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[DCID] Submission Acknowledgement - "Impact of Visual Impairment and Correction on Quality of Life: Comparing Among People with Different Levels of Visual Acuity in Indonesia"

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Disability, CBR and Inclusive Development <no-reply@ubiquitypartnernetwork.com>
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Nov 10, 2020, 3:47 PM

Dear Ms Maria Meiwati Widagdo,

Thank you for submitting the manuscript, "Impact of Visual Impairment and Correction on Quality of Life: Comparing Among People with Different Levels of Visual Acuity in Indonesia" to Disability, CBR & Inclusive Development. With our online journal management system, you will be able to track its progress through the editorial process by logging in to the journal web site.

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Impact of Visual Impairment and Correction on Quality of Life: Comparing Among People with Different Levels of Visual Acuity in Indonesia

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ABSTRACT

Introduction: Visual impairment is known to affect quality of life, but there has been no previous studies of this association in Indonesia.

Aim: This study assessed the extent to which visual impairment impacts on vision-related quality of life in indonesia, comparing four groups of people: those with 1) normal vision, 2) corrected visual impairment, 3) uncorrected visual impairment and 4) the blind.

Methods: There were 162 respondents aged 21 to 86 years old. Those with normal vision and blindness were community dwellers in Yogyakarta Indonesia. Those with corrected and uncorrected visual impairment were recruited from an eye clinic. Purposive sampling was used. This cross sectional study used NEI VFQ-25 to assess quality of life. The total and 11 NEI VFQ-25 subscales scores of four respondent groups were analysed using ANOVA, followed by post hoc analyses to reveal between group differences.

Results: There was a significant difference in the NEI VFQ-25 total score among the four respondent groups. Respondents with normal vision had the highest score and those with blindness had the lowest. There were also significant differences among the four groups for the 11 subscales. Post hoc analyses revealed no significant difference between respondents with normal vision and corrected visual

impairment in the total and nine NEI VFQ-25 subscales. Respondents with uncorrected visual impairment and blindness had significantly lower quality of life compared to those with normal vision or corrected visual impairment in the total and five NEI VFQ-25 subscales, indicating visual impairment decreases quality of life.

Conclusion: Visual impairment has a detrimental impact on a person's quality of life. Correction of visual impairment can ~~can~~ minimise the negative impact of visual impairment on vision-related quality of life. Failure to correct visual impairment leads to significantly lower quality of life.

Key words: Quality of life, visual acuity, blindness, visual correction, Indonesia

INTRODUCTION

The Global Burden of Diseases project conducted in 2017 reported that blindness and visual impairment caused 1.19% of DALYs globally (IHME, 2017). WHO released the World Report on Vision in 2019 and estimated that the number of people with visual impairments worldwide was 2.2 billion (WHO, 2019). The Ministry of Health of the Republic of Indonesia reported that the population with severe visual impairment was more than 2 million people and the number of people with blindness was greater than 900,000 people (Ministry of Health, 2013).

People with visual impairments experience limitations in carrying out various activities in their lives. They need more time to complete tasks like eating and drinking because they have difficulty in identifying food on a plate or~~,~~ pouring liquid into a glass because of their visual impairment (Pardhan *et al.*, 2015). Independence in conducting activities of daily living decreases as the visual impairment worsens (Christ *et al.*, 2014). Reduced visual acuity, decreased visual field and blurred vision have been associated with lower quality of life (Kim *et al.*, 2017; Medeiros *et al.*, 2014).

There are several studies on visual impairment in Indonesia. Asrorudin (2014) investigated the effect of eye diseases and visual impairment on vision-related quality of life in a population with severe visual impairment and blindness in Indonesia (Asrorudin, 2014). Mahayana (2017) studied primary school children in 3 districts in Yogyakarta Province and 1 district near the province to find the prevalence of uncorrected refractive error in urban, suburban, exurban and rural children (Mahayana,

Indrawati and Pawiroranu, 2017). Sasongko (2017) reported the prevalence of diabetic-related blindness of people residing in Yogyakarta (Sasongko *et al.*, 2017). Muhit (2018) examined 195 children aged 0-15 years in Sumba and Yogyakarta to study the epidemiology of childhood blindness (Muhit *et al.*, 2018).

AIM

This study aimed to compare quality of life of people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness, which has not been conducted previously in Indonesia.

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Commented [A2]: Why is it important that this research is done? And why in Indonesia?

METHODS

This cross-sectional study collected data from adults aged 18 years and over with normal vision, corrected visual impairment, uncorrected visual impairment and blindness.

WHO defines mild visual impairment as having visual acuity less than 6/12 and equal to or better than 6/18, moderate visual impairment between 6/18 and 6/60, severe visual impairment between 6/60 and 3/60, and blindness to be worse than 3/60 in the better eye with best correction (WHO, 2019).

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Respondents in Group 2 had either mild or moderate visual impairment, while those in Group 3 had moderate to severe visual impairment. Participants were recruited using purposive sampling. Visual acuity of respondents with visual impairment was examined by an ophthalmologist, and that of those with normal vision and blindness was done by a trained research assistant. The research participants with visual impairment were recruited from the eye clinic of Bethesda Hospital in Yogyakarta, and those with normal vision and blindness were community dwellers. The respondents with blindness were clients of Badan Sosial Mardi Wuto, a social organisation for people with low vison or blindness.

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However, the abstract says you are comparing corrected and uncorrected refractive errors. That is not the same!

Commented [A5]: Are the groups comparable if they are coming from different sources? Why were the two other groups (normal and blidn) not recruited from the eye clinic?

Vision-related quality of life was assessed using National Eye Institute – Vision Function Questionnaire – 25 (NEI VFQ-25) that had been culturally adapted and used in research of Asian people (Suzukamo *et al.*, 2005; Gyawali, Paudel and Adhikari, 2012). NEI VFQ-25 has 12 subscales. The total score is the sum of the 12 subscales scores. The respondents with blindness did not drive, so all of them scored 0 in the driving subscale. Multivariate ANOVA was conducted to test the

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differences of the NEI-VFQ total and 11 subscale (excluding driving) scores among the four with age and sex as covariates. Post hoc analyses using Dunnett C were conducted to find differences between respondent groups.

Ethical Clearance was obtained from the ethics committee of the Faculty of Medicine, Universitas Kristen Duta Wacana. Detailed explanation was given to the participants to acquire their written informed consent and to assure them about confidentiality and anonymity of the data.

RESULTS

Data were collected from 162 respondents: 41 people with normal vision (Group 1), 41 people with corrected visual impairment (Group 2), 40 people with uncorrected visual impairment (Group 3) and 40 people with blindness (Group 4). There were 28 females and 13 males in Group 1, 25 females and 16 males in Group 2, 19 females and 21 males in Group 3, 26 females and 14 males in Group 4. The mean and standard deviation of age were 33.59 ± 7,194 years in Group 1, 52.85 ± 14,307 years in Group 2, 60.98 ± 15.58 years in Group 3 and 46.83 ± 12.09 years in Group 4.

The most common cause of visual impairment in Group 2 was cataract (61%), followed by refractive disorders (24%) and glaucoma (7%). Cataract was also the most common cause of visual impairment in Group 3 (65%), followed by glaucoma (15%), diabetic retinopathy (12.5%) and Age Macular Degeneration (2.5%). Meanwhile, in respondents with blindness, measles (87.5%) was the most common cause of blindness since childhood, followed by congenital cataracts (7.5%) and respectively glaucoma and retinal detachment (2.5%). The majority of Group 2 (85%) and Group 3 (65%) respondents had visual impairment for less than 5 years, while respondents in Group 4 had been blind for more than 10 years (100%).

Most respondents had high school education in Group 1 (47.5%) and Group 3 (62.5%). In Group 2, 52.5% people had college education. Meanwhile respondents with blindness had the lowest level of education, 27.5% never went to school and 50% had elementary school education.

The majority of respondents in Group 1 and Group worked (75% and 57.5%, respectively). Half of the study participants in Group 3 worked, and most of those who did not work were pensioners. Almost

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all (97.5%) of the respondents with blindness worked as masseurs. In Indonesia, the department of social affairs provides free masseur training program for people with blindness.

The quality of life of respondents with normal vision, corrected visual impairment, uncorrected visual impairment and blindness, results of multivariate ANOVA and post-hoc analyses were presented in Table 1.

Table 1. Vision-related Quality of life of people with normal vision (Group 1), corrected visual impairment (Group 2), uncorrected visual impairment (Group 3) and blindness (Group 4) and results of multivariate ANOVA and post-hoc analyses of the 4 groups

Quality of Life	Group 1 (G1)	Group 2 (G2)	Group 3 (G3)	Group 4 (G4)	Multivariate ANOVA		Post-hoc analyses
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	p	
Total	946.84 ± 47.240	946.84 ± 47.240	781.29 ± 128.690	418.90 ± 89.468	282.469	<0.001	G1>G2** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
General health	59.76 ± 15.690	55.610 ± 13.332	40.000 ± 21.780	44.375 ± 18.334	7,391	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4**
General vision	81.95 ± 6.008	77.561 ± 6.626	58.500 ± 12.310	15.000 ± 19.612	243,605	<0.001	G1>G3*** G1>G4*** G2>G3***

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							G2>G4*** G3>G4***
Ocular pain	90.55 ± 14.344	82.317 ± 17.280	83.438 ± 21.067	75.300 ± 22.562	4,197	0,007	G1>G4***
Near vision activities	99.02 ± 2.650	96.37 ± 6.495	64.782 ± 20.283	39.574 ± 11.757	204,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Distance vision activities	98.63 ± 3.048	98.80 ± 3.487	69.995 ± 22.713	28.936 ± 8.427	285,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Social functioning	93.54 ± 8.571	88.83 ± 12.221	90.625 ± 12.894	55.000 ± 14.925	88,360	<0.001	G1>G4*** G2>G4*** G3>G4***
Mental health	98.00 ± 5.996	86.37 ± 18.208	65.625 ± 14.572	67.506 ± 15.453	31,393	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4***
Dependency	97.95 ± 5.882	86.66 ± 15.106	64.787 ± 16.616	57.275 ± 17.314	56,033	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3***

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Role difficulties	89.98 ± 22.469	79.80 ± 31.610	68.750 ± 24.677	56.563 ± 19.812	10,615	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***
Colour vision	99.39 ± 3.904	97.56 ± 15.617	98.750 ± 7.906	18.750 ± 30.356	208,119	<0.001	G1>G4*** G2>G4*** G3>G4***
Peripheral vision	99.39 ± 3.904	96.95 ± 16.003	85.000 ± 24.547	5.000 ± 14.097	330,665	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***

** $p<0.01$

*** $p<0.001$

Multivariate ANOVA that included age and sex as covariates, revealed a significant difference in the NEI VFQ-25 total score among the four groups of respondents. Group 1 had the highest mean total quality of life score and Group 4 had the lowest. Post hoc analyses revealed there was no significant difference between Group 1 and Group 2 respondents, but Group 1 and Group 2 respondents had significantly higher score than Group 3 and Group 4. The total quality of life score of Group 3 respondents was significantly higher than that of Group 4.

The mean quality of life scores of 11 subscales for the four groups of respondents varied, although the mean scores of almost all subscale scores in Group1 tended to be the highest, and those of Group 4 were likely to be the lowest.

In the general health subscale, post hoc analysis showed respondents in Group 1 and Group 2 had significantly higher general health score than those in Group 3 and Group 4. Respondents in Group 1

and Group 2 were reasonably healthy as the percentage of them having self-reported chronic diseases was lower than 20%. Almost half (47.5%) of respondents in Group 3 and 35% of those in Group 4 reported to have chronic health condition.

