

Prevalence of Childhood Cataract and Associated Factors Among a Pediatric Population at A Tertiary Hospital in Ghana

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Abstract

Background: Childhood cataract unlike adult-related cataract has received a little attention despite the devastating consequences on the early development of the visual system and the overall impact on the quality of life of children. The existence of accurate epidemiological data is a primary step towards management strategies, however, there remains a paucity of data in sub-Saharan Africa including Ghana. Therefore, the study sought to investigate the prevalence of childhood cataract and its associated factors among a pediatric population at a tertiary health facility in Ghana.

Methods: The study employed a retrospective electronic medical-record review on 263 pediatric cataract cases examined (from January 2019 to December 2020) at the pediatric ophthalmology department of the Komfo Anokye Teaching Hospital, Kumasi, Ghana. Patient clinical data including sociodemographic, signs and symptoms, primary diagnosis and associated ocular complications were gathered and analyzed using Statistical package and Service Solution (SPSS). Chi-square and regression statistics were used to summarize data at a significance of $p < 0.05$.

Results: The prevalence of childhood cataract was 4.25% (263/6,188). The proportionate distribution of cataracts was congenital (39.5%), traumatic (33.1%) and developmental (26.6%). Over half (51.7%) of the subjects had unilateral cataract. The major complications of childhood cataracts were strabismus (5.70%), nystagmus (3.0%) and retinal detachment (1.90%). Older age (2-12 years, OR = 0.27, $p < 0.001$; > 12 years, OR = 0.12, $p < 0.001$) was significantly associated with reduced odds of congenital cataract. Similarly, increasing age (2-12 years, OR = 12.59, $p < 0.001$; > 12 years, OR = 7.57, $p = 0.004$) and female sex (OR = 0.58, $p = 0.038$) was significantly associated with decreased odds of traumatic cataracts. Conversely, older age (2-12 years, OR = 11.02, $p < 0.001$; > 12 years, OR = 26.57, $p < 0.001$) and female sex (OR = 2.27, $p = 0.008$) were significantly associated with increased odds of developmental cataracts.

Conclusion: Our results suggest a higher burden of childhood cataract (approximately four in every hundred children had childhood cataract). This evidence warrants the implementation of pre-school vision screening and eye health education programmes to promote early detection and prevention of avoidable vision impairment and/or blindness within the pediatric population.

Background

Childhood cataracts are preventable or treatable cause of blindness with devastating visual consequences[1, 2]. Cataract is characterized by opacification or cloudiness of the transparent crystalline lens[3]. Clinically childhood cataracts presents as congenital, developmental, and traumatic, with either monocular or binocular involvements[4, 5]. Of note, untreated cataract impedes light stimulation of the retina, which compromises the integrity of the developing visual system, causing a decline in vision function measures such as visual acuity, contrast sensitivity, colour vision, depth perception, and stereo acuity[2, 6-8]. Sensory deprivation from longstanding cataract culminate in amblyopia and ultimately

irreversible vision impairments[9-12]. Additionally, infants with cataracts suffer from social stigmatization due to cosmetically unappealing lens opacification, which aggravates into psychological/emotional distress, cognitive impairments and with lasting negative impact on academic performance, career opportunities, future financial prospects and importantly life expectancy[13-21].

Although the World Health Organization (WHO) consider childhood cataract as a rare form of visual disorder, it accounts for 15-20% of infants blindness with an estimated annual incidence of 20,000-40,000[22]. Pediatric cataract distribution varies across geographical regions[23, 24]. In a systematic review by XiaohangWu et al., the pooled prevalence estimate for congenital cataract is 4.24/10,000, major cause being bilateral, hereditary and/or occur in isolation[23]. Likewise,Sheeladeviet al. reported a prevalence of 0.32-22.9/10,000 childhood cataract, with congenital cataracts accounting for 0.63-9.74/10,000.[25]. Despite the discrepancies in the prevalence estimates, the burden of childhood cataract in Africa is relatively high with over 19,000 cases annually[24]. A study conducted among children in school for the blind in West Africa, showed that approximately 16% of childhood cataracts were linked with crystalline lens disorders[26].

