (Table 3).

The most common cause of SVI for both genders was cataract with 54.5% followed by un- or under-corrected refractive error with 36.6%. The leading cause of MVI (52.9%) which was similar for both gender was un- or under-corrected refractive error in contrast to causes of SVI and blindness (Table 4).

Table 5 shows us Cataract Surgical Coverage (CSC) between the two groups. In this table we can see the differences of CSC where it is higher in men than in women in all categories of blindness and visual impairment. CSC among male is 70.4% for the group Blindness, 56.0% for SVI group and 31.6% for the MVI group, whereas among women CSC Blindness, SVI and MVI groups respectively 59.5%, 45.1% and 24.6%. Chi square calculation results with p value 0.998124, which means not significant ($p > 0.05$).

The most common barrier to cataract surgery of survey participants (Table 6) with vision impairment ($BCVA < 6/60$) due to un operated cataract by gender is "need not felt" with 47.2% in both males and females, and the least barrier is local reason with 1(0,9%) found in female. Only a small number were unaware that treatment is possible but did not feel the need for cataract surgery.

Table 2. Prevalence of Bilateral Blindness, Severe Visual Impairment (SVI) and Visual Impairment (VI) by City and District

Visual acuity	Makassar
%; CI 95% (n)	Gowa
%; CI 95%	
(n)	Luwu
%; CI 95%	
(n)	Palopo
%; CI 95%	

(n)

Total

Blindness: Best corrected VA<3/60 in the better eye, with best correction

1.2%

(0.7-1.6)

(22)

3.4%

(2.5-4.3)

(62)

2.5%

(1.3-3.7)

(9)

2.1%

(1.1-2.2)

(6)

2.3%

(1.8-2.8)

(99)

Blindness: Presenting VA<3/60 in the better eye, with available correction

1.7%

(1.1-2.3)

(32)

3.7%

(2.8-4.7)

(69)

2.2%

(1.5-3.0)

(8)

2.8%

(1.8-3.8)

(8)

2.7%

(2.1-3.2) (117)

SVI: Presenting VA<6/60 - 3/60 in the better eye, with available correction

2.2%

(1.5-3.0)

(42)

4.6%

(3.5-5.7)

(85)

4.5%

(2.8-6.2)

(16)

3.8%

(2.7-4.9)

(11)

3.5%

(2.9-4.2) (154)

MVI: Presenting VA<6/18 - 6/60 in the better eye, with available

12.6%

(10.5-14.7)

(236)

15.1%

(12.6-17.7)

(279)

15.1%

(12.6-17.7)

(54)

14.9%

(12.4-17.4)

(43)

14%

(12.6-15.5)

(612)

The data expressed as percentage.

VA: visual acuity; SVI: severe visual impairment; MVI: moderate visual impairment

Table 3. Main Causes of Blindness (People)

Main cause	Male	Female	Total
Cataract untreated	150 (61.5)	238 (66.3)	388 (64.3)

Non Trachomatous corneal opacity	26 (10.7)	39 (10.9)	65 (10.8)
Other Posterior Segment Disease	20 (8.2)	23 (6.4)	43 (7.1)
Refractive Error	16 (6.6)	14 (3.9)	30 (5.0)
Cataract Surgical Complication	6 (2.5)	19 (5.3)	25 (4.1)
Glaucoma	8 (3.3)	7(1.9)	15 (2.5)
Diabetic Retinopathy			
Oopathy	6 (2.5)	7 (1.9)	13 (2.2)
Phthisis	6 (2.5)	6 (1.7)	12 (2.0)
All Other Globe/CNS Abnormalities	3 (1.2)	4 (1.1)	7 (1.2)
Aphakia Uncorrected	2 (0.8)	1 (0.3)	3 (0.5)
ARMD	1 (0.4)	1 (0.3)	2 (0.3)
Total	244(100)	359 (100)	603 (100)

CNS: central nervous system; ARMD: age-related macular degeneration

Table 4. Main Causes of Severe Visual Impairment and Moderate Visual Impairment

Main cause	Presenting VA <6/60-3/60		Presenting VA ≤ 6/18 – 6/60		
	Male				
n (%)	Femalen (%)	Total			
n (%)	Male				
n (%)	Female				
n (%)	Total				
n (%)					
Cataract Untreated	85 (49.4)	167 (57.6)	252 (54.5)	190 (40.7)	382 (41.8)
	572 (41.4)				

