

# Prevalence and Causes of Blindness and Visual Impairment Among Nigerian Children: A Systematic Review

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**Background:** Low/middle-income countries have the highest burden of blindness and visual impairment, which directly affects the children and indirectly affects their community. Furthermore, the number of blind years suffered by children with low vision or blindness creates a self-perpetuating ripple effect on their development, health and the socio-economic development of their communities. This systematic review aims to interrogate the existing evidence on the prevalence and causes of blindness and visual impairment in Nigerian children to provide evidence to drive health policy.

**Methods:** This was a systematic review without meta-analysis (SwiM) using a narrative synthesis of the evidence reported using the PRISMA guidelines. All primary cross-sectional studies (in English) reporting the prevalence and causes of visual impairment among Nigerian children under 20 years old between 2003 and 2022 were included in this review. PUBMED, AJOL, BASE and ProQuest databases were searched for eligible studies between 6 June and 15 July 2023. The quality of the included studies was assessed using the AXIS tool. Results were extracted and summarised using descriptive statistics. Visual impairment and blindness using the presenting visual acuity in the better eye were reported using the WHO classification.

**Results:** Seventeen studies, involving 16,924 children from 13 states across five geo-political zones in Nigeria, were included in the final analysis of this review. The prevalence of visual impairment was 3.9%, 2.7% and 0.3% for mild, moderate and severe visual impairments, respectively, due to ametropia, cataracts, glaucoma, etc. The prevalence of blindness was 0.2% due to cataracts, corneal scars and optic atrophy.

**Conclusion:** Blindness and visual impairment is still a significant clinical and public health burden among Nigerian children. Hence, there is still a need for clinicians, especially ophthalmologists, public health specialists, policy-makers, and other relevant stakeholders to intensify efforts towards the prevention and control of this burden.

**Keywords:** visual impairment, blindness, childhood blindness, childhood visual impairment, Nigeria, systematic review

## Introduction

Visual impairment occurs when any eye condition affects the visual system and its function and may be categorised as distance and near visual impairment.<sup>1</sup> Globally, an estimated 2.2 billion people suffer from a near or distant visual impairment (VI), mainly caused by refractive errors or cataracts.<sup>1,2</sup> Unfortunately, over 80% of vision impairment is found among the underserved population in low- and middle-income countries,<sup>1,2</sup> with an attendant significant impact on the socio-economic status of these countries. The financial burden of VI is estimated to cost about USD 411 billion in productivity losses globally.<sup>3</sup>

The leading aetiologies of VI and Blindness in children are uncorrected refractive errors, cataracts, congenital ocular abnormalities, corneal scarring from trauma or traditional eye medications, cerebral visual impairments and retinopathy of prematurity. Blindness in children can have a significant impact on their early and long-term psychosocial and intellectual development. Currently, an estimated 450 million children have a form of visual impairment, and 90 million are blind.<sup>4</sup>

A recent systematic review reported the respective global prevalence of visual impairment and blindness in 1.7% and 0.2% using the best corrected visual acuity (BCVA), with refractive errors (ametropias) and cataract being the commonest causes of VI and blindness, respectively.<sup>5</sup> Using different definitions, different regions were reported to have the highest prevalence rates of VI. However, using the BCVA of <20/40 (6/12), the pacific region had the highest prevalence of 0.9%. On the other hand, the African region and the East Mediterranean had the highest prevalence of blindness of approximately 1.9%.<sup>5</sup> In Ghana, Ceesay et al<sup>6</sup> reported a prevalence of 4.3% for VI and ametropias were the most common causes of blindness.

Children are the future workforce of a nation; hence, all efforts need to be put in place to ensure that they remain in good health and wellbeing. There is a growing proportion of children under 18 years in the overall population of Nigeria.<sup>7,8</sup> Current UNICEF data estimated the 2023 population of children under 18 years of age in Nigeria to be 110,797,959, which is about half of the country's population.<sup>8</sup> Unfortunately, nationally representative data required to drive the necessary health policy to protect this vulnerable group does not exist in Nigeria. The lack of nationally representative data on the causes and prevalence of visual impairment and blindness in children makes it necessary to aggregate the available evidence in one report to help drive policy.