Evidence from past studies shows considerable delays in presentation and detection of childhood cataracts, especially in low- and-middle income countries[5]. The delays in presentation and uptake of cataract surgery results from varying factors such as sociocultural, demographics, economics, and health system factors.[27, 28]. Pre-school vision screening (PSVS) programs are critical for early identification of childhood cataract.[29] Thus, an exploratory study in Ghana showed that more than two-thirds of schools' seldom conduct PSVS and over 90% pointed to the unavailability of PSVS policies[30]. Also, pediatric eye health education and promotion are essential for early presentation and timely cataract removal. However, these services are inaccessible and expensive, which warrants studies to inform transitional policies.

Therefore, the overarching goal of this study is to investigate the prevalence of childhood cataract and associated factors among pediatric population at a tertiary hospital in Ghana. The study will provide additional evidence to corroborate with earlier studies on the need to institutionalize PSVS[30]. Furthermore, the epidemiological evidence from the study will assist policymakers and relevant stakeholders including the Ghana Health Services, the Ghana Ophthalmology Society, and Ghana Optometric Association on the urgent need of rejuvenated pediatric eye health education and promotion to foster early reporting and treatment. Early intervention measures could meaningfully improve infants' eye health and development, thereby enhancing their quality of life and the realization of the sustainable development goals 3 (SDG 3: ensure healthy lives and promote wellbeing for people of all ages) and VISION 2020 – the right to sight.

Methods

Study design

The study employed a retrospective design with an electronic medical record review of pediatric patients examined and treated for cataract at the pediatric ophthalmology department of the Komfo Anokye Teaching Hospital in Ghana. The two-year retrospective review spanned from January 1, 2019 to December 31, 2020 and utilized a structured questionnaire that gathered relevant patients' clinical information from cataract diagnosis register of the facility. In particular, data extracted included demographic characteristics, signs and symptoms, nature of cataract (etiology, laterality and morphology), and associated ocular complications. The extracted data was labelled with codes and that patients' identities could not be identified or traced. The hard copy of the filled questionnaires was stored in a key-protected locker, whereas softcopy data used for analysis secured with an alphanumeric password known to only the primary investigator.

Study settings

Briefly, the Komfo Anokye Teaching Hospital is a tertiary and referral centre situated in the Ashanti region of Ghana (the second most populous region in Ghana) [31]. The facility is strategically situated in the middle belt of Ghana and as the main tertiary hospital, serves four regions. The pediatric ophthalmology unit on preliminary visit provides comprehensive vision assessment including case history, visual acuity evaluation as well as anterior and posterior segment examination. In addition, they are well-equipped to provide specialized pediatric services such as cataract, strabismus and glaucoma surgeries.

Operational definitions

Broadly, cataract is a medical condition characterized by cloudiness or opacification of the transparent natural crystalline lens. Pediatric cataract in our study was primarily defined based on etiology and secondarily classified by morphology and laterality. Etiologically, we categorized cataract into congenital, developmental and traumatic. In brief, congenital cataracts are present at birth or occur within the baby's first year, developmental cataracts occur after the first year of life and grow throughout life, and traumatic cataracts are caused by an injury as a result of physical, chemical or radiation stimuli and/or associated with any systemic illness or medications. The morphological types were grouped into polar, cortical, subscapular and nuclear cataracts depending on the location of the opacity within the lens. The age at presentation was considered in the subgroup analysis, and categorized into infants; less than 2 years, preschool/school children; 2-12 years and adolescents; greater than 12 years.

Measures

The primary outcome variable was childhood cataract, therefore criteria for inclusion were pediatric patients who had undergone ophthalmological assessments and diagnosed and/or treated for cataract. The age cut-off for enrollment were cases with patients below 18 years. Per the statutory constitution of the republic of Ghana, the legally acceptable age limit considered for adulthood is 18 years, hence below this threshold was considered as childhood. Conversely, cases other than pediatric cataract, thus uncorrected refractive errors, amblyopia, and strabismus were excluded in this study. Similarly, lost and

defaced clinical records were excluded and that only well-validated patients' medical records constituted the analytic sample.

