Cross-sectional Study

Knowledge of and attitude to eye disorders among pediatricians in North Jordan

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ABSTRACT

Purpose: To assess the general knowledge of and attitude to various common eye conditions in children among pediatricians in north Jordan.

Methods: This was a descriptive cross-sectional study. An exploratory questionnaire was developed by the research team to collect the necessary qualitative information.

Results: In total, 48 pediatricians participated in the study. Around two-thirds performed eye examinations in children; however, only 10.4% (n = 5) carried out eye exams routinely as part of every child’s health visit. The most common test done was assessment of red reflex, which was performed by only 60.4% (n = 29) of responders. Almost all participants (95.8%, n = 46) recognized the risk factors for retinopathy of prematurity (ROP). The majority of pediatricians (n = 46, 95.8%) would immediately refer a child with suspected glaucoma to an ophthalmologist. In regard to leukocoria, the majority recognized cataract (n = 38, 79.2%) and retinoblastoma (n = 40, 83.3%) as major causes of this condition. Almost all pediatricians (n = 46, 95.8%) would immediately refer a child with leukocoria to an ophthalmologist. On the subject of refractive errors, only 62.5% (n = 30) of physicians confirmed that refractive errors could occur in children of any age and that they may need glasses. Nonetheless, 70.8% (n = 34) stated that refractive errors could be a cause of squint in children. Amblyopia and underlying central causes of squint were a major concern for most responders with 68.8% (n = 33) and 75% (n = 36), respectively.

Conclusion: Although the knowledge of and attitude to eye disease among pediatricians were at a satisfactory level, the degree of collaboration with ophthalmologists is limited. More workshops need to be held for pediatricians.

1. Introduction

A global and comprehensive approach to evaluating patients in pediatric practice is essential to ensure the proper detection and diagnosis of the various pediatric disease entities, and to promote and maximize the well-being of children. According to the American Academy of Pediatrics, the American Association for Pediatric Ophthalmology and Strabismus, and the American Academy of Ophthalmology, ophthalmic examination should be performed at birth and at all child health visits [1]. Early detection and prompt treatment of ocular disorders in children are important in order to avoid lifelong visual impairment. Accordingly, pediatricians should be able to identify common visual problems and ocular structural abnormalities, notably retinopathy of prematurity (ROP), leukocoria, congenital glaucoma, congenital cataract, refractive errors, amblyopia, strabismus, and red eye.
2. Materials and methods

A descriptive cross-sectional study design was implemented to assess ophthalmic knowledge among pediatricians practicing in Irbid, north Jordan. The research team designed a questionnaire which met the research objective, ensured that respondents fully understood the questions and encouraged respondents to provide accurate, unbiased and complete information. The exploratory questionnaire was divided into two sections; the first section addressed the demographics of the participants; the demographic data included age, sex and years of practice; and the second section addressed the pediatricians’ knowledge of commonly encountered eye pathologies and presentations such as painful red eye, abnormal pupillary reflex, eye deviation, etc. and how it was approached in their daily practice.

The targeted population included pediatric consultants, specialists, and residents practicing in different sectors in northern Jordan. Hard copies of the questionnaires were distributed to the pediatric departments at King Abdullah University Hospital, Princess Rahma Pediatric Hospital and Prince Rashid Ben Al-Hasan Military Hospital. Participation in the study was completely voluntary and anonymous. A total of 48 participants completed the questionnaire (n = 48). Participants were asked to sign a written consent (Appendix 1) with a detailed explanation of the study. All information was treated confidentially and used for academic purposes only. The work was not funded and there was no conflict in interest.

For an overview of the consent and questionnaire, see Appendix 1.

3. Results

A total of 48 doctors participated in the study. The distribution of participants by sociodemographic status, practice duration, working status, working in an institution with an ophthalmology department, and participating in conferences on pediatric eye conditions is demonstrated in Table 1.

In total, 54.2% (n = 26) were female doctors while 45.8% (n = 22) were male doctors with age ranging from 24 to 56 years; mean age was 32.13 years. The mean years in practice as a pediatrician was 5.06 years; 54.2% (n = 26) had an ophthalmology department in their work institute. Despite the importance of basic knowledge among pediatricians with regard to eye diseases in children, the majority (n = 35, 72.9%) reported they had never attended a conference or a workshop concerning issues about various eye conditions in children.

Table 2 shows the distribution of participants by knowledge about causes, signs and symptoms, risk factors, and ways of management of specific eye problems.

In answer to when an ophthalmologist should see a child, most participants (n = 37, 77.1%) knew that a child should be seen by an ophthalmologist for visual screening at least once before entering kindergarten.