In the general vision subscale, there was no significant difference between Group 1 and Group 2. Correction of Group 2 respondents' vision had a positive impact on the quality of life general vision subscale. Respondents in Group 1 and Group 2 had significantly higher scores than respondents of Group 3 and Group 4. Failure to make visual correction leading to uncorrected visual impairment or even blindness caused lower quality of life general vision subscale.

The results of near vision activities and distance vision activities subscales showed that visual correction helped people to have better ability to conduct near vision activities like reading a book, cooking, sewing or fixing things at home, and distance vision activities such as reading street signs, watching movies, going up and downstairs at night.

In the social functioning subscale, the respondents in Group 1, Group 2 and Group 3 had significantly higher score than Group 4. Group 2 and Group 3 respondents were able to understand other people's reaction during conversation or behave as expected when they were visiting people or attending a party despite their visual limitation. People with blindness had more difficulties in fulfilling their social function ~~that~~ which affected their quality of life.

In the mental health subscale, Group 1 had significantly higher score than the three groups. Group 2 respondents worried about their vision, felt some frustration, had less control on what they did and worried about ~~of getting~~being embarrassed due to their visual impairment. Group 3 and Group 4 individuals had bigger problems compared to Group 2 respondents, leading to lower quality of life.

Post hoc analysis showed that Group 1 and Group 2 had significantly higher quality of life role difficulties subscale than Group 3 and Group 4. Respondents in Group 3 and Group 4 thought that they could not complete tasks on time and their performance was lower because of their visual problem. Group 2 individuals did not think that their visual impairment affected their performance.

In the dependency subscale, Group 1 had significantly higher score than the other groups. Respondents in Group 2 felt some dependency on what other people said and needed help from other

people because of their visual problem. Individuals in Group 3 had worse problems than Group 2. Group 4 respondents had bigger problems and even felt they were forced to stay at home most of the time because of their blindness.

Group 1 and Group 2 individuals had significantly higher ~~quality of life~~ peripheral vision subscales than Group 3 and Group 4. People in Group 2 did not think that they had significant difficulties in seeing things off to sides, while those in Group 3 and Group 4 did.

There was no significant difference among respondents in Group 1, Group 2 and Group 3 in the colour vision subscale. The three groups had significantly higher score than Group 4. Individuals in Group 2 and Group 3 did not have a significant problem in matching clothes, but those in Group 4 had a lot of problem in doing the task.

DISCUSSION

People with normal vision had the highest total NEI VFQ-25 score and those with blindness had the lowest, indicating that quality of life decreases with the worsening of visual acuity, in accordance with other studies conducted in other countries (Yibekal *et al.*, 2020; Fleming, Farrokhyar and Sabri, 2019; Tharaldsen *et al.*, 2020).

Based on the NEI VFQ-25 subscale analysis, ~~quality of life related to~~ general health was found to be higher in respondents with normal vision and corrected visual impairment than those with uncorrected visual impairment and blindness. This result suggests that visual acuity may be an indicator of general health. Vision impairment has been associated with chronic condition in older adults (Court *et al.*, 2014; Crews *et al.*, 2017). People with visual impairment are more likely to have health problems compared to individuals with normal vision. Other researchers found cataract as a predictor of mortality in people aged over 50 years (Zhu *et al.*, 2016; Zhu *et al.*, 2019). A recent review reported ~~the~~ poor vision as a risk factor of falls in older adults that may lead to fatality (Joseph, Kumar and Bagavandas, 2019). This might partly explain the finding in this study where more than half of the respondents were over 50 years of age.

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Commented [A9]: Like you explain earlier, the NEI FVQ focuses on functioning, not on quality of life. If you want to translate it to quality of life, please demonstrate in your introduction which theory you are using to do so.

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Subscales of general vision, near vision activities, distance vision activities and peripheral vision showed a significant difference where respondents with normal vision and corrected visual impairment had higher ~~quality of life~~levels of functioning than individuals with uncorrected visual impairment or blindness. Visual correction may improve quality of life, while more severe visual impairment may cause more adverse effect on quality of life. This finding is consistent with other studies showing that best-corrected visual acuity can have positive impact on quality of life (Råen *et al.*, 2019).

There was no significant difference in the ocular pain subscale among respondents with corrected vision, uncorrected vision and blindness. Ocular pain is commonly associated with ocular surface disease found in most people with glaucoma, and the number of respondents with glaucoma in this study was low, and this might explain the result (Baudouin *et al.*, 2013; Tirpack *et al.*, 2019).

This study suggests that visual acuity does not affect social functioning until someone becomes blind. This finding is similar to studies that reported no significant difference in social function between people with normal vision and those with visual impairment (Dev *et al.*, 2014; Heine, Browning and Gong, 2019). Respondents with visual impairment could still carry out their social functions despite obstacles in doing so. Respondents with blindness found many difficulties in carrying out their social functions, and they experienced social isolation. Although most of the study participants with blindness worked as masseurs, they only waited for clients to come because they had problems in moving around the city due to their visual condition.

This study indicates that vision affects mental health. A study of older people has associated self-reported visual impairment with depression (Frank *et al.*, 2019). Vision problems have been associated with worse psychosocial outcomes. Visual impairment cause problems in doing everyday activities, i.e. reading newspaper, recognising people. People with those problems have been reported to have lower life satisfaction, increased depressive symptoms and decreased positive affect (Hajek *et al.*, 2020).

Dependency was different among all four groups~~;~~, it increased with decreasing visual acuity. This study shows that uncorrected visual impairment can lead to role difficulties, which is consistent with

other researchers who found that greater visual impairment affect psychosocial parameters, including role difficulty (Zhu *et al.*, 2015). Visual impairment forces one to take longer time to finish tasks leading to lower performance.

Respondents in Groups 2 had lower quality life in dependency subscale than those with normal vision despite their corrected vision. More than half participants in Group 2 wore glasses to correct their visual impairment. Glasses help people do a lot of activities, but glasses wearers complain the inconvenience of having frequent eye check-ups and glasses replacement to keep good vision (Kandel *et al.*, 2017). Without glasses, they need help from others to do tasks. Visual impairment decreases one's independence in doing activities of daily living, making one dependent on other people. Individuals with uncorrected visual impairment or blindness have more dependency on others in their daily lives.

This study suggests that neither corrected nor uncorrected visual impairment creates a significant problem in colour vision, but blindness does. This finding is consistent with other researchers who reported similar result (Zhu *et al.*, 2015).

Limitations

This study assessed vision-related quality of life based on the levels of vision, and did not analyse by specific diagnosis.

CONCLUSION

It can be concluded that there are significant differences in quality of life related to vision among people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness. Visual impairment has a detrimental impact on a person's quality of life. However, it has differential impact on different elements of quality of life. There are no significant difference between people with normal vision and corrected visual impairment in most subscales suggesting that visual correction can improve quality of life, highlighting the importance of visual acuity correction.

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Impact of Visual Impairment and Correction on Vision-Related Quality of Life: Comparing Among People with Different Levels of Visual Acuity in Indonesia

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ABSTRACT

Introduction: Visual impairment is known to affect quality of life, but there has been ~~no previous~~very limited studies of this association in Indonesia.

Aim: This study assessed the extent to which visual impairment impacts on vision-related quality of life in I~~i~~ndonesia, comparing four groups of people: those with 1) normal vision, 2) corrected visual impairment, 3) uncorrected visual impairment and 4) ~~the~~ blindness.

Methods: There were 162 respondents aged 21 to 86 years old. Those with normal vision and blindness were community dwellers in Yogyakarta Indonesia. Those with corrected and uncorrected visual impairment were recruited from an eye clinic. Purposive sampling was used. This cross sectional study used NEI VFQ-25 to assess vision-related quality of life. The total and 11 NEI VFQ-25 subscales scores of four respondent groups were analysed using ANOVA, followed by post hoc analyses to reveal between group differences.

Results: There was a significant difference in the NEI VFQ-25 total score among the four respondent groups. Respondents with normal vision had the highest score and those with blindness had the lowest. There were also significant differences among the four groups for the 11 subscales. Post hoc analyses revealed no significant difference between respondents with normal vision and corrected visual

impairment in the total and nine NEI VFQ-25 subscales. Respondents with uncorrected visual impairment and blindness had significantly lower ~~quality of life~~vision-related quality of life compared to those with normal vision or corrected visual impairment in the total and five NEI VFQ-25 subscales, indicating visual impairment decreases ~~quality of life~~vision-related quality of life.

Conclusion: Visual impairment has a detrimental impact on a person's ~~quality of life~~vision-related quality of life. Correction of visual impairment can ~~can~~ minimise the negative impact of visual impairment on vision-related quality of life. Failure to correct visual impairment leads to significantly lower ~~quality of life~~vision-related quality of life.

Key words: Quality of life, visual acuity, blindness, visual correction, Indonesia

INTRODUCTION

The Global Burden of Diseases project conducted in 2017 reported that blindness and visual impairment caused 1.19% of DALYs globally (IHME, 2017). WHO released the World Report on Vision in 2019 and estimated that the number of people with visual impairments worldwide was 2.2 billion (WHO, 2019). The Ministry of Health of the Republic of Indonesia reported that the population with severe visual impairment was more than 2 million people and the number of people with blindness was greater than 900,000 people (Ministry of Health, 2013).

People with visual impairments experience limitations in carrying out various activities in their lives. They need more time to complete tasks like eating and drinking because they have difficulty in identifying food on a plate or, pouring liquid into a glass because of their visual impairment (Pardhan *et al.*, 2015). Independence in conducting activities of daily living decreases as the visual impairment worsens (Christ *et al.*, 2014). Reduced visual acuity, decreased visual field and blurred vision have been associated with lower quality of life (Kim *et al.*, 2017; Medeiros *et al.*, 2014).

There are several studies on the prevalence of visual impairment in Indonesia. ~~Asrorudin (2014) investigated the effect of eye diseases and visual impairment on vision-related quality of life in a population with severe visual impairment and blindness in Indonesia (Asrorudin, 2014).~~ Mahayana (2017) studied primary school children in 3 districts in Yogyakarta Province and 1 district near the

province to find the prevalence of uncorrected refractive error in urban, suburban, exurban and rural children (Mahayana, Indrawati and Pawiroranu, 2017). Sasongko (2017) reported the prevalence of diabetic-related blindness of people residing in Yogyakarta (Sasongko *et al.*, 2017). Muhit (2018) examined 195 children aged 0-15 years in Sumba and Yogyakarta to study the epidemiology of childhood blindness (Muhit *et al.*, 2018).

Although much is known on the numbers of people with visual impairment, Indonesia still lacks studies on how visual impairment affects ~~quality of life~~vision-related quality of life. Asrorudin (2014) investigated the effect of eye diseases and visual impairment on vision-related quality of life in a population with severe visual impairment and blindness in Indonesia (Asrorudin, 2014). However, no studies have compared ~~quality of life~~vision-related quality of life between people with normal vision and people with different levels of visual impairment. The comparison between subjects with varying visual function will help elucidate the impact of visual impairment on ~~quality of life~~vision-related quality of life in Indonesia.

AIM

This study aimed to compare quality of life of people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness, which has not been conducted previously in Indonesia.

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METHODS

This cross-sectional study collected data from adults aged 18 years and over. The respondents were classified into 4 groups. Group 1 contained people with normal vision. Group 2 consisted of people with corrected visual impairment. Group 3 subjects had visual impairment who remained uncorrected although using visual aid. Group 4 subjects were legally blind.