Refractive Error	76 (44.2)	93 (32.1)	169 (36.6)	246 (52.7)	484 (53.0)	730 (52.9)
Non Trachomatous Corneal Opacity	6 (3.5)	8 (2.8)	14 (3.0)	10 (2.1)	13 (1.4)	23 (1.7)
Other Posterior Segment Disease	3 (1.7)	13 (4.5)	16 (3.5)	8 (1.7)	6 (0.7)	14 (1.0)
Diabetic Retinopathy	0 (0.0)	8 (2.8)	8 (1.7)	5 (1.1)	13 (1.4)	18 (1.3)
Aphakia Uncorrected	1 (0.6)	0 (0.0)	1 (0.2)	1 (0.2)	0 (0.0)	1 (0.1)
Cataract Surgical Complication	1 (0.6)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
All Other Globe/CNS Abnormalities	0 (0.0)	1 (0.3)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
Glaucoma		0 (0.0)	2 (0.2)	2 (0.1)		
ARMD		0 (0.0)	0 (0.0)	0 (0.0)		
Total	172(100)	290 (100)	462 (100)	467 (100.0)	914 (100.0)	1.381 (100.0)

VA: visual acuity; CNS: central nervous system; ARMD: age-related macular degeneration

Table 5. Cataract Surgical Coverage (Persons), by Gender

Visual acuity

Male

%

Female

%

Total

%

VA < 3/60

70.4

59.5

63.9

VA < 6/60 – 3/60

56.0

45.1

49.3

VA < 6/18 – 6/60

31.6

24.6

27.1

(chi square test : p value 0.998124, not significant, p>0.05)

VA: visual acuity

Table 6. Barriers to Cataract Surgery, of Survey Participants with Visual Impairment (BCVA<6/60) Due to Un-operated Cataract by Gender

Barriers *

Male

n (%)

Female n (%)

Total n (%)

Need not felt 30 (56.6) 47 (42.7) 77 (47.2)

Fear 15 (28.3) 32 (29.1) 47 (28.8)

Cost 6 (11.3) 14 (12.7) 20 (12.3)

Unaware treatment is possible

1 (1.9) 9 (8.2) 10 (6.2)

Cannot access treatment 1 (1.9) 4 (3.6) 5 (3.1)

Treatment denied by provider 0 (0.0) 3 (2.7) 3 (1.84)

Local reason 0 (0.0) 1 (0.9) 1(0.6)

Total

53 (100.0)

110 (100.0)

163(100.0)

DISCUSSION

This study was held in South Sulawesi in fourth quartal of 2013 and the result show us the age-adjusted prevalence of bilateral blindness in those aged ≥ 50 years was 2.6% (2,1 -3.2). Regarding the result of Indonesian Basic Health Research (RISKESDAS) in 2013 which uses different method and sampling process, this is significantly higher (0,6%), but similar with what has been reported in,China, East Africa and Bangladesh. Despite the national survey conclusions that there has been a 40% reduction in the prevalence of blindness in Indonesia. The increase in life expectancy, consequently become the main reason for the much higher prevalence of blindness in Indonesia. There are some different data from other studies about RAAB where prevalence of blindness in Thailand was 0,6%, Kenya 2,0%, Uruguay 0,9% and India 3,6%.^{8,,9,10,11} This difference of blindness prevalence can caused by geographic factors and population, and also caused by eye care services that have been held in each country. However, the high rate of blindness in India, even with excellent eye care services, yet caused by the population in India which is higher than in Indonesia. ¹¹

In our study, untreated cataract (64,3%) is the major cause of blindness and severe visual impairment. This finding is comparable with others RAAB survey in Bhutan (67,1%), Kenya (69,6%) and Bangladesh (79%).^{12,13} Improving access to cataract surgical services should be a priority especially in the rural area. The main barriers to surgery were need not felt (47.2 %) and fear (28.8%) which become a concern issue to overcome by providing the information about the importance and benefit the surgical care for better vision. The barrier was different with the findings from RAAB survey in China (cost) and in Philipine (lack of awareness).^{14,15} The quality of cataract surgery was of concern, since the percentage of those who eyes operated for cataract (IOL) could see 6/18 was only 64.5% .Implementing a monitoring system for cataract surgery could sensitise surgeons to quality control, thereby improving outcomes after surgery. The provision of spectacles after surgery, improved follow-up after surgery and better selection of patients for surgery will also improve outcomes.

The second causes of blindness in the survey participants was Non Trachomatous corneal opacity (10,8%), perhaps suggesting the occurrence corneal infection and vitamin A deficiency in the past. This finding is similar with the findings on RAAB survey in Kunming, China (14.7%), but in majority its a little different with the collected data from others survey which posterior segment disorders become the major contributors to blindness and severe visual impairment.¹⁴ The proportion of blindness and visual impairment due to posterior segment disease (including glaucoma and diabetic retinopathy) may grow as avoidable causes are brought under control, and with the continued global epidemic of diabetes, providing an important challenge in the future.

