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Visual impairment and refractive errors in school children in Andhra Pradesh, India

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Purpose: Addressing childhood vision impairment (VI) is one of the main goals of the World Health Organization's (WHO) combating blindness strategies. The primary aim of this study was to estimate the prevalence of VI, causes, and its risk factors in school children in Krishna district, Andhra Pradesh, India. **Methods:** Children aged 4–15 years were screened in schools using the 6/12 Snellen optotype by trained community eye health workers, and those who failed the test and those reported or found to have obvious eye conditions were referred to primary (VC), secondary (SC), or tertiary (TC) care centre appropriately, where they underwent a complete eye examination including cycloplegic refraction and fundus examination. **Results:** A total of 56,988 children were screened, of whom 51.18% were boys. The mean age was 9.69 ± 3.26 years (4–15 years). Overall, 2,802/56,988 (4.92%) children were referred to a VC, of which 632/56,988 (1.11%) required referral to SC/TC. PVA of <6/12 was found in 1.72% (95% confidence interval [CI]: 1.61–1.83). The prevalence of refractive error (corrected and uncorrected) was 2.38% (95% CI: 2.26–2.51) and myopia was 2.17% (95% CI: 2.05–2.29). In multivariable analysis, older children, those in urban schools, private schools, and children with a disability had an increased risk of VI and myopia. Additionally, the risk of myopia was higher among girls than boys. Of those referred and reached SC/TC, 73.64% were due to avoidable causes. **Conclusion:** Childhood VI prevalence was 1.72% in this region. Uncorrected refractive error (URE) was the major cause of VI in children. Older age, schools in urban locations, private schools, and the presence of disability were associated with the risk of VI among children.

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Combating childhood vision impairment (VI) and blindness is one of the important goals of the World Health Organization's (WHO) VISION-2020-The Right to Sight strategy.[1] As per the latest estimates, there are about 1.14 million children who are blind and 19 million visually impaired globally.[2] These estimates are mostly based on studies carried out in schools for the blind, a few population-based studies, and some also based on the under 5 mortality rate (U5MR).[1,2] However, it is difficult to generalize the estimates from schools for the blind to the population level as it is not a valid representation of the population. There have been several studies carried out in different parts of the world to estimate the prevalence of VI among children using the key informant method;[3-5] however, this method has its limitations and cannot capture the data on the prevalence of uncorrected refractive error (URE), causes, and risk factors.

Studies such as the Refractive Error Study in Children (RESC) have published information on URE and VI; however, they do not provide details on causes and risk factors for VI and blindness.[6-12] Hence, there is a need for population-based studies for the estimation of prevalence as well as causes and risk factors for childhood VI and blindness. In India, several studies have been carried out to estimate the prevalence of childhood VI and blindness over the last two decades.[13-17] However, these estimates differ due to factors such as different visual acuity cut-offs used, regions, and different time points. There are also no data available on childhood VI prevalence estimates from the state of Andhra Pradesh in decades. With this background, we designed a large project named, Initiative for Screening Children for Refractive Errors and other Eye Health Needs (I-SCREEN) in two Indian states of Andhra Pradesh (AP) and Telangana (TS). We previously reported the data from the schools for the blind.[15] Here we report the prevalence, causes, and risk factors for VI including blindness (BL) and low vision (LV) in children in schools in Krishna district, AP.

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Methods

Ethics

This study was approved by the Institutional Review Board of L V Prasad Eye Institute and adhered to the tenets of the Declaration of Helsinki. Initial approvals from the local governmental authorities were obtained before the study and informed written consent was taken from the relevant school authorities and information was sent to parents. Children who were referred for further services were accompanied by their parents. Informed consent was obtained from the parents at the referral centres.

Study area and population

The study area included four rural sub-districts randomly selected and an urban area (Vijayawada) in the Krishna district of AP [Fig. 1]. Fifty percent of children were selected from rural sub-districts and 50% from urban areas. Children aged ≤15 years, enrolled in schools, and residing in the study area were eligible to be screened in the study. As the government provides free education up to high school, the enrolment in the schools is more than 95%.[18]

The data were collected between June 2015 and April 2019.

