Systematic review and meta-analysis of childhood visual impairment in the Eastern Mediterranean Region

Saif Alrasheed[1,2]

[1]Department of Optometry, College of Applied Medical Sciences, Qassim University, Buraydah, Qassim, Saudi Arabia (Correspondence to S.H. Alrasheed: s.rasheed@qu.edu.sa). [2]Faculty of Optometry and Visual Sciences, Department of Binocular vision Al-Neelain University, Khartoum, Sudan.

Abstract

Background: Childhood visual impairment has a significant effect on social life, educational performance, and professional choices, and can lead to poverty.

Aims: To review the prevalence and causes of visual impairment among children aged 5–17 years in the Eastern Mediterranean Region (EMR).

Methods: This study was conducted in 2021 using the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) method. We searched Google Scholar, PubMed, Web of Science, Scopus, Index Medicus for the Eastern Mediterranean Region, and Medline for studies published between January 2000 and April 2020. The articles included were epidemiological studies of prevalence and causes of childhood visual impairment published in peer-reviewed journals.

Results: Of the 12 705 articles screened, 23 from 9 countries met the inclusion criteria. The pooled prevalence of uncorrected, presenting, and best-corrected childhood visual impairment was 11.57%, 8.34% and 1.21%, respectively. The most common causes of childhood visual impairment were refractive error (51.89%), amblyopia (11.15%), retinal disorders (3.90%), corneal opacity (3.0%), and cataract (1.88%). There was a highly significant heterogeneity between the studies ($P < 0.0001$).

Conclusion: The prevalence of visual impairment among children in the EMR was high, and the leading causes were uncorrected refractive error and amblyopia, which were avoidable. Access to eyecare services may help improve early diagnosis and treatment of preventable causes of childhood visual impairment.

Keywords: childhood visual impairment, refractive error, amblyopia, corneal opacity, retinal disorders

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Introduction

Visual impairment is defined as significant limitation of visual functions, such as visual acuity, contrast sensitivity, visual field, colour vision, and dark adaptation, resulting from disease, trauma, or congenital or degenerative conditions that can be treated or not (*1,2*). Visual impairment ranges in severity from mild visual loss to total absence of light perception (*3,4*). According to the International Classification of Diseases 11th revision, 2018, mild visual impairment is defined as visual acuity worse than 6/12 to 6/18 of the best-corrected eye; moderate visual impairment is visual acuity worse than 6/18 to 6/60; severe visual impairment is defined as visual acuity worse than 6/60 to 3/60; and blindness is defined as visual acuity worse than 3/60 in the better eye with the best correction possible (*3*). In 2020, an estimated 596 million people worldwide had visual impairment; 43.3 million were blind, and most of those affected (90%) lived in poor countries (*5*). Most causes of visual impairment are avoidable or treatable with highly cost-effective interventions (*5,6*). The latest prevalence figures for 2020 estimated that visual impairment resulted in annual global productivity loss of US$410.7 billion (*5*).

Universal estimations show that there are ~19 million children worldwide with visual impairment; 1.4 million are blind, 17.5 million have low vision, and most are in poor countries (*6*). The Lancet Commission Report on Global Eye Health predicted that the prevalence of childhood blindness would be 1.02 million by 2020; representing a global prevalence of 4.8 per 10 000 children (*5*). Visual impairment has a significant negative impact on the lifespan of children, with an estimated 60% dying within 1 year of becoming blind from preventable or treatable causes (*7,8*).

A recent estimation revealed that the leading causes of blindness globally were cataract in 15.2 million cases, followed by glaucoma in 3.6 million, uncorrected refractive error in 2.3 million, age-related macular degeneration in 1.8 million, and diabetic retinopathy in 0.86 million. However, the leading causes of mild visual impairment were uncorrected refractive error in 86.1 million cases and cataract in 78.8 million (*1*). Globally, it is estimated that 90% of paediatric visual impairment is treatable by early intervention at primary, secondary, and tertiary levels of eye care (*1,9*). The condition affects academic performance, career choice, and social life, with defective near vision affecting the ability to perform

various tasks that involve reading and writing (*10*,*11*). Timely detection and effective treatment of underlying causes at the sensitive period of visual development are important for preventing childhood visual impairment (*12*,*13*).

In 2010, the estimated prevalence of visual impairment, blindness, and low vision in the World Health Organization Eastern Mediterranean Region (EMR) was 8.2%, 12.5%, and 7.6%, respectively (*14*). Khandekar et al. reported that ~238 500 children with bilateral blindness were found in the EMR in 2012 (*13*). Accurate information on the prevalence and causes of childhood visual impairment could lead to the development of a systematic eye care plan for early detection and successful treatment of possible causes (*15*). Therefore, the purpose of this systemic review and meta-analysis was to assess the prevalence and causes of childhood visual impairment in the EMR.

Methods

Search strategy and selection criteria

The study was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (*16*). We searched Google Scholar, PubMed, Web of Science, Scopus, Index Medicus for the Eastern Mediterranean Region, and Medline for studies published between January 2000 and April 2020 that assessed the prevalence and causes of childhood visual impairment in the EMR. The search keywords were: (prevalence OR incidence OR rate OR frequency OR proportion OR epidemiology OR distribution) OR (major risk OR influencing factors) OR (cause OR reasons) OR (effect OR impact) and childhood visual impairment (paediatric visual impairment OR childhood low vision OR paediatric low vison). We also searched for 21 countries in the EMR: Afghanistan, Bahrain, Djibouti, Egypt, Islamic Republic of Iran, Iraq, Jordan, Kuwait Lebanon, Libya, Morocco, Oman, Palestine, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, and United Arab Emirates. The review was restricted to articles published in the English language and in peer-reviewed journals. Only epidemiological studies that reported the prevalence and causes of visual impairment among children aged 5–17 years were included. Articles were excluded if the research was not conducted in the EMR, or if they did not assess the prevalence and causes of childhood visual impairment. The study also excluded meeting abstracts, editorial discussions, conference papers, and studies without basic data collection.

