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Retinopathy of Prematurity in the Lower-Middle Income Countries of Middle East and North Africa Region

María del Pilar Alfaro-Goldaracena[1], Aeesha NJ Malik[2]

[1]London School of Hygiene and Tropical Medicine, London, United Kingdom & Asociación para Evitar la Ceguera en México, I.A.P. Mexico City, Mexico

[2]International Centre of Eye Health; London School of Hygiene and Tropical Medicine. London, United Kingdom

Corresponding Author:** ***María del Pilar Alfaro-Goldaracena, *London School of Hygiene and Tropical Medicine, London, United Kingdom & Asociación para Evitar la Ceguera en México, I.A.P. Mexico City, Mexico.*

Abstract

Introduction*: Retinopathy of prematurity (ROP) is a growing blinding disease in low and middle-income countries. There is little data on the Middle East and North Africa (MENA) and regional evidence is critical to make locally relevant clinical guidelines. This study aims to systematically review the published literature on ROP in the MENA including the epidemiology, screening, diagnosis, treatment and prognosis.*

Methods*: We searched CENTRAL, MEDLINE, Embase, Global Health, Global Index Medicus, clinical trials databases, and bibliographies of relevant articles from* January 1946 to July 2024. *We included 75 studies from middle-income countries in MENA according to the World Bank Classification (*Algeria, Djibouti, Egypt, Iran, Iraq, Jordan, Libya, Lebanon, Morocco, Tunisia and Palestine).

Results*: There was an overall incidence of ROP of 30% in the region. If international screening guidelines had been followed as opposed to national guidelines then 28% of the newborns needing ROP treatment would have been excluded. Only 59% of NICU pediatricians knew the guidelines. There was data on treatment from only three countries.*

Conclusion*: Although the prevalence of ROP is high, there is a gap in the evidence from most of the middle-income countries in the region. National guidelines based on local evidence are required to avoid missing babies who require treatment. More data is needed to tailor these screening guidelines according to national epidemiology as well as to have local data on the effectiveness, cost-effectiveness, and feasibility of the treatments available in the region.*

1. Introduction

Retinopathy of prematurity (ROP) is one of the leading causes of preventable blindness in children worldwide. The proportion of blindness in a specific region depends on the level of neonatal care, and the availability of appropriate screening and treatment programs.[1] The disease was first described in high-income countries by Terry[2] in 1942 and the first epidemic occurred during the late 1940s and 1950s in Europe and North America primarily due to unmonitored use of supplemental oxygen.

After the regulations on the use of oxygen increased, this "first epidemic" was controlled. Nevertheless, ROP re-emerged as a problem in the 1970s when more premature and smaller babies survived which led to the "second epidemic", also in high-income countries. Nowadays, these highly developed countries have controlled the disease by strict regulation on the use of oxygen and high-quality care within the neonatal intensive care units (NICUs) and it only occurs in very small babies.[3]Beginning in the 1990s there has been an increasing number of cases of ROP in middle-income countries which has led to a "third epidemic". This is caused by the improvement of the care provided in the NICUs but still with suboptimal quality which translates into more preterm babies surviving but with a high risk of developing ROP, even in those who are not very small babies. This epidemic has been spreading from Eastern Europe and Latin America towards East and South Asia, and Africa.[4]According to the systematic review made by Blencowe et al.,[5] in 2010 around 180,000 preterm babies developed ROP and, more importantly, 20,000 of them became blind or severely visually impaired. Most of the latter (65%) were born in middle-income countries.

Tackling children's blindness due to ROP requires effective screening with country-specific tailored guidelines so no baby with ROP is missed, as well as appropriate available treatment. This is why it is crucial to have local evidence of the disease. There are previous reviews about ROP in MENA with epidemiological evidence;[6,7] also with data on African countries but not from those in the Middle East.[8] However, we could not find a systematic review that includes screening, diagnosis, treatment and prognosis information from all the middle-income countries in MENA. A comprehensive review is important to understand the current knowledge and identify gaps in evidence to improve the diagnosis and treatment of babies at risk of ROP.