~~with normal vision, corrected visual impairment, uncorrected visual impairment and blindness.~~

WHO defines normal vision as visual acuity of 6/6, ~~mild visual impairment as having visual acuity less than 6/12 and equal to or better than 6/18, moderate visual impairment between 6/18 and 6/60, severe visual impairment between 6/60 and 3/60,~~ and blindness ~~to~~ as visual acuity ~~be~~ worse than 3/60

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in the better eye with best correction (WHO, 2019).~~-~~People with corrected visual impairment could reach 6/6 visual acuity with visual aids. People with uncorrected visual impairment still had visual acuity below 6/6 even using visual aids.

Respondents in Group 2 had either mild or moderate visual impairment, while those in Group 3 had moderate to severe visual impairment. Participants were recruited using purposive sampling. Visual acuity of respondents with visual impairment was examined by an ophthalmologist, and that of those with normal vision and blindness was done by a trained research assistant. The research participants with visual impairment were recruited from the eye clinic of Bethesda Hospital in Yogyakarta, and those with normal vision and blindness were community dwellers. The respondents with blindness were clients of Badan Sosial Mardi Wuto, a social organisation for people with low vison or blindness. Vision-related quality of life was assessed using National Eye Institute – Vision Function Questionnaire – 25 (NEI VFQ-25). This questionnaire has been used to measure vision-related quality of life, including in ~~that had been culturally adapted and used in research of~~ Asian people (Suzukamo *et al.*, 2005; Gyawali, Paudel and Adhikari, 2012~~);~~ ~~(~~Cortina and Hallak, 2015~~);~~ ~~(~~Saboo *et al.*, 2017~~);~~ ~~(~~Nickels *et al.*, 2017). NEI VFQ-25 has 12 subscales. The total score is the sum of the 12 subscales scores. The respondents with blindness did not drive, so all of them scored 0 in the driving subscale. Multivariate ANOVA was conducted to test the differences of the NEI-VFQ total and 11 subscale (excluding driving) scores among the four with age and sex as covariates. Post hoc analyses using Dunnett C were conducted to find differences between respondent groups.

Ethical Clearance was obtained from the ethics committee of the Faculty of Medicine, Universitas Kristen Duta Wacana. Detailed explanation was given to the participants to acquire their written informed consent and to assure them about confidentiality and anonymity of the data.

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However, the abstract says you are comparing corrected and uncorrected refractive errors. That is not the same!

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RESULTS

Data were collected from 162 respondents: 41 people with normal vision (Group 1), 41 people with corrected visual impairment (Group 2), 40 people with uncorrected visual impairment (Group 3) and

40 people with blindness (Group 4). There were 28 females and 13 males in Group 1, 25 females and 16 males in Group 2, 19 females and 21 males in Group 3, 26 females and 14 males in Group 4. The mean and standard deviation of age were 33.59 ± 7,194 years in Group 1, 52.85 ± 14,307 years in Group 2, 60.98 ± 15.58 years in Group 3 and 46.83 ± 12.09 years in Group 4.

The most common cause of visual impairment in Group 2 was cataract (61%), followed by refractive disorders (24%) and glaucoma (7%). Cataract was also the most common cause of visual impairment in Group 3 (65%), followed by glaucoma (15%), diabetic retinopathy (12.5%) and Age Macular Degeneration (2.5%). Meanwhile, in respondents with blindness, measles (87.5%) was the most common cause of blindness since childhood, followed by congenital cataracts (7.5%) and respectively glaucoma and retinal detachment (2.5%). The majority of Group 2 (85%) and Group 3 (65%) respondents had visual impairment for less than 5 years, while respondents in Group 4 had been blind for more than 10 years (100%).

Most respondents had high school education in Group 1 (47.5%) and Group 3 (62.5%). In Group 2, 52.5% people had college education. Meanwhile respondents with blindness had the lowest level of education, 27.5% never went to school and 50% had elementary school education.

The majority of respondents in Group 1 and Group 2 worked (75% and 57.5%, respectively). Half of the study participants in Group 3 worked, and most of those who did not work were pensioners. Almost all (97.5%) of the respondents with blindness worked as masseurs. In Indonesia, the department of social affairs provides free masseur training program for people with blindness.

The ~~quality of life~~vision-related quality of life of respondents with normal vision, corrected visual impairment, uncorrected visual impairment and blindness, results of multivariate ANOVA and post-hoc analyses were presented in Table 1.

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Table 1. Vision-related Quality of life of people with normal vision (Group 1), corrected visual impairment (Group 2), uncorrected visual impairment (Group 3) and blindness (Group 4) and results of multivariate ANOVA and post-hoc analyses of the 4 groups

~~Quality of Life~~Vision-related quality of life	Group 1 (G1)	Group 2 (G2)	Group 3 (G3)	Group 4 (G4)	Multivariate ANOVA		Post-hoc analyses
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	p	
Total	946.84 ± 47.240	946.84 ± 47.240	781.29 ± 128.690	418.90 ± 89.468	282.469	<0.001	G1>G2** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
General health	59.76 ± 15.690	55.610 ± 13.332	40.000 ± 21.780	44.375 ± 18.334	7,391	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4**
General vision	81.95 ± 6.008	77.561 ± 6.626	58.500 ± 12.310	15.000 ± 19.612	243,605	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Ocular pain	90.55 ± 14.344	82.317 ± 17.280	83.438 ± 21.067	75.300 ± 22.562	4,197	0,007	G1>G4***
Near vision activities	99.02 ± 2.650	96.37 ± 6.495	64.782 ± 20.283	39.574 ± 11.757	204,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***

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							G3>G4***
Distance vision activities	98.63 ± 3.048	98.80 ± 3.487	69.995 ± 22.713	28.936 ± 8.427	285,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Social functioning	93.54 ± 8.571	88.83 ± 12.221	90.625 ± 12.894	55.000 ± 14.925	88,360	<0.001	G1>G4*** G2>G4*** G3>G4***
Mental health	98.00 ± 5.996	86.37 ± 18.208	65.625 ± 14.572	67.506 ± 15.453	31,393	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4***
Dependency	97.95 ± 5.882	86.66 ± 15.106	64.787 ± 16.616	57.275 ± 17.314	56,033	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Role difficulties	89.98 ± 22.469	79.80 ± 31.610	68.750 ± 24.677	56.563 ± 19.812	10,615	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***
Colour vision	99.39 ± 3.904	97.56 ± 15.617	98.750 ± 7.906	18.750 ± 30.356	208,119	<0.001	G1>G4*** G2>G4***

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							G3>G4***
Peripheral vision	99.39 ± 3.904	96.95 ± 16.003	85.000 ± 24.547	5.000 ± 14.097	330,665	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***

** p<0.01

*** p<0.001

Multivariate ANOVA that included age and sex as covariates, revealed a significant difference in the NEI VFQ-25 total score among the four groups of respondents. Group 1 had the highest mean total ~~quality of life~~vision-related quality of life score and Group 4 had the lowest. Post hoc analyses revealed there was no significant difference between Group 1 and Group 2 respondents, but Group 1 and Group 2 respondents had significantly higher score than Group 3 and Group 4. The total ~~quality of life~~vision-related quality of life score of Group 3 respondents was significantly higher than that of Group 4.

The mean ~~quality of life~~vision-related quality of life scores of 11 subscales for the four groups of respondents varied, although the mean scores of almost all subscale scores in Group1 tended to be the highest, and those of Group 4 were likely to be the lowest.

In the general health subscale, post hoc analysis showed respondents in Group 1 and Group 2 had significantly higher general health score than those in Group 3 and Group 4. Respondents in Group 1 and Group 2 were reasonably healthy as the percentage of them having self-reported chronic diseases was lower than 20%. Almost half (47.5%) of respondents in Group 3 and 35% of those in Group 4 reported to have chronic health condition.

In the general vision subscale, there was no significant difference between Group 1 and Group 2. Correction of Group 2 respondents' vision had a positive impact on the ~~quality of life~~vision-related quality of life general vision subscale. Respondents in Group 1 and Group 2 had significantly higher scores than respondents of Group 3 and Group 4. Failure to make visual correction leading to

uncorrected visual impairment or even blindness caused lower ~~quality of life~~vision-related quality of life general vision subscale.

The results of near vision activities and distance vision activities subscales showed that visual correction helped people to have better ability to conduct near vision activities like reading a book, cooking, sewing or fixing things at home, and distance vision activities such as reading street signs, watching movies, going up and downstairs at night.

In the social functioning subscale, the respondents in Group 1, Group 2 and Group 3 had significantly higher score than Group 4. Group 2 and Group 3 respondents were able to understand other people's reaction during conversation or behave as expected when they were visiting people or attending a party despite their visual limitation. People with blindness had more difficulties in fulfilling their social function ~~that~~ which affected their ~~quality of life~~vision-related quality of life.

In the mental health subscale, Group 1 had significantly higher score than the three groups. Group 2 respondents worried about their vision, felt some frustration, had less control on what they did and worried about ~~of getting~~being embarrassed due to their visual impairment. Group 3 and Group 4 individuals had bigger problems compared to Group 2 respondents, leading to lower ~~quality of life~~vision-related quality of life.

Post hoc analysis showed that Group 1 and Group 2 had significantly higher ~~quality of life~~vision-related quality of life role difficulties subscale than Group 3 and Group 4. Respondents in Group 3 and Group 4 thought that they could not complete tasks on time and their performance was lower because of their visual problem. Group 2 individuals did not think that their visual impairment affected their performance.

In the dependency subscale, Group 1 had significantly higher score than the other groups. Respondents in Group 2 felt some dependency on what other people said and needed help from other people because of their visual problem. Individuals in Group 3 and Group 4 had ~~worse problems~~more difficulties than Group 2. Group 4 respondents ~~had bigger problems and~~ even felt they were forced to stay at home most of the time because of their blindness.

Group 1 and Group 2 individuals had significantly higher ~~quality of life~~ peripheral vision subscales

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than Group 3 and Group 4. People in Group 2 did not think that they had significant difficulties in seeing things off to sides, while those in Group 3 and Group 4 did.

There was no significant difference among respondents in Group 1, Group 2 and Group 3 in the colour vision subscale. The three groups had significantly higher score than Group 4. Individuals in Group 2 and Group 3 did not have a significant problem in matching clothes, but those in Group 4 had a lot of problem in doing the task.

DISCUSSION

People with normal vision had the highest total NEI VFQ-25 score and those with blindness had the lowest, indicating that ~~quality of life~~vision-related quality of life decreases with the worsening of visual acuity, in accordance with other studies conducted in other countries (Yibekal *et al.*, 2020; Fleming, Farrokhyar and Sabri, 2019; Tharaldsen *et al.*, 2020).

Based on the NEI VFQ-25 subscale analysis, ~~quality of life related to~~ general health was found to be higher in respondents with normal vision and corrected visual impairment than those with uncorrected visual impairment and blindness. This result suggests that visual acuity may be an indicator of general health. Vision impairment has been associated with chronic condition in older adults (Court *et al.*, 2014; Crews *et al.*, 2017). People with visual impairment are more likely to have health problems compared to individuals with normal vision. Other researchers found cataract as a predictor of mortality in people aged over 50 years (Zhu *et al.*, 2016; Zhu *et al.*, 2019). A recent review reported ~~the~~ poor vision as a risk factor of falls in older adults that may lead to fatality (Joseph, Kumar and Bagavandas, 2019). ~~This might partly explain the finding in this study where more than half of the respondents were over 50 years of age.~~

Subscales of general vision, near vision activities, distance vision activities and peripheral vision showed a significant difference where respondents with normal vision and corrected visual impairment had higher ~~quality of life~~levels of functioning than individuals with uncorrected visual impairment or blindness. Visual correction may improve ~~quality of life~~vision-related quality of life, while more severe visual impairment may cause more adverse effect on ~~quality of life~~vision-related

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quality of life. This finding is consistent with other studies showing that best-corrected visual acuity can have positive impact on ~~quality of life~~vision-related quality of life (Råen *et al.*, 2019).

