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Prevalence and causes of visual impairment in Saudi children of Arar city

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Abstract

Aim: In this study, we aimed to determine the prevalence and main causes of visual impairment (VI) among Saudi children of Arar, the capital city of the Northern Border Region of Saudi Arabia. Material and Method: This population-based cross-sectional study was conducted on 410 Saudi children aged from 6 to 16 years. The examination included visual acuity (VA) testing, ocular motility evaluation, refraction, slit lamp, and fundus examinations. Results: A total of 410 Saudi children aged from 6 to 16 (9.8 ± 2.9 years) were enrolled in the current study; 195 (47.5%) were males and 215 (52.4%) were females. According to WHO classification, VI was diagnosed in 42 (10.2%) cases and 36 (8.7%) cases suffered unilateral diminution of visual acuity (UDoVA). Cases of VI were further classified depending on the severity of VI into mild VI in 34 (8.3%), low vision in 6 (1.4%) and blindness in 2 (0.04%) children. Visual impairment was more common in children aged ≤ 10 years. Refractive error was the most common eye morbidity diagnosed in 167 (40.7%) children of the studied population followed by strabismus in 28 cases (6.8%), then amblyopia in 10 cases (2.4%). Discussion: Visual impairment (VI) in children can have a significant impact on the quality of their life including their performance at school and future employment opportunities. Visual impairment among Saudi children in Arar city is highly prevalent. The leading causes are refractive errors, strabismus and amblyopia. Strategies focused on screening, timely diagnosis and treatment of these causes should help to reduce the burden of childhood VI.

Keywords

Amblyopia; Blindness; Child; Refractive Error; Strabismus; Visual Impairment

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Introduction

Nineteen million children in the world are visually impaired, while 1.4 million are blind. [1] Blindness in children is important not only due to its prevalence but also in terms of the number of years the surviving child has to live with the blindness. Poor vision in a child negatively influences his academic performance, social life and as well as his future opportunities. [2] Visual impairment in children also affects the parents or caregivers as the service needs of children with VI are high especially the concerns for their education and career support and these challenges are expressed as family stress. [3,4] Majority of the causes leading to VI in children are preventable or treatable and that is why many recent studies have highlighted the importance of preschool vision screening [5-8] or screening in school children [9-12] for early detection and prompt management of the problems related to abnormal vision in children. The prevalence of VI in children varies with geographical locations in the world and within countries, facility of eye care services and economic development of the country. [1,13-15] The underlying causes for VI in children also vary considerably across the countries. Studies in some parts of Saudi Arabia [16,17] and abroad [18,19] indicate that refractive error is the primary cause of VI in school- age children.

To adequately deliver eye care services to the children, epidemiological data of eye diseases and VI in children are critical in terms of formulating guidelines, policies for saving the vision of this vulnerable age group. The data about the prevalence of VI in children of Arar city has not been established yet and the present study gives insight for the current state of the problem in this part of Saudi Arabia

Material and Method

Ethical issues: This study was conducted from February 2018 to October 2018 after obtaining ethical approval from the Ethics Committee of Deanship of Scientific Research of Northern Border University (NBU). Informed consent was obtained from the legal guardians of all children who willingly participated in this study.

Study design: Saudi children aged from 6 to 16 years were enrolled in the current study. The participants were initially screened in the free eye camps held at the main shopping mall (Arar Mall) of Arar city. Prior advertisement regarding the camp was made through banners and social media on the internet. The camp was inaugurated by the president of NBU and the dean of the College of Medicine.

Visual acuity (VA) was tested on Auto Chart Projector (TOPCON ACP-8 R). Each eye was tested separately unaided while the other eye was occluded. Children wearing glasses were rechecked in their current glasses. Pin holing and subjective refraction were carried out to get the best corrected visual acuity (BCVA). Children who had VA below 20/30 in one or both eyes or who didn't improve their VA beyond this level were referred to the central hospital of Arar for the evaluation through a comprehensive ophthalmic examination. The examination included checking the pupil and ocular motility, cover test, slit lamp examination, cycloplegic autorefraction and dilated fundus examination by the direct ophthalmoscope.

Definitions: Visual impairment (VI) was categorized, as per WHO classification, into mild VI [VA = ≥ 20/30 to ≤ 20/60], low vision [VA ≥ 20/60 to ≤ 20/400] and blindness [VA < 20/400] in the better eye with the best correction.

Data Analysis: Data was revised, coded, entered, tabulated and analyzed using SPSS version 20. Prevalence was calculated by dividing the number of visually impaired cases by the total number of the studied population, while their 95% confidence intervals (CI) were calculated following Newcombe [20]. The Chi-Square test was used to get the nominal association. The analysis was done using Prism5 (Graph Pad Software Inc., San Diego, CA). Significance was estimated with p-values <0.05.