2. Materials and Methods

2.1. Literature Search

We searched in Medline, and EMBASE databases from January 1st, 1946 to July 23rd, 2024, using the search terms *retinopathy of prematurity, retrolental fibroplasia, ROP,* and the subheadings of all the lower- and upper-middle-income countries in the region of MENA according to the World Bank classification for the 2025 fiscal year *(Algeria, Djibouti, Egypt, Iran, Iraq, Jordan, Libya, Lebanon, Morocco, Tunisia, Gaza or West Bank or Palestine).*[9] The detailed search strategy is described in the **Supplemental Material.**

The selection of the studies was based on the following criteria:

Inclusión Criteria

1) Design: Randomized Controlled Trials (RCT), observational studies (cohort, case-control, cross-sectional, case series); 2) Language: English; 3) Patient population: Premature infants at risk of ROP; 4) Intervention or exposure: screening or diagnostic method; and/or any treatment modality; 5) Outcomes: Incidence of ROP, association or relative risk of risk factors; sensitivity and specificity of screening; staging and severity of disease; prognosis; 6) Follow-up: no restrictions

Exclusion Criteria

Systematic review, case reports

The data extraction was made through a pre-established form that included year of publication, author(s), place, study design, number of participants included (n), demographic and clinical characteristics of the participants, and outcome measures.

Risk of Bias Assessment

The tools used to assess the risk of bias were the Joanna Briggs Institute Critical Appraisal Checklist for Observational Studies,[10] and the Critical Appraisal Skills Programme (CASP) Checklist for Randomised Controlled Trials, Clinical Prediction Rule, and Diagnostic Studies,[11] according to the type of study

2.2. Statistical Analysis

We performed a narrative synthesis of the studies, divided into 3 categories: epidemiology; screening and diagnosis; and treatment and prognosis. Stata 18 (Stata Corp 2023, v.18) was used for the meta-analyses of proportions with a random-effects model in the epidemiology section to calculate incidence; and proportion of stages, zones, and type 1 ROP.

3. Results

Studies Included

The study selection procedure is shown in **Figure 1**. The records identified without duplicates were 121 that were screened by title and abstract by the main researchers (MP and AM). In the end, 96 full-text reports were assessed for eligibility, and 75 of them were selected for inclusion in the review

Characteristics of the Studies

Of the 75 studies included, 67 were observational, 5 randomized controlled trials, and 3 studies of diagnostic tests. Forty-seven were from Iran; 18 from Egypt; 3 from Palestine; 3 from Iraq; 3 from Jordan; and 1 was a study from the United Kingdom with external validation in Egypt (among other countries).

The main characteristics of the included studies as well as their overall risk of bias are shown in the **Supplemental Material**

Risk of Bias of the included Studies

Thirty-nine studies were assessed as having a low risk of bias, 22 as moderate, and 14 as high.

The detailed risk of bias assessment can be consulted in the Supplemental Material.

Results of Syntheses

Epidemiology

A total of 46 studies were included in this section: 33 from Iran, 8 from Egypt, 2 from Iraq, 2 from Jordan, and 1 from Palestine. All of them are observational studies. Twenty-one of them have a low, 14 a moderate, and 11 a high risk of bias.

