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Changes in Daily Living and Vision-Related Quality of Life After Phacoemulsification in Senile Cataract

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Introduction: *Vision plays a critical role in maintaining quality of life, particularly among elderly individuals. Senile cataracts, a leading cause of visual impairment in older adults, can significantly hinder daily functioning and vision-related quality of life (VRQL). Although phacoemulsification surgery is the standard treatment, its broader impact on functional independence and VRQL warrants further exploration.*
Purpose: *This study aimed to evaluate changes in activities of daily living (ADL) and VRQL in patients with senile cataracts before and after undergoing phacoemulsification surgery.*
Methods: *An analytic cross-sectional study was conducted using purposive randomized sampling. ADL was assessed using the Barthel Index, while VRQL was measured using the National Eye Institute Visual Function Questionnaire-25 (NEI-VFQ-25). The Marginal Homogeneity test was applied to analyze changes in ADL, and the Wilcoxon test was used to analyze VRQL data.*
Results: *The study included 50 patients with a mean age of 65.9 ± 9.6 years, of whom 42% were male and 58% female. Of the participants, 58% had immature cataracts, and 42% had mature cataracts. There was a significant improvement in ADL post-surgery (p = 0.000). Preoperatively, 50% of the patients were severely dependent, 40% were moderately dependent, and 10% were mildly dependent. Postoperatively, 82% of the patients became independent, 14% mildly dependent and 4% moderately dependent. VRQL also showed significant improvements across domains, including overall function, visual acuity, near vision, distance vision, and color vision (p = 0.000).*
Conclusion: *Phacoemulsification surgery in patients with senile cataract significantly enhances both functional independence in daily living and vision-related quality of life.*

Key words:
ADL; Cataract; Phacoemulsification; VRQL

Introduction.

Cataracts are an eye disease caused by cloudiness that occurs in the lens. Lens opacities in cataract sufferers will cause decreased visual acuity and interfere with daily activities [1]. Cataract is the leading cause of blindness in Indonesia. The results of the Rapid Assessment of Avoidable Blindness (RAAB) survey conducted by Perhimpunan Dokter Spesialis Mata Indonesia (PERDAMI, Indonesian Ophthalmologists Association) in 15 provinces in Indonesia show that the blindness rate in the elderly over 50 years reaches 3% and senile cataract is one of the highest causes of blindness, with a rate of 81.2% [2]. In the last two decades, cataracts have been the cause of blindness and poor vision in 98 countries, especially in countries with low per capita income. In 2015, there were 52.6 million cases of blindness caused by cataracts and 216.6 million cases of poor vision caused by cataracts [3]. The World Health Organization (WHO) reported on the VISION 2020 program, there are 2.2 billion people with visual impairments worldwide, and 65.2 million of them are cataract patients [4].

The prevalence of cataracts increases with age, which is called senile cataract [5]. Increasing age results in a decrease in the thickness of eye fibers, reduced corneal endothelial cells, and sedimentation of old cells due to exposure to ultraviolet light and oxidative stress, resulting in hardening of the lens nucleus [6]. Immature cataracts in patients > 50 years with poor vision in both eyes will interfere with daily activities and can reduce the quality of life. Daily activities, such as eating, drinking, bathing, dressing, and going up and down stairs, can be disrupted, and the quality of life eventually decreases [1]. Thus, patients need to be treated to improve their quality of life. The assessment of an individual's quality of life (QoL) inherently encompasses various aspects, including their physical well-being, psychological condition, personal ideologies, social connections, and interactions with significant elements of their surroundings [7, 8].

The most effective treatment for senile cataracts is surgery with the aim of increasing visual acuity. Phacoemulsification is the operation of choice because of its low risk, short healing time, and low risk of astigmatism [1, 9, 10]. Phacoemulsification is reported as more cost-effective than the small incision cataract surgery (SICS) technique

for cataract surgery [11]. A previous study [12] reported that the visual outcomes following phacoemulsification at Ramata Eye Hospital in Denpasar, Bali, Indonesia, showed a noteworthy enhancement in visual acuity. This procedure also effectively reduced the proportion of severe vision impairment and blindness among elderly patients with cataracts. In addition, it reduces the incidence of postoperative problems. Improving postoperative vision improves daily activities (activities of daily living / ADL) and improves human vision-related life activities (vision-related quality of life / VRQL) [13, 14].

