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Review Article

Is the likelihood of receiving cataract surgery determined by place of residence? A systematic review and meta-analysis

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ABSTRACT

Objectives: This study aims to systematically review the literature and identify the association between place of residence and cataract surgery utilisation.

Materials and Methods: We conducted a systematic review and meta-analysis according to preferred reporting items for systematic review and meta-analysis guidelines. A literature search was performed on PubMed and ProQuest databases, screening all related articles in the past 10 years (2012–2022). Data were analysed using RevMan 5.3 software, with pooled effect estimates reported as an odds ratio (OR) with a 95% confidence interval (CI).

Results: A total of 10 studies from eight articles were identified and included in the meta-analysis. The pooling results of these studies suggest that there is a statistically significant association between residence and cataract surgery utilisation. Those who live in rural areas (OR: 0.70, 95% CI: 0.52–0.95, $P = 0.02$) are 0.7 times less likely to use cataract surgical services compared to urban areas. The heterogeneity was significant ($P < 0.0001$ and $I^2 = 76\%$) and a random effect model was adopted.

Conclusion: Our findings indicate that there is an association between place of residence and cataract surgery utilisation, with individuals residing in rural areas being less likely to use such treatment. These findings can inform targeted interventions aimed at improving cataract surgical coverage among rural populations.

Keywords: Residence, Cataract, Cataract surgery, Systematic review

INTRODUCTION

A cataract is a disease characterised by the opacity of the lens of the eye, with multifactorial aetiology, the most common cause is the aging process.[1] Cataracts as the leading cause of blindness globally can cause a substantial economic burden due to the diminished quality of life resulting from blindness.[2] In 2020, it is estimated that 15.2 million people aged 50 years and older worldwide were blind and 78.8 million people suffered from moderate-to-severe vision impairment due to cataracts.[3] Enhancing cataract surgical coverage (CSC), especially in developing and low-income countries, can contribute greatly to poverty reduction and improve the quality of life in the population with highly successful outcomes and cost-effectiveness.[4]

Cataract surgical rate and/or CSC is one of the essential indicators used to evaluate the adequacy of cataract surgical services and measure the improvement of eye health globally. The global target for effective CSC is increasing the coverage by 30% in 2030.[5,6] Estimated that if 95% of individuals with cataracts can undergo surgery, it would prevent more than 3.5 million healthy life years lost due to premature mortality or morbidity or disability-adjusted life years annually on a global scale.[7]

The utilisation of eye health services is also unevenly distributed, determined by factors such as availability, accessibility, affordability and acceptance of the services. The availability and accessibility are related to the geographical location of the residence. Eye health services in several countries, especially low- and middle-income countries, tend to be available only at secondary or tertiary hospitals in urban areas.[8] In many countries worldwide, there has been studied cataract surgical utilisation related to the place of residence especially the difference in uptake of cataract surgery in rural

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areas and urban areas with various results of association. Nevertheless, a systematic analysis of this topic has not been documented yet. Thus, this study aimed to systematically review the literature to assess the association between place of residence and the utilisation of cataract surgical services.

MATERIAL AND METHODS

This systematic review was conducted on PubMed and ProQuest databases to identify articles published from January 2012 to December 2022. We developed a search strategy to identify studies of 'cataract surgery' AND 'residence' and performed using specific keywords to investigate the relationship between cataract surgery and residence (see appendix 1 in the supplementary material). The study followed the guidelines of the preferred reporting items for systematic review and meta-analysis (PRISMA), which involved conducting a search, identification, screening and feasibility analysis.

The present study includes literature published in English between January 2012 and December 2022 and met specific criteria: (1) Conducted in a general adult population, (2) reporting of either the odds ratio (OR) or the number of cataract surgery performed and the number requiring cataract surgery and (3) residence classification was a rural and/or urban area. Studies in the form of letters, editorials, abstracts or those with inadequate data were excluded from the study. For each included study, the following information was collected: First author's name, country, year of publication, study design, sample size, *P*-value and OR.

The Joanna Briggs Institute Instrument was used for the quality assessment of each article, comprising eight items on a scale.[9] Only articles with a low risk of bias were considered for the meta-analysis. The OR values of each study were collected into the RevMan 5.3 software. The heterogeneity between studies was assessed using the I^2 statistics and if the heterogeneity was significant and/or high ($P < 0.10$ and/or $I^2 \geq 50\%$), the random effects model was used. Conversely, the fixed effect model was used if the heterogeneity was not significant and/or low ($P > 0.10$ and/or $I^2 < 50\%$). A funnel plot was employed to evaluate publication bias.

