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Research Article

Retinopathy of Prematurity at the University and Departmental Hospital of Borgou-Alibori in 2019

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Abstract

Introduction: Retinopathy of prematurity is one of the leading causes of childhood blindness, which extent should be known in Benin and especially in Parakou.

Aim: To study the retinopathy of prematurity in the University Hospital of Borgou-Alibori in 2019.

Methods: It was a cross-section, descriptive and analytical study with prospective data collection, over a period of 6 months, from April 2019 to September 2019 including all premature regardless of birth weight, having received or not oxygen and having at least 04 weeks of postnatal life. They were listed exhaustively after informed consent of the parents.

Results: Out of a total of 68 identified premature newborn, 36 had been undergone a fundus examination between the 04th and 06th week of postnatal life. The overall frequency of retinopathy of prematurity was 27.78%. The majority of abnormalities were stage 1 and Area 3 in temporal and were found more among males than in females. The oxygen therapy time (p = 0.026), gestational age (p = 0.0003), low birth weight (p = 0.026), the intraventricular hemorrhage (p = 0.015) and the red cell transfusion (p = 0.015) were significantly factors associated with retinopathy of prematurity.

Conclusion: The frequency of retinopathy of prematurity in CHUD-B/A at Parakou is relatively high. It would be wise to educate health professionals for a systematic proposal of a fundus examination in all premature infants that may allow to make an early diagnosis of this disease.

Keywords: Retinopathy of Prematurity; Blindness; Associated Factors; Parakou

Introduction

Prematurity is defined as a birth after the 22nd week of gestation and before the 37th week of amenorrhea (WA) [1]. It affects 10% of births worldwide (gestational age < 37 weeks of amenorrhea) [2]. Indeed, it is the most common cause of neonatal mortality and morbidity and the second leading cause of death in children under 5 years old [2]. Prematurity has always been a public health problem all over the world due to the immaturity and fragility of

the premature newborn. The increased of the survival rate also improved their health outcomes leading to the resurgence of complications of prematurity including one of the major causes of childhood blindness, the retinopathy of prematurity (ROP) [3]. Thus, this pathology encompasses a range of conditions ranging from minimal anomalies of the retinal vascularization, spontaneously resolving, to total retinal detachment, resulting in blindness. It is seeing its incidence increasing in some emerging countries where the survival of premature infants is improving, thanks.

Aim of the Study

The aim of this work was to study retinopathy of prematurity at the University and Departmental Hospital Center of Borgou-Alibori in 2019.

Patients and Methods

This was a cross-sectional, descriptive and analytical study with prospective data collection extended over a period of 06 months from April 1, 2019 to September 31, 2019 in the Ophthalmology department of the University and Departmental Hospital of Borgou-Alibori.

Were included in the study, all premature infants regardless of their birth weight, having received or not oxygen therapy and having at least 04 weeks postnatal age. They were enumerated exhaustively after informed consent of the parents.

The variables studied were constituted by the socio-demographic characteristics of the parents; premature; postnatal oxygen therapy and fundus examination features and stage of retinopathy.

All premature babies included had undergone a systematic examination of the eye fundus by an ophthalmologist (ophthalmologist-pediatrician) after maximum pupillary dilation.

To study the retinopathy of prematurity, we used the international classification of retinopathy of prematurity revised in 2005, using the 4 stages of development, the localization in 3 concentric zones around the papilla.

The data collected was entered and processed with the software EpiInfo 7.2.0.

Quantitative variables were expressed as mean plus or minus standard deviation. Qualitative variables were presented in proportion (percentage) with a 95% confidence interval if necessary.

The comparison of the proportions was carried out with the Chi^2 test (or Fisher's exact test as the case may be) to show the links between the dependent variable and the independent variables. For these comparisons, a probability $p < 0.05$ was considered statistically significant.

Results

A total of 68 premature newborns admitted to neonatal care during the study period and meeting the inclusion criteria were identified; 36 had received a fundus examination. Among these 36 premature infants, 10 had retinopathy of prematurity, i.e. a hospital frequency of 27.78%.

Parents' level of education

The level of secondary education was the most represented (61.11%) among mothers as well as among fathers (50.00%).