ADL is an individual's routine daily activities, including mobility and self-care such as using the toilet, getting on and off beds and chairs, dressing, eating, and bathing. The ability to perform ADLs depends on cognitive, motor, and perceptual abilities [15, 16]. ADL can be measured by the Barthel Index, which is an index to measure a person's quality of life based on the ability to perform ADLs independently [17]. The Barthel Index ADL Questionnaire is a reliable and valid measuring instrument that can be used to assess the basic functional status of elderly individuals [18].

VRQL can be measured using the National Eye Institute Visual Functioning Questionnaire (NEI-VFQ-25). This questionnaire contains 25 questions that cover general health and vision conditions, difficulties with daily activities (such as reading, observing close objects, and driving), and responses to vision problems. The questionnaire is specific and has high validity and reliability [14].

Research conducted at the Ume Manekan Hospital in the South Central Timor District reported that there were still obstacles to cataract surgery, including the inability of the community to pay for surgery, lack of access to treatment, fear of the surgery's results, and the perception that they did not need treatment. This may also happen in another area of Indonesia; thus, there is a need to have a policy to support cataract surgery programs and to motivate cataract sufferers to want to undergo surgery to increase independence in daily activities and improve the quality of life related to vision. This study aimed to compare the activities of daily living (ADL) and vision-related quality of life (VRQL) before and after phacoemulsification surgery in patients with senile cataract.

Methods

Study design

This study employed an analytical observational study with a pre–post comparison. The aim was to evaluate differences in activities of daily living (ADL) and vision-related quality of life (VRQL) before and after phacoemulsification surgery in patients with senile cataracts.

Population and sample

The study population consisted of male and female patients aged over 50 years who had been diagnosed with senile cataracts and underwent phacoemulsification surgery. The sample was selected using purposive randomized sampling. Inclusion criteria included: age >50 years, no history of diabetes mellitus or other systemic diseases, and no history of chronic ocular infections.

Data collection

Data were collected through direct eye examinations using a slit-lamp biomicroscope to confirm the diagnosis of cataracts. Additionally, structured interviews were conducted using two standardized instruments: the Barthel Index to assess ADL and the National Eye Institute Visual Function Questionnaire-25 (NEI-VFQ-25) to assess VRQL. These measurements were taken twice: two days before surgery (preoperative) and one month after surgery (postoperative).

Data analysis

Data were analyzed using SPSS 25 for both univariate and bivariate methods. The Wilcoxon signed-rank test was applied to compare ADL and VRQL scores before and after phacoemulsification surgery. A p-value of <0.05 was considered statistically significant.

Ethical statement

This study was approved by the Ethics Committee of the Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, with approval number 235/EC-KEPK FKIK UMY/VII/2023. Informed consent was obtained from all participants before their inclusion in the study, in accordance with ethical standards and institutional guidelines.

Results

In this study, 50 samples were collected with an average age of 65.9 ± 9.6 years, with 21 males (42%) and 29 females (58%). The frequency distribution of respondents can be seen in Table 1.

Table 1 indicates that the largest proportion of participants was in the 61–70 age group, comprising 24 individuals (48%), followed by the 71–80 age group with 13 individuals (26%). The majority of participants were female, accounting for 29 individuals (58%), while males represented 21 individuals (42%). The findings also showed that 26 participants (52%) had cataracts in the right eye (Oculus Dexter, OD), and 24 participants (48%) in the left eye (Oculus Sinister, OS). A total of 29 participants (58%) presented with immature cataracts, while 21 participants (42%) had mature cataracts, indicating that the immature stage accounted for more than half of the cases. The highest prevalence of senile immature cataracts (80.9%) was observed among patients at Mangusada Badung Regional Hospital, Bali.