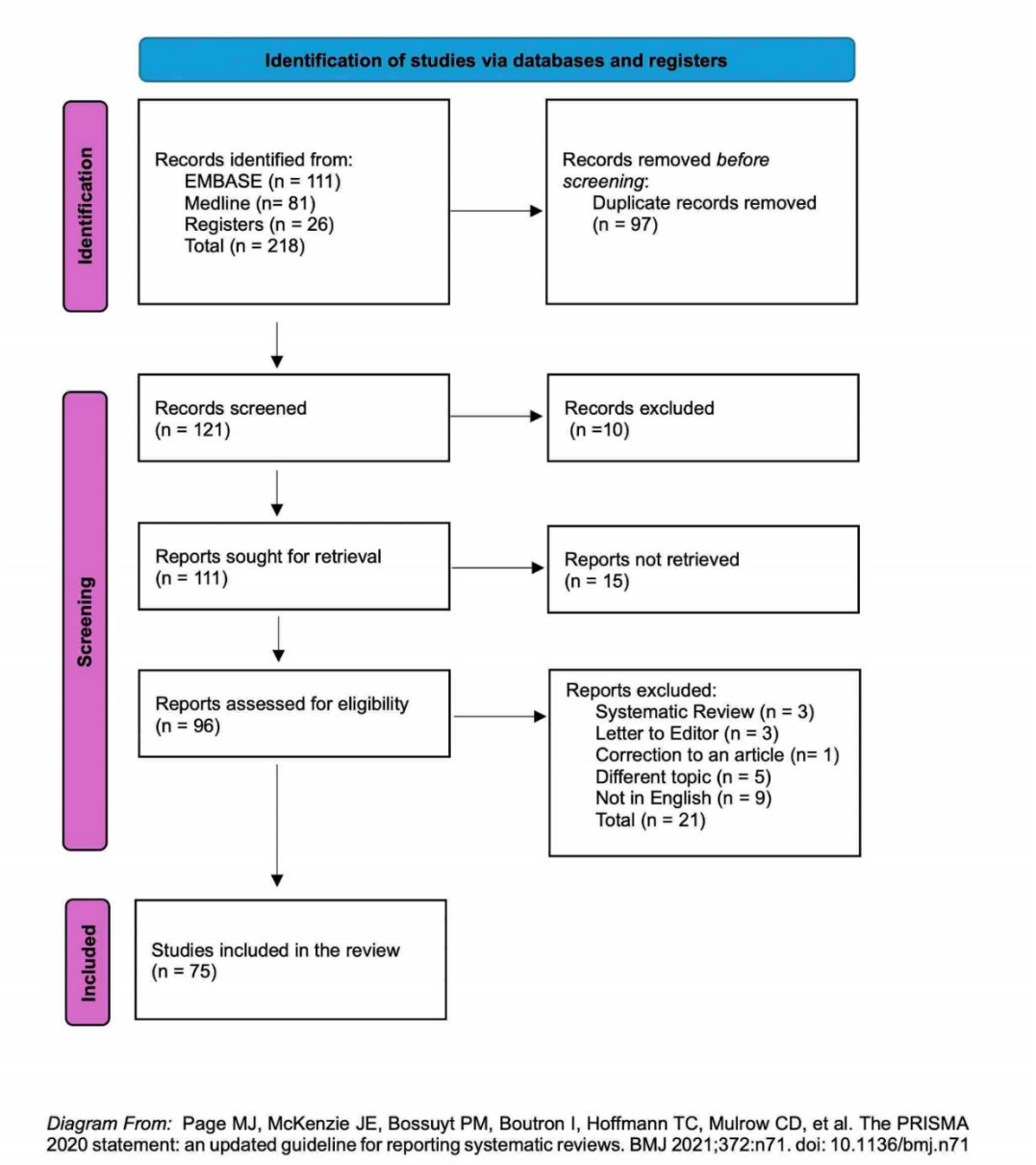

Figure 1. *PRISMA flow diagram of the selected studies*

Incidence

Table 1. *Incidence of ROP by subgroups*

Birth Weight	Studies included and Reference*	N (neonates)	Incidence
< or ≤ 1500 gr	12 studies[1,2,5,8,24,30,31,35, 39-41,45]	1,464	32% (95% CI 22 to 44%)
< or ≤ 2000 gr	10 studies[4,12,17,18,20,22,25,27,32,42]	3,298	30% (95% CI 25 to 36%)
< or ≤ 2500 gr	6 studies[10,15,19,23,34,43]	10,530	27% (95% CI 13 to 48%).
Country			
Iran	24 studies [7-10,12-20,22,23,25,26,31,34,35,39,42,43,45]	18,251	29% (95% CI 23 to 36%).
Egypt	7 studies[1-5,27,30]	1,345	33% (95% CI 23 to 43%).
Iraq	2 studies[40,41]	224	51% (95% CI 20 to 82%).
Palestine	1 study[24]	115	23.5%
Jordan	1 study[32]	91	28.6%
Total**	35 studies [1-5,7-10,12-20,22-27,30-32,34,35,39-43,45]	20,026	30% (95% CI 25 to 36%)

Thirty-five observational studies (n= 20,026 neonates) presented the incidence of ROP using different birth weights (BW) and gestational age (GA) thresholds. The overall incidence reported

by these studies is 30% (95% CI 25 to 36%) (**Figure 2**). We have also done sub-analyses according to the BWs and by country as shown in **Table 1**.