Concerning questions about causes of painful red eye in children, 93.8% reported conjunctivitis as a cause, 79.2% reported corneal abrasion, 75% reported uveitis, and 68.8% reported allergy; however, glaucoma was the least mentioned with only 27.1% (n = 13). In terms of management, 41.7% of pediatricians would manage a painful red eye by immediately referring the patient to an ophthalmologist, 12.5% would give eye drops and then immediately refer to an ophthalmologist, while 43.8% would give the patient eye drops and if there was no improvement within 3 days, then they would proceed with referral.

Regarding leukocoria, the majority recognized cataract (n = 38, 79.2%) and retinoblastoma (n = 40, 83.3%) as major causes of this condition. Moreover, 52.1% chose massive retinal disorder as a cause. Only a minority (n = 9, 18.8%) believed that glaucoma could be a cause. In terms of the implications of leukocoria, that it could be sight-threatening was known by 66.7% (n = 32) of participants. Furthermore, only 37.5% (n = 18) of participants reported that it could also be life-threatening, and 10.4% (n = 5) believed that it could be a normal variation among children, which is false. Almost all pediatricians (n = 46, 95.8%) would immediately refer a child with leukocoria to an ophthalmologist, and only 4.2% would do a follow up and if there was no improvement, then they would refer the child.

On the subject of refractive errors, only 62.5% (n = 30) of physicians confirmed that refractive errors could occur in children of any age and that they may need glasses. The rest wrongly believed they did not occur in children (n = 12, 25%) or they did not know (n = 6, 12.5%). In addition, 70.8% stated that refractive errors could be a cause of squint in children. The participants’ answers on signs of a true squint were as follows: 87.5% reported eye deviation, 56.3% reported face turning, and 47.3% reported anomalous head posture. Epicanthal folds and wide nasal bridge were both mentioned by 4.2% of physicians.

Amblyopia and underlying central causes of squint were a major concern for most physicians with 68.8% and 75%, respectively, while cosmetic concern was only mentioned by 20.8%. In relation to management of squint, 83.3% chose surgical repair and 77.1% chose glasses. However, more than half reported that it could also resolve spontaneously. In addition, 60.4% of pediatricians would immediately refer a child with squint to an ophthalmologist and 31.3% would order brain imaging, while 6.3% would follow up with the child and refer if no improvement. Only 2.1% would prescribe eye drops.

Concerning congenital glaucoma and its signs, 64.6% reported hazy cornea, 43.8% reported large cornea and 35.4% reported eye watering. Red eye was chosen by 20.8% and leukocoria by 13.3% of physicians. The majority of pediatricians (n = 46, 95.8%) would immediately refer a child with suspected glaucoma to an ophthalmologist, only 4.2% chose to follow up with the child and refer if there was no improvement. No participant chose to give eye drops for management.

Almost all participants recognized the risk factors for retinopathy of prematurity (ROP) as 95.8% (n = 46) chose birth weight less than 1500 g, gestational age of less than or equal to 32 weeks, and a premature baby with ROP (sib). Concerning ROP, 75% of pediatricians would refer a premature baby for ROP exam 4–6 weeks after birth or at 32 weeks, whichever is later, whereas 20.8% would refer a baby for ROP examination at the time of discharge from the NICU, and 4.2% chose that the ROP examination should be done at birth.

On the topic of pediatric practices in the sample group, around two-thirds performed eye examinations in children; however, 31.3% would perform an eye exam when the child’s care giver reported a problem, and only 10.4% would do the eye exam routinely as part of every child’s
Table 2
Distribution of participants by knowledge about causes, s/s, risk factors, and ways of management for specific eye problems (n = 48).