Ethical approval

The study adhered to the tenets of the declaration of Helsinki and approved by the Committee on Human Research, Publication and Ethics (CHRPE) of the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana (Reference number: CHRPE/AP/366/21) and the Komfo Anokye Teaching Hospital Research and Development Unit (Reference number: RD/CR21/119).

Statistical analysis

Data was first entered in Microsoft Excel version 7 and imported to Statistical Package for Service Solution Version 25 (IBM Corporation SPSS® Statistics for Windows 10, Version 25.0) for statistical analysis. The prevalence of pediatric cataract was computed as a percentage of the total eligible sample. Demographic characteristics of the sample was summarized with percentages, frequencies and confidence intervals. Characteristics of the sample were presented and differences between types of cataract investigated with chi-square statistics. The association between outcome and independent variables were investigated with bivariate regression analyses and those that were statistically significant enrolled for multiple logistic regression. All p-values less than 0.05 was considered statistically significant.

Results

Description of the sample

Overall, 6,188 folders were reviewed in this study, with 263 participants having childhood cataract, representing a prevalence of 4.25%. Majority of subjects were males (59.3) with mean age of 4.98 ± 4.05 years. Most participants (58.4%) were within the age group of 2-12 years and reside in urban areas (52.5%). A considerable number of the subjects lived in the Ashanti region (66.2) and a minority in the Greater Accra region (0.4%). Among the subjects diagnosed of pediatric cataract the proportions were 39.5%, 33.1% and 26.6% for congenital, traumatic and developmental cataracts, respectively. In terms of laterality, majority had cataract confined in one eye (51.7%), polar in morphology (12.2%) and fewer having cataract surgical complications (16.6%). Approximately six percent (5.7%) had strabismus, 3% nystagmus and 0.8% amblyopia. With respect to monocular visual acuities, majority of children had right (41.1%) and left (41.8%) visual acuity of fixate-and-follow light. Please see **Table 1**.

Table 1: Description of the sample

Variable	100%	95% CI	Frequency
Demographic characteristics			
Age (mean \pm SD)	4.98 \pm 4.05 (0.1-15.0)		
Age of presentation (years)			
<2.00	36	30.0-42.3	90
2.00 -12.00	58.4	52-64.6	146
>12.00	5.6	3.1-9.2	14
Not specified	4.9	2.7-8.3	13
Sex			
Female	40.7	34.7-46.9	107
Male	59.3	53.1-65.3	156
Residence			
Rural	40.3	34.3-46.5	106
Urban	52.5	46.2-58.6	138
Not specified	7.2	4.4-11.1	19
Regions			
Ahafo	1.9	0.6-4.4	5
Ashanti	66.2	60.1-71.9	174
Bono	9.5	6.2-13.7	25
Bono East	1.5	0.4-3.8	4
Central	1.5	0.4-3.8	4
Eastern	5.3	2.9-8.8	14
Greater Accra	0.4		1
Upper East	1.5	0.4-3.8	4
Western	3.4	1.6-6.4	9
Western North	1.1	0.2-3.3	3
Not specified	7.6	4.7-11.5	20
Eye health variables			

Type of Cataract			
Congenital	39.5	33.6-45.7	104
Developmental	26.6	21.4-32.4	70
Traumatic	33.1	27.4-39.1	87
Not specified	0.8	0.1-2.7	2
Laterality			
Unilateral	51.7	45.5-57.9	136
Bilateral	47.5	41.4-53.8	125
Not specified	0.8	0.1-2.7	2
Morphology			
Subcapsular	4.9	2.7-8.3	13
Polar	12.2	8.5-16.7	32
Cortical	1.9	0.6-4.4	5
Capsular	1.5	0.4-3.8	4
Nuclear	1.5	0.4-3.8	4
Not specified	77.9	72.4-82.8	205
Complications			
Yes	16.0	11.8-21.0	42
No	84.0	79-88.2	221
Associated ocular complications			
SeclusioPupillae	0.8	0.1-2.7	2
Congenital Malformation of Vitreous Humour	0.4		1
Congenital Rubella	0.4		1
Uveitis	0.4		1
Ocular Laceration and rapture with loss of intra ocular tissue	0.4		1
Papilledema	0.4		1
Amblyopia	0.8	0.1-2.7	2
Adherent Leucoma	0.4		1
Eyelid Ptosis	0.4		1