Sample size calculation

Using the WHO method of estimating the prevalence of childhood blindness, the expected rate in this area would be 0.5 per 1,000 children as the under-five mortality rate in the state of AP in 2011 as per the census was 47/1,000 live births. Hence, with an expected prevalence of 0.05%, a "worst acceptable" precision result of 0.02%, and a confidence level of 95%, the desired sample size would be 47,996. With a refusal of 10%, the expected number of children to be screened was 52,795.

Definitions

Children aged ≤15 years enrolled in schools at the time of screening were included. VI was defined as per WHO-ICD 11 criteria; presenting visual acuity (PVA) in the better eye <3/60 as blindness,<6/12–6/18 as mild, <6/18–6/60 as moderate, and <6/60–3/60 as severe VI.[19] Refractive error was categorized following the RESC protocol, that is, spherical equivalent (SE) of at least −0.50 diopters and more as myopia and ≥+2.00 D as hyperopia in the worse eye.[6] The RE magnitude was defined as; SE of −0.50 D to −5.00 D as low myopia, ≥−5.25 D as high myopia,[20] +2.00 D to +4.75 D as low hyperopia, and ≥+5.00 D as high hyperopia.[8-12] Amblyopia was defined as the best-corrected visual acuity (BCVA) of 6/12 or worse in one or both eyes due to abnormal binocular interaction and/or pattern vision deprivation with no apparent organic lesion, which could be explained and corrected by appropriate treatment.[21] Disability status was reported based on the school records as reported by the school teachers.

Screening protocol

The preliminary screening was performed by trained community eye health workers (CEHWs) (Phase 1). CEHW training was done as per the National Program for the Control of Blindness and Vision Impairment recommendation.[22]The CEHWs tested the visual acuity of children using 6/12 optotype letters at a 3-m distance. Those who were unable to identify 6/12 or those with any obvious eye conditions were referred to the vision centre (VC) for further evaluation by a vision technician (VT). (Phase 2) At the VC, the referred children underwent a complete eye examination including refraction.

Children requiring SC or TC services included (i) VA ≤6/12 in either eye even after refraction, (ii) any obvious ocular pathology requiring intervention, (iii) needing cycloplegic refraction, and (iv) a positive family history of major eye conditions such as retinoblastoma, congenital cataract, glaucoma, squint, and myopia were referred to SC or TC centres (Phase 3). In the SC/TC, a detailed comprehensive eye examination including cycloplegic refraction and a dilated posterior segment evaluation was done by a pediatric ophthalmologist. The principal cause of VI was assigned after a complete eye examination. When there were co-existing eye diseases, a clinical decision was made as to the primary cause of VI that is easily preventable, treatable, and unavoidable. Children whose VA improved in one or either eye after the refractive correction were provided spectacles and those requiring surgical treatment, low vision, and rehabilitation care were provided with the needed services.

Referral tracking

All children who were referred to a VC, SC, or TC were followed up to check for referral uptake. To improve the referral conversion rate from school to VC, for those children who did not visit VC, the VT visited the schools and examined the children.[23]

Data analysis

The statistical analysis was carried out using the STATA/SE 16 software, June 2019 edition by StataCorp LLC, TX, USA. Descriptive analysis was done to tabulate the demographic details and prevalence estimates. Univariate and multivariate logistic regression analyses were carried out for risk estimation.

Results

Of 237 schools covered during the screening program, 55.27% (n = 131) were private schools and 44.73% (n = 106) were public schools. Overall, 57.76% (n = 32,917) children were screened in private schools and 42.24% (n = 24,071) in public schools. Of 56,988 children screened, 51.18% (n = 29,166) were boys and 48.82% (n = 27,822) were girls. The mean age was 9.69 ± 3.26 years (4–15 years). Overall, 0.36% (n = 204) children were found to have a disability; among these, physical impairment was found to be more common with 90 (44%) children, followed by mental disability 54 (26.47%) and hearing impairment in 24 (11.76%).

In phase 1 of the school screening, 56,988 children were screened, of whom 98.28% (n = 56,005) passed the 6/12 VA test and 1.72% (n = 983) failed the VA test. Overall, 4.92% (n = 2,802) were referred to VC (phase 2).