| Variable | n (%) |
|----------|-------|
| When should an ophthalmologist see a child? | |
| No need if there is no complain | 5 (10.4%) |
| Should have visual screening at least once before going to kindergarten | 37 (77.1%) |
| I do not know | 6 (12.5%) |
| Total | 48 (100%) |
| Which of the following can cause painful red eye disease in children – more than one choice | |
| Conjunctivitis | 45 (93.8%) |
| Allergy | 33 (68.8%) |
| Uveitis | 36 (75%) |
| Corneal abrasion/trauma | 38 (79.2%) |
| Cataract | 3 (6.3%) |
| Glaucoma | 13 (27.1%) |
| Squint | 0 (0%) |
| Which of the following can cause leukoria (white pupil reflex) – more than one choice | |
| Cataract | 38 (79.2%) |
| Glaucoma | 9 (18.8%) |
| Retinoblastoma | 40 (83.3%) |
| Advanced retinal disorder | 25 (52.1%) |
| Leukoria could be – more than one option | |
| Sight-threatening | 32 (66.7%) |
| Life-threatening | 18 (37.5%) |
| Normal variation between children | 5 (10.4%) |
| Children of any age may have refractive errors and may need glasses | |
| True | 30 (62.5%) |
| False | 12 (25%) |
| I do not know | 6 (12.5%) |
| Total | 48 (100%) |
| Refractive errors can cause squint | |
| True | 34 (70.8%) |
| False | 6 (12.5%) |
| I do not know | 8 (16.7%) |
| Total | 48 (100%) |
| Which of the following give a clue that this child may have TRUE squint – more than one choice | |
| Eye deviation | 42 (87.5%) |
| Face turning | 27 (56.3%) |
| Anomalous head posture | 23 (47.9%) |
| Epicanthal folds | 2 (4.2%) |
| Wide nasal bridge | 2 (4.2%) |
| What are the concerns about a child with squint – more than one choice | |
| Cosmetically not acceptable | 10 (20.8%) |
| Amblyopia | 33 (68.8%) |
| Underlying central cause | 36 (75%) |
| Squint can be repaired by – more than one choice | |
| Glasses | 37 (77.1%) |
| Surgical repair | 40 (83.3%) |
| Spontaneously resolving | 28 (58.3%) |
| Which of the following is a sign of congenital glaucoma – more than one choice | |
| Eye watering | 17 (35.4%) |
| Leukoria | |

Table 2 (continued)

| Variable | n (%) |
|----------|-------|
| Large cornea | 16 (33.3%) |
| Hazy cornea | 21 (43.8%) |
| Red eye | 31 (64.6%) |
| Which of the following may be a risk factor for ROP | |
| Birth weight < 1500 g | 1 (2.1%) |
| Gestational age ≤ 32 weeks | 1 (2.1%) |
| Premature baby with comorbidities | 0 (0%) |
| All of the above | 46 (95.8%) |
| Total | 48 (100%) |
| Do you perform eye examinations in children? | |
| Yes | 32 (66.7%) |
| No | 16 (33.3%) |
| Total | 48 (100%) |
| How often do you perform eye examinations? | |
| When caregiver reports child has eye problem | 15 (31.3%) |
| At birth | 9 (18.8%) |
| As a routine part of every child’s exam | 5 (10.4%) |
| Once a year | 2 (4.2%) |
| What test do you do? – more than one choice | |
| Red reflex | 29 (60.4%) |
| Visual acuity | 13 (27.1%) |
| Funduscopic exam | 10 (20.8%) |
| Extraocular muscle motility | 15 (31.3%) |
| If no, why? – more than one choice | |
| Don’t have enough time | 3 (6.3%) |
| No equipment | 6 (12.5%) |
| Don’t know how to | 6 (12.5%) |
| It’s not relevant to my profession | 6 (12.5%) |
| How do you manage a child with painful red eye? | |
| Refer immediately to ophthalmologist | 20 (41.7%) |
| Give eye drops and refer immediately | 6 (12.5%) |
| Give eye drops and if no improvement after 3 days refer to ophthalmologist | 21 (43.8%) |
| Others | 1 (2.1%) |
| Total | 48 (100%) |
| How do you manage a child with leukoria? | |
| Refer immediately to ophthalmologist | 20 (41.7%) |
| Give eye drops and refer immediately | 6 (12.5%) |
| Give eye drops and if no improvement after 3 days refer to ophthalmologist | 21 (43.8%) |
| Others | 1 (2.1%) |
| Total | 48 (100%) |
| How do you manage a child with squint? | |
| Refer immediately to ophthalmologist | 29 (60.4%) |
| Give eye drops | 1 (2.1%) |
| Follow up and if no improvement refer to ophthalmologist | 3 (6.3%) |
| Brain imaging | 15 (31.3%) |
| Others | 0 (0%) |
| Total | 48 (100%) |
| How do you manage a child with congenital glaucoma? | |
| Refer immediately to ophthalmologist | 46 (95.8%) |
| Give eye drops | 0 (0%) |
| Follow up and if no improvement refer to ophthalmologist | 2 (4.2%) |
| Others | 0 (0%) |
| Total | 48 (100%) |

When do you refer a premature baby for ROP screening?

When discharged from NICU | 10 (20.8%) |

At 4-6 weeks after birth or at 32 weeks, whichever is later | 36 (75%) (continued on next page)
knowledge and practices of the Jordanian pediatric body in Irbid, therefore, we decided to conduct this study to assess the ophthalmic health visit. Moreover, 4.2% would do the eye exam once a year and 18.8% would do the examination at birth.