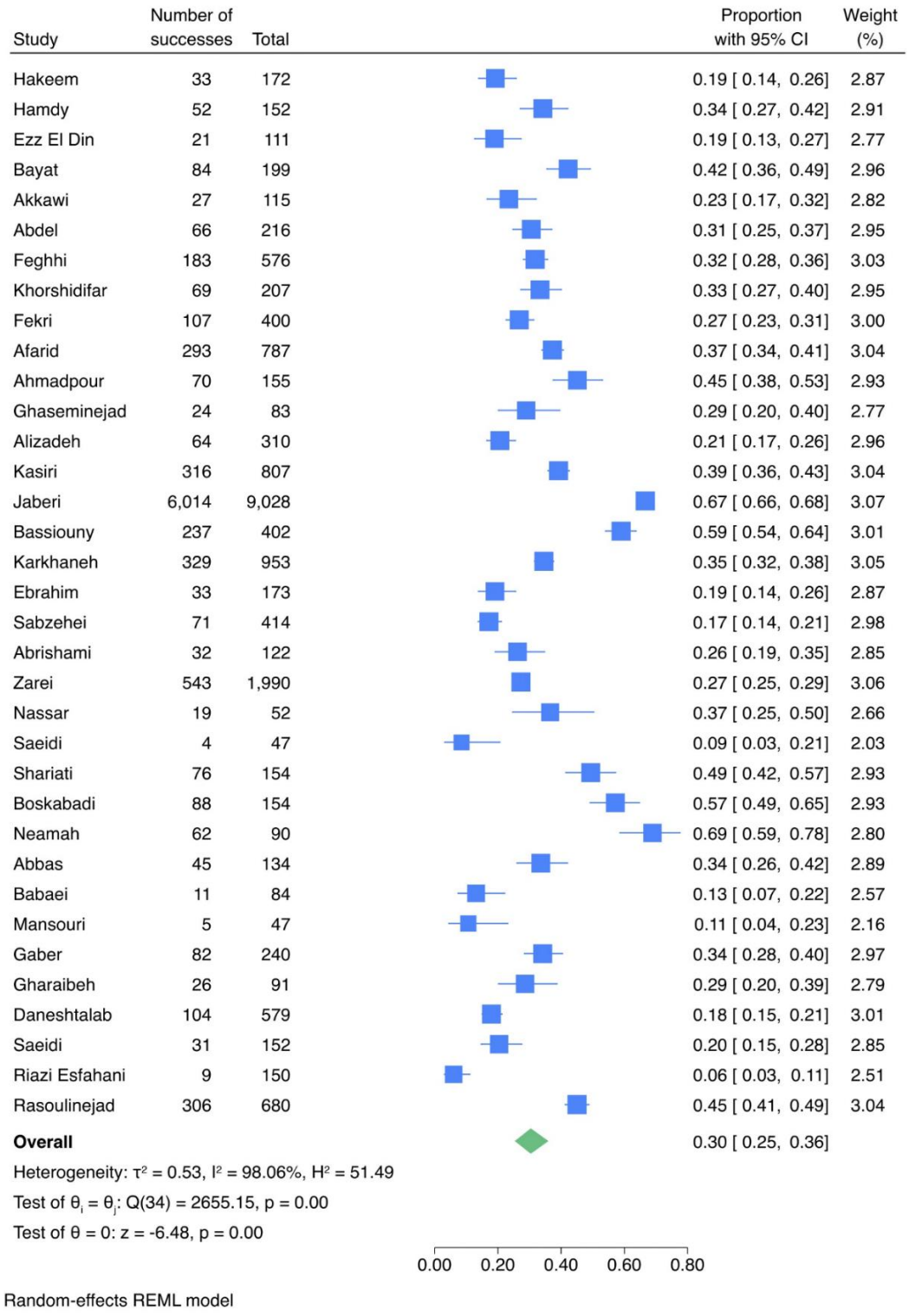

Figure 2. *Incidence of ROP of the thirty-five studies included in the Epidemiology section.*

*The references correspond to those of the included studies and can be consulted in the Supplemental Material

**Studies with references [3,7,9,13,14,16,26] were not included in the sub-analyses by BW because they did not consider this factor in their inclusion criteria, but were included in the total incidence calculation.

Stages, Zones, and Type 1 ROP

Twenty-two studies which included 6,122 neonates and 2,024 with ROP reported its stage according to the International Classification of Retinopathy of Prematurity.[12] Additionally, 2 studies reported only the proportion of those with

stage 5. Six studies including 1,876 neonates of which 660 had ROP reported the zones affected. Finally, 8 studies with 4,712 neonates reported the proportion of those with type 1 ROP. One study did not report the total number of neonates with ROP and, therefore, only 7 studies were considered when calculating the proportion with type 1 amongst those with the disease.