Of the 2,802 referred, 80% (n = 2,242) attended and 20% (n = 560) did not attend the services. Of those who attended VC, 50.18% (n = 1,125/2,242) were prescribed with spectacles, 28.19% (n = 632/2,242) were referred to a SC or TC, and 22.17% (n = 497/2,242) were normal.

Of 632 who were referred, only 43.83% (n = 277) attended SC or TC (phase 3). Of those who attended referral services 42.96% (n = 119/277) were prescribed spectacles 31.41% (n = 87/277) received medical or surgical care, 5.78% (n = 16/277)

Table 1: Risk factors for VI and blindness and need for referral services

Risk factors for vision impairment and blindness			Risk factors for need for referral services	
(*N*=56,988)	OR (95% CI)		OR (95% CI)	
	Univariate	Multivariate	Univariate	Multivariate
Age				
4-5 years	1	1	1	1
6-10 years	2.18 (1.95-2.44)	2.13 (1.55-2.92)	1.96 (1.84-2.09)	2.0 (1.67-2.39)
11-15 years		5.29 (3.9-7.19)	4.37 (3.67-5.2)	
Gender				
Male	1	1	1	1
Female	0.11* (0.98-1.26)	1.09*(0.96-1.24)	1.06* (0.99-1.15)	1.05*(0.97-1.13)
School setting				
Rural	1	1	1	1
Urban	3.06 (2.64-3.54)	2.43 (2.08-2.83)	2.11 (1.95-2.29)	1.84 (1.69-2.01)
Type of school				
Public	1	1	1	1
Private	2.4 (2.07 -2.78)	2.26 (1.93-2.64)	1.68 (1.55-1.83)	1.72 (1.58-1.88)
Disability				
No disability	1	1	1	1
Disability present	3.92 (2.23-6.89)	5.84 (3.27-10.44)	9.02 (6.7-12.16)	13.03 (9.54-17.79)

**P*-value not statistically significant (*P*>0.05)

Table 2: Prevalence of vision impairment and blindness

(*n*=56,988)		
Category	*n* (%)	
	PVA	BCVA
Prevalence of VI and blindness	983 (1.72)	151 (0.26)
Mild VI	391 (0.69)	74 (0.13)
Moderate VI	552 (0.97)	59 (0.10)
Severe VI	19 (0.03)	3 (0.01)
Blindness	21 (0.04)	15 (0.03)
Missing data or could not be assessed	35 (0.06)	

VI-vision impairment; PVA-presenting visual acuity; BCVA-best corrected visual acuity

received low vision care, and 19.86% (*n* = 55/277) were normal [Fig. 2].

Of the total number of children screened (*n* = 56,988), 4.92% (*n* = 2,802) required referral services, of which 50.29% (*n* = 1,409/2,802) were girls and 49.71% (*n* = 1,393/2,802) were boys. The mean age was 11.02 ± 2.91 years (range: 4–15 years). Disability was found among 2.28% (*n* = 64/2,802) who were referred for SC or TC services. The referral to a VC from schools was higher in children studying in schools in urban as well as private schools ($P < 0.05$). The need for referral services also increased with increasing age ($P < 0.05$). Those with any disability also had higher odds of referral to VC than those without any disability ($P < 0.05$) [Table 1].

Vision impairment and blindness

Of the 56,988 children who were screened, the prevalence of VI based on PVA was 1.72% (95% confidence interval [CI]: 1.61–1.83), which included 0.03% SVI and 0.04% blindness [Table 2]. On multivariate analysis, the risk of VI was higher in older children, those studying in urban schools, private schools, and those with a disability ($P < 0.05$) [Table 1]. The prevalence of VI was 0.65% (*n* = 45/6,960), 1.20% (*n* = 308/25,662), and 2.63% (*n* = 641/24,366) in 4–5 years, 6–10 years, and 11–15 years age groups, respectively.