RESULTS

A systematic search was conducted on two databases, PubMed and ProQuest, resulting in a total of 689 articles. After removing duplicates, a total of 454 articles were screened for titles and abstracts. We identified 164 articles that appeared potentially relevant to our study. After assessing the eligibility, only 42 articles underwent full-text review. Thirty-four articles were excluded due to: (1) Insufficient data or not reporting either the OR (or not reporting the number of cataract surgery performed and the number requiring cataract surgery), (2) classification of residential areas that are different from what we have determined and (3) publication before 2012. Finally, eight articles were included in the meta-analysis.[10-17] [Figure 1] shows the preferred reporting items for systematic review and meta-analysis (PRISMA) flow diagram illustrating the process of the study selection.

[Table 1] provides an overview of the characteristics of the studies included in this systematic review, such as the first author's name, country, published year, study design, sample size, *P*-value and OR. A total of 10 studies from eight articles were identified, representing a diverse range of countries including Nigeria, Ghana, India, Sri Lanka, Korea, Uganda, Kenya, Bangladesh, Philippines and China. All of the studies were classified as having a low risk of bias [Table 2]. Notably, one of the articles included three separate studies conducted in Bangladesh, Kenya and Philippines.[16]

A meta-analysis of 10 studies was conducted to determine the pooled effect estimates reported as OR with a 95% confidence interval (CI). Our meta-analysis showed a pooled OR of 0.70 (95% CI 0.52–0.95) with $P = 0.02$ for people who live in rural areas have 0.7 times less likely to utilise cataract surgical services compared with people who live in urban areas [Figure 2]. The heterogeneity was significant ($P < 0.0001$ and I^2 76%) and a random effect model was adopted. [Figure 3] describes an asymmetrical Funnel plot of this meta-analysis which indicates a tendency of publication bias.

DISCUSSION

The present study found a significant association between the utilisation of cataract surgical services and place of residence. Specifically, rural residents have a lower likelihood to use cataract surgical services compared to urban residents. A study of Tana in Indonesia, also found that type of residence, has a significant association with cataract surgical service utilisation.[18] Similar findings were also reported in a study in India that urban areas had higher coverage rates of cataract surgery than rural areas.[19] Access to health-care services that enable cataract surgery for rural communities often has to travel long distances to access medical services.[12] Similar disparities in CSC between urban and rural communities were found in Pakistan, where cataract surgery coverage was higher in urban areas compared to rural areas. This disparity is attributed to differences in access to cataract surgical services.[20] In Ghana, cataract surgical services are centralised in urban areas. To improve CSC, it is important to address the disparities in access to health-care services in rural communities by providing comprehensive outreach services that can reach cataract patients.[11] The low population density and also inadequate public transportation system in rural areas in Nigeria are considered some of the barriers for cataract patients living in rural areas. High transportation costs are also perceived as one of the obstacles for patients.[10] To overcome these barriers, providing outreach services for cataract patients in rural areas where all services are provided