Glaucoma	1.1	0.2-3.3	3
Ocular Hypertension	0.8	0.1-2.7	2
Down Syndrome	0.4		1
Retinal Detachment	1.9	0.6-4.4	5
Retinoblastoma	0.4		1
Strabismus	5.7	3.2-9.2	15
Exotropia	1.5	0.4-3.8	4
Esotropia	3.0	1.3-5.9	8
Not Specified	1.1	0.2-3.3	3
Nystagmus	3.0	1.3-5.9	8
Visual acuity; OD			
NFFL	0.4		1
FFL	41.1	35.1-47.3	108
NPL	2.3	0.8-4.9	6
PL	4.2	2.1-7.4	11
HM	8.4	5.3-12.4	22
CF	5.7	3.2-9.2	15
6/60	0.8	0.1-2.7	2
6/36	1.1	0.2-3.3	3
6/24	0.4		1
6/18	0.8	0.1-2.7	2
6/12	2.3	0.8-4.9	6
6/9	1.5	0.4-3.8	4
6/6	11.4	7.8-15.9	30
6/5	7.6	4.7-11.5	20
Not specified	12.2	8.5-16.7	32
Visual acuity; OS			
FFL	41.8	35.8-48.0	110
NPL	1.9	0.6-4.4	5

PL	6.5	3.8-10.1	17
HM	9.1	5.9-13.3	24
CF	7.6	4.7-11.5	20
6/60	1.1	0.2-3.3	3
6/36	1.5	0.4-3.8	4
6/24	1.5	0.4-3.8	4
6/18	1.1	0.2-3.3	3
6/12	0.8	0.1-2.7	2
6/9	2.3	0.8-4.9	6
6/6	7.2	4.4-11.1	19
6/5	5.3	2.9-8.8	14
Not specified	12.2	8.5-16.7	32
<i>Signs and Symptoms</i>			
Eyelids			
Healthy	97.0	94.1-98.7	255
Drooping eyelid	0.8	0.1-2.7	2
Periorbital swelling	0.4		1
Not specified	1.9	0.6-4.4	5
Conjunctiva			
Healthy	90.5	86.3-93.8	238
Hyperemia	7.2	4.4-11.1	19
Brown	0.4		1
Not Specified	1.9	0.6-4.4	5
Cornea			
Healthy	88.6	84.1-92.2	233
Edema	1.1	0.2-3.3	3
Perforated	3.0	1.3-5.9	8
Hazy	1.5	0.4-3.8	4
Scar	2.3	0.8-4.9	6

Ulcer	0.8	0.1-2.7	2
Keratic Precipitate	0.8	0.1-2.7	2
Not specified	1.9	0.6-4.4	5
Pupillary reaction			
Reactive	77.6	72.0-82.5	204
Not reactive	4.6	2.4-7.8	12
Briskly	13.7	9.8-18.4	36
Dilated	2.3	0.8-4.9	6
Not Specified	1.9	0.6-4.4	5
Anterior Chamber			
Deep	92.4	88.5-95.3	243
Shallow	2.3	0.8-4.9	6
Hyphema	3.4	1.6-6.4	9
Not specified	1.9	0.6-4.4	5
Red Reflex			
Present	79.1	73.7-83.8	208
Absent	13.7	9.8-18.4	36
Dull	5.7	3.2-9.2	15
Not Specified	1.5	0.4-3.8	4
Vitreous			
Transparent	97.7	95.1-99.2	257
Opacities	0.4		1
Not specified	1.9	0.6-4.4	5
Retina			
Healthy	95.4	92.2-97.6	251
Optic atrophy	0.4		1
Retinoblastoma	0.4		1
Fovea atrophy	0.4		1
Retinal Detachment	1.1	0.2-3.3	3

Papilledema	0.4		1
Not specified	1.9	0.6-4.4	5

SD, Standard deviation; CI, Confidence interval; N, Frequency; %, percentage frequency; NFFL, Unable to fixate and follow light; FFL, Fixates and follow light; NPL, No light perception; PL, Perception of light; HM, Hand movement; CF, Counting fingers

Distribution of childhood cataracts among study sample

Table 2 presents data on the distribution of the types of pediatric cataracts. There was a significant variation in age of presentation ($p < 0.001$) sex ($p = 0.022$), laterality ($p < 0.001$) and types of pediatric cataracts.