Results

A total of 410 Saudi children were enrolled in the current study. Their ages ranged from 6 to16 years with a mean (9.8 ± 2.9 years). From these, 195 (47.5%) children were males and 215 (52.4%) females. Initial screening of VA without correction revealed that 226 (55.1%) of children had diminished VA (VA = <20/30) in one or both eyes, who were further corrected. After correction, 148 (36%) [95%CI; 31.6-40.8%] cases were fully corrected to VA >20/30 in both eyes. The remaining cases were further classified according to WHO classification based on BCVA, into 42 (10.2%) [95% CI;7.6-13.5%] cases with VI and 36 (8.7%) [95% CI; 6.4-11.9%] cases of UDoVA. Cases of VI were further classified depending on the severity of VI into mild VI in 34 (8.3%) [95% CI; 5.9-11.3%], low vision in 6 (1.4%) [95% CI; 0.6-3.1%], and blindness in 2 (0.04%) [95% CI; 0.01-1.7%] children (Figure 1).

The visual acuity was significantly related to the ages of participants with higher percentages of VI and UDoVA among participants aged 6-10 years old (p= 0.017*). While there was no significant difference regarding VA data between both genders (Table1). Interestingly, about one-third of cases who were fully corrected were females aged over 10 years (Table 2).

In the current study, refractive error (RE) was the most common eye morbidity diagnosed in 167cases (40.7%) followed by strabismus in 28 cases (6.8%) and amblyopia in 10 cases (2.4%) (Table 3). Refractive error was also found to be the commonest correctable cause of unilateral VI [24 cases (57.1%)] (Figure 2). Also, RE, strabismus, and amblyopia were the leading causes of diminished VA in cases of VI and UDoVA (Figure 2 and 3). The current study also showed that RE was the primary cause of reduced vision in 122 (82.4%) fully corrected cases (Figure 4).

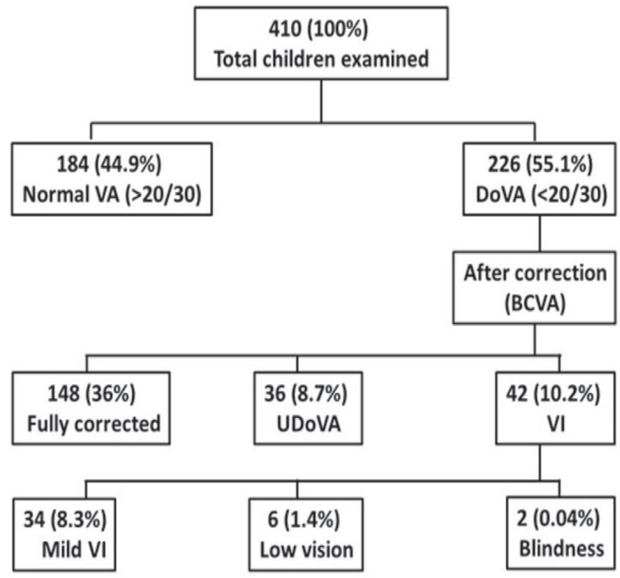

Figure 1. VA Data of the participants

BCVA: Best corrected visual acuity; DoVA: Diminution of visual acuity; UDoVA: Unilateral diminution of visual acuity; VA: Visual acuity; VI: Visual impairment

Table 1. Results of VA after correction (BCVA) in relation to ages and genders.

Groups	N (%) [95%CI]	Gender		p-value	Ages		p-value
		Male	Females		6-10 years	11-16 years	
VI	42(10.2) [7.6-13.5%]	20 (4.9%)	22 (5.3%)		29 (7%)	13 (3.2%)	
UDoVA	36 (8.8) [6.4-11.9%]	24 (5.8%)	12 (2.9%)		22 (5.4%)	14 (3.4%)	
Corrected	148(36.1) [31.6-40.8%]	70 (17%)	78 (19%)	0.102 6.197, 3	67 (16.3%)	81 (19.7%)	0.017* 10.22, 3
Normal	184(44.9) [40.1-49.7%]	81 (19.7%)	103 (25%)		85 (20.7%)	99 (24%)	
Totals	410 (100%)	195 (47.5%)	215 (52.4%)		203 (49.5%)	207 (50.5%)	

BCVA: Best corrected visual acuity; CI: Confidence interval; N: Number; UDoVA: Unilateral diminution of visual acuity; VA: Visual acuity; VI: Visual impairment

