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Research Article

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Prediction of Retinopathy of Prematurity in Single and Twin Babies: The Predictive Accuracy of WINROP

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cular retinal detachment and permanent blindness are the risks associated with ROP [2]. Among the risk factors, low gestational age (GA), low birth weight (BW) and oxygen level are the major [3]. However, to minimize the risk and to increase the identification of high-risk infants, researchers have introduced and developed multiple prediction models such as WINROP, CO-ROP, ROP Score

and CHOP-ROP [1]. Among these prediction model, studies have indicated sensitivity of WINROP (Weight, Insulin-like growth factor, 15%. For twins, the inclusion criteria were that both twin infants were alive. Infants with congestive heart failure, Neonatal nephrot-

Methodology

This was a retrospective study conducted on 63 infants born between 01/2014 and 04/2015 and who were at high risk of developing ROP. Infants with the following criteria were included: (i) birth weight less than 1500 grams; (ii) gestational age 30 weeks; (iii) infants with birth weight between 1500 g and 2000 g or (iv) gestational age more than 30 weeks and with an unstable clinical course and at high risk for ROP. The enrolled infant population also included 6 pairs (12 infants) of twin neonates with ROP. Twins were called discordant if their birth weight difference was more than

the first week was 1310 g (1100.0-1547.50 g) which increased to 1587 g (range: 1353.75-1797.5 g) in the fifth week. Based on birth plurality, out of 63 preterm infants, 51 were single babies and 12 (6 pairs) were twin babies. WINROP alarm was signaled in 52.3% of infants and 39 (61.9%) infants developed Type 2 ROP, 22 (34.9%) developed Type 1 ROP and 2 (3.1%) had no ROP.

	Frequency (%)
Birth weight	
ELBW	5 (7.94)
LBW	14 (22.22)
VLBW	44 (69.84)
Gender	

born to mother with pregnancy-induced hypertension (PIH). ROP showed highly significantly association with malnutrition (χ^2 = 20.46, p < 0.001), RDS (χ^2 = 9.33, p < 0.001) and anemia of prematurity (χ^2 = 9.58, p < 0.001) and significant association with blood transfusion (χ^2 = 6.48, p < 0.05) and PIH (χ^2 = 7.28, p < 0.05). Type 1 ROP was associated with malnutrition and anemia of prematurity and Type 2 ROP was associated with RDS, blood transfusion and

					p value
					0.923
					0.205
					0.171
					0.079
					0.221
					0.180
					0.146
					0.146
					0.144
					0.140
in fifth week		308.59	276.70		

Table 2: *Association of birth characteristics and type of ROP with WINROP.*

associated with WINROP alarm (p > 0.05).

Association between type of ROP and comorbidities

Infants had multiple comorbidities including respiratory distress syndrome (RDS) (76.1%), followed by blood transfusion (44.4%) anemia of prematurity (42.8%), hyaline membrane disease (23.8%) and malnutrition (22.2%). In addition, about 76.1% of infants were

Effectiveness of WINROP to predict ROP

WINROP alarm was signaled in 33 infants, out of which 14 (42.4%) developed Type 1 ROP and 19 (57.6%) developed non-Type 1 ROP. About 8 infants developed type 1 ROP without any WINROP alarm. In the prediction of type 1 ROP, WINROP tool had a sensitivity of 63.6%, specificity of 53.6%, positive predictive value (PPV) of 42.4% and the negative predictive value (NPV) of 73.3% (Table 3).

		WINROP		Chi square/ t value	p value
		Alarm	No Alarm		
Sex	Male	0 (0%)	2 (100%)	2.400	0.121
	Female	6 (60%)	4 (40%)		
Birth weight	LBW	0 (0%)	3 (100%)	4.000	0.046
	VLBW	6 (66.7%)	3 (33.3%)		
Type of ROP	No ROP	0 (0%)	2 (100%)	4.000	0.135

bies, malnutrition (χ^2 = 12.00, p < 0.001) and PIH (χ^2 = 7.33, p < 0.05) showed significant association with Type 1 ROP, and RDS (χ^2 = 12.00, p < 0.001) and anemia of prematurity (χ^2 = 7.33, p < 0.05) showed significant association with Type 2 ROP.

WINROP algorithm for the detection of ROP in preterm infant babies in Indian setup. The median BW of 1250 g and GA of 30 weeks was comparable to studies from other Asian population including China [11] and Taiwan (12). WINROP alarm was signaled in 52.3% of infants which was low compared to previous studies from Malaysia

(72.8%) [13], India (74.2%) (8) and Saudi (70.9%) [14] but higher than percent of WINROP alarm in study from Australia (42.6%) [6] and another study from India (27.7%) [15]. In the present study, WINROP alarm showed no association with birthweight ($p > 0.05$), (100%) [22] and Malaysia (95.2%) [13] which reported high sensitivity but comparable to previous studies from Taiwan (64.7%) [10] and South Africa (72.9%) [5]. Further, the specificity of WINROP was low (53.6%) but comparable to previous studies in litera-

PPV	33.33				
NPV	100				

Table 5: *Sensitivity, specificity, PPV, NPV in predicting type 1 ROP using the WINROP.*

In various cohorts, the sensitivity and specificity of WINROP to predict ROP has varied. In the present study the sensitivity to predict type 1 ROP through WINROP was low (63.6%) compared to previous studies from countries such as Saudi (100%) [14], Sweden

of ROP in discordant twins with lower birth weights [25], however, Azad et al [24] states that birth weight as a factor to screen ROP in twins should be performed with caution. The authors state that presentation and progression of ROP can vary in twins as heavier siblings were also presented with severe ROP. On the contrary, Sanghvi et al [26] reported that birth order, birthweight and postgestational neonatal risk factors do not predict the severity of ROP in twins. Furthermore, the WINROP model predicted type 1 ROP in twin babies with a high sensitivity of 100% and NPV value of 100%

in this study. As stated by Sanghi et al [8] NPV of 100% presents an ideal situation which can reduce the ROP screening for infants with no alarm. In support of this, Raffa et al [14] argues that since predic-

used potentially as an accessory tool and standard ROP screening be performed alongside on infants with WINROP alarm.

the algorithm, WINROP model should be modified to accommodate populations with different characteristics such as larger and older babies, and additionally multiple postnatal risk factors should be incorporated.

Conclusion

Overall, the WINROP model had a moderate sensitivity of 63.6%, low specificity of 53.6%, low PPV of 42.4% and high NPV of 73.3% to predict type 1 ROP. Further, WINROP had a high sensitivity of 100%, a high NPV of 100% but low specificity of 60% and low PPV of 33% to predict type 1 ROP in twin neonates. Based on these performance parameters, it is suggested that WINROP algorithm be

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