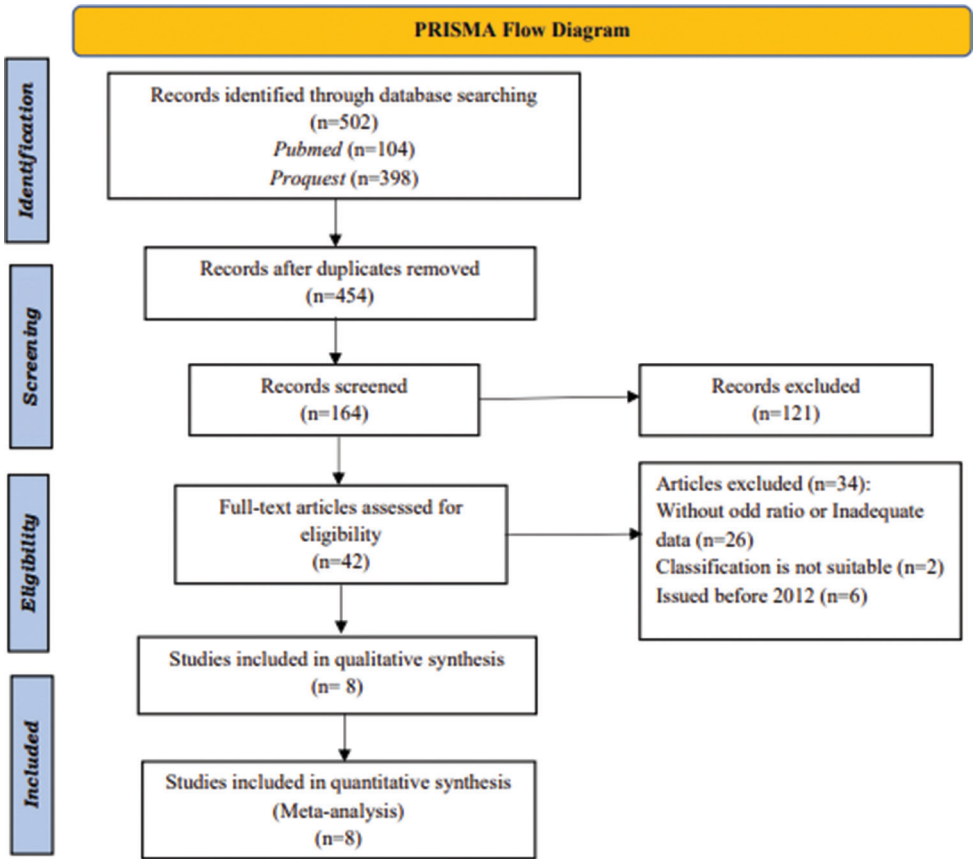

Figure 1: Preferred reporting items for systematic review and meta-analysis (PRISMA) flow diagram. n = number of articles.

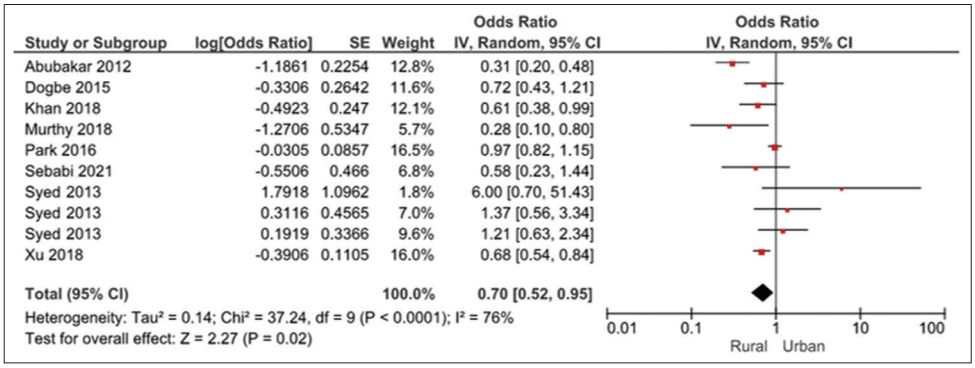

Figure 2: Forest plot of odd ratio for cataract surgery utilisation by place of residence. Syed (2013) conducted a study in 3 different countries (Bangladesh, Kenya, and Philippines).[16] A black rectangle represents a pooled Odd Ratio of 0.7 (95% CI, 052-0.95) with *P*-value = 0.02 from all studies (red squares). SE = Standard error; IV = Inverse variance; CI = Confidence interval; df = Degree of freedom.

without charge to patients. In the long-term, access to cataract surgical services by people living in rural areas, especially women and those who cannot read or write, will only improve if the overall health system is strengthened and factors that promote recruitment and retention of healthcare workers in rural areas are implemented.[21] Certain groups within the population still has lower access to cataract surgical services in Sri Lanka, including the poor, elderly, those living in rural areas and those with low education. The national plan for blindness prevention needs to address these disparities by improving access to high-quality cataract surgical services outside of major urban areas and for disadvantaged groups in

Table 1: Characteristics of studies.