This systematic review aims to determine the prevalence and causes of blindness and visual impairment among children in Nigeria by interrogating the evidence in the last 20 years.

## Methods

### Study Design

This study was a systematic review without meta-analysis (SwiM) of literature reported using the Preferred Reporting Items for Systematic Reviews and Meta-analysis Statement (PRISMA) guidelines.<sup>9</sup> An initial search was carried out on the International Prospective Register for Systematic Reviews (PROSPERO) to determine if there were any recent or ongoing systematic reviews on the topic. After that, the study was pre-registered in PROSPERO on 12 June 2023 (CRD42023430374).

### Screening and Eligibility

All primary cross-sectional studies reporting the prevalence and causes of visual impairment in Nigerian children under 18 years between 2003 and 2022 were included in this review. Studies not in English, grey literature, letters to editors, or editorials were excluded from this review.

### Literature Sources

The African Journal Online (AJOL), Bielefeld University Search Engine (BASE), PubMed, and the ProQuest online library databases were searched for relevant literature between 16 June and 15 July 2023.

### Search Strategy

An initial search was carried out on PubMed to identify the availability of reports on the prevalence and causes of VI and blindness in Nigerian children. Furthermore, this also aided the identification of relevant keywords used to design the search strategy. The final database search used relevant keywords, phrase searching and controlled vocabulary searching through database-specific indexing terms. Boolean operators truncation and field tags were used. The search terms containing relevant keywords were combined as follows: ("prevalence" OR "frequency" OR "occurrence" OR "pattern" OR "commonness" OR "regularity") AND ("causes OR aetiology" OR "risk factor") AND ("blindness" OR "visual loss") AND ("visual impairment" OR "poor vision") AND ("children" OR "childhood" OR "paediatric") AND (Niger\*). The search was further refined to include literature published within the past 20 years (AND "2003–2022").

## Study Selection Process

Identified studies from the respective databases were exported to Rayyan, which was used to manage and organise the screening process. Following de-duplication by Rayyan, EUA and OOC independently screened the titles and abstracts of the retrieved studies in line with the inclusion and exclusion criteria. Title and abstract screening was followed by a screening of the complete texts independently by EUA, OOC, DVS, MB, and YOO. Any conflicts arising from the screening process were resolved by consensus, and where an agreement was impossible, KKK resolved the dispute. Studies included in the review were studies that reported prevalence of visual impairment, or blindness among children in Nigeria, studies that reported the causes of blindness and visual impairment in Nigeria. According to UNICEF, a child is defined as an individual less than 18 years old; this was the benchmark used for this systematic review.<sup>10</sup>

## Quality Appraisal

The Appraisal tool for cross-sectional studies (AXIS) was used to assess the included studies' quality and risk of bias.<sup>11</sup> The tool has a 20-point questionnaire that addresses the quality of a cross-sectional study covering seven areas – study design, sample size justification, target population, sampling frame, sample selection, validity and reliability measurement, and overall methods.

## Data Extraction and Synthesis

Data were extracted from the included studies using a bespoke data extraction sheet. Information retrieved from the studies included the author(s) name(s), year of publication, essential demographic details of study participants, geographic location of the study, study setting, design and methods, sample size, sampling technique, and results on prevalence and causes of blindness. Visual impairment was defined as presenting visual acuity worse than 6/12 in the better eye and characterised as mild ( $<6/12$ – $6/18$ ), moderate ( $\leq 6/18$ – $6/60$ ) and severe ( $\leq 6/60$ – $3/60$ ).<sup>12</sup> Blindness was defined as presenting visual acuity in the better eye  $\leq 3/60$ .<sup>12</sup> If there were any missing data, attempts were made to contact the author(s) to clarify and supply the data where possible. EUA and OCO independently extracted data, and any conflicts were resolved by consensus. Meta analysis could not be accomplished in this review due to heterogeneity of the included studies as not all the included papers reported effect estimates and measures of precision such as standard error of confidence interval. Descriptive statistics (mean and range) was used to estimate the prevalence from the nine (9) included community-based studies.<sup>13–16</sup> Community-based studies were used to estimate the prevalence because they give a better representation of the general population.<sup>17</sup> Clinic-based studies included mainly provided more detailed causes of blindness and visual impairment.