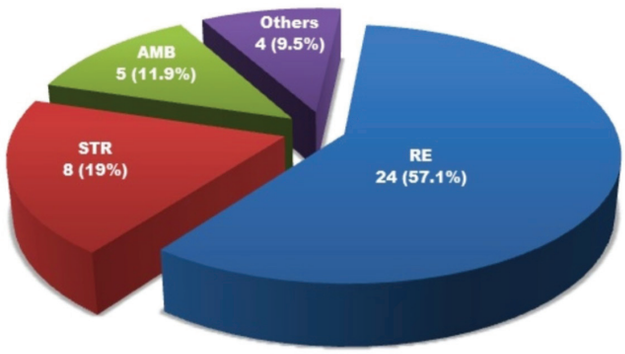

Figure 2. Causes of visual impairment (VI).

AMB: Amblyopia; RE: Refractive error; STR: Strabismus

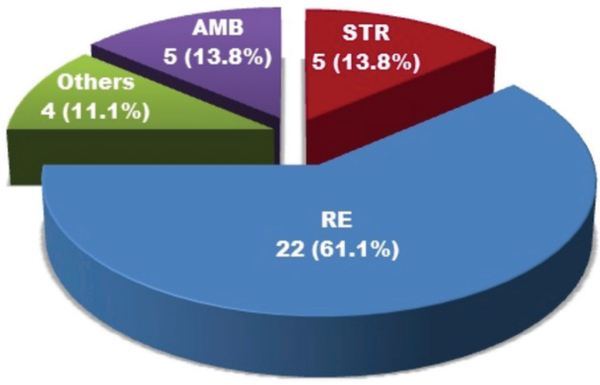

Figure 3. Causes of unilateral diminution of visual acuity (UDoVA).

AMB: Amblyopia; RE: Refractive error; STR: Strabismus

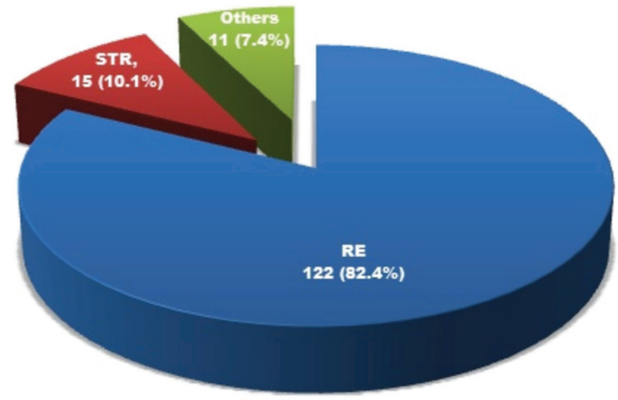

Figure 4. Causes in fully corrected cases.

RE: Refractive error; STR: Strabismus

Table 2. BCVA data in genders of studied children in relation to their ages.

Groups	Age	Totals	Gender		p-value	Totals
			Males	Females		
VI	6 -10 y	29 (69%)	14 (33.3%)	15 (35.7%)	1	42 (100%)
	11-16 y	13 (31%)	6 (14.3%)	7 (16.7%)		
UDoVA	6-10 y	22 (61.1%)	14 (38.9%)	8 (22.2%)	0.727	36 (100%)
	11-16 y	14 (38.9%)	10 (27.7%)	4 (11.1%)		
Corrected	6 -10 y	73 (49.3)	41 (27.7%)	32 (21.6%)	0.047*	148 (100%)
	11-16 y	75 (50.7%)	29 (15.8%)	46 (31%)		
Normal	6 -10 y	85 (31.5%)	38 (20.6%)	47 (25.5%)	0.882	184 (100%)
	11-16 y	99 (66.9%)	43 (23.4%)	56 (30.4%)		

BCVA: Best corrected visual acuity; UDoVA: Unilateral diminution of visual acuity; VI: Visual impairment

Table 3. Pattern and frequency of eye morbidities in the studied children.

Eye disease	Number of children (%)
Amblyopia	10 (2.4%)
Cataract	2 (0.4%)
Corneal opacity	8 (1.9%)
Keratoconus	3 (0.7%)
Optic atrophy	1 (0.2%)
Ptosis	2 (0.4%)
Refractive error	167 (40.7%)
Strabismus	28 (6.8%)
Trauma	3 (0.7%)
Vernal keratoconjunctivitis	2 (0.4%)

Discussion

This is the first study to estimate the prevalence of VI in Saudi children of Arar city. Four hundred and ten children were enrolled in the study. Based on WHO classification considering the BCVA, 10.2% of cases were diagnosed as VI and 8.7% of participants suffered UDoVA. Cases of VI were further classified into mild VI in 34 (8.3%) [95% CI; 5.9-11.3%], low vision in 6 (1.4%) [95% CI; 0.6-3.1%] and blindness in 2 (0.04%) [95% CI; 0.01-1.7%] children. VI and UDoVA were more prevalent among participants aged between 6-10 years. Refractive errors were the most common eye morbidity diagnosed in the studied population [167 cases (40.7%)] followed by strabismus [28 cases (6.8%)], and amblyopia [10 cases (2.4%)].