There was no significant difference in the ocular pain subscale among respondents with corrected vision, uncorrected vision and blindness. Ocular pain is commonly associated with ocular surface disease found in most people with glaucoma, and the number of respondents with glaucoma in this study was low, and this might explain the result (Baudouin *et al.*, 2013; Tirpack *et al.*, 2019).

This study suggests that visual acuity does not affect social functioning until someone becomes blind. This finding is similar to studies that reported no significant difference in social function between people with normal vision and those with visual impairment (Dev *et al*., 2014; Heine, Browning and Gong, 2019). Respondents with visual impairment could still carry out their social functions despite obstacles in doing so. Respondents with blindness found many difficulties in carrying out their social functions, and they experienced social isolation. Although most of the study participants with blindness worked as masseurs, they only waited for clients to come because they had problems in moving around the city due to their visual condition.

This study indicates that vision affects mental health. A study of older people has associated self-reported visual impairment with depression (Frank *et al.*, 2019). Vision problems have been associated with worse psychosocial outcomes. Visual impairment cause problems in doing everyday activities, i.e. reading newspaper, recognising people. People with those problems have been reported to have lower life satisfaction, increased depressive symptoms and decreased positive affect (Hajek *et al.*, 2020).

Dependency was different among all four groups~~;~~, it increased with decreasing visual acuity. This study shows that uncorrected visual impairment can lead to role difficulties, which is consistent with other researchers who found that greater visual impairment affect psychosocial parameters, including role difficulty (Zhu *et al.*, 2015). Visual impairment forces one to take longer time to finish tasks leading to lower performance.

Respondents in Groups 2 had lower quality life in dependency subscale than those with normal vision despite their corrected vision. More than half participants in Group 2 wore glasses to correct their

visual impairment. Glasses help people do a lot of activities, but glasses wearers complain the inconvenience of having frequent eye check-ups and glasses replacement to keep good vision (Kandel *et al.*, 2017). Without glasses, they need help from others to do tasks. Visual impairment decreases one's independence in doing activities of daily living, making one dependent on other people. Individuals with uncorrected visual impairment or blindness have more dependency on others in their daily lives.

This study suggests that neither corrected nor uncorrected visual impairment creates a significant problem in colour vision, but blindness does. This finding is consistent with other researchers who reported similar result (Zhu *et al.*, 2015).

Limitations

This study assessed vision-related quality of life based on the levels of vision, and did not analyse by specific diagnosis.

Comparison between the groups may have been hampered by the different source of research participants. Group 1 and 4 subjects were recruited from the community, while Group 2 and 3 participants were patients from a hospital eye clinic.

CONCLUSION

It can be concluded that there are significant differences in ~~quality of life~~vision-related quality of life related to vision among people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness. Visual impairment has a detrimental impact on a person's ~~quality of life~~vision-related quality of life. However, it has differential impact on different elements of ~~quality of life~~vision-related quality of life. There are no significant difference between people with normal vision and corrected visual impairment in most subscales suggesting that visual correction can improve ~~quality of life~~vision-related quality of life, highlighting the importance of visual acuity correction.

ACKNOWLEDGEMENT

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Thank you.
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Impact of Visual Impairment and Correction on Vision-Related Quality of Life: Comparing People with Different Levels of Visual Acuity in Indonesia

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ABSTRACT

Purpose*: This study assessed the extent to which visual impairment impacts on vision-related quality of life in Indonesia, by comparing four groups of people: those with 1) normal vision, 2) corrected visual impairment, 3) uncorrected visual impairment, and 4) blindness.*

Method: *Purposive sampling was used. There were 162 respondents, between 21 and 86 years of age. Participants with normal vision and blindness were community-dwellers in Yogyakarta, Indonesia. Those with corrected and uncorrected visual impairment were recruited from an eye clinic. This cross-sectional study used NEI VFQ-25 to assess vision-related quality of life. The total scores and 11 NEI VFQ-25 subscales scores of four respondent groups were analysed using ANOVA, followed by post-hoc analyses to reveal between group differences.*

Results*: There was a significant difference in the NEI VFQ-25 total scores among the four respondent groups. Respondents with normal vision had the highest score and those with blindness had the lowest. There were also significant differences among the four groups for the 11 subscales. Post-hoc analyses revealed no significant difference between respondents with normal vision and corrected visual impairment in the total and 9 NEI VFQ-25 subscales. Respondents with uncorrected visual impairment and blindness had significantly lower vision-related quality of life compared to those with normal vision or corrected visual impairment in the total and 5 NEI VFQ-25 subscales, indicating that visual impairment decreases vision-related quality of life.*

Conclusion*: Visual impairment has a detrimental impact on a person's vision-related quality of life. The negative impact of visual impairment can be minimised by correction. Failure to correct visual impairment leads to significantly lower vision-related quality of life.*
Key words: *quality of life, visual acuity, blindness, visual correction, Indonesia*

INTRODUCTION

The Global Burden of Diseases project, conducted in 2017, reported that blindness and visual impairment caused 1.19% of DALYs globally(Institute for Health Metrics and Evaluation - IHME, 2017). The World Health Organisation's World Report on Vision, released in 2019, estimated that the number of people with visual impairments worldwide was 2.2 billion(WHO, 2019). The Ministry of Health of the Republic of Indonesia reported that the population with severe visual impairment was more than 2 million people and the number of people with blindness was more than 900,000 (Ministry of Health, 2013).

People with visual impairments experience limitations in carrying out various activities in their lives. They need more time to complete tasks like eating and drinking as they have difficulty in identifying food on a plate or pouring liquid into a glass because of their visual impairment(Pardhan et al, 2015). Independence in conducting activities of daily living decreases as the visual impairment worsens(Christ et al, 2014). Reduced visual acuity, decreased visual field and blurred vision have been associated with lower quality of life(Medeiros et al, 2014; Kim et al, 2017).

There are several studies on the prevalence of visual impairment in Indonesia. Mahayana et al (2017) studied primary school children in 3 districts in Yogyakarta Province and 1 district nearby to find the prevalence of uncorrected refractive error in urban, suburban, exurban and rural children. Sasongko et al (2017) reported the prevalence of diabetic-related blindness of people residing in Yogyakarta. Muhit et al (2018) examined 195 children aged 0-15 years in Sumba and Yogyakarta to study the epidemiology of childhood blindness.

Although much is known about the number of people with visual impairment, Indonesia still lacks studies on how visual impairment affects vision-related quality of life. Asrorudin (2014) investigated

the effect of eye diseases and visual impairment on vision-related quality of life in a population with severe visual impairment and blindness in Indonesia. However, no studies have compared vision-related quality of life between people with normal vision and people with different levels of visual impairment. The comparison between subjects with varying visual function will help elucidate the impact of visual impairment on vision-related quality of life in Indonesia.

Objective

Unlike previous studies conducted in Indonesia, this study aimed to compare the quality of life of people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness.

METHOD

Study Sample

For this cross-sectional study, adults aged 18 years and older were recruited using purposive sampling. The respondents were classified into 4 groups: Group 1 - people with normal vision, Group 2 - people with corrected visual impairment, Group 3 – people with visual impairment that remained uncorrected although using visual aids, and Group 4 – people who were legally blind. Respondents in Group 2 had either mild or moderate visual impairment, while those in Group 3 had moderate to severe visual impairment.

Those with normal vision and blindness were community dwellers, while participants with visual impairment were recruited from the eye clinic of Bethesda Hospital in Yogyakarta. The respondents with blindness were clients of Badan Sosial Mardi Wuto, a social organisation for people with low vision or blindness.

WHO defines normal vision as visual acuity of 6/6, and blindness as visual acuity worse than 3/60 in the better eye with best correction (WHO, 2019). Visual acuity of respondents with visual impairment was examined by an ophthalmologist, and people with normal vision and blindness were examined by a trained research assistant. People with corrected visual impairment could reach 6/6 visual acuity with

visual aids. People with uncorrected visual impairment had visual acuity below 6/6 despite the use of visual aids.

Data Collection

Vision-related quality of life was assessed using National Eye Institute – Vision Function Questionnaire – 25 (NEI VFQ-25). This questionnaire has been used to measure vision-related quality of life among Asian people as well (Suzukamo et al, 2005; Gyawali et al, 2012; Cortina and Hallak, 2015; Saboo et al, 2017; Nickels et al, 2017). NEI VFQ-25 has 12 subscales. The total score is the sum of the 12 subscales scores. The respondents with blindness did not drive, so all of them scored '0' in the driving subscale. Multivariate ANOVA was conducted to test the differences of the NEI-VFQ total and 11 subscale (excluding driving) scores among the four groups with age and sex as covariates. Post- hoc analyses using Dunnett C were conducted to find differences between respondent groups.

Ethics Approval

Ethical clearance was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Kristen Duta Wacana. Detailed explanations were given to the participants to obtain their written informed consent. They were assured that the data would be kept confidential and anonymity would be maintained.

RESULTS

Data was collected from 162 respondents: 41 people with normal vision (Group 1), 41 people with corrected visual impairment (Group 2), 40 people with uncorrected visual impairment (Group 3), and 40 people with blindness (Group 4). There were 28 females and 13 males in Group 1, 25 females and 16 males in Group 2, 19 females and 21 males in Group 3, and 26 females and 14 males in Group 4. The mean and standard deviations of age were: 33.59 ± 7.194 years in Group 1; 52.85 ± 14.307 years in Group 2; 60.98 ± 15.58 years in Group 3; and 46.83 ± 12.09 years in Group 4.

The most common cause of visual impairment in Group 2 was cataract (61%), followed by refractive disorders (24%) and glaucoma (7%). Cataract was also the most common cause of visual impairment in Group 3 (65%), followed by glaucoma (15%), diabetic retinopathy (12.5%) and age-related macular

degeneration (2.5%). Meanwhile, among respondents with blindness, measles (87.5%) was the most common cause of blindness since childhood, followed by congenital cataracts (7.5%) and glaucoma and retinal detachment (2.5% each) respectively. The majority of respondents in Group 2 (85%) and Group 3 (65%) had visual impairment for less than 5 years, while respondents in Group 4 had been blind for more than 10 years (100%).

Most respondents had high school education in Group 1 (47.5%) and Group 3 (62.5%). In Group 2, 52.5% had college education, while respondents with blindness had the lowest level of education, as 27.5% had never been to school and 50% had elementary school education.

The majority of respondents in Group 1 and Group 2 were working people (75% and 57.5%, respectively). Half of the study participants in Group 3 worked, and most of those who did not work were pensioners. Almost all of the respondents with blindness (97.5%) worked as masseurs. In Indonesia, the department of social affairs provides free masseur training programmes for people with blindness.

The vision-related quality of life of respondents with normal vision, corrected visual impairment, uncorrected visual impairment and blindness, the results of multivariate ANOVA and post-hoc analyses are presented in Table 1.