## Ethical Considerations

Being a systematic review, and the respective included studies had obtained ethical clearances, primary ethical approval was not obtained for this review.

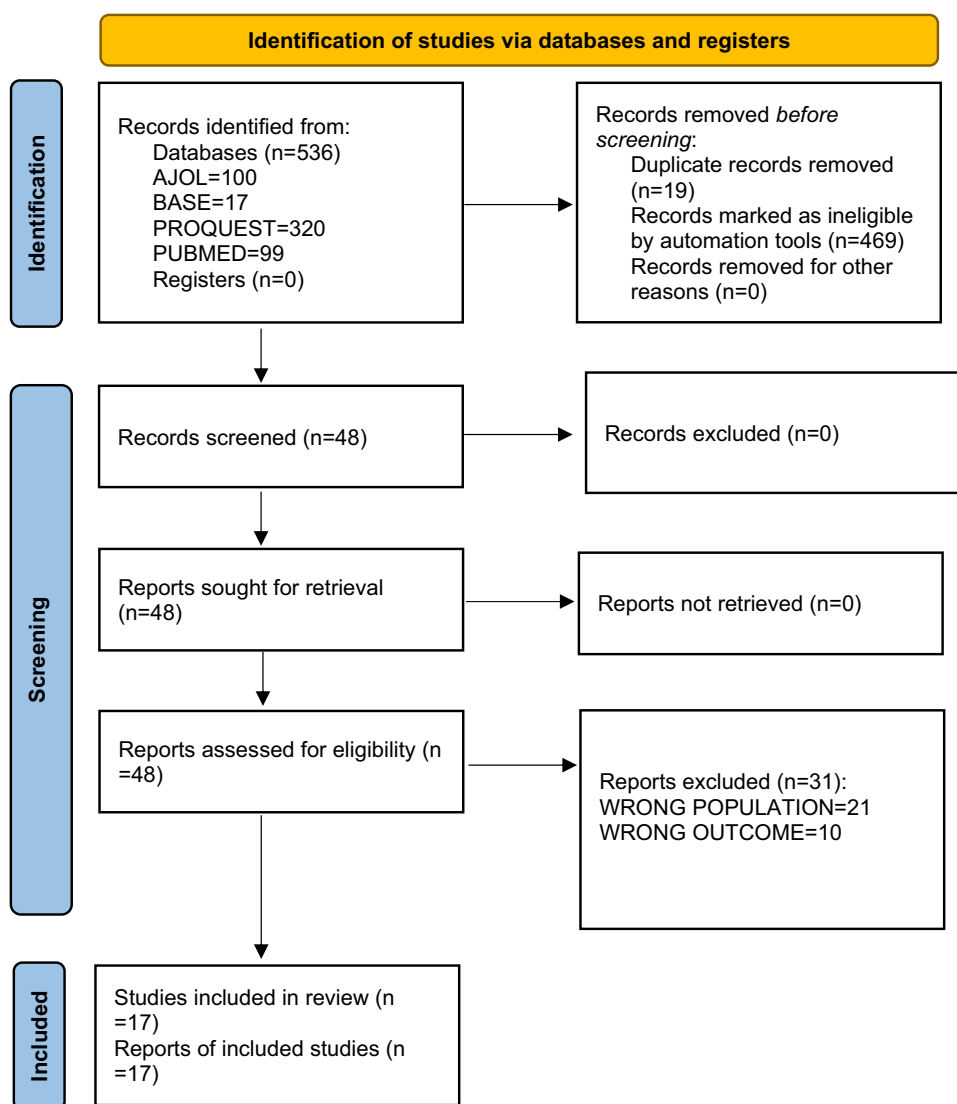
## Results

### Search Findings

A total of 536 literature were retrieved from the database search. After deduplication and screening, a total of 17 studies (reports) were included into the systematic review for quality appraisal, data extraction, and data synthesis (Figure 1).