Figure 1 (based on the Barthel Index) shows that preoperatively, 25 patients (50%) had severe dependence, 20 patients (40%) had moderate dependence and 5 patients (10%) had mild dependence. Following postoperative phacoemulsification, there were significant changes, with 41 patients (82%) categorized as independent, 7 patients (14%) as having mild dependence, and 2 patients (4%) as having moderate dependence. The difference test for ADL (categorically more than 2) before and after the phacoemulsification operation, using the Marginal Homogene-

Table 1. Respondents' characteristics

Characteristic		Number	Total
Age	40 – 50	N	4
		%	8
	51 – 60	N	7
		%	14
	61 – 70	N	24
		%	48
	71-80	N	13
		%	26
	81-90	N	2
		%	4
Gender	Male	N	21
		%	42
	Female	N	29
		%	58
	Total	N	50
		%	100
Unilaterality Cataract	OD	N	26
		%	52
	OS	N	24
		%	48
Cataract stage	Matture	N	21
		%	42
	Immaturee	N	29
		%	58

Note: OD (Oculus Dexter); OS (Oculus Sinister)

ity test, showed a significantly improved difference (p = 0.000), as shown in Table 2.

The results showed that of the 50 respondents who underwent phacoemulsification surgery, the Barthel Index score increased sharply, as indicated by 41 indivisuals (82%) being independent and not requiring assistance from others. This is due to the increased visual acuity so that daily activities are not disturbed.

Figure 2 (results of the NEI-VFQ-25 questionnaire) shows that the overall pre- and post-phacoemulsification total increased from a score of 35.19 ± 9.77 to 86.79 ± 5.04. This indicates that the quality of life related to vision is improving.

Figure 3 (results of the NEI-VFQ-25 questionnaire) shows the overall score of vision, near, distance, and color increased from pre- and post-phacoemulsification operations. The Wilcoxon analysis test showed significant differences (p = 0.000) between pre- and post- phacoemulsification operations related to the quality of life related to vision in total or overall, vision (vision), near (near vision), distance (distance vision) and color (see color) as shown in Table 3.

Table 3 shows that the 5 parameters resulting from interviews using the NEI-VFQ-25 questionnaire showed a significant increase in scores. It can be concluded that phacoemulsification improves patients' ADL. Additionally, patients report that their vision is improving, including near vision, distance vision, and colour perception, as well as an overall improvement in their quality of life. Vision is crucial for maintaining the quality of human life.

Table 2. ADL pre and post phacoemulsification surgery (with Barthel Index)

ADL Criteria	Pre op phacoemulsification	Post op phacoemulsification	p
Mild dependency	5	7	0.000
Moderate dependency	20	2	
Severe dependency/ Fully independent	25	41	