Data extraction

The title and abstract of each article were evaluated by the reviewer, and data such as the first author's name, publication date, study location (country), and participants' characteristics (age and sample size) were extracted. In each study, patients with visual acuity ≤ 6/12 were used to calculate the pooled prevalence of uncorrected, presenting, and best-corrected visual impairment, and the causes of childhood visual impairment were determined. We used the threshold definition of the International Classification of Diseases 10th revision, H54 for prevalence and cause of childhood visual impairment: (1) uncorrected visual impairment, defined as visual acuity ≤ 6/12 in the better eye without refractive correction (to assess the extent of visual impairment caused by uncorrected refractive errors); (2) presenting visual impairment, defined as visual acuity ≤ 6/12 in the better eye, obtained with currently available refractive correction; and (3) best-corrected visual impairment, defined as visual acuity ≤ 6/12 in the better eye, obtained with the best-possible refractive correction.

Data analysis

The data from the included studies were entered separately in a predesigned format that recorded information about the first author's name, country of study, date of publication, mean age, sample size, number of children with visual impairment, and different causes of childhood visual impairment. After extraction, all related data were entered into Microsoft Excel for compilation. The data were analysed with MedCalc version 19.6.1 (MedCalc Software, Mariakerke, Belgium). Heterogeneity among studies was assessed using Q statistics that were distributed as χ^2 under the assumption of homogeneity of effect sizes and I^2 values of 0–75%, which represented none to high heterogeneity. The overall pooled prevalence of uncorrected, presenting, best-corrected, and causes of childhood visual impairment was estimated using a random-effect model. $P < 0.05$ was considered statistically significant.

Results

Study characteristics

We identified 12 711 articles (Figure 1). After excluding duplicate studies, we reviewed the titles or abstracts of 6457 articles. Then, we excluded 6350 articles after reading their abstracts because they did not meet the inclusion criteria, and we excluded 84 articles after reading their full texts because the required data could not be extracted. The final meta-analysis included 23 articles from 9 countries (Table 1). Publication years were 2007–2020, and the overall sample size of the studies was 63 814 children with a mean age of 10.03 (1.96) years. The visual acuity threshold for the definition of childhood visual impairment varied from < 6/9 to < 6/18.

Prevalence of childhood visual impairment

The pooled prevalence of uncorrected visual impairment among children using the random-effect model was 11.57% [95% confidence interval (CI): 8.37–15.33%, Q = 2759.9, I^2 = 99.35%] (Table 2). Heterogeneity between studies showed a highly significant difference ($P < 0.0001$). The overall pooled prevalence of presenting visual impairment was 8.34% (95% CI: 5.32–11.95%, Q = 3333.7, I^2 = 99.46%). Heterogeneity between studies showed a highly significant difference ($P < 0.0001$). Pooled prevalence

Figure 1 Flowchart for identification of articles used in this study.

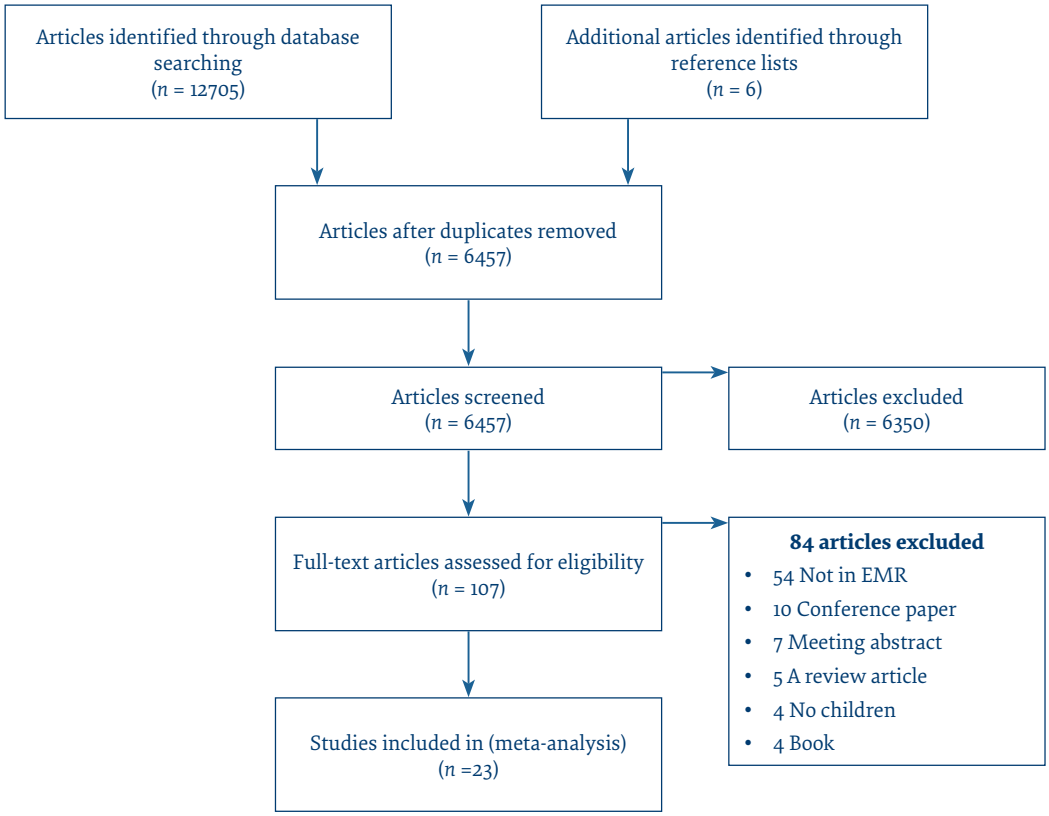

Table 1 Studies reporting the prevalence of childhood visual impairment across the Eastern Mediterranean Region