### Study Characteristics

Seventeen studies comprising 15,810 from thirteen states across five of the country's six geo-political zones (GPZ) were included in this review. The studies included were all cross-sectional studies (Table 1).



**Figure 1** PRISMA 2020 flowchart of included studies.

## Prevalence of Visual Impairment and Blindness

The mean prevalence of mild, moderate and severe visual impairment and blindness for respective geo-political zones are shown in [Table 2](#). The overall mean (range) prevalence of blindness was 0.3% (0.2–0.4%) while that of mild, moderate, severe visual impairments were 3.9% (0.2–15.9), 2.9% (0.1–10), and 0.2% (0.1–0.5), respectively.

## Causes of Visual Impairment and Blindness

The leading causes of mild to severe visual impairment in children were refractive errors, cataracts (congenital or acquired), corneal opacities (congenital, presumed vitamin A deficiency, infectious or traumatic), glaucoma, and amblyopia. Other less common causes were strabismus, retinal diseases (including dystrophies and macular scars) and ptosis ([Tables 3–5](#)).

The causes of blindness were cataracts, optic atrophy, cornea scars and cornea-related pathologies, and trauma ([Table 6](#)). Other less common causes were globe abnormalities, malignancies and glaucoma.

**Table 1** Descriptive Summary of Studies Reporting the Prevalence of Blindness and Visual Impairment Among Nigerian Children

S/N	Author(s)	Study Location	Aim of Study	Age Group	Study Setting	Study Design	Sample Size	Sampling Technique	Prevalence (%)	
									Visual Impairment (VI)	Blindness
1	Adejumo et al <sup>18</sup> (2021)	Ijebu-Ode, Ogun State, South West	To determine the prevalence and causes of ocular disorders in preschool children	3–5 years	Community	Cross-Sectional	560	Multi-staged random sampling	Moderate-10.5% Severe – 0.4%	0.2%
2	Adekoya et al <sup>19</sup> (2014)	Lagos, South West	To investigate types and presentation patterns of congenital eye and adnexal defects	1–15 years	Hospital	Cross-Sectional	40	Retrospective chart review	56.3%	
3	Aghaji et al <sup>20</sup> (2017)	Nsukka, Enugu State, South-East	To determine the prevalence and causes of childhood blindness	Three months-15 years	Community	Population-based key informant survey				0.012%
4	Ajige et al <sup>21</sup> (2022)	Nassarawa Eggon, Nassarawa State, North Central	To estimate the magnitude and identify the major causes of childhood blindness and severe visual impairment	1–5 years	Community	Population-based key informant survey		Case finding by key informants		0.1%
5	Alabi et al <sup>22</sup> (2018)	Ifo, Ogun State, South West	To determine the prevalence of visual impairment and ocular morbidity in Ifo	5–15 Years	School-based	Cross-Sectional	1308	Multi-staged stratified sampling	87 (6.7%) Mild – 61 Moderate – 19 Severe – 7	
6	Ayaniyi et al <sup>23</sup> (2010)	Ilorin, Kwara State,		4–15 Years	School-based	Cross-Sectional	1393			2.2%
7	Duke et al <sup>8,24</sup> (2014)	Calabar, Cross River State, South-South		1–16 years	Community	Population-based key informant survey	994			0.09–0.22%
8	Ezegwui et al <sup>25</sup> (2021)	Enugu, South East		5–15 years	School-based	Cross-Sectional	1167		3.6%	
9	Ezinne et al <sup>26</sup> (2018)	Onitsha, Anambra State, South East		5–16 years	School-based	Cross-Sectional	998		9.7%	
10	Ezinne et al <sup>27</sup> (2022)	Lagos, South West	To determine the distribution and causes of visual impairment in the centre	4–17 years	Hospital-based	Cross-Sectional	500	Systematic random sampling	8.8%	0.4%

(Continued)

Table 1 (Continued).