Maternal history

Mothers of premature babies had no medical history in 91.67% of cases. Three (8.33%) had hemoglobinopathy.

Sociodemographic characteristics

Age of mothers

The mean age of the mothers was 27.06 ± 4.89 years old with extremes of 19 and 39 years. The majority age group was 19 - 27 years old.

Socio-professional categories of parents

Mothers were housewives in 36.11% of cases while fathers were traders in 47.22% of cases.

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Clinical features of prematures

Gestational age

The mean gestational age was 33.28 WA ± 2.43 WA. The most represented gestational age group was that of premature babies (34 WA-36 WA + 6 days) or 68.57% as shown in figure 1.

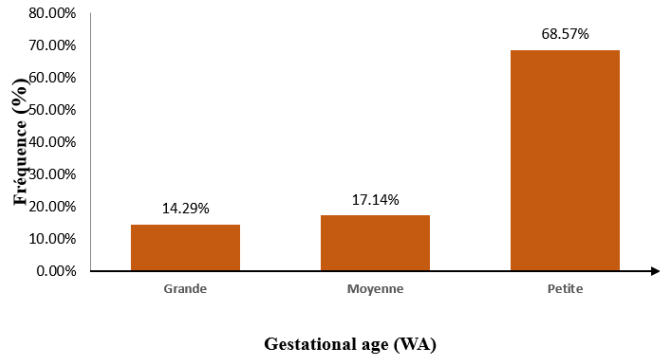

Figure 1: Distribution of premature babies according to their gestational age, CHUD-B/A, 2019 (N = 36).

Birth weight

The mean birth weight was 2019.14g ± 462.79g with extremes of 900g and 2850g. The premature babies mostly weighed between 1900g and 2850g.

Sex

The female sex was the most represented at 55.56%. The sex ratio was 0.8.

Resuscitation modalities at birth

The majority of premature infants (69.44%) had received resuscitation for a mean duration of 2.27 ± 0.79 minutes with extremes of 1 and 3 minutes. This resuscitation consisted primarily on upper airway release (UAR), stimulation of the newborn, and mask and bag ventilation.

Duration of neonatal hospitalization

The mean neonatal hospital staying was 5.47 days ± 4.53 days with extremes of 0 and 21 days. More than half (58.33%) of premature babies had spent between 0 and 5 days in hospital.

Oxygen therapy

Among the 36 premature babies, 17 (47.22%) had received oxygen therapy at an amount of 2 liters per minute (58.82%) during more than the first 24 hours (52.94%), while 19 (58.78%) had not benefited from it.

Red blood cells (RBC) transfusion

Of the 36 premature babies, 05 (13.98%) had received a transfusion of red blood cells while 31 (86.11%) had not.

Pathologies associated with prematurity

Neonatal infection found in 44.44% of premature infants was the main pathology associated with prematurity followed by intraventricular hemorrhage (13.89%) and sepsis (5.56%).

The eye fundus examination

Age of the premature at the first fundus examination

The mean age at the first fundus examination was 1.67 ± 0.38 months. All premature babies had their first fundus examinations between the 4th and 6th week of postnatal life.

Presence or not of retinopathy of prematurity

In this study, 10 premature babies presented with retinopathy, i.e. a hospital frequency of 27.78%.

Stages and location of retinopathy of prematurity

These retinopathies were mainly at stage 1 and in zone 3 temporally (90.00%) in both eyes, characterized by the presence of a demarcation line between the vascular retina and the avascular retina.

01 case (10%) was at stage 2 in zone 3 temporally in both eyes, characterized by the presence of intraretinal neovascularization taking the appearance of a bead at the level of the demarcation line. Neither stage 3 and 4 nor stage 5 was diagnosed.

Relationships between variables

There was a statistically significant association between retinopathy of prematurity and gestational age (p = 0.0003). The lower the gestational age, the greater the risk of ROP.

Likewise, birth weight was statistically associated with retinopathy of prematurity (p = 0.026). The lower the birth weight, the higher the risk of developing retinopathy of prematurity.