Refractive error and Myopia

Overall, the prevalence of refractive error (RE) (corrected and uncorrected) among the screened population (*n* = 56,988) was 2.38% (95% CI: 2.26–2.51) (*n* = 1357). Myopia was found to be most common at 2.17% (95% CI: 2.05–2.29) (*n* = 1,238/56,998), of which low myopia accounted for 2.06% (*n* = 1,174/56,998) and high myopia 0.11% (*n* = 64/56,998). Hyperopia accounted for 0.21% (95% CI: 0.17–0.25) (*n* = 119/56,998), which included 0.15% (*n* = 86/56,998) low hyperopia and 0.06% (*n* = 33/56,998) high hyperopia [Table 3]. Overall, 2.18% (*n* = 1,244/56,998) children were given spectacle correction.

On multivariable analysis, the risk of RE was seen with increasing age, that is, in 6–10 years (adjusted odds ratio [OR]: 2.52; 95% CI: 1.86–3.42) and amongst 11–15 years (adjusted OR: 7.81; 95% CI: 5.81–10.5). The risk of RE was also higher among children studying in urban schools (adjusted OR: 1.8; 95% CI: 1.59–2.03), private schools (adjusted OR: 2.42; 95% CI: 2.12–2.76), and among girls (adjusted OR: 1.16; 95% CI: 1.04–1.3). Disability increased the risk of RE by 2.76 times (95% CI: 1.4–5.47).

The multivariable analysis also showed increased risk of myopia with increasing age, that is, in 6–10 years and amongst 11–15 years ($P < 0.05$). The risk of myopia was also higher among children studying in urban schools, private schools, and

Table 3: Refractive error magnitude and age wise distribution

n (%)	Age group			Overall
	4-5 years	6-10 years	11-15 years	4-15 years
	n=6960 (%)	*n*=25662 (%)	*n*=24366 (%)	*n*=56988 (%)
Refractive error (myopia and hyperopia)	47 (0.68)	360 (1.40)	950 (3.89)	1357 (2.38)
Myopia	37 (0.53)	307 (1.20)	894 (3.67)	1238 (2.17)
Low myopia (−0.50 to−4.75)	33 (0.47)	282 (1.10)	859 (3.53)	1174 (2.06)
High myopia (≥−5.00)	4 (0.06)	25 (0.10)	35 (0.14)	64 (0.11)
Hyperopia	10 (0.14)	53 (0.21)	56 (0.23)	119 (0.21)
Low hyperopia (+2.00 to+5.00)	10 (0.14)	40 (0.16)	36 (0.15)	86 (0.15)
High hyperopia (≥ +5.25)	0	13 (0.05)	20 (0.08)	33 (0.06)

Table 4: Risk factors for myopia

N=56,988	OR (95% CI)	
	Univariate	Multivariate
Age		
4-5 years	1	1
6 -10 years	2.97 (2.66-3.32)	2.75 (1.95-3.87)
11-15 years		9.42 (6.76-13.13)
Gender		
Male	1	1
Female	1.25 (1.12-1.4)	1.23 (1.1-1.38)
School setting		
Rural	1	1
Urban	2.44 (2.15-2.76)	1.84 (1.62-2.1)
Type of school		
Public	1	1
Private	2.4 (2.10-2.73)	2.56 (2.23-2.95)
Disability		
No disability	1	1
Disability present	2.33 (1.23-4.41)	3.53 (1.83-6.78)

P-value not statistically significant (*P*>0.05)

among girls ($P < 0.05$). Disability increased the risk of myopia by 3.53 times ($P < 0.05$) [Table 4].

Service uptake and ocular morbidity profile

Of 632 children referred from VC, 277 (43.83%) reached the SC/TC centres. Of those who attended referral services (n = 277), on examination by the pediatric ophthalmologist, 42.96% (n = 119/277) were prescribed glasses, 31.41% (n = 87/277) were given medical or surgical treatment, 5.78% (n = 16/277) were provided low-vision care, and the remaining 19.86% (n = 55/277) were normal [Fig. 2]. Among the 277 who were examined at the higher centres, 73.64% had avoidable avoidable causes of VI (preventable 26.35% and treatable 47.29%). The most common preventable cause of VI was amblyopia (19.13%) and correctable were URE (16.61%) followed by squint (16.25%) [Table 5].