S/N	Author(s)	Study Location	Aim of Study	Age Group	Study Setting	Study Design	Sample Size	Sampling Technique	Prevalence (%)	
									Visual Impairment (VI)	Blindness
11	Isawunmi et al <sup>28</sup> (2017)	Oshogbo, Osun State, South West		0–16 years	Hospital-based	Prospective Case series	56		60.7%	25%
12	Isawunmi et al <sup>29</sup> (2017)	Oshogbo, Osun State, South West	To investigate common causes of blindness and visual impairment	0–15 years	Hospital-based	Cross-Sectional	214	Non-random convenient	Moderate – 43.0% Severe – 22.4%	34.6%
13	Obajolowo et al <sup>30</sup> (2019)	Ilorin, Kwara State, North Central	To determine the prevalence and causes of visual impairment in children 3–5 years	3–5 years	Community	Cross-Sectional	464	Multi-staged stratified sampling	5.0%	
14	Okoye et al <sup>5,31</sup> (2013)	Abagana, Anambra State, South-East	To determine the prevalence and causes of eye disease among children residing in rural communities in Nigeria.	6–16 years	School-based	Cross-Sectional	2092		1.43%	0.19%
15	Maduka et al <sup>32</sup> (2021)	All States in South-East	To determine the prevalence of refractive errors and causes of visual impairment in school children in south-east Nigeria	5–15 years	Cross-Sectional	Cross-Sectional	5723	Multi-staged cluster sampling	8.8%	0.4%
16	Muhammad et al <sup>33</sup> (2014)	5 LGAs in Sokoto State, North- West	To trace blind and visually impaired children in the LGA to link them with clinical, educational and rehabilitative services	0–14 years	Community	Population-based key informant survey		Case finding by key informants		0.008%
17	Nathaniel et al <sup>34</sup> (2015)	Kegbara-dere, Rivers State, South-South	To determine the proportion of children with ocular disorders in a rural community	5–15 years	School-based	Cross-sectional	271	Multi-staged sampling	Mild – 0.6% Moderate – 0.2%	

**Table 2** Population-Based Prevalence of Blindness and Visual Impairment

Author(s) and GPZ	Mild VI (%)	Moderate VI (%)	Severe VI (%)	Blindness (%)
Adejumo et al <sup>18</sup> (2021), SW		10	0.3	0.2
Alabi et al <sup>6,22</sup> (2018), SW	4.7	1.5	0.5	
Ayaniyi et al <sup>23</sup> (2010), NC	1.0	0.1	0.1	0.4
Ezegwui et al <sup>25</sup> (2021), SE	2.4	0.8	0.2	
Ezinne et al <sup>26</sup> (2018) SE	5.1	2.5	0.1	
Maduka et al, <sup>32</sup> (2021), SE	0.2	0.1		
Nathaniel et al <sup>34</sup> (2015), SS	1.3	0.2		
Obajolowo et al, <sup>30</sup> (2019), NC	15.9	8.0		
Okoye et al <sup>31</sup> (2013), SE	0.95			0.2
<b>Mean/ Range</b>	<b>3.9 (0.2–15.9)</b>	<b>2.9 (0.1–10)</b>	<b>0.2 (0.1–0.5)</b>	<b>0.3 (0.2–0.4)</b>

**Abbreviations:** NC, North Central; NVW, North West; SE, South East; SS, South-South; SW, South West; VI, Visual Impairment; GPZ, Geo-political zones.

**Table 3** Causes of Visual Impairment Among Nigerian Children

S/N	Author(s) and GPZ	Visual Impairment	
		Cause	Proportion (%)
1	Adejumo et al <sup>18</sup> (2021)	Ametropia	38.6
		Vernal conjunctivitis	12.3
		Amblyopia	10.5
		Anisometropia	8.8
		Strabismus	8.8
		Blepharitis	5.3
		Cataract	3.5
		Ptosis	3.5
		Posterior segment lesions	3.5
		Corneal opacity	1.8
		Phthisis bulbi	1.8
		Ectopia lentis	1.8
2	Adekoya et al <sup>19</sup> (2014)	Congenital Cataract	39.1
		Congenital ptosis	17.4
		Congenital Glaucoma	8.7
		Congenital cornea opacity	7.2
		Microcornea	5.8
		Microphthalmos	4.3
		Dermoid cyst	2.9
		Anophthalmos	2.9
		Aniridia	2.9
		Proptosis	2.9
		Lid coloboma	1.4
		Iris coloboma	1.4
		Epicanthus	1.4
		Patulous hypoplasia of canaliculus	1.4