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Table 1: Vision-related Quality of Life of People with Normal Vision (Group 1), Corrected Visual Impairment (Group 2), Uncorrected Visual Impairment (Group 3) and Blindness (Group 4), the Results of Multivariate ANOVA and Post-hoc Analyses of the 4 Groups

Vision-related Quality of Life	**Group 1 (G1)**	**Group 2 (G2)**	**Group 3 (G3)**	**Group 4 (G4)**	**Multivariate ANOVA**		**Post-hoc Analyses**
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	p	
Total	946.84 ± 47.240	946.84 ± 47.240	781.29 ± 128.690	418.90 ± 89.468	282.469	<0.001	G1>G2** G1>G3***

							G1>G4*** G2>G3*** G2>G4*** G3>G4***
General health	59.76 ± 15.690	55.610 ± 13.332	40.000 ± 21.780	44.375 ± 18.334	7,391	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4**
General vision	81.95 ± 6.008	77.561 ± 6.626	58.500 ± 12.310	15.000 ± 19.612	243,605	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Ocular pain	90.55 ± 14.344	82.317 ± 17.280	83.438 ± 21.067	75.300 ± 22.562	4,197	0,007	G1>G4***
Near vision activities	99.02 ± 2.650	96.37 ± 6.495	64.782 ± 20.283	39.574 ± 11.757	204,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Distance vision activities	98.63 ± 3.048	98.80 ± 3.487	69.995 ± 22.713	28.936 ± 8.427	285,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***

Social functioning	93.54 ± 8.571	88.83 ± 12.221	90.625 ± 12.894	55.000 ± 14.925	88,360	<0.001	G1>G4*** G2>G4*** G3>G4***
Mental health	98.00 ± 5.996	86.37 ± 18.208	65.625 ± 14.572	67.506 ± 15.453	31,393	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4***
Dependency	97.95 ± 5.882	86.66 ± 15.106	64.787 ± 16.616	57.275 ± 17.314	56,033	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Role difficulties	89.98 ± 22.469	79.80 ± 31.610	68.750 ± 24.677	56.563 ± 19.812	10,615	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***
Colour vision	99.39 ± 3.904	97.56 ± 15.617	98.750 ± 7.906	18.750 ± 30.356	208,119	<0.001	G1>G4*** G2>G4*** G3>G4***
Peripheral vision	99.39 ± 3.904	96.95 ± 16.003	85.000 ± 24.547	5.000 ± 14.097	330,665	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***

** $p<0.01$

*** $p<0.001$

Multivariate ANOVA that included age and sex as covariates, revealed a significant difference in the NEI VFQ-25 total scores among the four groups of respondents. Group 1 had the highest mean total vision-related quality of life score and Group 4 had the lowest. Post- hoc analyses revealed there was no significant difference between Group 1 and Group 2 respondents, but Group 1 and Group 2 respondents had significantly higher scores than those in Group 3 and Group 4. The total vision-related quality of life score of Group 3 respondents was significantly higher than that of respondents in Group 4.

The mean vision-related quality of life scores of 11 subscales for the four groups of respondents varied, although the mean scores of almost all subscale scores in Group1 tended to be the highest, and those of Group 4 were likely to be the lowest.

In the general health subscale, post-hoc analysis showed that respondents in Group 1 and Group 2 had significantly higher general health scores than those in Group 3 and Group 4. Respondents in Group 1 and Group 2 were reasonably healthy, as the percentage with self-reported chronic diseases was below 20%. Almost half of the respondents in Group 3 (47.5%) and 35% of those in Group 4 reported having a chronic health condition.

In the general vision subscale, there was no significant difference between Group 1 and Group 2. The correction of Group 2 respondents' vision had a positive impact on the vision-related quality of life general vision subscale. Respondents in Group 1 and Group 2 had significantly higher scores than respondents of Group 3 and Group 4. Failure to make visual correction, leading to uncorrected visual impairment or even blindness, resulted in lower vision-related quality of life general vision subscale.

The results of near vision activities and distance vision activities subscales showed that visual correction improved people's ability to conduct near vision activities like reading a book, cooking, sewing or fixing things at home, as well as distance vision activities such as reading street signs, watching movies, and going up and down stairs at night.

In the social functioning subscale, the respondents in Groups 1, 2 and 3 had significantly higher scores than those in Group 4. Despite their visual limitations, Group 2 and Group 3 respondents were able to

understand other people's reactions during conversation or behave as expected when they were visiting people or attending a party. People with blindness had more difficulties in fulfilling their social function which affected their vision-related quality of life.

In the mental health subscale, Group 1 had a significantly higher score than the other three Groups. Group 2 respondents worried about their vision, felt some frustration, had less control over what they did, and worried about being embarrassed due to their visual impairment. Group 3 and Group 4 individuals had bigger problems compared to Group 2 respondents, leading to lower vision-related quality of life.

Post- hoc analysis showed that respondents in Group 1 and Group 2 had significantly higher vision-related quality of life role difficulties subscale than those in Group 3 and Group 4. Respondents in Group 3 and Group 4 thought that they could not complete tasks on time and their performance was lower because of their visual problem. Group 2 individuals did not think that their visual impairment affected their performance.

In the dependency subscale, Group 1 had a significantly higher score than the other Groups. Respondents in Group 2 felt some dependency on what other people said, and needed help from other people because of their visual problems. Individuals in Group 3 and Group 4 had more difficulties than those in Group 2. Group 4 respondents even felt they were forced to stay at home most of the time because of their blindness.

Group 1 and Group 2 individuals had significantly higher peripheral vision subscales than those in Group 3 and Group 4. People in Group 2 did not think that they had significant difficulties in seeing things on the sides, while those in Group 3 and Group 4 did.

There was no significant difference among respondents in Groups 1, 2 and 3 in the colour vision subscale. The three groups had significantly higher scores than those in Group 4. Individuals in Group 2 and Group 3 did not have a significant problem in matching clothes, but those in Group 4 had a lot of problems in performing this task.

DISCUSSION

People with normal vision had the highest total NEI VFQ-25 score and those with blindness had the lowest, indicating that vision-related quality of life decreases with the worsening of visual acuity. This is in accordance with other studies conducted in other countries(Fleming et al, 2019; Tharaldsen et al, 2020; Yibekal et al, 2020).

Based on the NEI VFQ-25 subscale analysis, general health was found to be higher in respondents with normal vision and corrected visual impairment than among those with uncorrected visual impairment and blindness. This result suggests that visual acuity may be an indicator of general health. Vision impairment has been associated with chronic conditions in older adults(Court et al, 2014; Crews et al, 2017). People with visual impairment are more likely to have health problems compared to individuals with normal vision. Other researchers found cataract as a predictor of mortality in people aged over 50 years(Zhu et al, 2016;Zhu et al, 2019). A recent review reported poor vision as a risk factor of falls in older adults that may lead to fatality(Joseph et al, 2019).

Subscales of general vision, near vision activities, distance vision activities and peripheral vision showed a significant difference, where respondents with normal vision and corrected visual impairment had higher levels of functioning than individuals with uncorrected visual impairment or blindness. Visual correction may improve vision-related quality of life, while more severe visual impairment may have a more adverse effect on vision-related quality of life. This finding is consistent with other studies showing that best-corrected visual acuity can have positive impact on vision-related quality of life(Råen et al, 2019).

There was no significant difference in the ocular pain subscale among respondents with corrected vision, uncorrected vision and blindness. Ocular pain is commonly associated with ocular surface disease found in most people with glaucoma. The number of respondents with glaucoma in this study was low, and this might explain the result(Baudouin et al, 2013; Tirpack et al, 2019).

This study suggests that visual acuity does not affect social functioning until someone becomes blind. This finding is similar to studies that reported no significant difference in social function between people with normal vision and those with visual impairment(Dev et al, 2014; Heine et al, 2019). Respondents with visual impairment could still carry out their social functions despite obstacles in

doing so. Respondents with blindness had many difficulties in carrying out their social functions, and experienced social isolation. Although most of the study participants with blindness worked as masseurs, they waited for clients to visit them because they had problems in moving around the city due to their visual condition.

This study indicates that vision affects mental health. A study on older people has associated self-reported visual impairment with depression(Frank et al, 2019). Vision problems have been associated with worse psychosocial outcomes. Visual impairment causes problems in doing everyday activities, i.e., reading newspapers, recognising people. People with these problems have been reported to have lower life satisfaction, increased depressive symptoms and decreased positive affect(Hajek et al, 2020).

Dependency was different among all four groups; it increased with decreasing visual acuity. This study shows that uncorrected visual impairment can lead to role difficulties, which is consistent with other researchers' findings that greater visual impairment affects psychosocial parameters, including role difficulty(Zhu et al, 2015). Visual impairment forces the individual to take longer over completing tasks, leading to lower performance.

Despite their corrected vision, respondents in Group 2 had lower quality of life in the dependency subscale than those with normal vision. More than half of the participants in Group 2 wore glasses to correct their visual impairment. Glasses help people perform many activities, but those who wear them complain about the inconvenience of having frequent eye check-ups and getting replacements to keep good vision(Kandel et al, 2017). Without glasses, they need help from others to accomplish tasks. Visual impairment decreases one's independence in doing activities of daily living, and increases dependence on other people. Individuals with uncorrected visual impairment or blindness have more dependency on others in their daily lives.

This study suggests that neither corrected nor uncorrected visual impairment creates a significant problem in colour vision, but blindness does. This finding is consistent with other researchers who reported a similar result(Zhu et al, 2015).

Limitations

This study assessed vision-related quality of life based on the levels of vision, and did not analyse by specific diagnosis.

Comparison between the Groups may have been hampered by the differing sources of research participants. Participants in Groups 1 and 4 were recruited from the community, while participants in Groups 2 and 3 were clients from a hospital eye clinic.

CONCLUSION

It can be concluded that there are significant differences in vision-related quality of life related to people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness. Visual impairment has a detrimental impact on a person's vision-related quality of life. However, it has differential impacts on different elements of vision-related quality of life. There are no significant differences between people with normal vision and corrected visual impairment in most subscales, suggesting that visual correction can improve vision-related quality of life, and thereby highlighting the importance of visual acuity correction.

ACKNOWLEDGEMENT

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The researchers report no conflicts of interest.

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Impact of Visual Impairment and Correction on Vision-Related Quality of Life: Comparing People with Different Levels of Visual Acuity in Indonesia

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ABSTRACT

***Purpose**: This study assessed the extent to which visual impairment impacts on vision-related quality of life in Indonesia, by comparing four groups of people: those with 1) normal vision, 2) corrected visual impairment, 3) uncorrected visual impairment, and 4) blindness.*

***Method:** Purposive sampling was used. There were 162 respondents, between 21 and 86 years of age. Participants with normal vision and blindness were community-dwellers in Yogyakarta, Indonesia. Those with corrected and uncorrected visual impairment were recruited from an eye clinic. This cross-sectional study used NEI VFQ-25 to assess vision-related quality of life. The total scores and 11 NEI VFQ-25 subscales scores of four respondent groups were analysed using ANOVA, followed by post-hoc analyses to reveal between group differences.*

***Results**: There was a significant difference in the NEI VFQ-25 total scores among the four respondent groups. Respondents with normal vision had the highest score and those with blindness had the lowest. There were also significant differences among the four groups for the 11 subscales. Post-hoc analyses revealed no significant difference between respondents with normal vision and corrected visual impairment in the total and 9 NEI VFQ-25 subscales. Respondents with uncorrected visual impairment and blindness had significantly lower vision-related quality of life compared to those with normal vision or corrected visual impairment in the total and 5 NEI VFQ-25 subscales, indicating that visual impairment decreases vision-related quality of life.*

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***Conclusion**: Visual impairment has a detrimental impact on a person's vision-related quality of life. The negative impact of visual impairment can be minimised by correction. Failure to correct visual impairment leads to significantly lower vision-related quality of life.*

***Key words:** quality of life, visual acuity, blindness, visual correction, Indonesia*

INTRODUCTION

The Global Burden of Diseases project, conducted in 2017, reported that blindness and visual impairment caused 1.19% of DALYs globally (Institute for Health Metrics and Evaluation - IHME, 2017). The World Health Organisation's World Report on Vision, released in 2019, estimated that the number of people with visual impairments worldwide was 2.2 billion (WHO, 2019). The Ministry of Health of the Republic of Indonesia reported that the population with severe visual impairment was more than 2 million people and the number of people with blindness was more than 900,000 (Ministry of Health, 2013).