Limited published data are available in Saudi Arabia pertain-

ing to the prevalence VI in children. Most of the studies related to children in Saudi Arabia were focused on blindness and RE. The studies done for VI have considered adolescents, adults and elderly populations in their researches. The prevalence of childhood VI in Arar is 10.2%, which is nearly double the prevalence of VI reported among children in Riyadh (Tabbara et al., 2005) [21]. In nearby countries, a Turkish study revealed about 5% of school children showed 6/9.5 VA (Azizoğlu et al., 2017) [5], while an Egyptian study reported 30% prevalence of VI among children in Sinai cities (Yamamah et al., 2015) [22]. In Pakistan, the prevalence of VI in school children was estimated to be 22% (Awan et al., 2018) [23]. In addition, the prevalence of VI in the present study is about half the prevalence of VI reported in the adult population of Arar (23.5%) (Parrey and Alswelmi 2017) [24]. This difference is logical as VI is known to be more common in older age populations.

Childhood blindness is a major health problem. In 1985, while studying the patients who were blind before the age of 14 years, Tabbara and Badr revealed that 70% of the studied cases were blind before the age of two years [25]. The present data revealed blindness in 0.04% of the studied children. This prevalence is one-fifth of the prevalence reported in a study by Tabbara et al. (2005) in Riyadh [21]. In Lebanon, blindness was 0.6% and that of low vision 3.9% (Mansour et al., 1997) [26], while in Sudan VI was reported as 1.5% in children of traditional Quranic boarding Schools (Mohamed et al., 2017) [27]. These wide variations in the prevalence of VI and blindness may be due to the differences in the quality of eye care services and classification systems applied in these studies.

In the current study, VI was more prevalent among children below 10 years of age. This is in accordance with the high incidence of VI (13%), reported in preschool children of Riyadh (Alsaqr et al. 2017) [7]. This may be due to the delayed diagnosis because of lack of awareness among parents and nursery and primary school teachers in noticing these cases with visual problems, while in elder group, children can detect their visual problems and complain to their families to seek the medical advice. Interestingly, about one-third of cases in the present study who were fully corrected were females above the age of 10 years which means that female children are more careful about their vision or their families are more caring for the female children's visual complaints as they believe that if these complaints are not addressed early, they may need spectacles which is not socially accepted especially for the females.

Refractive error was the most common eye morbidity diagnosed in the studied children [167(40.7%)]. It was present in about 82% of the fully corrected cases and was the primary cause for the VI and UDoVA. The current prevalence of RE is higher than previously reported among children in the kingdom. Prevalence of RE among school children was reported to be around 35% in Western Saudi Arabia (Alrahili et al., 2017) [8] and 32% in Riyadh (Alsaqr et al., 2017) [7]. Lower incidence (26.5%) was reported in Jazan (Darraj et al., 2016) [29] and in Al-Hassa primary school children (13.7%) by Al Wadaani et al., 2012 [17]. Studies in nearby countries revealed 36% prevalence of RE among Sudanese School children (Mohamed et al., 2017) [27], 26% in Egyptian children (Yamamah et al., 2015) [22] and around 17% among Pakistani children (Awan et al., 2018) [23].

Strabismus was the second (6.8%) and amblyopia the third (2.4%) common eye disease among the studied population. The popularity of these both eye diseases among children is in line with other studies. Strabismus was reported to be the most common eye disease among children in Jazan (36.9%) [30]. Amblyopia was shown in 3.9% of the studied children in Qassim province (Aldebasi, 2015) [19] and in 0.5% of children attending King Abdulaziz Medical City, Riyadh (Al-Rowaily, 2010) [31].

Although the prevalence of VI in children in Arar city is high, a large proportion of the VI is treatable or preventable. These findings are useful for better planning of eye care services for children in this region. Comprehensive screenings targeted for the causes of VI should be more strengthened as a part of the school health program to minimize the load of VI caused by the refractive error and also to detect and timely treat the causes leading to amblyopia. We recommend that these screenings should be conducted not only at the preschool or upon school entry levels but also periodically during the school going years.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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