**Abbreviations:** NC, North Central; NW, North West; SE, South East; SS, South-South; SW, South West; VI, Visual Impairment; GPZ, Geo-political zones.

**Table 4** Causes of Mild-Moderate, Severe Visual Impairment in Nigerian Children

S/ NO	Author(s) and GPZ	Mild to Moderate VI		Severe VI	
		Cause	Proportion (%)	Cause	Proportion (%)
1	Ajige et al <sup>21</sup> (2022) NC	Ametropia Cataract Glaucoma Corneal scar Retinal dystrophy	56.3 12.5 12.5 6.3 6.3	Ametropia Glaucoma Macular scar	37.5 12.5 12.5
2	Alabi et al <sup>22</sup> (2018) SW	Ametropia Glaucoma Vernal Keratitis Corneal Opacity Cataract Bacterial conjunctivitis Chorioretinal lesions Strabismus Ptosis	39.7 33.5 19.2 2.7 2.2 1.3 0.4 0.4 0.4		
3	Ayaniyi et al <sup>23</sup> (2010) NC	Ametropia Allergy Congenital Glaucoma Ocular infections Ocular trauma	34.7 33.6 14.1 7.2 6.5 4.0		
4	Duke et al <sup>24</sup> (2014) SS	Ametropia Amblyopia Cataract Unidentified causes	86.1 6.9 1.3 5.5		
5	Ezegwui et al <sup>25</sup> (2021) SE	Ametropia Retinal Disease Corneal opacity Amblyopia Albinism	86.6 4.1 2.1 4.1 3.1		
6	Ezinne et al <sup>26</sup> (2018) SE	Ametropia Cataract Corneal scar Glaucoma Other optic neuropathies Others	75.0 2.3 2.3 2.3 2.3 15.9		

**Abbreviations:** NC, North Central; NW, North West; SE, South East; SS, South-South; SW, South West; VI, Visual Impairment; GPZ, Geo-political zones.

## Quality Appraisal and Risk of Bias

The quality of the studies was adjudged moderate to good. However, almost all studies did not report how non-responders were handled or how missing data were categorised. The quality of the included studies is described in [Table S1](#).

## Discussion

The findings obtained in this systematic review are insightful and of importance to clinical and public health research, practice, and policy. To start with, this review is believed to be the first to estimate a representative national prevalence of visual impairment and blindness among Nigerian children. The mean national prevalence (and range) of 3.9 (0.2–15.9),



**Table 5** Causes of Moderate and Severe Visual Impairment Among Nigerian Children

S/NO	Author(s) and GPZ	Moderate VI		Severe VI	
		Cause	Proportion (%)	Cause	Proportion (%)
1	Isawunmi et al <sup>29</sup> (2017) SW	Ametropia	47.8	Cataract	35.4
		Cataract	13.0	Corneal opacities	25
		Corneal opacities	12.0	Trauma	12.5
		Glaucoma	9.8	Glaucoma	8.3
		Trauma	9.8	Ametropia	6.3
		Chorioretinal Scar	1.1	Corneal opacities	4.2
		Others	6.5	Globe abnormalities	2.1
				Others	6.3
2	Obajolowo et al <sup>30</sup> (2019) NC	Ametropia	91.3		
		Amblyopia	4.3		
		Strabismus	4.3		
3	Okoye et al <sup>31</sup> (2013) SE	Amblyopia	50	Congenital Glaucoma	25
		Albinism	16.7	Traumatic Cataract	25
		Congenital glaucoma	16.7	Albinism	25
				Traumatic optic neuropathy	25
44	Maduka et al <sup>32</sup> (2021) SE	Ametropia	88.8		
		Amblyopia	5.7		
		Cataract	0.4		
		Retinal disease	1.1		
		Corneal scar	0.4		
		Aphakia	0.4		
		Undetermined cause	3.8		
5	Muhammad et al <sup>33</sup> 2014 NW	Ametropia	47	Cataract	36
		Cataract	21	Phthisis/staphyloma	21
		Corneal opacity	21	Optic atrophy	15
		Optic atrophy	11	Retinopathies	10
				Corneal opacity	8
				Cortical blindness	8
				Glaucoma	3
6	Nathaniel et al <sup>34</sup> (2015) SS	Ametropia	35.7		
		Vernal	17.9		
		Conjunctivitis			
		Amblyopia	7.1		
		Corneal opacity	7.1		
		Squint	7.1		
		Ptosis	7.1		
		Glaucoma suspect	7.1		
		Infective conjunctivitis	3.6		
		Colour blindness	3.6		