Oxygen therapy (p = 0.13) by itself was neither statistically associated with ROP nor to the amount of oxygen (p = 0.343) admin-

istered, while the duration of oxygen therapy was statistically associated with retinopathy of premature babies (p = 0.026). Premature infants who received oxygen for 72 hours or more (57.15%) were more likely to develop retinopathy than those who received it for 24 hours (14.28%).

In our study, there was also a statistically significant association between the occurrence of ROP and RBC transfusion (p = 0.015) and intraventricular hemorrhage (p = 0.015).

Overall, factors associated with retinopathy of prematurity in our study were low gestational age, low birth weight, duration of oxygen therapy, pellet transfusion, and intraventricular hemorrhage (p < 0.05).

Discussion

Frequency

The frequency of retinopathy of prematurity in all stages in our study was 27.78%. It is much higher compared to most studies carried out in the sub-region.

Indeed, Fajoul., *et al*. [4] in 2015 reported an incidence of 15% in Lagos (Nigeria); Diawara [5] in 2009 found a frequency of 10% in Mali; likewise, Abdel., *et al*. [6] in Morocco in 2012 reported a frequency of 19.2%. Some authors have reported frequencies similar to ours, for example Beby., *et al*. [7] in 2004 in France reported a frequency of 22.3%.

These differences could be explained by the fact that the inclusion criteria varied from one author to another. In countries with a more efficient infrastructures and technical platforms for the childcare of very premature newborns, the criteria were much more precise (weight < 1500g and gestational age < 32WA) and the number of premature babies included also differed from one author to another.

This difference in frequency shows the extent of retinopathy of prematurity in our country, which is however unknown to health professionals.

Nevertheless, some authors have reported higher prevalence's after cohort studies. Thus, Adebayo., *et al*. [8] in Port Harcourt in Nigeria in 2014 have reported a prevalence of 47.2% and Onyango., *et al*. [9] in Kenya in 2018 found a prevalence of 41.7% and Ashish., *et al*. [10] in southern India in 2018 recovered 32.6%. This shows that the prevalence of retinopathy of prematurity varies from region to region, country to country, and even city to city within the same country. According to Chen., *et al*. [11] in China in 2015, the incidence of ROP varied depending on the environment. This finding may be due to the difference in the study methods chosen and to the duration of the study, which was longer than that of many other authors.

Clinical features of premature infants

Sex

The female sex was the most represented at 55.32%. The sex ratio was 0.8.

Among the 10 cases of ROP, there were 6 (60%) boys and 4 (40%) girls. This male predominance was already reported by Hartnett [12] in 2012 while Abdoulaye Diawara [5] in Mali found a female predominance (2/3) and Beby., *et al*. [7] found gender equality. This difference could be explained by the number of newborns initially included in each study.

There was no significant association between gender and the occurrence of retinopathy of prematurity. This same observation was made by Hakeem., *et al*. [13] in Egypt in 2012.

Weight and gestational age

The mean gestational age of our series was 33.28 WA ± 2.43 WA with a mean birth weight of 2019.14g ± 462.79g. This average age and weight in our study is much higher than that reported by Onyango., *et al*. [9] in 2018 in Kenya (29.9 ± 2.2 WA; 1280 ± 330g) as well as by Ashish., *et al*. [10] (29.71 ± 2.64 WA; < 1000g). Other authors have reported gestational age and even lower weight as shown in table 1.

This difference in gestational age and weight could be explained by the availability of more modern infrastructures in some countries for childcare for extremely premature children, which is not the case in our center. It therefore seems important to us that more modern equipment be made available to our health structures, especially in neonatology, for better care of newborns and particularly premature babies.

There was a statistically significant association between low birth weight, low gestational age and retinopathy of prematurity especially in very premature infants (p < 0.05).

Authors	Year	Country	Gestational age	Weight	Frequency
Ali., *et al.* [14]	2017	Egypt	< 37 WA	<2500g	69.4%
Lomuto., *et al.* [15]	2010	Argentine	≤ 32 WA	≤ 1500g	26.2%
Ragi., *et al.* [16]	2010	Cuba	< 35 WA	< 1750g	15.3%
Fortes., *et al.* [17]	2009	Brasil	≤ 32 WA	≤ 1500g	24.2%

Table 1: Comparison of weights and gestational age of different authors.