Discussion

Vision impairment and blindness

This is the first study with a large sample size in Krishna district, Andhra Pradesh reporting the prevalence, risk factors, and causes of VI amongst school children. The results from this study in schools in South India could serve as the baseline data for future comparisons with other studies in south India and other regions. Table 6 gives an overview of the prevalence and definition of VI as well as the prevalence of RE and myopia over the last two decades in India based on available school-based as well as population-based study estimates.

VI prevalence estimates reported in school-based studies from India varied from 0.7% to 5.67% from 2011 to 2019.[14,16,24-26] In the current study, it was found to be 1.72% among school children aged between 4 and 15 years, which falls within the range of these school-based estimates. The difference within these estimates could be explained by variations in definitions, and the inclusion and exclusion criteria used in these studies. Therefore, this should be kept in mind while comparing these estimates.

Although the prevalence of VI estimates reported in population-based surveys from India has been changing over the last two decades, the difference is not very remarkable. The VI prevalence reported in suburban areas of Hyderabad, South India, was 3.1% (<6/18) in 1997 among 3–18-year-old children,[13] and 2.6% (≤6/12) in neighboring rural districts, Mahabubnagar among children aged between 7 and 15 years in 2002.[8] However, an increased prevalence was reported in the same region in 2009; 7.1% and 3.3% (≤6/12) among urban and rural school children, respectively.[27] Nevertheless, the current estimate is lower compared to these estimates. Population-based studies in 2016 and 2018 from Karnataka, South India, among children ≤15 years of age, seem to report comparable VI and blindness prevalence estimate to this study.[28,29]

The present study reports a much lower estimate as compared to what has been reported in school-based studies from other Asian and African countries.[30-37] However, estimates from Nigeria and Latin America are comparable (1.26% and 2.67%).[38,39]Although it is difficult to compare these studies due to the difference in inclusion criteria, one similarity that could be found between these studies and the present study is the trend in increasing VI prevalence with age. Secondly, one cannot deny the influence of geographic variation in the distribution of VI prevalence attributed to other factors such as availability and accessibility of care, the influence of genetics as well as lifestyle-related factors, which could also have played a role.[40] Increased risk of VI among children in urban schools reported in the current study was also found in other parts of India.[17,25] Amongst those who were referred for SC/TC, 44.4% had VI and blindness, which reduced