Table 2: Distribution of the types of pediatric cataract by age of presentation, sex, residence, region and laterality

Type of Cataract	Congenital (N =104, 39.8%)	Traumatic (N=87, 33.1%)	Developmental (N=70, 26.6%)	Not specified (N=2, 0.8%)	p value (chi square)
	% (frequency)	% (frequency)	% (frequency)	% (frequency)	
Age of presentation (years)					
<2.00	75 (78)	6.9 (6)	7.1 (5)	50 (1)	<0.001*
2.00 -12.00	21.2 (22)	79.3 (69)	77.1 (54)	50 (1)	
>12.00	1.0 (1)	5.7 (5)	11.4 (8)	0 (0)	
Not specified	2.9 (3)	8.0 (7)	4.3 (3)	0 (0)	
Sex					
Female	40.4 (42)	31.0 (27)	51.4 (36)	100 (2)	0.022*
Male	59.6 (62)	69.0 (60)	48.6 (34)	0 (0)	
Residence					
Rural	42.3 (44)	46.0 (40)	31.4 (22)	0 (0)	0.219
Urban	50.0 (52)	44.8 (39)	64.3 (45)	100 (2)	
Not specified	7.7 (8)	9.2 (8)	4.3 (3)	0 (0)	
Regions					
Ahafo	1.0 (1)	3.4 (3)	1.4 (1)	0 (0)	0.983
Ashanti	69.2 (72)	64.4 (56)	62.9 (44)	100 (2)	
Bono	8.7 (9)	9.2 (8)	11.4 (8)	0 (0)	
Bono East	1.9 (2)	1.1 (1)	1.4 (1)	0 (0)	
Central	0 (0)	1.1 (1)	4.3 (3)	0 (0)	
Eastern	6.7 (7)	4.6 (4)	4.3 (3)	0 (0)	
Greater Accra	0 (0)	0 (0)	1.4 (1)	0 (0)	
Upper East	1.0 (1)	1.1 (1)	2.9 (2)	0 (0)	

Western	2.9 (3)	3.4 (3)	4.3 (3)	0 (0)	
Western North	1.0 (1)	2.3 (2)	0 (0)	0 (0)	
Not specified	7.7 (8)	9.2 (8)	5.7 (4)	0 (0)	
Laterality					
Unilateral	28.8 (30)	94.3 (82)	31.4 (22)	100 (2)	<0.001*
Bilateral	71.2 (74)	3.4 (3)	68.6 (48)	0 (0)	
Not specified	0 (0)	2.3 (2)	0 (0)	0 (0)	

N, frequency; %, percentage frequency; chi-square analyses at a significance set at $p < 0.05$

Factors associated with types of childhood cataract.

Table 3 shows factors associated with pediatric cataract. Age of presentation (2-12 years, odds ratio (OR) = 0.27, $p < 0.001$) and >12 years, odds ratio (OR) = 0.12, $p < 0.001$ compared with <2 years) was significantly associated with congenital cataract. Similarly, age of presentation (2-12 years, odds ratio (OR) = 11.02, $p < 0.001$) and >12 years, odds ratio (OR) = 26.57, $p < 0.001$ compared with <2 years) and sex (females, odds ratio (OR) = 2.27, $p = 0.008$ compared with males) significantly associated with developmental cataract. Likewise, there as a significant association between age of presentation (2-12 years, odds ratio (OR) = 12.59 $p < 0.001$) and >12 years, odds ratio (OR) = 7.57, $p 0.004$ compared with <2 years), sex (females, odds ratio (OR) = 0.54, $p = 0.038$ compared with males) and traumatic cataracts.