People with visual impairments experience limitations in carrying out various activities in their lives. They need more time to complete tasks like eating and drinking as they have difficulty in identifying food on a plate or pouring liquid into a glass because of their visual impairment (Pardhan et al, 2015). Independence in conducting activities of daily living decreases as the visual impairment worsens (Christ et al, 2014). Reduced visual acuity, decreased visual field and blurred vision have been associated with lower quality of life (Medeiros et al, 2014; Kim et al, 2017).

There are several studies on the prevalence of visual impairment in Indonesia. Mahayana et al (2017) studied primary school children in 3 districts in Yogyakarta Province and 1 district nearby to find the prevalence of uncorrected refractive error in urban, suburban, exurban and rural children. Sasongko et al (2017) reported the prevalence of diabetic-related blindness of people residing in Yogyakarta. Muhit et al (2018) examined 195 children aged 0-15 years in Sumba and Yogyakarta to study the epidemiology of childhood blindness.

Although much is known about the number of people with visual impairment, Indonesia still lacks studies on how visual impairment affects vision-related quality of life. Asrorudin (2014) investigated the effect of eye diseases and visual impairment on vision-related quality of life in a population with severe visual impairment and blindness in Indonesia. However, no studies have compared

vision-related quality of life between people with normal vision and people with different levels of visual impairment. The comparison between subjects with varying visual function will help elucidate the impact of visual impairment on vision-related quality of life in Indonesia.

Objective

Unlike previous studies conducted in Indonesia, this study aimed to compare the quality of life of people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness.

METHOD

Study Sample

For this cross-sectional study, adults aged 18 years and older were recruited using purposive sampling.

The respondents were classified into 4 groups: Group 1 - people with normal vision, Group 2 - people with corrected visual impairment, Group 3 – people with visual impairment that remained uncorrected although using visual aids, and Group 4 – people who were legally blind. Respondents in Group 2 had either mild or moderate visual impairment, while those in Group 3 had moderate to severe visual impairment.

Those with normal vision and blindness were community dwellers, while participants with visual impairment were recruited from the eye clinic of Bethesda Hospital in Yogyakarta. The respondents with blindness were clients of Badan Sosial Mardi Wuto, a social organisation for people with low vision or blindness.

WHO defines normal vision as visual acuity of 6/6, and blindness as visual acuity worse than 3/60 in the better eye with best correction (WHO, 2019). Visual acuity of respondents with visual impairment was examined by an ophthalmologist, and people with normal vision and blindness were examined by a trained research assistant. People with corrected visual impairment could reach 6/6 visual acuity with visual aids. People with uncorrected visual impairment had visual acuity below 6/6 despite the use of visual aids.

Data Collection

Vision-related quality of life was assessed using National Eye Institute – Vision Function Questionnaire – 25 (NEI VFQ-25). This questionnaire has been used to measure vision-related quality of life among Asian people as well (Suzukamo et al, 2005; Gyawali et al, 2012; Cortina and Hallak, 2015; Saboo et al, 2017; Nickels et al, 2017). NEI VFQ-25 has 12 subscales. The total score is the sum of the 12 subscales scores. The respondents with blindness did not drive, so all of them scored '0' in the driving subscale. Multivariate ANOVA was conducted to test the differences of the NEI-VFQ total and 11 subscale (excluding driving) scores among the four groups with age and sex as covariates. Post- hoc analyses using Dunnett C were conducted to find differences between respondent groups.

Ethics Approval

Ethical clearance was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Kristen Duta Wacana. Detailed explanations were given to the participants to obtain their written informed consent. They were assured that the data would be kept confidential and anonymity would be maintained.

RESULTS

Data was collected from 162 respondents: 41 people with normal vision (Group 1), 41 people with corrected visual impairment (Group 2), 40 people with uncorrected visual impairment (Group 3), and 40 people with blindness (Group 4). There were 28 females and 13 males in Group 1, 25 females and 16 males in Group 2, 19 females and 21 males in Group 3, and 26 females and 14 males in Group 4. The mean and standard deviations of age were: 33.59 ± 7.194 years in Group 1; 52.85 ± 14.307 years in Group 2; 60.98 ± 15.58 years in Group 3; and 46.83 ± 12.09 years in Group 4.

The most common cause of visual impairment in Group 2 was cataract (61%), followed by refractive disorders (24%) and glaucoma (7%). Cataract was also the most common cause of visual impairment in Group 3 (65%), followed by glaucoma (15%), diabetic retinopathy (12.5%) and age-related macular degeneration (2.5%). Meanwhile, among respondents with blindness, measles (87.5%) was the most common cause of blindness since childhood, followed by congenital cataracts (7.5%) and glaucoma and retinal detachment (2.5% each) respectively. The majority of respondents in Group 2 (85%) and Group 3 (65%) had visual impairment for less than 5 years, while respondents in Group 4 had been blind for more than 10 years (100%).

Most respondents had high school education in Group 1 (47.5%) and Group 3 (62.5%). In Group 2, 52.5% had college education, while respondents with blindness had the lowest level of education, as 27.5% had never been to school and 50% had elementary school education.

The majority of respondents in Group 1 and Group 2 were working people (75% and 57.5%, respectively). Half of the study participants in Group 3 worked, and most of those who did not work were pensioners. Almost all of the respondents with blindness (97.5%) worked as masseurs. In Indonesia, the department of social affairs provides free masseur training programmes for people with blindness.

The vision-related quality of life of respondents with normal vision, corrected visual impairment, uncorrected visual impairment and blindness, the results of multivariate ANOVA and post-hoc analyses are presented in Table 1.

Table 1: Vision-related Quality of Life of People with Normal Vision (Group 1), Corrected Visual Impairment (Group 2), Uncorrected Visual Impairment (Group 3) and Blindness (Group 4), the Results of Multivariate ANOVA and Post-hoc Analyses of the 4 Groups

Vision-related Quality of Life	Group 1 (G1)	Group 2 (G2)	Group 3 (G3)	Group 4 (G4)	Multivariate ANOVA		Post-hoc Analyses
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	p	
Total	946.84 ± 47.240	946.84 ± 47.240	781.29 ± 128.690	418.90 ± 89.468	282.469	<0.001	G1>G2** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
General health	59.76 ± 15.690	55.610 ± 13.332	40.000 ± 21.780	44.375 ± 18.334	7,391	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4**
General vision	81.95 ± 6.008	77.561 ± 6.626	58.500 ± 12.310	15.000 ± 19.612	243,605	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***

Ocular pain	90.55 ± 14.344	82.317 ± 17.280	83.438 ± 21.067	75.300 ± 22.562	4,197	0,007	G1>G4***
Near vision activities	99.02 ± 2.650	96.37 ± 6.495	64.782 ± 20.283	39.574 ± 11.757	204,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Distance vision activities	98.63 ± 3.048	98.80 ± 3.487	69.995 ± 22.713	28.936 ± 8.427	285,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Social functioning	93.54 ± 8.571	88.83 ± 12.221	90.625 ± 12.894	55.000 ± 14.925	88,360	<0.001	G1>G4*** G2>G4*** G3>G4***
Mental health	98.00 ± 5.996	86.37 ± 18.208	65.625 ± 14.572	67.506 ± 15.453	31,393	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4***
Dependency	97.95 ± 5.882	86.66 ± 15.106	64.787 ± 16.616	57.275 ± 17.314	56,033	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Role difficulties	89.98 ± 22.469	79.80 ± 31.610	68.750 ± 24.677	56.563 ± 19.812	10,615	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***
Colour vision	99.39 ± 3.904	97.56 ± 15.617	98.750 ± 7.906	18.750 ± 30.356	208,119	<0.001	G1>G4*** G2>G4*** G3>G4***
Peripheral vision	99.39 ± 3.904	96.95 ± 16.003	85.000 ± 24.547	5.000 ± 14.097	330,665	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***

** $p<0.01$

*** $p<0.001$

Multivariate ANOVA that included age and sex as covariates, revealed a significant difference in the NEI VFQ-25 total scores among the four groups of respondents. Group 1 had the highest mean total vision-related quality of life score and Group 4 had the lowest. Post- hoc analyses revealed there was no significant difference between Group 1 and Group 2 respondents, but Group 1 and Group 2 respondents had significantly higher scores than those in Group 3 and Group 4. The total vision-related quality of life score of Group 3 respondents was significantly higher than that of respondents in Group 4.

The mean vision-related quality of life scores of 11 subscales for the four groups of respondents varied, although the mean scores of almost all subscale scores in Group1 tended to be the highest, and those of Group 4 were likely to be the lowest.

In the general health subscale, post-hoc analysis showed that respondents in Group 1 and Group 2 had significantly higher general health scores than those in Group 3 and Group 4. Respondents in Group 1 and Group 2 were reasonably healthy, as the percentage with self-reported chronic diseases was below 20%. Almost half of the respondents in Group 3 (47.5%) and 35% of those in Group 4 reported having a chronic health condition.

In the general vision subscale, there was no significant difference between Group 1 and Group 2. The correction of Group 2 respondents' vision had a positive impact on the vision-related quality of life general vision subscale. Respondents in Group 1 and Group 2 had significantly higher scores than respondents of Group 3 and Group 4. Failure to make visual correction, leading to uncorrected visual impairment or even blindness, resulted in lower vision-related quality of life general vision subscale.

The results of near vision activities and distance vision activities subscales showed that visual correction improved people's ability to conduct near vision activities like reading a book, cooking, sewing or fixing things at home, as well as distance vision activities such as reading street signs, watching movies, and going up and down stairs at night.

In the social functioning subscale, the respondents in Groups 1, 2 and 3 had significantly higher scores than those in Group 4. Despite their visual limitations, Group 2 and Group 3 respondents were able to understand other people's reactions during conversation or behave as expected when they were visiting people or attending a party. People with blindness had more difficulties in fulfilling their social function which affected their vision-related quality of life.

In the mental health subscale, Group 1 had a significantly higher score than the other three Groups. Group 2 respondents worried about their vision, felt some frustration, had less control over what they did, and worried about being embarrassed due to their visual impairment. Group 3 and Group 4 individuals had bigger problems compared to Group 2 respondents, leading to lower vision-related quality of life.

Post- hoc analysis showed that respondents in Group 1 and Group 2 had significantly higher vision-related quality of life role difficulties subscale than those in Group 3 and Group 4. Respondents in Group 3 and Group 4 thought that they could not complete tasks on time and their performance was lower because of their visual problem. Group 2 individuals did not think that their visual impairment affected their performance.