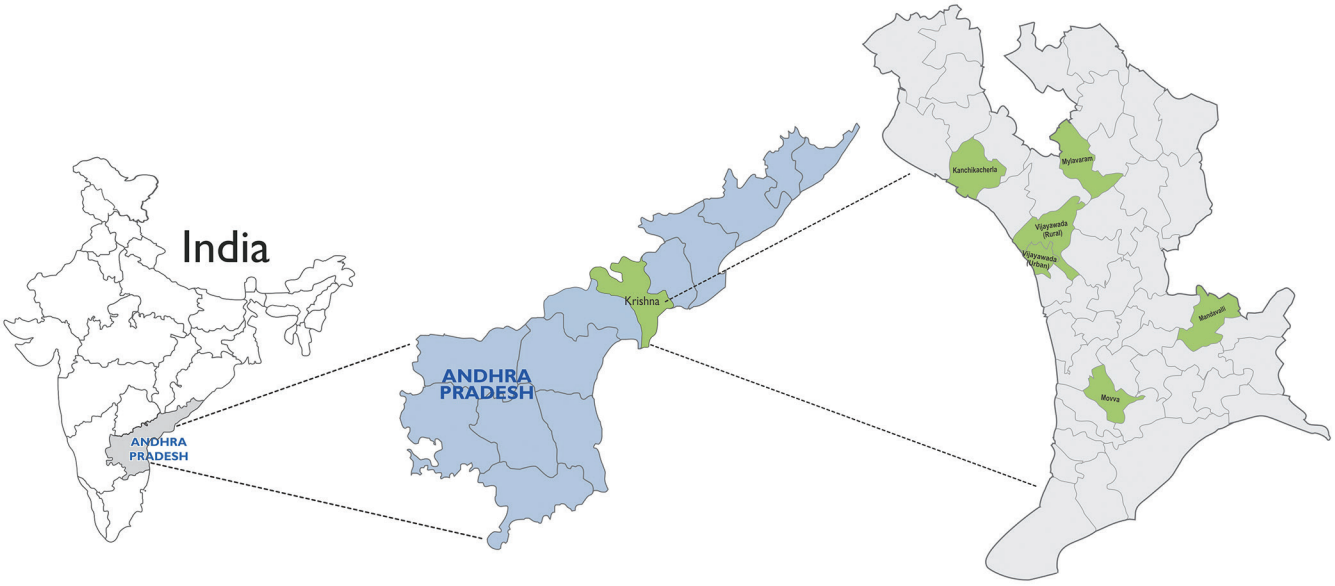

Figure 1: Map of Krishna district screening locations

Table 5: Causes of vision impairment among school children

	n=277 (%)				
	Avoidable			Unavoidable	
Preventable		Treatable			
Amblyopia	53 (19.13)	Allergy	9 (3.24)	Albinism	1 (0.36)
Corneal scar	9 (3.24)	Aphakia	3 (1.08)	Cerebral visual impairment	2 (0.72)
Toxoplasma scar	7 (2.53)	Cataract	7 (2.53)	Coat's disease	1 (0.36)
Optic atrophy (due to infection)	3 (1.08)	Congenital nystagmus	4 (1.44)	Microphthalmos	5 (1.81)
Vitamin A deficiency	1 (0.36)	Dermolipoma	1 (0.36)	Morning glory syndrome	2 (0.72)
		Ectopia lentis	1 (0.36)	Optic disc hypoplasia	2 (0.72)
		Ectropion	1 (0.36)	Phthisis bulbi	1 (0.36)
		Eyelid hemangioma	1 (0.36)	Retinal dystrophy	3 (1.08)
		Glaucoma	3 (1.08)	Uveal coloboma	2 (0.72)
		Keratoconus	2 (0.72)		
		Pseudophakia	2 (0.72)		
		Ptosis	6 (2.17)		
		Refractive error	45 (16.25)		
		Squint	45 (16.25)		

55 (19.86%) children were normal

to 5.4% after refractive correction. Hence, this could be implied as a significant percentage of VI due to URE.

The overall prevalence of refractive error was 2.4% with URE being 1.7%, which is lower compared to 10.8% as per school-based studies that were reported in a systematic review in 2018 from India.[41] Globally, URE is the leading cause of avoidable VI among children,[42] in this study also, URE was found to be the leading cause of VI amongst school children. Myopia contributed to 92.7% of all RE and this is similar to what has been reported in several studies across India in the last one to two decades.[25,43-47] The overall myopia prevalence in this study was 2.17%, which is lower as compared to 13.1% that was reported in the North Indian Myopia study (NIM) in 2015, 7.5% reported in a meta-analysis in 2020, and 3.57% from 2011 to 2015 reported in the SN-SEES study in 2020 in India.[25,48,49] This study showed an increased prevalence of low myopia among school children and the prevalence of high myopia increased with age. This trend was also reported in China.[50]

A systematic review in 2020 reported an increased risk of myopia among school children in areas with a high population density.[51] Although this study did not focus on the effect of population density on myopia, this could also be indirectly attributed to the lower myopia prevalence compared to the 13.1% prevalence reported in the NIM study done in Delhi, which has almost 36 times higher population density compared to the current study location.[52] Another possibility could be the mode of education in these schools