**Abbreviations:** NC, North Central, NW, North West, SE, South East, SS, South-South, SW, South West, VI-Visual Impairment, GPZ- Geo-political zones.

**Table 6** Causes of Blindness in Nigeria Children

S/ NO	Author(s) and GPZ	Blindness	
		Cause	Proportion (%)
1	Aghaji et al <sup>20</sup> (2017)	Cataract	40.0
		Optic atrophy	13.3
		Corneal scar	13.3
		Ametropia	13.3
		Microphthalmia	6.7
		Optic nerve hypoplasia	6.7
		Phthisis bulbi	6.7
2	Ezinne et al <sup>27</sup> (2022)	Corneal opacities	31.1
		Globe abnormalities	23.0
3	Isawunmi et al <sup>28</sup> (2017)	Cataract	17.6
		Trauma	8.1
		Retinoblastoma	6.8
		Chorioretinal scar	4.1
		Neglected Ametropia	2.7
		Glaucoma	2.7
		Others	4.1

**Abbreviations:** NC, North Central; NW, North West; SE, South East; SS, South-South; SW, South West; VI, Visual Impairment; GPZ, Geo-political zones.

2.9 (0.1–1.0) and 0.2 (0.1–0.5) percent (%) for mild, moderate and severe visual impairments, respectively, using descriptive statistics. Furthermore, the mean prevalence rate of visual impairment in children per geopolitical zone of Nigeria was determined too. The lowest mean prevalence rate of visual impairment was reported in the south-south geopolitical zone (0.75%),<sup>34</sup> while the highest prevalence was reported in the north-central geopolitical zone.<sup>30</sup> The study found a prevalence rate of 15.9% and 8% for mild and moderate visual impairment, respectively.<sup>30</sup> (Table 2).

There were notable differences in the mean prevalence of blindness that we reported concerning the different geopolitical zones of the country (Table 2); these may have been attributable to various factors including the varying differences in the number of studies reporting the prevalence of visual impairment and blindness in the different geopolitical zones. Other reasons include the lack of data from the Northeastern geo-political zone of the country (this geopolitical zone accounts for 12% of the total Nigerian population).<sup>35</sup> In addition, data from the National Eye Care program of Nigeria's Federal Ministry of Health and Social Welfare show that there is a gap in the availability for all cadres of eye care workers.<sup>36</sup> The gap in the eye care workforce may translate to a higher prevalence of blindness among children. The highest gap was reported in the north-western geo-political zone, which has the least ophthalmologist to-patient ratio among all the geopolitical zones in Nigeria.<sup>36</sup> It is also the most populous geopolitical zone in the country.<sup>37</sup>

Cataract was found to be the most common cause of blindness in this review. This is similar to the global picture reported in another systematic review by Yekta et al in 2022.<sup>5</sup> According to the National Blindness and Visual Impairment Survey, cataracts were the most common cause of blindness among Nigerian adults, while uncorrected ametropia and cataract were the most important causes of visual impairment.<sup>38</sup> While earlier studies (ie, studies conducted before the year 2003) in Nigeria reported corneal opacities and vitamin A deficiency (VAD) as the leading cause of childhood blindness,<sup>39</sup> the prevalence of these aetiological factors has profoundly decreased over time due to the implementation of public health policies that had tackled vitamin A deficiency by improving uptake of vitamin A in different parts of Nigeria, and fortification of foods in Nigeria with vitamin A. Other leading causes of blindness were corneal opacities or scars (from diverse causes other than VAD) and optic atrophy.