Study	Country	Mean age (SD), yr	Sample size	VA threshold	Weight (%)
Aldebasi 2013 (17)	Saudi Arabia (Qassim)	9.5 (1.8)	5176	≤6/12	8.11
Alghamdi 2020 (18)	Saudi Arabia (Qassim)	9.2 (1.9)	417	≤6/9	0.65
Alsaqr et al. 2017 (19)	Saudi Arabia (Riyadh)	4.5 (0.9)	335	≤6/9	0.52
Alrahili et al. 2015 (20)	Saudi Arabia (western)	6.2 (1.9)	1893	≤6/12	2.97
Al Wadaani et al. 2012 (21)	Saudi Arabia (Eastern)	9.4 (2.3)	2246	≤6/12	3.52
Alrasheed et al. 2016 (22)	Sudan (Darfur)	10.8 (2.8)	1678	≤6/12	2.63
Mohamed et al. 2017 (23)	Sudan (Al-Gazira	12.4 (1.9)	822	≤6/12	1.29
Zeidan et al. 2007 (24)	Sudan (Khartoum)	11.8 (1.8)	29 048	≤6/18	45.52
Arafa et al. 2018 (25)	Egypt (Beni-Suef)	12.8 (0.7)	469	<6/9	0.73
Yamamah et al. 2010 (26)	Egypt (Sinai)	10.7 (3.1)	2070	≤6/9	3.24
Elmajri 2017 (27)	Libya (Darnah)	9.5 (1.5)	920	≤6/12	1.44
Fotouhi et al. 2007 (28)	Islamic Republic of Iran (Dezful)	12.8 (1.5)	5721	<6/12	8.96
Yekta et al. 2009 29	Islamic Republic of Iran (Shiraz)	10.1 (1.8)	1872	≤6/12	2.93
Razavi et al. 2011 30	Islamic Republic of Iran (Lorestan)	10.2 (1.7)	123	≤6/12	0.20
Jamali et al. 200931	Islamic Republic of Iran (Shahrood)	10.1 (2.1)	815	≤6/12	1.28
Rezvan et al. 201132	Islamic Republic of Iran (Northeastern)	9.1 (2.8)	1551	≤6/12	2.43
Shah et al. 201133	Pakistan (Peshawar)	11 (2.8)	270	≤6/18	0.42
Hameed 2016 34	Pakistan (Kohat)	9.8 (1.8)	1644	<6/12	2.58
Ullah et al. 202035	Pakistan (Lakki)	8.1 (2.3)	2288	< 6/12	3.59
Awan et al. 2018 36	Pakistan (Muzaffarabad)	10.0 (2.8)	725	<6/18	1.14
Jamil et al. 201737	Iraq (Baghdad)	10.0 (1.8)	2104	<6/18	3.30
Awad et al. 201738	Palestine (Gaza)	10.3 (1.8)	423	<6/18	0.66
Abdi et al. 202039	Somalia (Hargesia)	11.2 (2.5)	1204	≤6/12	1.89
Total		10.0 (1.9)	63814		100

VA = visual acuity; SD = standard deviation.

Table 2 Prevalence of childhood visual impairment across the Eastern Mediterranean Region

Study	Country	Uncorrected VI (95% CI)	Presenting VI (95% CI)	Best-corrected VI (95% CI)	Weight (%)
Aldebasi 2013 (17)	Saudi Arabia (Qassim)	16.31 (15.30–17.34)	14.01 (13.07–14.98)	6.11 (5.47–6.79)	8.32
Alghamdi 2020 (18)	Saudi Arabia (Qassim)	18.46 (14.86–22.53)	13.66 (10.52–17.35)	0.00 (0.0–0.88)	0.67
Alsaqr et al. 2017 (19)	Saudi Arabia (Riyadh)	13.73 (10.23–17.89)	12.53 (9.19–16.57)	1.19 (0.33–3.03)	0.54
Alrahili et al. 2015 (20)	Saudi Arabia (western)	34.92 (32.77–37.11)	33.59 (31.47–35.78)	0.0 (0.0–0.20)	3.04
Al Wadaani et al. 2012 (21)	Saudi Arabia (Eastern)	13.71 (12.32–15.21)	4.32 (3.52–5.24)	0.00 (0.0–0.16)	3.61
Alrasheed et al. 2016 (22)	Sudan (Darfur)	6.37 (5.26–7.65)	4.41 (3.48–5.51)	1.13 (0.68–1.77)	2.70
Mohamed et al. 2017 (23)	Sudan (Al-Gazira)	2.55 (1.59–3.88)	2.55 (1.59–3.88)	1.46 (0.76–2.54)	1.32
Zeidan et al. 2007 (24)	Sudan (Khartoum)	7.09 (6.81–7.40)	7.7.40–6.81) 09)	5.50 (5.24–5.77)	46.70
Arafa et al. 2018 (25)	Egypt (Beni-Suef)	22.81 (19.09–26.88)	8.10 (5.80–10.95)	0.0 (0.0–0.78)	0.76
Yamamah et al. 2010 (26)	Egypt (Sinai)	29.42 (27.46–31.44)	29.42 (27.46–31.44)	4.87 (3.99–5.90)	3.33
Elmajri 201727	Libya (Darnah)	11.63 (9.63–13.88)	11.63 (9.63–13.88)	1.08 (0.52–1.99)	1.48
Fotouhi et al. 2007 (28)	Islamic Republic of Iran (Dezful)	3.79 (3.31–4.32)	1.69 (1.38–2.07)	0.29 (0.17–0.48)	9.20
Yekta et al. 2009 (29)	Islamic Republic of Iran (Shiraz)	6.46 (5.39–7.67)	1.49 (1.0–2.155)	0.91 (0.53–1.45)	3.01
Rezvan et al. 2011 (32)	Islamic Republic of Iran (Northeastern)	2.19 (1.52–3.05)	1.03 (0.59–1.67)	0.19 (0.04–0.56)	2.50
Hameed 2016 (34)	Pakistan (Kohat)	10.71 (9.25–12.30)	10.71 (9.25–12.30)	2.49 (1.80–3.37)	2.64
Ullah et al. 2020 (35)	Pakistan (Lakki)	4.02 (3.80–5.58)	4.02 (3.25–4.91)	2.12.82–1.59) 4)	3.68
Awan et al. 2018 (36)	Pakistan (Muzaffarabad)	21.93 (18.97–25.12)	21.925.12–18.97) 3)	2.35 (1.37–3.73)	1.17
Jamil et al. 2017 (37)	Iraq (Baghdad)	5.42 (4.49–6.47)	0.90 (0.55–1.41)	0.90 (0.55–1.41)	3.38
Abdi et al. 2020 (39)	Somalia (Hargesia)	13.62 (11.73–15.69)	7.54 (6.20–9.29)	0.75 (0.34–1.41)	1.94
All		11.57 (8.37–15.33)	8.34 (5.32–11.95)	1.21 (0.44–2.34)	100.00
Heterogeneity between groups		$P < 0.0001$	$P < 0.0001$	$P < 0.0001$	
I^2 (inconsistency)		99.4 (99.25–99.44)	99.5 (99.38–99.53)	98.9 (98.8–99.12)	