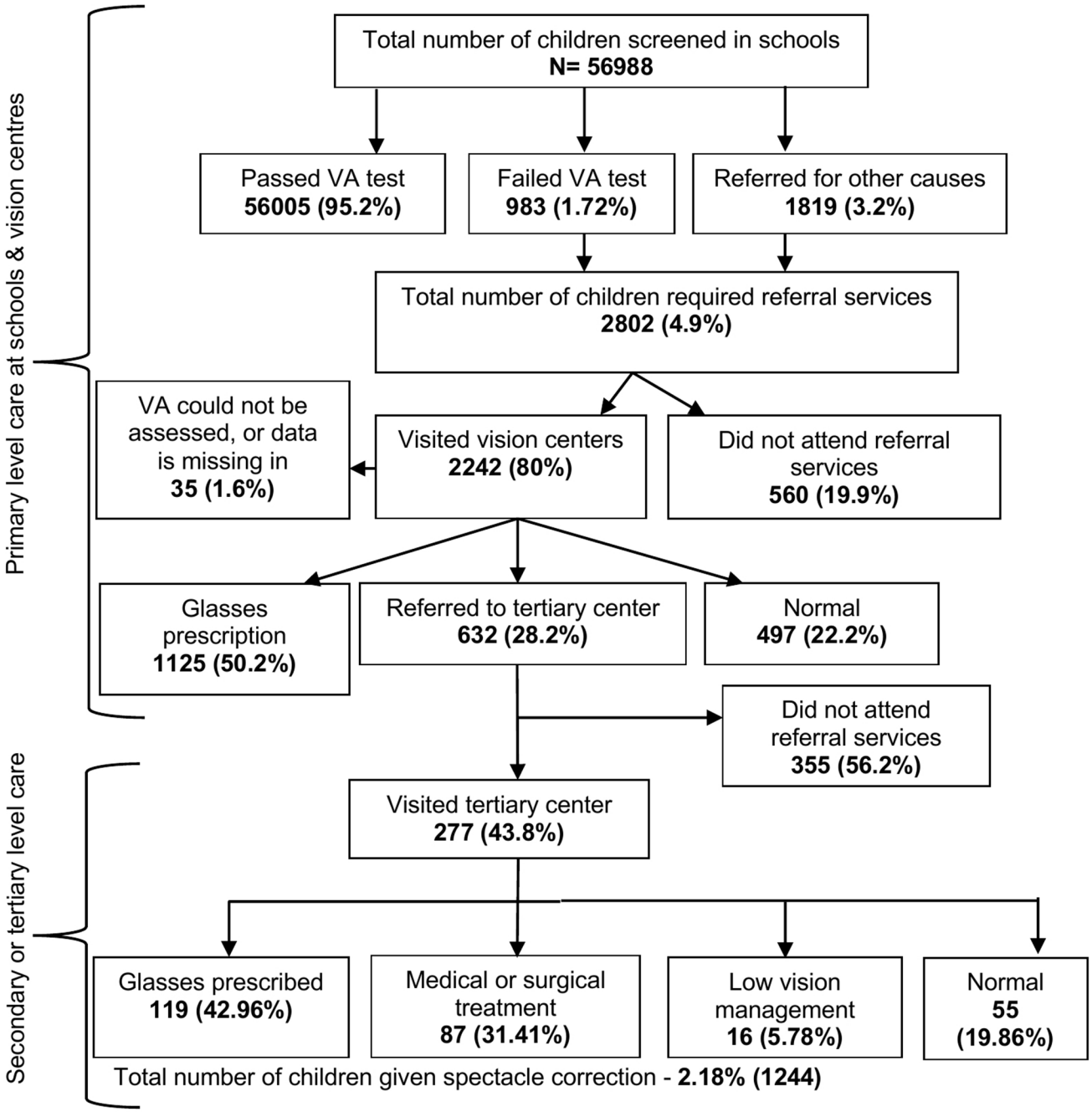

Figure 2: The screening output at different phases

included in the NIM study, most of which are located in urban areas. In recent times, the digital mode of education has become more common, especially in urban settings and there is also evidence for the association between increased screen time and risk of developing myopia,[53] which was not covered in this study. The current study reports higher myopia prevalence in urban schools, which could have been the reason for the increased referral need in these schools. This trend was also reported in a meta-analysis (8.5% in urban and 6.1% rural) in 2020.[48]

The risk factors for myopia in the current study also included age, gender, and disability. Older children had a higher risk of myopia as compared to younger children; the risk was higher amongst 6–10 and 11–15 years old children, respectively, and among girls. These findings were similar to what was reported in the NIM study, in 2015 as well as studies from Cambodia in 2012 and China in 2020.[49,54,55] These studies also reported an increased risk of myopia amongst children in private schools as compared to those in public schools, which is also found in the current study (2.56 times higher odds).