The main cause of vision loss in persons (VA $\leq 6 / 18 - 6/60$ with available correction) was the refractive error, showing that more optical services are needed. This finding was also similar with the RAAB survey

in Iran and Philippines.^{15,16} We can also assume that almost all of the people aged 50 years will need presbyopic glasses. Spectacle provision to the needy at a peripheral level by means of mobile refraction units and spectacle dispensing outfits further enhance the coverage of other avoidable causes of blindness.

Our study found that the prevalence of blindness was equal in men and women; the prevalence rates of SVI and low vision were almost the same between two gender. The same study in Iran showed prevalence rates of SVI and low vision in women were significantly higher than in men (1.76-0.78 vs. 1.05-0.63 and 8.09-1.33 vs. 5.84-1.27, respectively). A recent comprehensive meta-analysis of various studies revealed a consistent pattern of sexual inequality in eye health and reported that approximately two thirds of worldwide blindness was in women, a difference that was significant in most countries and even in some studies in Iran; however, our results did not show such a consistent pattern (the blindness rate was similar).

Even though most studies in Asia, Africa, the Middle East region, Eastern European countries, South America, and an American black population reported cataract as the chief cause of blindness and low vision, some developed countries have declared other causes of blindness. In North America, Western European countries, and Japan, the main causes of blindness have mostly been posterior segment diseases, such as myopic degeneration, optic neuropathy, AMD, and senile macular degeneration. It seems that although cataract is still considered as the main cause of blindness in developing countries, posterior segment disorders (e.g., AMD) are more likely to be responsible for blindness in developed countries.¹⁷ However, limitation of facilities used in a rapid assessment should be borne in mind when comparing results with other studies, especially in posterior segment disorders.

On the basis of the national survey, the prevalence of blindness observed in the rapid assessment of avoidable blindness in South Sulawesi was higher than expected, although the distribution of causes was similar. The difference could be explained by bias in the national survey. Information bias in the national survey could happen, as the examinations were conducted by inexperienced persons, whereas in the RAAB survey the examinations were conducted by ophthalmology resident with acceptable interobserver reliability. The national survey used the random walk method for selecting people in the cluster, which may have led to an overestimation of the prevalence of blindness if blind people were preferentially included. In contrast, compact segment sampling was used for the survey, which ensured objectivity in household selection and avoided other biases inherent in the random walk methodology.

The Cataract Surgery Coverage, which is a marker of the availability of eye care service was moderate; 63.9% of people with bilateral cataract blindness (visual acuity <3/60) had undergone surgery. It is comparable with the data from RAAB survey in Bangladesh (61%), higher with the data from Rwanda (47%), but lower than data from Kenya (72.7%), suggesting that the barrier may contribute to the low prevalence.^{8,17} The access is one of the main things that the provider should be concerned with, since the uneven distribution of the ophthalmologist.¹⁹

Based on data from Indonesian Association of Ophthalmologists there are about 3000 ophthalmologists in Indonesia of whom most of them are distributed in Java island and do the service in the capital of the

provinces. Our province as the east gate of Indonesia and the sixth most populous province in Indonesia have around 50 ophthalmologist whom distributed not to all districts where there are a few districts that do not have ophthalmologist. According to that, the eye care services in Indonesia are not ideal because they are not evenly and there are some areas that has provided eye care services while other area has not provided any eye care services. The eye care services in Indonesia have not spread evenly, neither have in South Sulawesi.

There are some limitations in RAAB survey in South Sulawesi. During cluster sampling most village has different areas with separated by empty land, field or river. And the selected sample in the cluster sometimes not in place when the survey done. So it takes more time for team field to visit the sample again. The selected regions (Makassar, GowaLuwu and Palopo) which represented South Sulawesi should be done in more regions to see the similarity of prevalence and cause of avoidable blindness in South Sulawesi. So that the government could take action or even policy in future of vision loss and vision impairment. The decision to take 4 district as the survey area also plays a role as limitation to this study but they represent each area of south sulawesi that are south area (Makassar and Gowa) and North Area (Palopo and Luwu) where these districts are the most populous districts in South Sulawesi.

Main causes of blindness in South Sulawesi were cataract untreated, non trachomatous corneal opacity and other posterior segment disease. RAAB survey should give special attention in those two main causes, not only in cataract untreated. RAAB would be an appropriate method where comprehensive eye care services are available or where there are plans for establishing comprehensive eye care services. It needs all divisions such as government, stake holders and medical teams to works together.

At last, these data should be a great start for South Sulawesi in planning and implementing eye care programs as not every province in Indonesia have the chance to be taken their data by RAAB.

conclusion The prevalence of Blindness in people aged ≥ 50 years in South Sulawesi was 2.6%, with main causes of blindness are untreated caratact. Most people still fear and need not felt in undergone cataract surgery. It suggests the enhanced eye care programmes such as RAAB Surveys are having an impact, although clearly there remains more work to be done as over half of the existing vision loss and vision impairment is preventable or treatable.

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