Note: ADL: Activity of daily living; op: operation

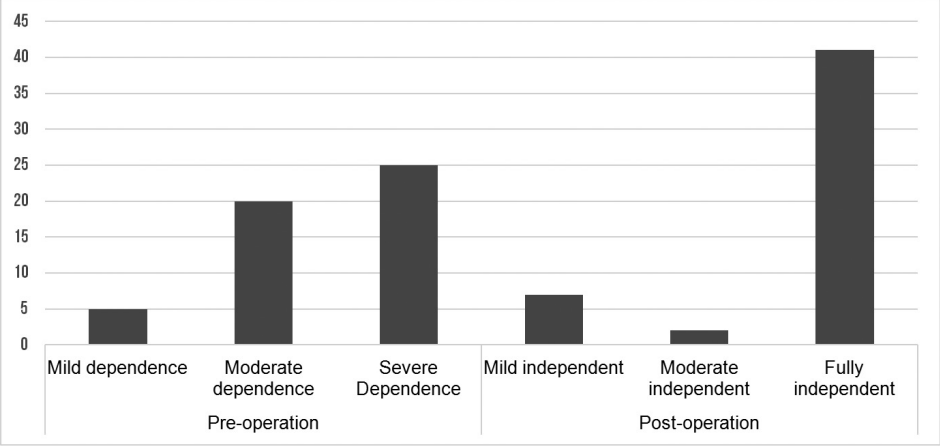

Figure 1. Patient's dependence and independence levels pre- and post-operation

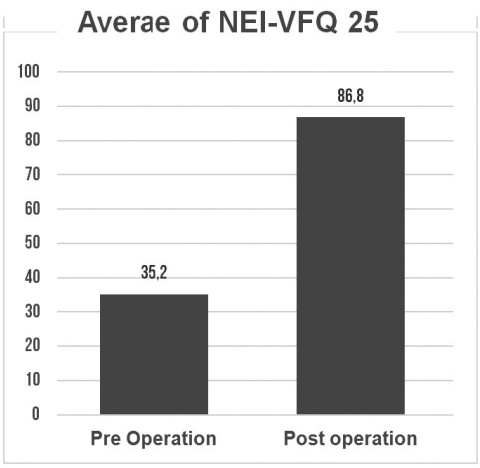

Figure 2. Mean NEI-VFQ-25 total score.
*Note: NEI-VFQ: National Eye Institute Visual Functioning Questionnaire

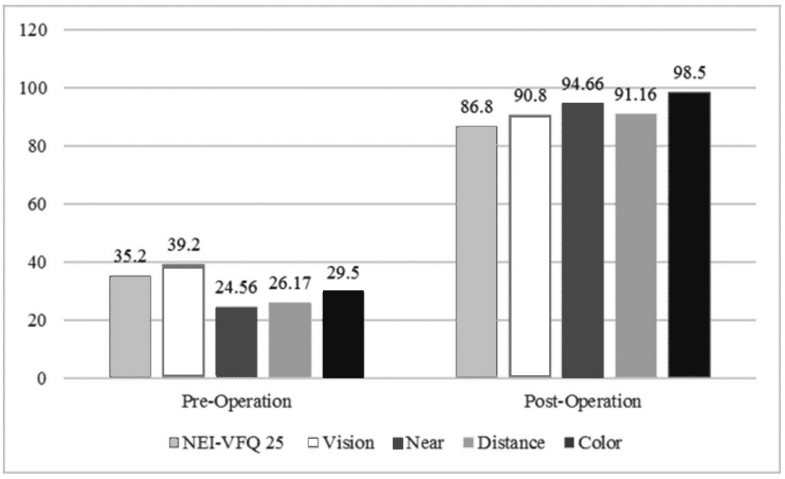

Figure 3. Mean score of 5 indicators.
*Note: NEI-VFQ: National Eye Institute Visual Functioning Questionnaire

Table 3. VRQL pre and post phacoemulsification operations (with NEI-VFQ-25)

NEI-VFQ-25 criteria	Pre op Phacoemulsification Score (Mean ± SD)	Post op phacoemulsification score (Mean ± SD)	p
VRQL (overall)	35.19 ± 9.77	86.79 ± 5.04	p=0.000
Vision (vision)	39.20 ± 17.12	90.80 ± 10.07	p=0.000
Near (near vision)	24.56 ± 16.84	94.66 ± 9.34	p=0.000
Distance (distance vision)	26.17 ± 18.44	91.15 ± 16.96	p=0.000
Color (near vision)	29.50 ± 19.36	98.50 ± 5.98	p=0.000

*Note: NEI-VFQ: National Eye Institute Visual Functioning Questionnaire; VRQL: vision-related quality of life

Discussion

The results of this study showed that the female sex group was more numerous than the male group, namely 29 people (58%) while in men there were 21 people (42%). According to Andjelic (2012) the female hormone estrogen may affect cataract formation. Ovarian hormones increase radiation-induced cataracts. The major endogenous estrogen, ß-estradiol has mitogenic and anti-oxidative effects at physiological concentrations, while pharmacological levels induce oxidative stress and act pro-apoptically in the lens. Research reporting hormone supplements shows that estrogen is responsible for cataract formation [20].

The results of this study showed that 26 people (52%) had cataracts in the right eye / Occuli Dextra (OD) and 24 people (48%) in the left eye / Oculi Sinistra (OS). In the literature study it is not stated whether there is a tendency for cataract development on which side of the eye occurs first. This is because the protein denaturation is progressive in both eyes. According to Javitt, in most cases one eye will be affected earlier than the other [21].