Table 6: Summary of prevalence studies from India

Author	Year	Location	Rural -Urban	Sample size	Age group	VI Definition	VI prevalence	RE prevalence	Myopia prevalence
*Kalikivayi V[6]	1997	Hyderabad, SI	Urban (Low income)	3987	3-18 years	<6/18	3.10%	41.50%	8.60%
Dandona R[20]	2002	Mahabubnagar, SI	Rural	4414	7-15 years	≤6/12	2.60%	4.90%	4.10%
Uzma N[21]	2009	Hyderabad, SI	Rural	1525	7-15 years	≤6/12	3.30%	8%	NA
			Urban	1789			7.10%	25.20%	
*Nangia V[7]	2011	Nagpur, CI	Rural	11829	7-21 years	<6/18	0.86%	NA	NA
						<6/12	1.87%		
*Ghosh S[19]	2012	Kolkata, NEI	Urban (Low income)	2570	6-17 years	≤6/12	4.2%	14.70%	11.90%
Kemmanu V[23]	2016	Karnataka, SI	Urban and Rural	23100	≤15 years	<6/18	Unavailable	0.6%	NA
Kemmanu V[22]	2018	Karnataka, SI	Urban and Rural mixed	8553	≤15 years	<6/18	0.36%?	2.77%	NA
*Panda L[10]	2019	Odisha, CI	Rural	153107	5-15 years	≤6/12	0.56%	0.41%	NA
			Urban	10038			0.57%	0.99%	
*Prabhu AV[9]	2019	Udupi, SI	Rural	1191	5-15 years	≤6/12	7.70%	10.70%	4.80%
			Urban	593			11.30%	15.30%	
*Narayanan A[18]	2020#	Tamil Nadu, SI	Rural	36660	6-17 years	≤6/9	4.41%	2.92%	2.25%
			Urban	54885			6.52%	5.43%	4.45%
			Overall	91545			5.67%	4.42%	3.57%
*Present study	2019	Andhra Pradesh, SI	Rural	28007	4-15 years	<6/12	0.85%	1.44%	1.27%
			Urban	28981			2.57%	3.29%	3.04%
			Overall	56988			1.72%	2.38%	2.17%

* School-based study; SI- South India; CI - Central India; NEI - Northeast India; VI -Vision impairment; RE- Refractive error; #2011-2015 data

Children with disability were found to have a higher risk of developing RE, especially myopia, which was also reported in Taiwan in 2017.[56] However, generalizing disability-attributed risk from the current study may not be appropriate as the disability was defined based on subjective measurements.

Although myopia risk factor findings from the current study agree with other similar studies from within as well as outside India, the prevalence seems to be lower as compared to East Asia, South Korea, Taiwan, and China and comparable to Latin America and some parts of Africa.[51]

Strengths and weaknesses

This is the first study with the largest sample from school-based screening programs in this area. However, this study only covered school-going children and did not include those who were not admitted to a school. Nevertheless, as more than 95% of children can be found in school, this may not be significant. Secondly, although the response rate to VC was 80%, it was less than 50% (43.6%) for SC or TC services; hence, the possibility of missing out on data on important causes of VI and blindness cannot be ignored. However, this is one of the highest referrals uptakes reported from any school screening program.

In terms of limitations, the urban sample in this study was marginally higher (50.91%) than the urban population proportion found in the 2011 census in the Krishna district (41%); hence, the prevalence percentage could be somewhat overestimated. Risk factors for myopia such as parental myopia, time spent outdoors, and screen times were not included as this study was not designed to look specifically at myopia risk factors. Apart from this, a history of premature birth, which again is a risk factor for myopia, was not elicited. Therefore, this should be kept in mind while interpreting the results pertaining to myopia risk factors. The presence of disability was documented based on what was reported by the school teachers. Hence, this would have underestimated the actual disability prevalence among these children.

Conclusion

The prevalence of VI and blindness among school children was 1.72% in Krishna District, Andhra Pradesh. URE was the major cause of avoidable VI among these children. Myopia contributed to the majority of RE. The older age group, children in urban schools, private schools, and those with a disability

had a higher risk of VI, URE, myopia, and increased need for referral services in this region. Additionally, the risk of myopia was higher among girls than boys.

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Conflicts of interest

There are no conflicts of interest.

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