The percentages of the different stages, zones, and type 1 ROP are presented in Table 2.

Table 2. *Proportion of ROP by stage, zone, and type 1*

Stage	Studies included and Reference*	N	N ROP	% of the total n (95% CI)	% among those neonates with ROP (95% CI)
1	22 studies[1-4,12-15,17,18,20,25-27,29,30,35,40-43,45]	6,122	2,024	11% (8 to 15%)	40% (32 to 50%)
2	22 studies [1-4,12-15,17,18,20,25-27,29,30,35,40-43,45]	6,122	2,024	10% (7 to 14%)	35% (27 to 43%)
3	22 studies [1-4,12-15,17,18,20,25-27,29,30,35,40-43,45]	6,122	2,024	5% (4 to 7%)	18% (13 to 26%)
4	22 studies [1-4,12-15,17,18,20,25-27,29,30,35,40-43,45]	6,122	2,024	1% (0 to 1%)	2% (1 to 4%)
5	24 studies [1-4,7,12-17,18,20,25-27,29,30,35,40-43,45]	9,065	2,896	1% (0 to 1%)	2% (1 to 4%)
Zone					
1	6 studies[3,17,18,29,41,42]	1,876	660	3% (2 to 5%)	8% (4 to 15%)
2	6 studies[3,17,18,29,41,42]	1,876	660	14% (9 to 22%)	40% (30 to 50%)
3	6 studies[3,17,18,29,41,42]	1,876	660	18% (10 to 29%)	50% (37 to 63%)
Type 1 ROP					
	8 studies[3,7,11,16,19,24,27,41]	4,712	-	11% (6 to 19%)	-
	7 studies[3,7,16,19,24,27,41]	4,641	1,579	-	33% (15 to 58%)

*The references correspond to those of the included studies and can be consulted in the Supplemental Material

N: Total number of neonates included in the study

N ROP: Total number of neonates who had any type of ROP

Risk Factors

Forty observational studies evaluated the different risk factors associated with ROP. The details are available in the **Supplemental Material.**

The most frequently associated risk factors were GA (27 studies), BW (27 studies), oxygen therapy (18 studies), blood transfusions (8 studies), and sepsis and indirect hyperbilirubinemia (7 and 6 studies, respectively). Additionally, an association between advanced ROP (Type 1) and the mean leukocyte count (p=0.04), massive transfusion (p=0.01), and hypocapnic episodes (p=0.02) was found by Bejeh et al.[13], and with the mean total serum bilirubin (p<0.001) by Fereshtehnejad et al.[14]

Screening and Diagnosis

Eighteen studies contained information about screening and diagnosis. Eight from Iran; 6 from Egypt; 2 from Palestine; 1 from Jordan; and 1 from the United Kingdom and Egypt. Most of them are observational (n=14); 3 are diagnostic test studies and 1 RCT. Twelve have a low, and 6 a moderate risk of bias.

Sensitivity and Specificity of available guidelines

Three studies from Egypt and 2 from Iran evaluated the performance of guidelines for screening ROP (**Table 3**).

Table 3. *Performance of the different screening guidelines for any ROP and treatment-requiring ROP*

Study (Ref.)+	N neonates (inclusion criteria)	Guidelines used	Sensitivity	Specificity
Tawfik[48]	276 (≤34 weeks, ≤2000 gr; or clinically unstable)	AAP/AAO *	- ROP: 63.2% - Treatment-requiring ROP: 71.4% - Missing of 36.8% (n 49) of infants with ROP and 28.6% (n 63) of those requiring treatment.	

Aziz[49]	384 (<37 weeks; ≤2000 gr; or clinically unstable)	AAP/AAO *	- Treatment-requiring ROP: 97.1% - All infants that required treatment who fell outside AAP screening criteria had co-morbidities and an unstable clinical course.	
Noor[50]	159 (≤34 weeks; ≤2000 gr; or multiple comorbidities)	British Guidelines **	- Treatment-requiring ROP: 80%. - The rest 20% had comorbidities.	
Roohipoor[53]	1,932 (≤37 weeks; ≤3000 gr)	AAP/ AAO* And ≤32 weeks or ≤2000.	**AAP/AAO:** - ROP: 74.6%. - Treatment-requiring ROP: 91.6%. **≤32 weeks or ≤2000:** - ROP: 93.9% - Treatment-requiring ROP: 100% (regardless of comorbidities).	**≤32 weeks or ≤2000:** - ROP: 32.3% - Treatment-requiring ROP: 26.7%.
Alizadeh[55]	716 (≤37 weeks)	National Guidelines (Iran)*** And AAP/AAO	**National:** - ROP: 99.9% - Treatment requiring ROP: 100% **AAP/AAO:** - ROP: 84.1% - Treatment requiring ROP: 94.5%	**National**: - ROP: 8.6% - Treatment requiring ROP: 7%