The results of this study reported that 29 people (58%) had immature cataract stages and the remaining 21 people (42%) had mature cataracts. According to the literature, the immature stage is the stage where the turbidity has reached a part of the lens [22]. Generally, senile cataract sufferers will go to the doctor at the immature stage because it interferes with vision. The prevalence of patients with senile immature cataract stage was the highest (80.9%) in the Mangusada Badung Regional Hospital, Bali, also reported by [23]. Several studies have reported that cataract surgery can significantly improve human vision and quality of life [24].

Furthermore, other studies have corroborated that cataract surgery contributes to improvements not only in visual function but also in general health and psychological well-being. Enhancements have been observed across multiple domains, including mobility, self-care, daily functioning, pain management, and emotional health such as anxiety or depression [25]. Patients also reported better performance in activities such as driving, walking, and navigating stairs.

In contrast, individuals with cataracts who do not undergo surgical intervention often experience progressive visual deterioration, which may eventually lead to blindness. Hence, implementing a structured and accessible cataract surgery program is essential. Such a program can ensure optimal postoperative outcomes and significantly

improve the quality of life for patients affected by cataracts.

This study has several limitations that should be acknowledged. First, the research was conducted at a single center with a relatively small sample size of 50 participants, which may limit the generalizability of the findings to broader populations or different clinical settings. Second, the study design involved short-term follow-up data collected only one month postoperatively therefore, long-term outcomes related to functional independence, visual performance, and sustained quality-of-life improvements could not be assessed. Future studies with larger, multicenter cohorts and extended follow-up periods are recommended to validate these results and provide a more comprehensive understanding of the long-term impact of phacoemulsification on daily living and vision-related quality of life.

Conclusion

Based on the significant improvements observed in ADL and VRQL following phacoemulsification surgery, it is recommended that cataract screening and surgical services be prioritized, particularly for elderly populations. Health policymakers should consider expanding access to cataract surgery through structured community-based programs to reduce delays in treatment and prevent vision-related disability. Future studies should be conducted with larger sample sizes and multicenter involvement to strengthen the evidence base. Additionally, longitudinal studies are recommended to assess the long-term impact of phacoemulsification surgery on functional independence, psychological well-being, and economic productivity.