In the dependency subscale, Group 1 had a significantly higher score than the other Groups. Respondents in Group 2 felt some dependency on what other people said, and needed help from other people because of their visual problems. Individuals in Group 3 and Group 4 had more difficulties than those in Group 2. Group 4 respondents even felt they were forced to stay at home most of the time because of their blindness.

Group 1 and Group 2 individuals had significantly higher peripheral vision subscales than those in Group 3 and Group 4. People in Group 2 did not think that they had significant difficulties in seeing things on the sides, while those in Group 3 and Group 4 did.

There was no significant difference among respondents in Groups 1, 2 and 3 in the colour vision subscale. The three groups had significantly higher scores than those in Group 4. Individuals in Group 2 and Group 3 did not have a significant problem in matching clothes, but those in Group 4 had a lot of problems in performing this task.

DISCUSSION

People with normal vision had the highest total NEI VFQ-25 score and those with blindness had the lowest, indicating that vision-related quality of life decreases with the worsening of visual acuity. This is in accordance with other studies conducted in other countries(Fleming et al, 2019; Tharaldsen et al, 2020; Yibekal et al, 2020).

Based on the NEI VFQ-25 subscale analysis, general health was found to be higher in respondents with normal vision and corrected visual impairment than among those with uncorrected visual impairment and blindness. This result suggests that visual acuity may be an indicator of general health. Vision impairment has been associated with chronic conditions in older adults(Court et al, 2014; Crews et al, 2017). People with visual impairment are more likely to have health problems compared to individuals with normal vision. Other researchers found cataract as a predictor of mortality in people aged over 50 years (Zhu et al, 2016; Zhu et al, 2019). A recent review reported poor vision as a risk factor of falls in older adults that may lead to fatality (Joseph et al, 2019).

Subscales of general vision, near vision activities, distance vision activities and peripheral vision showed a significant difference, where respondents with normal vision and corrected visual impairment had higher levels of functioning than individuals with uncorrected visual impairment or blindness. Visual correction may improve vision-related quality of life, while more severe visual impairment may have a more adverse effect on vision-related quality of life. This finding is consistent with other studies showing that best-corrected visual acuity can have positive impact on vision-related quality of life(Råen et al, 2019).

There was no significant difference in the ocular pain subscale among respondents with corrected vision, uncorrected vision and blindness. Ocular pain is commonly associated with ocular surface disease found in most people with glaucoma. The number of respondents with glaucoma in this study was low, and this might explain the result(Baudouin et al, 2013; Tirpack et al, 2019).

This study suggests that visual acuity does not affect social functioning until someone becomes blind. This finding is similar to studies that reported no significant difference in social function between people with normal vision and those with visual impairment(Dev et al, 2014; Heine et al, 2019). Respondents with visual impairment could still carry out their social functions despite obstacles in doing so. Respondents with blindness had many difficulties in carrying out their social functions, and experienced social isolation. Although most of the study participants with blindness worked as masseurs, they waited for clients to visit them because they had problems in moving around the city due to their visual condition.

This study indicates that vision affects mental health. A study on older people has associated self-reported visual impairment with depression(Frank et al,

2019). Vision problems have been associated with worse psychosocial outcomes. Visual impairment causes problems in doing everyday activities, i.e., reading newspapers, recognising people. People with these problems have been reported to have lower life satisfaction, increased depressive symptoms and decreased positive affect(Hajek et al, 2020).

Dependency was different among all four groups; it increased with decreasing visual acuity. This study shows that uncorrected visual impairment can lead to role difficulties, which is consistent with other researchers' findings that greater visual impairment affects psychosocial parameters, including role difficulty(Zhu et al, 2015). Visual impairment forces the individual to take longer over completing tasks, leading to lower performance.

Despite their corrected vision, respondents in Group 2 had lower quality of life in the dependency subscale than those with normal vision. More than half of the participants in Group 2 wore glasses to correct their visual impairment. Glasses help people perform many activities, but those who wear them complain about the inconvenience of having frequent eye check-ups and getting replacements to keep good vision(Kandel et al, 2017). Without glasses, they need help from others to accomplish tasks. Visual impairment decreases one's independence in doing activities of daily living, and increases dependence on other people. Individuals with uncorrected visual impairment or blindness have more dependency on others in their daily lives.

This study suggests that neither corrected nor uncorrected visual impairment creates a significant problem in colour vision, but blindness does. This finding is consistent with other researchers who reported a similar result(Zhu et al, 2015).

Limitations

This study assessed vision-related quality of life based on the levels of vision, and did not analyse by specific diagnosis.

Comparison between the Groups may have been hampered by the differing sources of research participants. Participants in Groups 1 and 4 were recruited from the community, while participants in Groups 2 and 3 were clients from a hospital eye clinic.

CONCLUSION

It can be concluded that there are significant differences in vision-related quality of life related to people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness. Visual impairment has a detrimental impact on a person's vision-related quality of life. However, it has differential impacts on different elements of vision-related quality of life. There are no significant differences between people with normal vision and corrected visual impairment in most subscales, suggesting that visual correction can improve vision-related quality of life, and thereby highlighting the importance of visual acuity correction.

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Impact of Visual Impairment and Correction on Vision-Related Quality of Life: Comparing People with Different Levels of Visual Acuity in Indonesia

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ABSTRACT

***Purpose**: This study assessed the extent to which visual impairment impacts on vision-related quality of life in Indonesia, by comparing four groups of people: those with 1) normal vision, 2) corrected visual impairment, 3) uncorrected visual impairment, and 4) blindness.*

***Method:** Purposive sampling was used. There were 162 respondents, between 21 and 86 years of age. Participants with normal vision and blindness were community-dwellers in Yogyakarta, Indonesia. Those with corrected and uncorrected visual impairment were recruited from an eye clinic. This cross-sectional study used NEI VFQ-25 to assess vision-related quality of life. The total scores and 11 NEI VFQ-25 subscales scores of four respondent groups were analysed using ANOVA, followed by post-hoc analyses to reveal between group differences.*

***Results**: There was a significant difference in the NEI VFQ-25 total scores among the four respondent groups. Respondents with normal vision had the highest score and those with blindness had the lowest. There were also significant differences among the four groups for the 11 subscales. Post-hoc analyses revealed no significant difference between respondents with normal vision and corrected visual impairment in the total and 9 NEI VFQ-25 subscales. Respondents with uncorrected visual impairment and blindness had significantly lower vision-related quality of life compared to those with normal vision or corrected visual impairment in the total and 5 NEI VFQ-25 subscales, indicating that visual impairment decreases vision-related quality of life.*

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***Conclusion**: Visual impairment has a detrimental impact on a person's vision-related quality of life. The negative impact of visual impairment can be minimised by correction. Failure to correct visual impairment leads to significantly lower vision-related quality of life.*

***Key words:** quality of life, visual acuity, blindness, visual correction, Indonesia*

INTRODUCTION

The Global Burden of Diseases project, conducted in 2017, reported that blindness and visual impairment caused 1.19% of DALYs globally (Institute for Health Metrics and Evaluation - IHME, 2017). The World Health Organisation's World Report on Vision, released in 2019, estimated that the number of people with visual impairments worldwide was 2.2 billion (WHO, 2019). The Ministry of Health of the Republic of Indonesia reported that the population with severe visual impairment was more than 2 million people and the number of people with blindness was more than 900,000 (Ministry of Health, 2013).

People with visual impairments experience limitations in carrying out various activities in their lives. They need more time to complete tasks like eating and drinking as they have difficulty in identifying food on a plate or pouring liquid into a glass because of their visual impairment (Pardhan et al, 2015). Independence in conducting activities of daily living decreases as the visual impairment worsens (Christ et al, 2014). Reduced visual acuity, decreased visual field and blurred vision have been associated with lower quality of life (Medeiros et al, 2014; Kim et al, 2017).

There are several studies on the prevalence of visual impairment in Indonesia. Mahayana et al (2017) studied primary school children in 3 districts in Yogyakarta Province and 1 district nearby to find the prevalence of uncorrected refractive error in urban, suburban, exurban and rural children. Sasongko et al (2017) reported the prevalence of diabetic-related blindness of people residing in Yogyakarta. Muhit et al (2018) examined 195 children aged 0-15 years in Sumba and Yogyakarta to study the epidemiology of childhood blindness.

Although much is known about the number of people with visual impairment, Indonesia still lacks studies on how visual impairment affects vision-related quality of life. Asrorudin (2014) investigated the effect of eye diseases and visual impairment on vision-related quality of life in a population with severe visual impairment and blindness in Indonesia. However, no studies have compared

vision-related quality of life between people with normal vision and people with different levels of visual impairment. The comparison between subjects with varying visual function will help elucidate the impact of visual impairment on vision-related quality of life in Indonesia.

Objective

Unlike previous studies conducted in Indonesia, this study aimed to compare the quality of life of people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness.

METHOD

Study Sample

For this cross-sectional study, adults aged 18 years and older were recruited using purposive sampling.

The respondents were classified into 4 groups: Group 1 - people with normal vision, Group 2 - people with corrected visual impairment, Group 3 – people with visual impairment that remained uncorrected although using visual aids, and Group 4 – people who were legally blind. Respondents in Group 2 had either mild or moderate visual impairment, while those in Group 3 had moderate to severe visual impairment.

Those with normal vision and blindness were community dwellers, while participants with visual impairment were recruited from the eye clinic of Bethesda Hospital in Yogyakarta. The respondents with blindness were clients of Badan Sosial Mardi Wuto, a social organisation for people with low vision or blindness.

WHO defines normal vision as visual acuity of 6/6, and blindness as visual acuity worse than 3/60 in the better eye with best correction (WHO, 2019). Visual acuity of respondents with visual impairment was examined by an ophthalmologist, and people with normal vision and blindness were examined by a trained research assistant. People with corrected visual impairment could reach 6/6 visual acuity with visual aids. People with uncorrected visual impairment had visual acuity below 6/6 despite the use of visual aids.

Data Collection

Vision-related quality of life was assessed using National Eye Institute – Vision Function Questionnaire – 25 (NEI VFQ-25). This questionnaire has been used to measure vision-related quality of life among Asian people as well (Suzukamo et al, 2005; Gyawali et al, 2012; Cortina and Hallak, 2015; Saboo et al, 2017; Nickels et al, 2017). NEI VFQ-25 has 12 subscales. The total score is the sum of the 12 subscales scores. The respondents with blindness did not drive, so all of them scored '0' in the driving subscale. Multivariate ANOVA was conducted to test the differences of the NEI-VFQ total and 11 subscale (excluding driving) scores among the four groups with age and sex as covariates. Post- hoc analyses using Dunnett C were conducted to find differences between respondent groups.

Ethics Approval

Ethical clearance was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Kristen Duta Wacana. Detailed explanations were given to the participants to obtain their written informed consent. They were assured that the data would be kept confidential and anonymity would be maintained.

RESULTS

Data was collected from 162 respondents: 41 people with normal vision (Group 1), 41 people with corrected visual impairment (Group 2), 40 people with uncorrected visual impairment (Group 3), and 40 people with blindness (Group 4). There were 28 females and 13 males in Group 1, 25 females and 16 males in Group 2, 19 females and 21 males in Group 3, and 26 females and 14 males in Group 4. The mean and standard deviations of age were: 33.59 ± 7.194 years in Group 1; 52.85 ± 14.307 years in Group 2; 60.98 ± 15.58 years in Group 3; and 46.83 ± 12.09 years in Group 4.