Cataract blindness is largely both preventable and avoidable. Good-quality cataract surgery is the only acceptable intervention available for the prevention/elimination of cataract blindness across all age groups. Cataract surgery is a bit

more challenging in children because of the nature of the paediatric eye, tissue inflammation, postsurgery visual rehabilitation and other peculiarities related to the postoperative care in children.<sup>40–42</sup> This explains why after basic ophthalmic training, there is a special training for paediatric ophthalmology to optimize the surgical outcomes. This further justifies the need to train more eye care workers to cover the existing eye care manpower gap in Nigeria.

According to the WHO, spectacle correction (for refractive error) and cataract surgery rank high among all the available health-care interventions. However, distance visual impairment from refractive error and cataract-related visual impairment remain highly prevalent as only about 36% and 17%, respectively, have access to spectacle correction and quality cataract surgery globally.<sup>1</sup> This could be largely attributable to poor access to eye care services in low-resource settings like Nigeria. Results from reviews like this are expected to guide planning of policies that help eliminate common causes of blindness and visual impairment.

Interventions such as continuous health education and legislations are effective strategies needed to prevent blindness and visual impairment from most causes reported in this review (such as cataract, ametropia, corneal opacity (from whatever cause), glaucoma, amblyopia, and ocular infections). It is particularly important that stakeholders at all levels remain steadfast in educating people about the negative effects of some harmful traditional eye practices which have been shown to constitute a burden on eye care.<sup>43</sup> A recent narrative review in Nigeria has shown that about 16.7%–85.9% people with prior use of traditional eye medications (TEM) were legally blind at presentation to the hospital, while about 7.1–31.4%, 1.8–27.1% and 5.3%–20.8% had normal vision/mild, moderate and severe visual impairment, respectively, at presentation.<sup>44,45</sup> The review also presented a comprehensive list of harmful TEM used in Nigeria.<sup>43</sup> This further justifies the need for a massive public health enlightenment campaign in Nigeria on the benefits of seeking professional eye care services over traditional services.

We acknowledge the limitations of this systematic review as there were variabilities in the methods used in estimating prevalence of blindness and visual impairment in the included studies. This introduced some methodological and statistical heterogeneities in those included studies. This also prevented a meta-analysis and necessitated the use of descriptive estimates of prevalence values. While we understand this could be a potential source of bias, the results from this review have provided valuable verifiable information on the subject in Nigeria.

Regardless of the above-stated limitations, this review has its strength. To the best of the authors' knowledge, this review is believed to be the first study to provide nationally representative estimates on the prevalence and causes of blindness among Nigerian children. Also, the findings synthesized in this review provide deep insights that can inform existing and future policies and strategies needed for the eradication of avoidable blindness and visual impairments among Nigerian children.

## Conclusion

According to the review, cataract is the most common cause of blindness among Nigerian children, while ametropia and cataract are the most common causes of visual impairment. These and other causes are largely treatable and preventable and invariably render blindness from them avoidable. The prevalence rates of visual impairments and blindness in children in Nigeria may also seem low, but the number of blind years and disability-adjusted life years this may cause the affected children is the major source of concern to stakeholders. The data obtained can inform policies expected to provide strategies and interventions such as continuous health education and monitoring of existing interventions needed to mitigate all the avoidable causes of blindness and visual impairment among Nigerian children.

## Data Sharing Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study. All authors have read and approved the final version of the manuscript. The lead author, Ugochukwu A Eze, had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

## Ethical Considerations

Not applicable. This study did not collect data from human or animal subjects but an open research repository.

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## Disclosure

The authors have no conflicts of interest to declare for this work.

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