References

1. **Nizami AA, Gulani AC**. Cataract. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2023 Aug 16]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK539699/
2. **Sugihantono.** Katarak Penyebab Tertinggi Kebutaan Di Indonesia. 2019; Available from: https://p2ptm.kemkes.go.id/kegiatan-p2ptm/pusat-/katarak-penyebab-tertinggi-kebutaan-di-indonesia.
3. **Flaxman SR, Bourne RRA, Resnikoff S, Ackland P, Braithwaite T, Cicinelli MV, et al.** Global causes of blindness and distance vision impairment 1990–2020: a systematic review and meta-analysis. The Lancet Global Health. 2017 Dec;5(12):e1221–34.
4. WHO. World report on vision [Internet]. Geneva: World Health Organization; 2019. Available from: https://apps.who.int/iris/handle/10665/328717
5. **Hashemi H, Pakzad R, Yekta A, Aghamirsalim M, Pakbin M, Ramin S, et al.** Global and regional prevalence of age-related cataract: a comprehensive systematic review and meta-analysis. Eye. 2020 Aug;34(8):1357–70.
6. **Li X, Cao X, Hou X, Bao Y**. The Correlation of Age and Postoperative Visual Acuity for Age-Related Cataract. BioMed Research International. 2016;2016:1–7.
7. **Fahrizal Y, Irmawan HS.** The Quality of Life of Adolescents Experiencing Online Game Addiction During the COVID-19 Pandemic. Jurnal Keperawatan Indonesia. 2023 Mar 31;26(1):68–77.
8. **Rochmawati E, Wiksuarini E, Rahmah R.** Depression and quality of life among cancer patients undergoing chemotherapy. Palliative Medicine in Practice. 2020;14(1):1–6.
9. **Davis G.** The Evolution of Cataract Surgery. Mo Med. 2016;113(1):58–62.
10. **Moshirfar M, Milner D, Patel BC**. Cataract Surgery. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2023 Aug 16]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK559253/
11. **Wulandari A, Dahlui M, Ernawaty, Wulandari RD, Rochmah TN**. Cost effectiveness analysis between small incision cataract surgery and phacoemulsification. Journal of Health and Translational Medicine. 2020;23(1).
12. **Satwika AAP, Permatasari AD, Jayanegara IWG, Sumanjaya S.** Visual Outcome Improvement of Phacoemulsification in Eyes with Senile Cataract at Ramata Eye Hospital, Denpasar, Bali, Indonesia. EJMED. 2022 Apr 15;4(2):109–12.
13. **To QG, Huynh VAN, Do DV, Do VQ, Congdon N, Dingle K, et al**. Psychometric Properties of the Vietnamese Catquest-9 Short Form Questionnaire. Optom Vis Sci. 2020 Mar;97(3):192–7.
14. **Koch CR, Neves GDF, Paredes RS, Siqueira ARAD, Kara N.** Impact of cataract surgery on visual acuity and quality of life assessed using the National Eye Institute Visual Function Questionnaire 25 in a public teaching hospital in Brazil. Revista Brasileira de Oftalmologia. 2022 Feb 16;81:e0011.
15. **Nlp Wistya Eka Mahadewi, Jayanegara IWG, Siska, I Made Agus Kusumadjaja.** Effect of uncontrolled glycemic on cataract surgery outcome in patient with diabetic retinopathy. Intisari Sains Medis. 2022 Aug 12;13(2):466–9.
16. **Turkstra LM, Van Os A, Bhatia T, Beyeler M.** Information Needs and Technology Use for Daily Living Activities at Home by People Who Are Blind. 2023 [cited 2023 Aug 16]; Available from: https://arxiv.org/abs/2305.03019
17. **Finger RP, Kupitz DG, Fenwick E, Balasubramaniam B, Ramani RV, Holz FG, et al.** The Impact of Successful Cataract Surgery on Quality of Life, Household Income and Social Status in South India. Mendelson JE, editor. PLoS ONE. 2012 Aug 31;7(8):e44268.
18. **Hormozi S, Alizadeh-Khoei M, Sharifi F, Taati F, Aminalroaya R, Fadaee S, et al.** Iranian version of barthel index: validity and reliability in outpatients' elderly. Int J Prev Med. 2019;10(1):130.
19. **Michael R, Bron AJ.** The ageing lens and cataract: a model of normal and pathological ageing. Phil Trans R Soc B. 2011 Apr 27;366(1568):1278–92.
20. **Fernanda F, Hayati F, Rizarullah.** Hubungan Usia Dan Jenis Kelamin Dengan Angka Kejadian Penyakit Katarak Di Poli Mata RSUD Meuraxa Banda Aceh Tahun 2018. Jurnal Aceh Medika. 2020;4(1).
21. **Chellappa SL, Bromundt V, Frey S, Steinemann A, Schmidt C, Schlote T, et al.** Association of Intraocular Cataract Lens Replacement With Circadian Rhythms, Cognitive Function, and Sleep in Older Adults. JAMA Ophthalmol. 2019 Aug 1;137(8):878.
22. **Asmara AAGA, Budhiastra P, Niti Susila NK.** Hasil tajam pengelihatan pasca operasi katarak senilis di RSUP Sanglah Denpasar periode Oktober 2016 - Juni 2017. Intisari Sains Medis [Internet]. 2019 Jun 17 [cited 2023 Aug 16];10(2).

Available from: https://isainsmedis.id/index.php/ism/article/view/187
23. **Manggala S, Jayanegara IWG, Putrawati AAM.** Gambaran Karakteristik Penderita Katarak Senilis di Rumah Sakit Daerah Mangusada Badung Periode 2018. Jurnal Medika Udayana. 2021;10(7).
24. **Acharya S.** The Study of Juvenile Delinquency with Reference to Psychological Perspectives in The Juvenile Homes of Delhi. International Journal of Advanced Research, Management, and Social Sciences. 2017;6:14–14.
25. **Bandhu S, Vabale Y, Sambarey P, Walke A, Raje S.** Impact of cataract on the quality of life of rural patients in India. J Clin Ophthalmol Res. 2016;4(2):75.

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