First Author	Country	Published year	Study design	Sample Size	*P*-value	Odd ratio (95% CI)
Abubakar *et al.*	Nigeria	2012	Cross sectional	15.027	0.001	0.31 (0.20-0.48)
Dogbe *et al.*	Ghana	2015	Cross sectional	5571	0.210	0.72 (0.43–1.21)
Khan *et al.*	India	2018	Cross sectional	5501`	0.04	0.61 (0.38-0.99)
Murthy *et al.*	Sri Lanka	2018	Cross sectional	6.713	0.01	0.28 (0.10-0.80)
Park *et al.*	Korea	2016	Cross sectional	20.419	0.72	0.97 (0.82-1.15)
Sebabi *et al.*	Uganda	2021	Cross sectional	82	0.23	0.58 (0.23-1.44)
Syed *et al* .	Bangladesh	2013	Cross sectional	147	0.10	6.00 (0.70-51-43)
Syed *et al.*	Kenya	2013	Cross sectional	217	0.49	1.37 (0.56-3.34)
Syed *et al.*	Philippines	2013	Cross sectional	238	0.56	1.21 (0.63-2.34)
Xu *et al.*	China	2018	Cross sectional	2342	0.0004	0.68 (0.54-0.84)

Syed *et al.* conducted a study in 3 different countries (Bangladesh, Kenya, and Philippines).[16]
CI = Confidence interval.

Table 2: Risk of bias of individual studies.

First Author (Published year)	1	2	3	4	5	6	7	8	Summary item	Interpretation
Abubakar *et al.* (2012)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	87,5%	Low risk of Bias
Dogbe *et al.* (2015)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100%	Low risk of Bias
Khan *et al.* (2018)	Yes	Yes	Yes	Yes	No	No	Yes	Yes	75%	Low risk of Bias
Murthy *et al.* (2018)	Yes	Yes	Yes	Yes	No	No	Yes	Yes	75%	Low risk of Bias
Park *et al.* (2016)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	87,5%	Low risk of Bias
Sebabi *et al.* (2021)	Yes	Yes	Yes	Yes	No	No	Yes	Yes	75%	Low risk of Bias
Syed *et al.* (2013)	Yes	Yes	Yes	Yes	No	No	Yes	Yes	75%	Low risk of Bias
Xu *et al.* (2018)	Yes	Yes	Yes	Yes	No	No	Yes	Yes	75%	Low risk of Bias

Eight question scale items for risk of bias. 1 = were the criteria for inclusion in the sample clearly defined? 2 = were the study subjects and the setting described in detail? 3 = was the exposure measured in a valid and reliable way? 4 = were objective, standard criteria used for measurement of the condition? 5 = were confounding factors identified? 6 = were strategies to deal with confounding factors stated? 7 = were the outcomes measured in a valid and reliable way? 8 = was appropriate statistical analysis used?

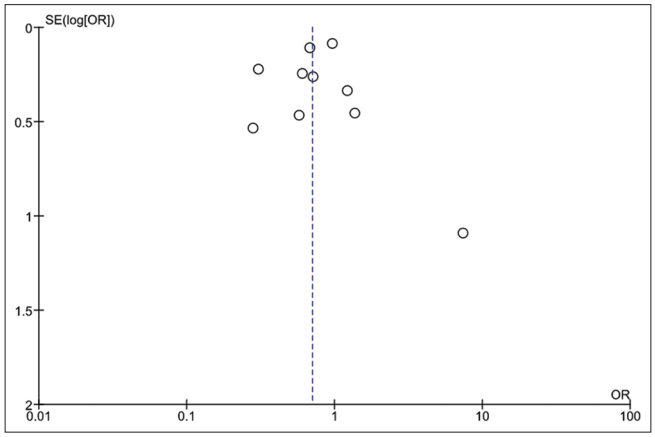

Figure 3: Funnel plot of odd ratio for cataract surgery utilisation by place of residence. SE = Standard error; OR = Odd ratio.

accessing cataract surgical services.[13] Various challenges create barriers for rural populations to access and utilise reliable health information, including obstacles such as geography, distance, inclement weather and lack of financial resources and specialised health-care services.[22] The rural population faces significant challenges in accessing eye care services due to long distances and poor road quality.[8] The geographical location is considered one of the factors influencing the utilisation of cataract surgical services. Distance, transportation costs, also difficult and damaged travel access are reasons why the place of residence is a cause of low cataract surgery coverage in rural areas. Most patients with cataract blindness live in rural areas while most ophthalmologists live in urban areas. The use of medical services tends to be related to distance or proximity, with people living far from hospitals being less likely to use health services.[23]

CONCLUSION

Residence is a determining factor in the utilisation of cataract surgical services as individuals residing in rural areas are less inclined to utilise cataract surgical services.

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Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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