CI = confidence interval; VI = visual impairment.

of best-corrected visual impairment was 1.21% (95% CI: 0.44–2.34%, Q = 1736.6, I^2 = 98.96%). Heterogeneity between studies showed a highly significant difference ($P < 0.0001$).

Causes of childhood visual impairment

We assessed the causes of childhood visual impairment (Table 3). Refractive error was the main cause with a pooled proportion of 51.89% (95% CI: 20.39–82.56%). The pooled proportion of amblyopia was 11.15% (95% CI: 5.24–18.91%), retinal disorder 3.90% (95% CI: 1.49–7.40%), corneal opacity 3.0% (95% CI: 0.0–11.49%), and cataract 1.88% (95% CI: 0.27–4.91%). The pooled prevalence of other causes of childhood visual impairment was 11.3% (95% CI: 3.49–22.82%). Heterogeneity between studies showed a highly significant difference ($P < 0.0001$).

Discussion

The prevalence of childhood visual impairment varies between countries and is influenced by socioeconomic status and childhood mortality rate. Posterior eye lesions are the leading causes of childhood visual impairment in developed countries, whereas corneal scarring caused by measles and vitamin A deficiency, and uncorrected refractive error are the main causes in less developed countries (40). This review attempted to provide information about the prevalence and causes of childhood visual impairment in the EMR. The pooled prevalence of uncorrected, presenting, and best-corrected childhood visual impairment was 11.57%, 8.34%, and 1.21%, respectively. Refractive error was the main cause (51.89%), followed by amblyopia (11.15%), retinal disorder (3.9%), corneal opacity (3.0%), and cataract (1.88%). There was high heterogeneity among reported estimates for each of these disorders, which showed a highly significant difference (P < 0.0001). These differences may explain the heterogeneity in childhood visual impairment observed among the countries in the EMR.

Our results revealed that the prevalence of presenting childhood visual impairment was 8.3% lower than that reported globally for children around the same age (18.9%) (14). The prevalence of childhood visual impairment was comparable with the estimation for all ages in 6 WHO regions, which was 9.2%, 9.3%, 8.2%, 9.9%, 9.8%, and 5.2% in the African Region, Region of the Americas, EMR, European Region, South-East Asia Region, and Western Pacific Region, respectively (14). We found that the prevalence of uncorrected visual impairment was 11.57% when tested without correction, which was reduced to 8.34% with presenting correction, and only 1.21% with best

Table 3 Causes of childhood visual impairment across the Eastern Mediterranean Region