Among our participating physicians, 60.4% assessed red reflex, 35.4% assessed extracocular muscle motility, and 27.1% assessed visual acuity, while 20.8% performed fundoscopic examinations.

The pediatricians who did not perform eye examinations were asked about their reasons, and 18.8% stated that they did not have the necessary equipment, 10.4% did not have sufficient time, 12.5% did not know how to do the examination, and 12.5% believed it was not relevant to their profession.

4. Discussion

It is crucial that common eye conditions in children are properly diagnosed and managed by pediatricians or primary care physicians. Some eye diseases could be sight-threatening or even life-threatening, therefore, we decided to conduct this study to assess the ophthalmic knowledge and practices of the Jordanian pediatric body in Irbid, northern Jordan.

According to the American Academy of Pediatrics, vision screening from birth through adolescence is recommended, with visual acuity testing and binocular screening to begin at 3 years of age [4]. In addition, the American Association for Pediatric Ophthalmology and Strabismus recommends that screening should be at least once from the age of 12–36 months [5]. In our study, 77.1% of pediatricians thought that children should be seen at least once before entering kindergarten, while 10.4% believed that they should be seen only if there was a complaint, and 12.5% did not know when children should be screened. The problem lies in the fact that many of the childhood eye diseases are silent. Also, children may not be able to complain or communicate well about vision problems until later in life. Ophthalmic screening and eye examination are very important in children, therefore, it is highly recommended that the pediatric departments in Jordanian teaching hospitals invest in training their staff accordingly.

Knowledge of the participants in relation to the causes of painful red eye disease was very good. The most common causes reported were conjunctivitis (93.8%) and corneal abrasion/trauma (79.2%), followed by uveitis and allergy. Our results are comparable with a similar study performed in Kenya, where the Kenyan study found that trauma and conjunctivitis were also the most common causes chosen by responders for a painful red eye [6].

Regarding the causes of leukocoria, 83.3% of responders mentioned retinoblastoma, which is a much higher percentage in comparison to a study conducted in Brazil by Manica et al. where retinoblastoma was mentioned by only 37% of responders [7]. Other causes mentioned included cataract (79.2%) and advanced retinal disorder (52.1%). Glaucoma, which is not a cause of leukocoria, was mentioned by 18.8% of responders [8]. The response was very good, as retinoblastoma, the most serious and life-threatening cause, was mentioned by the majority. Furthermore, cataract, which is the most common cause of leukocoria, was also mentioned by the majority of responders. Both eye diseases can cause lifelong visual impairment if not diagnosed and treated promptly; 66.7% of responders stated that retinoblastoma/leukocoria is a sight-threatening disease, while 37.2% stated that it could be life-threatening too. Almost all pediatricians (n = 46, 95.8%) would immediately refer a child with leukocoria to an ophthalmologist. In another study on retinoblastoma awareness in Jordan, only 2% of pediatricians scored a proficiency grade in the questionnaire and only 63% of pediatricians knew that retinoblastoma required urgent management [9].

Concerning the knowledge of refractive errors among children, only 62.5% of our responders knew that children may have refractive errors. However, 70.8% of them admitted that refractive errors are a major cause of squint. In comparison, in the study in the United States which included 576 pediatricians, only 5% assessed red reflex, 92% checked visual acuity, and 65% performed fundus exams [14]. Examinations done by our pediatricians are insufficient compared to our current knowledge. Red reflex is part of the pediatric general examination and when around 40% of pediatricians do not perform it, this will lead to missing many children with certain eye conditions and increase morbidity among them [15–17]. Moreover, one-third (33.3%) of pediatricians in our study did not perform eye exams, attributing this to different causes. For instance, some did not have sufficient time, equipment was unavailable, or they

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### Table 2 (continued)

| Variable | n (%) |
|----------|-------|
| At birth | 2 (4.2%) |
| Total    | 48 (100%) |

NICU, neonatal intensive care unit; ROP, retinopathy of prematurity.
did not know how to do it, and some believed that it was not relevant to their profession.

According to our study, most pediatricians would refer a child with an eye problem to an ophthalmologist. When a child presented with painful red eye, 41.7% would proceed with referral immediately and 43.8% would prescribe eye drops then refer the child. This practice is similar to the practice of general practitioners in the US where 55% prescribed chloramphenicol ointment whenever they faced a patient with allergic or bacterial conjunctivitis, besides blepharitis and meibomian cysts, where all of these conditions may cause a red eye [14].

5. Conclusion

Although the knowledge of and attitude to eye diseases among pediatricians in northern Jordan were at a satisfactory level, the degree of collaboration with ophthalmologists is limited. More workshops need to be held for pediatricians.