The most common cause of visual impairment in Group 2 was cataract (61%), followed by refractive disorders (24%) and glaucoma (7%). Cataract was also the most common cause of visual impairment in Group 3 (65%), followed by glaucoma (15%), diabetic retinopathy (12.5%) and age-related macular degeneration (2.5%). Meanwhile, among respondents with blindness, measles (87.5%) was the most common cause of blindness since childhood, followed by congenital cataracts (7.5%) and glaucoma and retinal detachment (2.5% each) respectively. The majority of respondents in Group 2 (85%) and Group 3 (65%) had visual impairment for less than 5 years, while respondents in Group 4 had been blind for more than 10 years (100%).

Most respondents had high school education in Group 1 (47.5%) and Group 3 (62.5%). In Group 2, 52.5% had college education, while respondents with blindness had the lowest level of education, as 27.5% had never been to school and 50% had elementary school education.

The majority of respondents in Group 1 and Group 2 were working people (75% and 57.5%, respectively). Half of the study participants in Group 3 worked, and most of those who did not work were pensioners. Almost all of the respondents with blindness (97.5%) worked as masseurs. In Indonesia, the department of social affairs provides free masseur training programmes for people with blindness.

The vision-related quality of life of respondents with normal vision, corrected visual impairment, uncorrected visual impairment and blindness, the results of multivariate ANOVA and post-hoc analyses are presented in Table 1.

Table 1: Vision-related Quality of Life of People with Normal Vision (Group 1), Corrected Visual Impairment (Group 2), Uncorrected Visual Impairment (Group 3) and Blindness (Group 4), the Results of Multivariate ANOVA and Post-hoc Analyses of the 4 Groups

Vision-related Quality of Life	Group 1 (G1)	Group 2 (G2)	Group 3 (G3)	Group 4 (G4)	Multivariate ANOVA		Post-hoc Analyses
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	p	
Total	946.84 ± 47.240	946.84 ± 47.240	781.29 ± 128.690	418.90 ± 89.468	282.469	<0.001	G1>G2** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
General health	59.76 ± 15.690	55.610 ± 13.332	40.000 ± 21.780	44.375 ± 18.334	7,391	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4**
General vision	81.95 ± 6.008	77.561 ± 6.626	58.500 ± 12.310	15.000 ± 19.612	243,605	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***

Ocular pain	90.55 ± 14.344	82.317 ± 17.280	83.438 ± 21.067	75.300 ± 22.562	4,197	0,007	G1>G4***
Near vision activities	99.02 ± 2.650	96.37 ± 6.495	64.782 ± 20.283	39.574 ± 11.757	204,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Distance vision activities	98.63 ± 3.048	98.80 ± 3.487	69.995 ± 22.713	28.936 ± 8.427	285,248	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Social functioning	93.54 ± 8.571	88.83 ± 12.221	90.625 ± 12.894	55.000 ± 14.925	88,360	<0.001	G1>G4*** G2>G4*** G3>G4***
Mental health	98.00 ± 5.996	86.37 ± 18.208	65.625 ± 14.572	67.506 ± 15.453	31,393	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4***
Dependency	97.95 ± 5.882	86.66 ± 15.106	64.787 ± 16.616	57.275 ± 17.314	56,033	<0.001	G1>G2*** G1>G3*** G1>G4*** G2>G3*** G2>G4*** G3>G4***
Role difficulties	89.98 ± 22.469	79.80 ± 31.610	68.750 ± 24.677	56.563 ± 19.812	10,615	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***
Colour vision	99.39 ± 3.904	97.56 ± 15.617	98.750 ± 7.906	18.750 ± 30.356	208,119	<0.001	G1>G4*** G2>G4*** G3>G4***
Peripheral vision	99.39 ± 3.904	96.95 ± 16.003	85.000 ± 24.547	5.000 ± 14.097	330,665	<0.001	G1>G3*** G1>G4*** G2>G3*** G2>G4***

** $p<0.01$

*** $p<0.001$

Multivariate ANOVA that included age and sex as covariates, revealed a significant difference in the NEI VFQ-25 total scores among the four groups of respondents. Group 1 had the highest mean total vision-related quality of life score and Group 4 had the lowest. Post- hoc analyses revealed there was no significant difference between Group 1 and Group 2 respondents, but Group 1 and Group 2 respondents had significantly higher scores than those in Group 3 and Group 4. The total vision-related quality of life score of Group 3 respondents was significantly higher than that of respondents in Group 4.

The mean vision-related quality of life scores of 11 subscales for the four groups of respondents varied, although the mean scores of almost all subscale scores in Group1 tended to be the highest, and those of Group 4 were likely to be the lowest.

In the general health subscale, post-hoc analysis showed that respondents in Group 1 and Group 2 had significantly higher general health scores than those in Group 3 and Group 4. Respondents in Group 1 and Group 2 were reasonably healthy, as the percentage with self-reported chronic diseases was below 20%. Almost half of the respondents in Group 3 (47.5%) and 35% of those in Group 4 reported having a chronic health condition.

In the general vision subscale, there was no significant difference between Group 1 and Group 2. The correction of Group 2 respondents' vision had a positive impact on the vision-related quality of life general vision subscale. Respondents in Group 1 and Group 2 had significantly higher scores than respondents of Group 3 and Group 4. Failure to make visual correction, leading to uncorrected visual impairment or even blindness, resulted in lower vision-related quality of life general vision subscale.

The results of near vision activities and distance vision activities subscales showed that visual correction improved people's ability to conduct near vision activities like reading a book, cooking, sewing or fixing things at home, as well as distance vision activities such as reading street signs, watching movies, and going up and down stairs at night.

In the social functioning subscale, the respondents in Groups 1, 2 and 3 had significantly higher scores than those in Group 4. Despite their visual limitations, Group 2 and Group 3 respondents were able to understand other people's reactions during conversation or behave as expected when they were visiting people or attending a party. People with blindness had more difficulties in fulfilling their social function which affected their vision-related quality of life.

In the mental health subscale, Group 1 had a significantly higher score than the other three Groups. Group 2 respondents worried about their vision, felt some frustration, had less control over what they did, and worried about being embarrassed due to their visual impairment. Group 3 and Group 4 individuals had bigger problems compared to Group 2 respondents, leading to lower vision-related quality of life.

Post- hoc analysis showed that respondents in Group 1 and Group 2 had significantly higher vision-related quality of life role difficulties subscale than those in Group 3 and Group 4. Respondents in Group 3 and Group 4 thought that they could not complete tasks on time and their performance was lower because of their visual problem. Group 2 individuals did not think that their visual impairment affected their performance.

In the dependency subscale, Group 1 had a significantly higher score than the other Groups. Respondents in Group 2 felt some dependency on what other people said, and needed help from other people because of their visual problems. Individuals in Group 3 and Group 4 had more difficulties than those in Group 2. Group 4 respondents even felt they were forced to stay at home most of the time because of their blindness.

Group 1 and Group 2 individuals had significantly higher peripheral vision subscales than those in Group 3 and Group 4. People in Group 2 did not think that they had significant difficulties in seeing things on the sides, while those in Group 3 and Group 4 did.

There was no significant difference among respondents in Groups 1, 2 and 3 in the colour vision subscale. The three groups had significantly higher scores than those in Group 4. Individuals in Group 2 and Group 3 did not have a significant problem in matching clothes, but those in Group 4 had a lot of problems in performing this task.

DISCUSSION

People with normal vision had the highest total NEI VFQ-25 score and those with blindness had the lowest, indicating that vision-related quality of life decreases with the worsening of visual acuity. This is in accordance with other studies conducted in other countries(Fleming et al, 2019; Tharaldsen et al, 2020; Yibekal et al, 2020).

Based on the NEI VFQ-25 subscale analysis, general health was found to be higher in respondents with normal vision and corrected visual impairment than among those with uncorrected visual impairment and blindness. This result suggests that visual acuity may be an indicator of general health. Vision impairment has been associated with chronic conditions in older adults(Court et al, 2014; Crews et al, 2017). People with visual impairment are more likely to have health problems compared to individuals with normal vision. Other researchers found cataract as a predictor of mortality in people aged over 50 years (Zhu et al, 2016; Zhu et al, 2019). A recent review reported poor vision as a risk factor of falls in older adults that may lead to fatality (Joseph et al, 2019).

Subscales of general vision, near vision activities, distance vision activities and peripheral vision showed a significant difference, where respondents with normal vision and corrected visual impairment had higher levels of functioning than individuals with uncorrected visual impairment or blindness. Visual correction may improve vision-related quality of life, while more severe visual impairment may have a more adverse effect on vision-related quality of life. This finding is consistent with other studies showing that best-corrected visual acuity can have positive impact on vision-related quality of life(Råen et al, 2019).

There was no significant difference in the ocular pain subscale among respondents with corrected vision, uncorrected vision and blindness. Ocular pain is commonly associated with ocular surface disease found in most people with glaucoma. The number of respondents with glaucoma in this study was low, and this might explain the result(Baudouin et al, 2013; Tirpack et al, 2019).

This study suggests that visual acuity does not affect social functioning until someone becomes blind. This finding is similar to studies that reported no significant difference in social function between people with normal vision and those with visual impairment(Dev et al, 2014; Heine et al, 2019). Respondents with visual impairment could still carry out their social functions despite obstacles in doing so. Respondents with blindness had many difficulties in carrying out their social functions, and experienced social isolation. Although most of the study participants with blindness worked as masseurs, they waited for clients to visit them because they had problems in moving around the city due to their visual condition.

This study indicates that vision affects mental health. A study on older people has associated self-reported visual impairment with depression(Frank et al,

2019). Vision problems have been associated with worse psychosocial outcomes. Visual impairment causes problems in doing everyday activities, i.e., reading newspapers, recognising people. People with these problems have been reported to have lower life satisfaction, increased depressive symptoms and decreased positive affect(Hajek et al, 2020).

Dependency was different among all four groups; it increased with decreasing visual acuity. This study shows that uncorrected visual impairment can lead to role difficulties, which is consistent with other researchers' findings that greater visual impairment affects psychosocial parameters, including role difficulty(Zhu et al, 2015). Visual impairment forces the individual to take longer over completing tasks, leading to lower performance.

Despite their corrected vision, respondents in Group 2 had lower quality of life in the dependency subscale than those with normal vision. More than half of the participants in Group 2 wore glasses to correct their visual impairment. Glasses help people perform many activities, but those who wear them complain about the inconvenience of having frequent eye check-ups and getting replacements to keep good vision(Kandel et al, 2017). Without glasses, they need help from others to accomplish tasks. Visual impairment decreases one's independence in doing activities of daily living, and increases dependence on other people. Individuals with uncorrected visual impairment or blindness have more dependency on others in their daily lives.

This study suggests that neither corrected nor uncorrected visual impairment creates a significant problem in colour vision, but blindness does. This finding is consistent with other researchers who reported a similar result(Zhu et al, 2015).

Limitations

This study assessed vision-related quality of life based on the levels of vision, and did not analyse by specific diagnosis.

Comparison between the Groups may have been hampered by the differing sources of research participants. Participants in Groups 1 and 4 were recruited from the community, while participants in Groups 2 and 3 were clients from a hospital eye clinic.

CONCLUSION

It can be concluded that there are significant differences in vision-related quality of life related to people with normal vision, corrected visual impairment, uncorrected visual impairment and blindness. Visual impairment has a detrimental impact on a person's vision-related quality of life. However, it has differential impacts on different elements of vision-related quality of life. There are no significant differences between people with normal vision and corrected visual impairment in most subscales, suggesting that visual correction can improve vision-related quality of life, and thereby highlighting the importance of visual acuity correction.

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