Study	Country	Refractive error (95% CI)	Amblyopia (95% CI)	Corneal opacity (95% CI)	Cataract (95% CI)	Retinal disorder (95% CI)	Other causes (95% CI)
Aldebasi 2013 (17)	Saudi Arabia (Qassim)	93.96 (92.13–95.47)	5.68(4.22–7.47)	0.00 (0.0–0.44)	0.0 (0.0–0.44)	0.12 (0.0–0.66)	0.36 (0.07–1.04)
Alrasheed 2016 (22)	Sudan (Darfur)	57.01 (47.08–66.54)	5.60 (2.09–11.81)	0.94 (0.02–5.10)	3.74 (1.03–9.30)	13.08 (7.34–20.98)	19.63 (12.61–28.4)
Mohamed 2017 (23)	Sudan (Al-Gazira)	38.09 (18.12–61.57)	4.76 (0.12–23.82)	19.0541.91–5.45))	23.81 (8.2–47.2)	9.52 (1.18–30.38)	9.52 (1.18–30.38)
Zeidan et al. 2007 (24)	Sudan (Khartoum)	0.0 (0.0–0.19)	32.49 (30.5–34.56)	40.01 (37.89–42.13)	12.51 (11.11–14.02)	7.52 (6.42–8.74)	7.52 (6.42– 8.74)
Yamamah 2010 (26)	Egypt (Sinai)	90.31 (87.68–92.54)	2.79 4.43–1.63))	0.0 (0.0–0.60)	0.33 (0.04–1.18)	0.33 (0.04–1.18)	6.08 (4.31–8.28)
Elmajri 2017 (27)	Libya (Darnah)	90.6595.4–83.48))	8.41 (3.92–15.37)	0.94 (0.02–5.10)	0.0 (0.0–3.39)	0.0 (0.0– 3.39)	0.0 (0.0–3.34)
Razavi et el 2011 (30)	Islamic Republic of Iran (Lorestan)	0.0 (0.0–12.77)	0.0 (0.0–12.77)	0.0 (0.0–12.77)	0.0 (0.0–12.77)	44.44 (25.48–64.67)	66.67 (46.11–83.52)
Jamali et al. 2009 (31)	Islamic Republic of Iran (Shahrood)	62.06 (42.26–79.31)	37.9357.74–20.7))	0.0 (0.0–11.94)	0.0 (0.0–11.94)	0.0 (0.0–11.94)	0.0 (0.0–11.94)
Shah et al. 2011 (33)	Pakistan (Peshawar)	11.11 (7.62–15.48)	3.706.71–1.79))	2.22 (0.82–4.77)	2.96 (1.29–5.76)	10.0 (6.69–14.22)	67.41 (61.52–73.03)
Hameed 2016 (34)	Pakistan (Kohat)	76.7082.70–69.75))	15.9022.17–10.80))	1.71 (0.35–4.90)	0.0 (0.0–2.07)	2.27 (0.62–5.72)	3.41 (1.26–7.27)
Ullah et al. 2020 (34)	Pakistan (Lakki)	52.83 (42.89–62.60)	35.84 (26.80–45.75)	7.55 (3.32–14.33)	0.0 (0.0–3.42)	2.83 (0.58–8.05)	0.0 (0.0–3.42)
Awan et al. 2018 (36)	Pakistan (Muzaffarabad)	89.3093.6–83.43))	6.91 (3.50–12.04)	1.89 (0.39–5.42)	1.26 (0.15–4.47)	0.0 (0.0–2.29)	0.63 (0.02–3.45)
Jamil et al. 2017 (37)	Iraq (Baghdad)	83.33 (75.20–89.6)	0.0 (0.0–3.18)	0.0 (0.0–3.18)	0.0 (0.0–3.18)	0.0 (0.0– 3.18)	16.67 (10.33–24.85)
Awad et al. 2017 (38)	Palestine (Gaza)	0.0 (0.0–0.87)	18.44 (14.90– 22.51)	1.89 (0.82–3.69)	3.78 (2.18–6.07)	13.0 (9.95–16.59)	62.88 (58.13–67.51)
Abdi et al. 2020 (39)	Somalia (Hargesia)	76.8283.05–69.61))	21.9529.07–15.87))	0.61 (0.02–3.35)	0.61 (0.02– 3.35)	0.0 (0.0–2.22)	0.0 (0.0–2.22)
All		51.89 (20.39–82.56)	11.15 (5.24–18.91)	3.0 (0.0–11.49)	1.88 (0.27– 4.91)	3.90 (1.49–7.40)	11.31 (3.49–22.82)
Heterogeneity between groups		P < 0.0001	P < 0.0001	P < 0.0001	P < 0.0001	P < 0.0001	P < 0.0001
I2 (inconsistency)		99.8 (99.79–99.83)	98.1 (97.62–98.51)	99.30 (99.11–99.37)	96.90 (95.90–97.62)	96.0 (94.60–97.01)	99.10 (98.92–99.23)

CI = confidence interval.

correction of the refractive error. These findings indicate that childhood visual impairment can be improved by correction of refractive error, which agrees with previous studies conducted among children in different countries with various environments and ethnic groups (*41–42*).

In our meta-analysis, uncorrected refractive error was the leading cause of childhood visual impairment and was responsible for 51.89% of cases. This was lower than in countries outside the study region, such as Ethiopia (77.3%) (*43*), India (77%) (*44*), and Malaysia (87.0%) (*45*). However, some studies within the EMR showed a high percentage of childhood visual impairment caused by uncorrected refractive error, such as Saudi Arabia (94.0%) (*17*), Libya (90.7%), and Pakistan (89.3%) (*26*). Our analysis showed a wide variation in the prevalence and causes of childhood visual impairment, which reflected the heterogeneity among the studies. This could have resulted from racial and environmental diversity, as well as poor accessibility, availability, affordability, and awareness of paediatric eye care services in some countries. The high proportion of cases of childhood visual impairment resulting from uncorrected refractive error may have been related to the recent increase in myopia caused by young people spending a lot of time studying and reading, and more recently, increased use of smart devices. This agreed with Morgan and Rose (*46*), who reported convincing evidence for the rapid, environmentally induced change in the prevalence of refractive error associated with increased education and urbanization. Geographical distribution was considered a risk factor for the development of childhood refractive errors. The second most frequent cause of childhood visual impairment in the EMR overall was amblyopia (11.15%), with higher levels in Somalia (22.0%) (*39*), Sudan (32.5%) (*24*), and Pakistan (35.8%) (*35*). This could have resulted from the high rate of poverty and illiteracy, as well as poor accessibility to paediatric eye care services and the absence of annual school visual examinations. We found that corneal opacity was responsible for 3.0% of the cases of childhood visual impairment in the EMR. This may have been associated with the low prevalence of active trachoma in the EMR, or with implementation of a strategy for the prevention of avoidable childhood visual impairment. Corneal opacity caused by trachomatous trichiasis was reported as the cause of 3.0% of cases of visual impairment in a previous study in Cambodia (*47*).

This study had some limitations. It was a review of articles that had variations in study methods, such as the use of different definitions of visual impairment threshold, and different methods for gathering and analysing data, as well as different sample sizes. Many articles were excluded from the final meta-analysis because they used different methods or different age groups, which reduced the number of articles included and may have affected the accuracy of the estimates. The study estimated the prevalence and causes of childhood visual impairment for both sexes but did not calculate sex differences. There was an unequal geographic distribution of studies included in this review; some countries had several studies, whereas others had no studies about childhood visual impairment, which may have created bias in the final results. Regardless of these limitations, this meta-analysis estimated the overall prevalence and causes of uncorrected, presenting, and best-corrected childhood visual impairment in the EMR, and included different environments and racial groups.

Conclusion

The prevalence of visual impairment among children in the EMR was high, and the leading causes were uncorrected refractive error, amblyopia, and retinal disorders. These causes are avoidable; therefore, access to eye care services may lead to early diagnosis and treatment of preventable causes of childhood visual impairment.

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Analyse systématique et méta-analyse des déficiences visuelles chez les enfants dans la Région de la Méditerranée orientale

Résumé

Contexte : La déficience visuelle chez les enfants a un effet significatif sur la vie sociale, les résultats scolaires et les choix professionnels, et peut mener à la pauvreté.

Objectifs : Examiner la prévalence et les causes des déficiences visuelles chez les enfants âgés de 5 à 17 ans dans la Région de la Méditerranée orientale.