Our work was conducted in accordance with STROCSS criteria [18].

Ethical approval

Institutional approval was obtained from the Institutional Review Board at Jordan University of Science and Technology.

Sources of funding

No funding.

Author contribution

All authors contributed significantly and in agreement with the content of the article. All authors were involved in project design, data collection, analysis, statistical analysis, data interpretation and writing the manuscript. All authors presented substantial contributions to the article and participated of correction and final approval of the version to be submitted.

Consent

Informed consent was obtained from each patient.

Registration of research studies

researchregistry6754
https://www.researchregistry.com/browse-the-registry?view_2_search=6754&view_2_page=1.

Guarantor

Laila Ababneh.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jamsu.2021.102430.

References

[1] Committee on Practice and Ambulatory Medicine, Section on Ophthalmology, American association of certified orthoptists, American association for pediatric ophthalmology and strabismus, American Academy of ophthalmology. Eye examination in infants, children, and young adults by pediatricians, Pediatrics 111 (4 Pt 1) (2003) 902–907.
[2] W.M. Fierson, American Academy of pediatrics, section on ophthalmology. American Academy of ophthalmology, American association for pediatric ophthalmology and strabismus, American association of certified orthoptists. Screening examination of premature infants for retinopathy of prematurity, Pediatrics 142 (6) (2018), e20183061.
[3] A. Gharaiheb, M. Khassawneh, W. Khriesat, et al., Adopting western retinopathy of prematurity screening programs in eastern countries, are we screening properly? Middle East Afr. J. Ophthalmol. 18 (3) (2011) 209–213.
[4] T.C. Wall, W. Marsh-Tootle, J.H. Evans, et al., Compliance with vision-screening guidelines among a national sample of pediatricians, Ambul. Pediatr. 2 (6) (2002) 449–455.
[5] American Association for Pediatric Ophthalmology & Strabismus, Vision screening recommendations, Available from: https://aapos.org/members/vision-screening-guidelines.
[6] L.A. Nyanasi, D. Kanyata, L. Njamba, M. Njuguna, Knowledge, attitude and practice on refractive error among students attending public high schools in Nairobi County, J. Ophthalmol. Eastern Central Southern Africa (2016) 36–41.
[7] M. Broilo, Z. Correa, M. Mundialino, et al., What do pediatricians know about children’s eye diseases? Arq. Bras. Oftalmol. 66 (2003) 489–492.
[8] N.M. Girgis, K.A. Frantz, A case of primary congenital glaucoma: a diagnostic dilemma, Optometry 78 (4) (2007) 167–175.
[9] Y. Yousef, T. AlNawaiseh, R. AlJabari, et al., Retinoblastoma awareness among first contact physicians in Jordan, Ophthalmic Genet. 40 (3) (2019) 191–195.
[10] H. Zhu, J.J. Yu, R.B. Yu, et al., Association between childhood strabismus and refractive error in Chinese preschool children, PLoS One 10 (3) (2015), e0120720.
[11] American Academy of Ophthalmology, Basic and Clinical Science Course; Section 6: Pediatric Ophthalmology and Strabismus, 2011-2012.
[12] S.R. Sathiamohanraj, P.K. Shah, D. Seethakkumar, et al., Awareness of retinopathy of prematurity among pediatricians in a tier two city of South India, Oman J. Ophthalmol. 4 (2) (2011) 77–80.
[13] M.T. Akkawi, J.A.S. Qaddumi, H.R.M. Issa, L.J.K. Yaseen, Awareness of retinopathy of prematurity among pediatricians in West Bank, Palestine: a descriptive study, BMC Ophthalmol. 18 (1) (2018) 195.
[14] P.J. McDonnell, How do general practitioners manage eye disease in the community? Br. J. Ophthalmol. 72 (10) (1988) 733–736.
[15] M. Tamura, L. Teixeira, Leukocoria and the red reflex test, Einstein 7 (2009), 902–907.
[16] American Academy of Pediatrics, Section on Ophthalmology, American association for pediatric ophthalmology and strabismus, American Academy of ophthalmology, American association of certified orthoptists. Red reflex examination in neonates, infants, and children, Pediatrics 122 (6) (2008) 1401–1404.
[17] J. Salmon, Kanski’s Clinical Ophthalmology: A Systematic Approach, ninth ed., Elsevier, 2019.
[18] R. Agha, A. Abdalli-Razak, E. Crosley, N. Dowlut, C. Iosifidis, G. Mathew, For the STROCSS group. The STROCSS 2019 guideline: strengthening the reporting of cohort studies in surgery, Int. J. Surg. 72 (2019) 156–165.