+ The references correspond to those of the included studies and can be consulted in the Supplemental Material

*AAP/ AAO Guideline's threshold: ≤1500 gr and/or ≤30 weeks.

**British Guideline's threshold: ≤1500 gr and/or <32 weeks.

***Iranian National Guideline's threshold: ≤2000 gr; <34 weeks

From those studies using the American Academy of Ophthalmology Guidelines[15] (AAO) the sensitivity ranged from 63.2% (Tawfik et al.)[16] to 84.1% (Alizadeh et al.)[17] for any ROP; and from 71.4% (Tawfik et al.)[16] to 97.1% (Aziz et al.)[18] for treatment-requiring ROP. Additionally, Roohipoor et al.[19] found that changing the AAO recommendations to a threshold of ≤32 weeks and/or ≤2000 gr increased the sensitivity from 74.6% to 93.9%, and from 91.6% to 100% for ROP and treatment-requiring disease, respectively.

Alizadeh et al.[17] also compared their results to the National Iranian Guidelines and found that the performance of the test was better in the latter. Finally, Noor et al.[20] followed the British Guidelines[21] and found a sensitivity for treatment-requiring ROP of 80%, stating that all of those who fell outside the criteria had comorbidities. Two studies reported the specificity. Using ≤32 weeks and/or ≤2000 gr as a threshold, Roohipoor et al.[19] found a specificity of 32.3% for ROP and 26.7% for treatment-requiring ROP. Alizadeh et al.[17] described a specificity of 8.6% and 7%, for ROP and treatment-requiring ROP, respectively, following the National Iranian Guidelines.

New Models for Screening

Four studies from Egypt and 2 from Iran evaluated new models of screening. Ahmed et al.[22] suggested a new model to detect any stage of ROP by screening infants with GA≤ 33 and/or BW≤1500, and postnatal net weight gain ratio (NWGR) at 28 days after birth <0.3 with a sensitivity of 100% and specificity of 50.45%.

The same author[23] published in 2022 a study to validate the G-ROP model that incorporates data on weight gain and hydrocephalus. For the Egyptian cohort, it had a sensitivity of 97.1% (95%CI 93 to 98.9%), and specificity of 19.9% (95%CI 15.8 to 24.7%) for any ROP; and 100% (95%CI 91.1 to 100), and 15% (95%CI 11.9 to 18.7%), for Type 1 ROP. In 2024, Fares et al.[24] concluded that the WINROP algorithm for detecting sight-threatening ROP might help in ROP prediction but cannot be used alone (sensitivity: 51.6%; specificity: 86.2%). Also, Karkhaneh et al.[25] found that digital retinal imaging reading had a sensitivity of 85% and a

specificity of 35% in the diagnosis of referral-warranted ROP.

Wagner et al.[26] concluded in a study made in the UK with external validation from 4 countries including Egypt, that there might be a potential role for code-free deep-learning (CFDL) models to discriminate between healthy, pre-plus, and plus disease nevertheless, further validation is needed. Finally, Madvar et al.[27] found no difference in mean pain score between acetaminophen, dextrose 50%, and placebo for pain control before screening for ROP (p=0.38).

Awareness and Factors Affecting Screening

Seven studies report factors that affect the effectiveness of screening. Ebrahimiadib et al.[28] compared the efficacy of an internet-based vs traditional referral system for ROP and found that the mean time of the first examination of patients from the conventional referral group was 3.6 weeks (CI 3.2 to 4.1; p<0.001) higher than patients from the internet-based group. Other factors affecting the time of the first visit were GA (p<0.001) and income level (p=0.011).