Méthodes : L'étude a été menée en 2021 à l'aide des directives PRISMA (Éléments de notification préférés à des fins d'examens et de méta-analyse systématique). Nous avons recherché les études publiées entre janvier 2000 et avril 2020 dans Google Scholar, PubMed, Web of Science, Scopus, Index Medicus pour la Région de la Méditerranée orientale et Medline. Les articles retenus étaient des études épidémiologiques sur la prévalence et les causes de la déficience visuelle chez les enfants, publiées dans des revues à comité de lecture.

Résultats : Sur les 12 705 articles examinés, 23 provenant de neuf pays répondaient aux critères d'inclusion. La prévalence globale des déficiences visuelles infantiles non corrigées, détectées et les mieux corrigées était respectivement de 11,57 %, 8,34 %, et 1,21 %. Les causes les plus fréquentes de déficience visuelle infantile étaient le

vice de réfraction (51,89 %), l'amblyopie (11,15 %), les troubles de la rétine (3,90 %), l'opacité cornéenne (3,0 %) et la cataracte (1,88 %). L'hétérogénéité entre les études était très significative ($p < 0,0001$).

Conclusion : La prévalence des déficiences visuelles chez les enfants dans la Région de la Méditerranée orientale était élevée et les principales causes étaient le vice de réfraction non corrigé et l'amblyopie, qui auraient pu être évités L'accès aux services de soins oculaires peut contribuer à améliorer le diagnostic et le traitement précoces des causes évitables de déficience visuelle chez l'enfant.

استعراض منهجي وتحليل تَلَوي لضعف البصر في مرحلة الطفولة في إقليم شرق المتوسط

سيف الرشيد

الخلاصة

الخلفية: لضعف البصر في مرحلة الطفولة تأثيرٌ كبيرٌ على الحياة الاجتماعية، والأداء التعليمي، والخيارات المهنية، وقد يؤدي ذلك إلى الفقر.

الأهداف: هدفت هذه الدراسة الى مراجعة معدل انتشار ضعف البصر وأسبابه لدى الأطفال الذين تتراوح أعمارهم بين 5 و17 عامًا في إقليم شرق المتوسط.

طرق البحث: أُجريت الدراسة في عام 2021 باستخدام بنود التبليغ المفضلة للاستعراضات المنهجية والتحليلات التلوية (PRISMA). وبحثنا في كلٍّ من Google Scholar، وPubMed، وWeb of Science، وScopus، والفهرس الطبي لإقليم شرق المتوسط، وقاعدة بيانات مدلاين (Medline)، للاطلاع على الدراسات التي نُشرت في الفترة بين يناير/ كانون الثاني 2000 وأبريل/ نيسان 2020. وشملت المقالات المُدرَجة دراسات وبائية نُشرت في مجلات طبية خاضعة لاستعراض الأقران، عن معدل انتشار ضعف البصر وأسبابه في مرحلة الطفولة.

النتائج: من بين المقالات التي دُرست والبالغ عددها 12705 مقالا استوفت 23 مقالةً من 9 بلدان معايير الإدراج. وقد بلغ معدل الانتشار المُجمَّع لضعف البصر غير المُصحَّح، والماثل، والمُصحَّح على أفضل وجه11.57٪، و8.34٪، و1.21٪، على التوالي. وكانت أكثر الأسباب شيوعًا لضعف البصر في مرحلة الطفولة هي الخطأ الانكساري (51.89٪)، والغمش (11.15٪) واضطرابات الشبكية (3.90٪)، وعتامة القرنية (3.0٪)، والسادّ (1.88٪). وتبيَّنَ وجود تبايُن كبير بين الدراسات (القيمة الاحتمالية < 0.0001).

الاستنتاجات: كان معدل انتشار ضعف البصر مرتفعًا بين الأطفال في إقليم شرق المتوسط، وتمثلت الأسباب الرئيسية وراء ذلك في الخطأ الانكساري، والغمش، اللذين يمكن الوقاية منهما . ومن شأن الحصول على خدمات رعاية العيون أن تُحسِّن التشخيص المبكر وعلاج الأسباب التي يمكن الوقاية منها لضعف البصر في مرحلة الطفولة.

References

1. Steinmetz JD, Bourne RR, Briant PS, Flaxman SR, Taylor HR, Jonas JB, Abdoli AA, Abrha WA, Abualhasan A, Abu-Gharbieh EG, Adal TG. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. Lancet Global Health. 2021 Feb 1;9(2):e144–60. https://doi.org/10.1016/S2214-109X(20)30489-7
2. Ferede AT, Alemu DS, Gudeta AD, Alemu HW, Melese MA. Visual impairment among primary school children in Gondar Town, Northwest Ethiopia. J Ophthalmol. 2020 Aug 22;2020: 6934013. https://doi.org/10.1155/2020/6934013 PMID:32908684
3. Visual impairment and blindness. Fact sheet no. 282. Geneva: World Health Organization; 2014 (http://www.who.int/mediacentre/factsheets/fs282/en/, accessed 12 April 2022).
4. Gilbert CE, Ellwein LB. Prevalence and causes of functional low vision in school-age children: results from standardized population surveys in Asia, Africa, and Latin America. Invest Ophthalmol Vis Sci. 2008 Mar 1;49(3):877–81. https://doi.org/10.1167/iovs.07-0973 PMID:18326706
5. Burton MJ, Ramke J, Marques AP, Bourne RR, Congdon N, Jones I, et al. The Lancet Global Health Commission on global eye health: vision beyond 2020. Lancet Global Health. 2021 Apr 1;9(4):e489–551. https://doi.org/10.1016/ S2214-109X (20)30488-5
6. Bourne R, Steinmetz JD, Flaxman S, Briant PS, Taylor HR, Resnikoff S, et al. Trends in prevalence of blindness and distance and near vision impairment over 30 years: an analysis for the Global Burden of Disease Study. Lancet Global Health. 2021 Feb 1;9(2):e130–43. https://doi.org/10.1016/S2214-109X(20)30425-3
7. Courtright P, Hutchinson AK, Lewallen S. Visual impairment in children in middle-and lower income countries. Arch Dis Child. 2011 Dec 1;96(12):1129–34. https://doi.org/10.1136/archdischild-2011-300093 PMID:21868404
8. Alrasheed SH, Naidoo KS, Clarke-Farr PC, Binnawi KH. Building consensus for the development of child eye care services in South Darfur State in Sudan using the Delphi technique. Afr J Prim Health Care Fam Med. 2018 Oct 24;10(1):1–9. https://doi.org/10.4102/phcfm. v10i1.1767 PMID:30456975
9. Alrasheed SH, Naidoo KS, Clarke-Farr PC. Attitudes and perceptions of Sudanese high-school students and their parents towards spectacle wear. Afr Vision Eye Health. 2018;77(1):a392. https://doi.org/10.4102/aveh.v77i1.392