Table 3: Bivariate and multiple logistic regression of factors associated with types of childhood cataract

Variable	Bivariate regression			Multiple regression		
	OR	95%CI	p-value	AOR	95%CI	p-value
Congenital Cataract						
Age of presentation						
<2.00	Ref					
2.00 -12.00	0.27	0.01-0.06	<0.001*			
>12.00	0.12	0.00-0.10	<0.001*			
Not specified	0.46	0.01-0.19	<0.001*			
Sex						
Male	Ref					
Female	0.98	0.59-1.62	0.936			
Residence						
Rural	Ref					
Urban	0.85	0.51-1.43	0.544			
Not specified	1.03	0.38-2.76	0.961			
Regions						
Ahafo	Ref					
Ashanti	2.82	0.31-25.78	0.358			
Bono	2.25	0.22-23.32	0.497			
Bono East	4	0.21-75.66	0.355			
Central	0	0	0.999			
Eastern	4	0.35-45.38	0.263			
Greater Accra	0	0	1.000			
Upper East	1.33	0.06-31.12	0.858			
Western	2	0.15-26.73	0.600			
Western North	2	0.08-51.59	0.676			
Not specified	2.67	0.25-28.44	0.417			

Traumatic Cataract

Age of presentation						
<2.00	Ref			Ref		
2.00 -12.00	12.55	5.15-30.54	<0.001*	12.59	5.15-30.77	<0.001*
>12.00	7.78	1.97-30.66	0.003*	7.57	1.90-30.11	0.004*
Not specified	16.33	4.15-64.23	<0.001*	16.43	4.13-65.40	<0.001*
Sex						
Male	Ref			Ref		
Female	0.54	0.31-0.93	0.026	0.54	0.30-0.97	0.038*
Residence						
Rural	Ref					
Urban	0.65	0.38-1.12	0.118			
Not specified	1.2	0.45-3.24	0.719			
Regions						
Ahafo	Ref					
Ashanti	0.32	0.51-1.95	0.215			
Bono	0.31	0.43-2.66	0.250			
Bono East	0.22	0.01-3.98	0.307			
Central	0.22	0.01-3.98	0.307			
Eastern	0.27	0.03-2.25	0.224			
Greater Accra	0.0	0.0	1.000			
Upper East	0.22	0.01-3.98	0.307			
Western	0.33	0.04-3.21	0.341			
Western North	1.33	0.07-26.62	0.851			
Not specified	0.44	0.06-3.29	0.427			

Developmental Cataract

Age of presentation						
<2.00	Ref			Ref		
2.00 -12.00	9.98	3.81-26.13	<0.001*	11.02	4.15-29.21	<0.001*

>12.00	22.67	5.64-91.06	<0.001*	26.57	6.42-109.89	<0.001*
Not specified	5.1	1.06-24.62	0.430	5.527	1.12-27.22	0.036
Sex						
Male	Ref			Ref		
Female	1.82	1.05-3.16	0.034	2.27	1.23-4.16	0.008*
Residence						
Rural	Ref					
Urban	0.04	1.03-3.33	1.848			
Not specified	0.62	0.19-2.68	0.716			
Regions						
Ahafo	Ref					
Ashanti	1.35	0.15-12.44	0.789			
Bono	1.88	0.18-19.68	0.597			
Bono East	1.33	0.06-31.12	0.858			
Central	12	0.51-280.09	0.122			
Eastern	1.09	0.09-13.78	0.946			
Greater Accra	0		1.000			
Upper East	4	0.21-75.66	0.355			
Western	2	0.15-26.73	0.600			
Western North	0		0.999			
Not specified	1	0.09-11.59	1.000			

OR, Odds ratio; CI, Confidence Interval; AOR, Adjustable odds ratio; multiple logistic regression was performed only for variables that were statistically significant $p < 0.05$ in bivariate analyses

Discussion

This study provides the prevalence of childhood cataract and its associated factors among pediatric population in Ghana using hospital based data. We found that about four out of every one hundred children had childhood cataract, and the proportionate distribution of etiological types in decreasing trends were congenital, traumatic and developmental cataracts. Similarly, the most prevalent forms of morphological cataracts were polar and subscapular cataracts and the least occurring forms were of cortical and nuclear origin. Most patients reported with unilateral cataracts involvement. Older age was

significantly associated with decreased likelihood of childhood cataract, similarly, increased age and female sex were associated significantly with traumatic cataract with decreasing odds. Conversely, older age and female sex were significantly associated with increased odds of developmental cataract.