Three studies evaluated the knowledge and awareness about ROP of the personnel in the NICUs. In Palestine, Akkawi et al.[29] found that 41.4% (n=29) of the pediatricians in their study did not know when ROP screening should be started, and 15.7% (n=11) responded it was not preventable. The main barrier identified was "ophthalmologist not available" by 37.1% (n=26). Ababneh et al.[30] in Jordan, reported that although 95.8% (n=46) of the pediatricians recognized the risk factors of ROP, only 75% (n=36) would correctly refer a premature baby for screening. Finally, Ibrahim et al.[31] found that out of 289 neonate intensive care nurses in Palestine, 48% had a low knowledge of ROP prevention.

Additionally, Mousavi et al.[32–34] published 3 studies in Iran about the predisposing factors and consequences of late examination of preterm newborns and concluded that the incidence of ROP is significantly higher in these babies compared to those with an early examination (40.3 vs 29.2%, p=0.004); also, that out of those with advanced ROP 74.7% had been examined after 9 weeks of age; and that not giving written information about the consequences of ROP, date and place of appointment for screening increases the risk of a late examination (aOR 6.051, CI 2.571 to 14.243; p<0.001).

Treatment and Prognosis

Six studies from Iran (3 observational and 3 RCTs); 4 from Egypt (1 RCT and 3 observational); and 1 observational study from Iraq were included in this section. Six had a low, 2 a moderate, and 3 a high risk of bias.

Anti-Angiogenic Therapy

Three studies evaluated the use of ranibizumab for type 1 ROP:

Tawfik et al.[35] compared ranibizumab (0.25 mg/ 0.025 mL) vs bevacizumab (0.625 mg/ 0.025 mL) and found no difference in the rate of regression between groups (88.9 vs 77.8%; p=0.659). Bassiouny et al.[36] evaluated the evolution of 216 eyes who had received ranibizumab (0.25 mg/ 0.025 mL) and reported a reactivation rate of 2.3% (n=5 eyes), all of which had APROP in zone 1 at first diagnosis. Finally, Ahmed et al.[37] reported regression of active ROP in all of their 24 cases that received ranibizumab ultra-dose (0.1 mg /0.01 mL) with few side-effects.

Milani et al.[38] found in a cross-sectional study of 150 children significant differences in foveal thickness between babies with ROP who had been treated with bevacizumab and those who had improved spontaneously (p<0.001). Nevertheless, the groups were different at baseline, the first group with more eyes with advanced ROP.

Finally, Zarei et al.[39] evaluated in a retrospective cohort the relative contribution of each indication category for intravitreal injection in one center in Tehran from 2014 to 2016 and found that 0.92% (n=349) corresponded to ROP. Something to highlight is that most patients in all indication categories were from Tehran, except for patients with ROP who came from other provinces.

Propranolol and Other Preventive Therapy

Hosseini et al.[40] estimated the efficacy of oral propranolol (0.5 mg/kg every 8 hours) to stop the progression of stage 1 or 2 ROP to the next stage, finding a significant difference between the groups (p=0.001 for progression from Stage 1 to 2; p=0.009, from Stage 2 to 3).

Mohammadi et al.[41] compared the same those of propranolol vs routine care in 50 newborns finding a significant difference in the duration of the retinal vascularization (61 vs 70 days; p<0.001) in favor of the intervention group but no difference in the recovery rate (p=0.088) or the incidence of plus disease (p=0.297).

Finally, Tehranchi et al.[42] found no difference in the incidence of ROP in 80 very low birth weight newborns when given oral colostrum (p=0.923).

Treatment Success and Prognosis

Hamdy et al.[43] documented the types of treatment used in ROP in Alexandria and found that out of 52 eyes, 53.85% (n=14) received ablative laser ophthalmoscopy; 30.77% (n=20), intravitreal injection of ranibizumab; 3.8% (n=2) underwent pars plana vitrectomy; and 1.9% (n=1), lensectomy-vitrectomy.

Bahrani et al.[44] reported a 64.5% (n=20) anatomic success rate of 31 eyes with ROP stage 4 or 5 that had undergone vitrectomy, ranging from 90.9% in Stage 4a to 33.3% in Stage 5a. The most frequent complications were vitreous hemorrhage and cataracts with an incidence of 16.1% (n=5, each).

Finally, Sadeghzadeh et al.[45] reported the prognosis of a cohort of 179 preterm newborns who had been screened for ROP between 2001 and 2003. Seventy-eight (43.6%) of them survived and 54 (30.2%) entered school. Out of the latter, only 1 participant had visual problems, and 3 of them had some degree of mental retardation.