10. Rahi JS, Cable N, British Childhood Visual Impairment Study Group. Severe visual impairment and blindness in children in the UK. Lancet 2003;362(9393):1359–65. https://doi.org/10.1016/S0140-6736(03)14631-4 PMID:14585637
11. Alrasheed SH, Naidoo KS, Clarke-Farr PC. Childhood eye care services in South Darfur State of Sudan: learner and parent perspectives. Afr Vision Eye Health. 2016;75(1):a315. http://dx.doi.org/10.4102/aveh.v75i1.315
12. Kvarnström G, Jakobsson P, Lennerstrand G. Visual screening of Swedish children: an ophthalmological evaluation. Acta Ophthalmol Scand. 2001 Jun;79(3):240–4. https://doi.org/10.1034/j.1600-0420.2001.790306.x PMID:11401631
13. Khandekar R, Kishore H, Mansu RM, Awan H. The status of childhood blindness and functional low vision in the Eastern Mediterranean region in 2012. Middle East Afr J Ophthalmol. 2014 Oct–Dec;21(4):336–43. https://doi.org/10.4103/0974-9233.142273 PMID:25371641
14. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. Br J
15. Ophthalmol. 2012 May;96(5):614–8. https://doi.org/10.1136/bjophthalmol-2011-300539 PMID:22133988
16. Atowa UC, Hansraj R, Wajuihian SO. Visual problems: a review of prevalence studies on visual impairment in school-age children. Int J Ophthalmol. 2019;12(6):1037–43. https://doi.org/10.18240/ijo.2019.06.25 PMID:31236365
17. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009 Jul 21; 6(7):e1000097. https://doi.org/10.1371/journal.pmed.1000097 PMID:19621072
18. Aldebasi YH. Prevalence of correctable visual impairment in primary school children in Qassim Province, Saudi Arabia. J Optom. 2014 Jul 1;7(3):168–76. https://doi.org/10.1016/j.optom.2014.02.001.
19. Alghamdi W. Refractive errors and binocular anomalies in primary schools in Uyoun Aljawa: a small urban town in Saudi Arabia. Glob J Health Sci. 2020;12(10):116–21. https://doi.org/10.5539/gjhs.v12n10p116.
20. Alsaqr AM, Ghayda'a Ibrahim AA, Fagehi R. Investigating the visual status of preschool children in Riyadh, Saudi Arabia. Middle East Afr J Ophthalmol. 2017 Oct–Dec;24(4):190-94. https://doi.org/10.4103/meajo.MEAJO_123_17 PMID:29422753
21. Alrahili NH, Jadidy ES, Alahmadi BS, Abdula'al MF, Jadidy AS, Alhusaini AA, et al. Prevalence of uncorrected refractive errors among children aged 3-10 years in western Saudi Arabia. Saudi Med J. 2017 Aug;38(8):804–10. https://doi.org/10.15537/smj.2017.8.20412.
22. Al Wadaani FA, Amin TT, Ali A, Khan AR. Prevalence, and pattern of refractive errors among primary school children in Al Hassa, Saudi Arabia. Glob J Health Sci. 2012 Nov 11;5(1):125–34. https://doi.org/10.5539/gjhs.v5n1p125 PMID:23283044
23. Alrasheed SH, Naidoo KS, Clarke-Farr PC. Prevalence of visual impairment and refractive error in school-aged children in South Darfur State of Sudan. Afr Vision Eye Health. 2016;75(1):a355. https://doi.org/10.4102/ aveh. v75i1.355
24. Mohamed ZD, Binnawi KH, Abdu M. Prevalence and causes of childhood blindness and visual impairment in Quranic boarding schools in Al-Gazira state of Sudan. Sudanese J Ophthalmol 2017;9(2):44–9. https://doi.org/10.4103/sjopthal.sjopthal_1_18
25. Zeidan Z, Hashim K, Muhit MA, Gilbert C. Prevalence and causes of childhood blindness in camps for displaced persons in Khartoum: results of a household survey. East Mediterr Health J. 2007 May–Jun;13(3):580–5, 2007. PMID:17687831
26. Arafa AE, Ewis AA, Mahran WM, Mohamed AA, El-Shabrawy EM. Prevalence and risk factors of refractive errors among preparatory school students in Beni-Suef, Egypt. J Public Health. 2019 Feb 6;27(1):43–7. https://doi.org/10.1007/s10389-018-0930-8
27. Yamamah GA, Talaat Abdel Alim AA, Mostafa YS, Ahmed RA, Mahmoud AM. Prevalence of visual impairment and refractive errors in children of South Sinai, Egypt. Ophthalmic Epidemiol. 2015 Jul 4;22(4):246–52. https://doi.org/10.3109/09286586.2015.1056811 PMID:26218107
28. Elmajri KAK (2017) A survey of the prevalence of refractive errors among children in lower primary schools in Darnah City, Libya. Adv Ophthalmol Vis Syst. 2017;7(5):00235. https://doi.org/10.15406/aovs.2017.07.00235.
29. Fotouhi A, Hashemi H, Khabazkhoob M, Mohammad K. The prevalence of refractive errors among schoolchildren in Dezful, Iran. Br J Ophthalmol. 2007 Mar 1;91(3):287–92. https://doi.org/10.1136/bjo.2006.099937 PMID:17035280
30. Yekta A, Fotouhi A, Hashemi H, Dehghani C, Ostadimoghaddam H, Heravian J, et al. Prevalence of refractive errors among schoolchildren in Shiraz, Iran. Clin Exptl Ophthalmol. 2010 Apr;38(3):242–8. https://doi.org/10.1111/j.1442-9071.2010.02247.x PMID:20447119
31. Razavi H, Kuper H, Rezvan F, Amelie K, Mahboobi-Pur H, Oladi MR, et al. Prevalence and causes of severe visual impairment and blindness among children in the lorestan province of Iran, using the key informant method. Ophthalmic Epidemiol. 2010 Mar;17(2):95–102. https://doi.org/10.3109/09286581003624954 PMID:20302431
32. Jamali P, Fotouhi A, Hashemi H, Younesian M, Jafari A. Refractive errors, and amblyopia in children entering school: Shahrood, Iran. Optometry Vis Sci. 2009 Apr;86(4):364–9. https://doi.org/10.1097/OPX.0b013e3181993f42
33. Rezvan F, Khabazkhoob M, Fotouhi A, Hashemi H, Ostadimoghaddam H, Heravian J, et al. Prevalence of refractive errors among school children in Northeastern Iran. Ophthalmic Physiol Opt. 2012 Jan;32(1):25–30. https://doi.org/10.1111/j.1475-1313.2011.00879.x. PMID:22023649
34. Shah M, Khan M, Khan MT, Khan MY, Saeed N. Causes of visual impairment in children with low vision. J Coll Physicians Surg Pak. 2011 Feb 1;21(2):88–92. PMID:21333239
35. Hameed A. Screening for refractive errors and visual impairment among. Rawal Med J. 2016 Oct;41(4):437–40.