Cataract has profound consequences on the quality of life and with a greater impact on children compared to adults. Untreated cataract predisposes children to ocular comorbidities such as amblyopia[9], strabismus[32], and nystagmus[33]. The associated vision loss could compromise academic performance[16, 17], social relations[34], career aspiration[35] and mental health[18]. Generally, the prevalence of childhood cataract varies across studies and this may be attributed to differences in study methodologies, case definitions for cataract and reliability of diagnostic approaches[25, 36-39]. Past retrospective studies often report a higher burden of pediatric cataract compared to studies that utilized cross-sectional and cohort-based methodologies, as the latter usually misses out on developmental cataracts[36, 37, 39-41]. Also, studies that utilize the lens opacification criteria normally reports a higher prevalence of childhood blindness than studies that define cataract based on visual impairment/blindness in the better eye and those who had undergone surgical procedure. Given the subtle details of some presenting cataracts clinicians diagnosis on slit-lamp biomicroscopy other than ophthalmoscopy is more specific and reliable. The results in our study could be attributed to the study design and diagnostic approach used in data collection, because the retrospective nature decreased the possibility of missing developmental cataract cases and the comprehensive slit lamp examination increased the tendency to identify subtle forms of cataracts.

The categorization of childhood cataracts is usually challenging, since a cataract may exist at birth but may only be diagnosed at later life. However, the study identified the commonest etiological of cataract as congenital and the least diagnosed type being developmental cataract. Approximately 50% of childhood cataracts are present at birth and occur as result of mutation in genes that encodes for crystalline lens proteins[42, 43]. Healthy young crystalline lenses are less susceptible to cataract given the gradual and time dependent biochemical and cellular changes within the lens fibers[44]. The frequently used sharply pointed objects by children predispose them to traumatic cataract whereas aggressive systemic diseases may progress to affect the lens, resulting in developmental cataracts[45, 46]

We found polar cataract as the commonest form of morphological cataract which is consistent with other published studies[47, 48]. Polar cataract are dysplastic lens fibers that adhere to either the central anterior or posterior poles of the crystalline lens. Depending on the anatomical orientation of the opacity they are grouped into anterior or posterior polar cataracts. The former present as a centrally visible opacified dot whereas the latter is characterized by a posterior round discoid opaque mass. Children with untreated polar cataract are at increased risk of amblyopia[47]. Subscapular cataract recognized as the second most prevalent form of morphologic cataract in this study is characterized by an irregular pseudopodia-like central opacification of the lens capsule. On the one hand, cortical and nuclear cataracts were the least diagnosed form of morphological cataracts. Cortical cataract presents as a whitish-wedged shaped opacification at the cortex of the lens and commonest among patients with

syndromic conditions such as Down syndrome[49]. Nuclear cataract is associated with yellowish or brownescence of the lens and with the old age at risk[50]. The lower prevalence of cortical and nuclear cataract in this study could be ascribed to the absence of syndromic disorders as well as the younger age of the study participants.

A major coexistent complication of childhood cataract in this study was strabismus and with twice distribution of esotropia compared with exotropia. Strabismus characterized by misalignment of the visual axes during bifoveal fixation remains a frequent complication of childhood cataract both preoperatively and postoperatively and with estimates of ranges 20.5-86.0% [51-53]. The appearance of strabismus preoperatively as found in our study could be linked to confusion of the oculomotor system as a result of sensory and consequently deviation of the visual axes from the object of regard signified by strabismus[54]. Furthermore, we identified nystagmus (involuntary rhythmic oscillation of the eyes accompanied by excessive retina image motion) as a complication of childhood cataract and this is consistent with a study by Abedi et al. which reported a higher proportion of nystagmus in subjects with a significant form deprivation due to infantile cataract[54] as well as a paper by Hwang and colleagues which showed the appearance of monocular symmetric nystagmus in congenital cataract patients with adequate stereopsis[55].