4. DISCUSSION

ROP is a growing problem in middle and lower income settings which presents different challenges than high income settings requiring guidelines and practice determined by local evidence.[46,47] We have calculated an incidence of ROP in the region of 30% which relates to the 26.1% reported by Maroufizadeh et al.[6] in Iran and which also corresponds to the global prevalence of 31.9% that García et al.[47] published in their meta-analysis in 2024. This incidence varies according to the different thresholds used for screening, but it does not vary much between the countries with published studies in the MENA region. We found an incidence of 29% in Iran and 33% in Egypt, also 28% and 24% in Jordan and Palestine, respectively, although the latter included only 1 study each. The only country with a higher incidence was Iraq with 51%, nevertheless, the precision of this result was low (CI 20 to 82%). We could not find data from the rest of the middle-income countries in the region.

Having national guidelines should be a priority for each country. The published evidence shows that following international guidelines could leave out up to 28.6% of neonates with ROP needing treatment.[16] This is explained by the rising number of neonatal care units with suboptimal care that increases the risk of developing the disease even in bigger babies.[1]

The newly developed guidelines could make use of new models such as G-ROP[23] that improve the specificity of the test by incorporating easily available variables such as weight gain, and thus, diminish the number of resources spent unnecessarily especially in countries with economic constraints.

One of the barriers to properly screening preterm neonates is the lack of trained human resources. As mentioned by Akkawi et al.[29] not having an ophthalmologist available has been identified as an important barrier. Also, increasing the awareness of the personnel in the neonatal intensive care units (NICUs) about the disease is crucial.[29–31]

Additionally, many of these babies belong to provincial regions and not necessarily to the capital such as Zarei et al.[39] found in their study. This means that if they are dispatched from a NICU, or if they were born in a hospital far away from the capital, the chances of being screened and getting treatment are lower.[39]

The use of internet-based referral systems, telemedicine, or deep-learning models could be of great value where trained ophthalmologists are lacking as the screening could be done by trained technicians.[25,26,28]

Finally, it is important to validate the effectiveness of international guidelines[48] for the treatment of ROP in different populations. This is why the studies by Tawfik et al.,[35] Ahmed et al.,[37] and Basoiuny et al.[36] on the use of anti-angiogenic therapy or those by Hosseini et al.[40], and Mohammadi et al.[41] on the use of propranolol as a preventive measure for the progression of the disease are relevant.

However, overall, there are not many studies done in the MENA about treatment and prognosis of ROP. Having other studies involving treatment effectiveness, availability, and/or cost-effectiveness would contribute greatly to decision-making in the region.

Strengths

To our knowledge, this is the first review of ROP in the lower- and upper-middle-income countries of the MENA. This contributes to the knowledge about the current situation of the disease in the region based on the published studies.

The search and analysis were done systematically and, when possible, the results were combined in

meta-analyses. Also, a risk of bias assessment was done to consider the quality of the existing evidence.

Limitations

The main limitations of the review process are that we did not search in all the databases or the grey literature, and only papers published in English were included. This could have led to missed studies and language bias.

Also, most papers are observational. One explanation is that most of them are epidemiological studies, and it does not necessarily mean that their risk of bias is high. Finally, due to the variability among the studies, we were unable to conduct a meta-analysis on certain factors.

5. Conclusion

We found an incidence of 30% of ROP in the MENA which corresponds to that in other middle-income countries worldwide.[47] Nevertheless, there is a lot of missing information from most of the countries (72% of the studies in epidemiology come from Iran). Additionally, only 5 studies from 2 countries (Egypt and Iran) evaluated the performance of different screening guidelines which is crucial information for the tailoring of national guidelines. These local guidelines are vital because following the international guidelines could leave without screening up to 28% of the babies needing treatment.[16] Additionally, training of the personnel in the NICUs is essential. From 25 to 41% of the pediatricians included in the studies by Ababneh et al.[30] and Akkawi et al.[29] did not know when screening should be started. Finally, we only found data on treatment and prognosis from 3 countries: Iran, Egypt, and Iraq. More evidence needs to be generated in the region about epidemiology to tailor national screening guidelines, and about effectiveness, cost-effectiveness, and feasibility of the treatment modalities available in the region.

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