36. Ullah F, Mahsood N, Mohyuddin W, Afridi S, ur Rehman Z. Prevalence of refractive error and strabismus in primary school children of Tehsil Lakki Marwat, Khyber Pakhtunkhwa Pakistan. J Gandhara Med Dent Sci. 2020 Jul 22;7(1):11–21. https://doi.org/10.37762/jgmds.7-1.99

37. Awan AR, Jamshed J, Khan MM, Latif Z. Prevalence and causes of visual impairment and blindness among school children in Muzaffarabad, Pakistan. Int J Sci Rep. 2018 Apr;4(4):93–8. https://doi.org/10.18203/issn.2454-2156.IntJSciRep20181393.

38. Jamil NF, Atta BA. Screening for visual impairment among primary school students in Baghdad Al-Karkh. Iraqi J Commun Med. 2017;30(3):136–40.

39. Awad KS, Aljarousha MA, Alasmar AI, Eslayeh AH, Alshaer DY, Elbanna SM. The prevalence and major causes of low vision among children in Gaza strip, Palestine. IUG J Nat Stud. 2017 Mar 14–15. https://journals.iugaza.edu.ps/index.php/IUGNS/article/view/2580

40. Abdi Ahmed Z, Alrasheed SH, Alghamdi W. Prevalence of refractive error and visual impairment among school-age children of Hargesia, Somaliland, Somalia. East Mediterr Health J. 2020 Nov 11;26(11):1362–70. https://doi.org/10.26719/emhj.20.077 PMID:33226104

41. Steinkuller PG, Du L, Gilbert C, Foster A, Collins ML, Coats DK. Childhood blindness. J Am Assoc Pediatr Ophthalmol Strabismus. 1999 Feb 1;3(1):26–32. https://doi.org/10.1016/S1091-8531(99)70091-1.

42. Afarid M, Molavi Vardanjani H, Mahdaviazad H, Alamolhoda M, Farahangiz S. Visual impairment prevalence, causes, and role of healthcare access: a systematic review and meta-analysis in Iran. J Ophthalmol. 2020 Nov 23;2020: Article ID 4710328. https://doi.org/10.1155/2020/4710328.

43. Khoshhal F, Hashemi H, Hooshmand E, Saatchi M, Yekta A, Aghamirsalim M, et al. The prevalence of refractive errors in the Middle East: a systematic review and meta-analysis. Int Ophthalmol. 2020 Jun;40(6):1571–86. https://doi.org/10.1007%2Fs10792-020-01316-5

44. Yared AW, Belaynew WT, Destaye S, Ayanaw T, Zelalem E. Prevalence of refractive errors among school children in Gondar Town, Northwest Ethiopia. Middle East Afr J Ophthalmol. 2012 Oct;19(4):372–6. https://doi.org/10.4103/0974-9233.102742 PMID:23248538

45. Padhye AS, Khandekar R, Dharmadhikari S, Dole K, Gogate P, Deshpande M. Prevalence of uncorrected refractive error and other eye problems among urban and rural school children. Middle East Afr J Ophthalmol. 2009 Apr;16(2):69–74. https://doi.org/10.4103/0974-9233.53864 PMID:20142964

46. Goh PP, Abqariyah Y, Pokharel GP, Ellwein LB. Refractive error and visual impairment in school-age children in Gombak District, Malaysia. Ophthalmology. 2005 Apr 1;112(4):678–85. https://doi.org/10.1016/j.ophtha.2004.10.048 PMID:15808262

47. Morgan I, Rose K. How genetic is school myopia? Prog Retin Eye Res. 2005 Jan 1;24(1):1–38. https://doi.org/10.1016/j.preteyeres.2004.06.004 PMID:15555525

48. Rutzen AR, Ellish NJ, Schwab L, Graham PJ, Pizzarello LD, et al. Blindness and eye disease in Cambodia. Ophthalmic Epidemiol. 2007 Jan 1;14(6):360–6. https://doi.org/10.1080/01658100701436033 PMID:18161609