We observed a significantly decreased trend in prevalence of congenital cataract with age. Congenital cataracts are diagnosed at birth, hence, without complications at birth or pregnancy the natural lens is usually transparent, an adaptive mechanism required for adequate interaction with the external environment and pursuit of activities of daily living. Any noticeable lens changes in later life are usually ascribed to exogenous insults other than a congenital cause, and this could explain our patterns of observations[56].

We noticed a significant inverse relationship between old age and traumatic cataract. Our findings are consistent with a Shanghai pediatric study, where Du et al. reported a decreased proportion of traumatic cataract with age among children in Eastern China[45]. A study in Nepal showed similar trends where children aged less than ten years were more prone to ocular trauma compared to their older counterparts [57]. At a tender age, children are frequently mobile and adventurous in exploring their environment, nonetheless, they have limited self-awareness and perception of danger which ultimately result in hurting their own eyes with playing toys, sharp or blunt pointed objects[45].

In this study females were less likely to present with traumatic cataract compared to males. Our patterns of evidence are similar to studies conducted in Australia[58], China[45], Denmark[39], Nepal[57], India[46] and Malaysia[59]. These findings are explained by the differences in the nature of boys and girls while the latter are generally reserved, the former are usually adventurous -actively engaged in rough outdoor and aggressive sporting activities and importantly show greater tendency in playing with potentially dangerous tools such as firecrackers, paintballs, and bullet guns[58, 60, 61].

Our study showed a significant association between older age and developmental cataract. Unlike congenital cataract that arise as a result of genetic predisposition and presents at birth, developmental

cataract lens opacification shows up in later life. As one ages, the various components of the visual system including the mammalian lens are exposed to exogenous toxins such as dietary nutrients[62-65], steroid medications[66, 67], and ultraviolet radiations[68, 69] which triggers cataractogenesis. Furthermore, females in our study were more prone to developmental cataract compared with males and this was statistically significant. While the exact causal factors cannot be explained hormonal sex variations could account for the observations between these groups[70].

A major strength of the study is that it provides a most recent epidemiological data on childhood cataract in Ghana. Potential bias from inter-assessor variability was eliminated as all cases discussed above were diagnosed by a single certified well-trained pediatric ophthalmologist. The underestimation of prevalence estimates associated with defaced and missing details in paper-based record review were avoided given the paperless approach employed in this study. On the other hand, the study has some limitations worth highlighting. Researchers were unable to make direct observations given the retrospective design and hence recommend future prospective investigations. Also, the burden reported may differ from community-based prevalence estimates and as such, caution be taken in generalizing the study results.

Conclusion

In summary, over four in hundred pediatrics in our study had cataract with the established etiological types being congenital, traumatic and developmental cataracts. Given the higher burden of the condition in the pediatric group a nationwide and/or regional pediatric vision screening programs should be implemented to facilitate early detection. Further, child health education and awareness creation should be fostered among parents to promote early presentation and safety.

Abbreviations

PSVS: Pre-school vision screening; OR: Odds Ratio; CI: Confidence Interval; CHRPE: Committee on Human Research Publication and Ethics; KNUST: Kwame Nkrumah University of Science and Technology; WHO: World Health Organization

Declarations

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Authors contribution

DAF, KA, IODJ and KOA conceived and designed the project; KA carried out data collection; DAF, KA, DBK, IODJ and KOA provided technical support; IODJ, KA, and KOA performed data analyses; KA, DAF, DBK,

IODJ, EKA, AAS and KOA interpreted data for this study; IODJ, KA, DAF, DBK, EKA, AAS and KOA drafted the work and revised critically for essential intellectual content; DAF, DBK and KOA supervised the study.

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Availability of data and materials

The dataset used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical approval and consent to participate

The study adhered to the tenets of the declaration of Helsinki and participants' informed consent waived by the Research and Development Unit of the Komfo Anokye Teaching Hospital (Reference number: RD/CR21/119). The final protocol was approved by the Committee on Human Research, Publication and Ethics (CHRPE) of the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana (Reference number: CHRPE/AP/366/21). The retrospective nature of the study denied researchers from making contact with participants.

Consent for publication

Not applicable

Competing interest

The authors declare they have no competing interest.

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