Our study shows that the lower the birth weight, the higher the risk of developing retinopathy of prematurity. Also, the lower the gestational age, the greater the risk of developing retinopathy of prematurity. This same conclusion was made by Adebayo., *et al.* [8] in Port Harcourt (Nigeria) in 2014. According to Lala-Gitteau [18] in France in 2007, there is an inverse relationship between birth weight, gestational age and ROP: the lower the birth weight or the shorter gestational age, the higher the risk of developing ROP and the more severe it will be.

Resuscitation at birth

In our study, 11 (30.56%) premature babies did not received resuscitation at birth while 25 (69.44%) did. It was not statistically associated with retinopathy of prematurity (p = 0.454). The study by Thouvenin., *et al.* [19] in France clearly demonstrated the relationship between the duration of resuscitation and the occurrence of ROP (2.9% in the absence of resuscitation and 75.8% in the event of resuscitation lasting more than 1 month). This difference could be explained by the availability of more modern resuscitation equipment's in France than in our center. Zhang., *et al.* [20] in 2018 in China reported that newborn resuscitation should not be performed with 100% oxygen supplementation and the level of SaO2 during the neonatal period should be maintained between 85% and 93%.

The duration of neonatal hospitalization

The mean duration of neonatal hospitalization was 5.47 days ± 4.53 days with extremes of 0 and 21 days while Diawara [5] in Mali found an average of 09 days of hospitalization. This shows that prematurity is a factor in long-term neonatal hospitalization and requires an adequate infrastructure to better raise and keep these premature babies alive.

Features of the eye fundus examination

The developmental stages of retinopathy of prematurity determine the degree of retinal lesions and conditioned the treatment. The affected area, in turn, influences the severity of the disease. In our study, among the 10 cases of retinopathy of prematurity we found:

- 9 cases in stage 1 and in zone 3 temporally, i.e. 90% on both (02) eyes (right eye and left eye) characterized by the presence of a non-protruding pinkish white demarcation line between the vascular and avascular retina.
- 01 case at stage 2 and in zone 3 temporally, i.e. 10% on both eyes (right eye and left eye) characterized by the presence of a bead forming in the region of the demarcation line. None of the premature babies had any stage 3, stage 4 or 5 lesions.

Different results have been reported by Celebi., *et al.* [21] (25.9% at stage 1 and 11.06% at stage 2) and Ebtisam., *et al.* [22] in 2015 (18.5% at stage 2; 5.7% at stage 3; 1.4% at stage 4). One possible explanation may be that these authors performed eye fundus examinations in very premature infants, which increases the risk of severe-stage retinopathy requiring treatment.

Factors associated with retinopathy of prematurity

Several authors have reported in different studies factors associated with retinopathy of prematurity. These included low birth weight, low gestational age, oxygen therapy, repeated red blood cells transfusion, sepsis, intraventricular hemorrhage, infections, ulcerative necrotizing enterocolitis [23,24].

In addition to these factors, other authors have shown that there is also vitamin E deficiency and low IGF-1 levels [21]

In our study the factors associated with retinopathy of prematurity were: The duration of oxygen therapy (p = 0.026); low gestational age (p = 0.0003); low birth weight (p = 0.026); intraventricular hemorrhage (p = 0.015) and red blood cells transfusion (p = 0.015).

However, Ashish., *et al*. [10] in India in 2018, as well as Maroufizadeh., *et al*. [25] in Iran in 2017 reported that among these factors, low birth weight and low gestational age were the most significant.

One possible explanation would be the fact that the immaturity of the organs and especially the retina of these premature babies is more pronounced if the gestational age and weight are lower.

While oxygen has been described as a risk factor for retinopathy of prematurity since old times, it is the same for the duration of time it has been administered. Indeed, in our study, the duration of oxygen therapy was statistically associated with ROP. The longer the duration of oxygen therapy, the greater the risk of developing ROP. Thus, the study carried out by Chunhong., *et al*. [26] in 2018 at Nanchang University in China on the correlation between the polymorphism of NOS3, oxygen therapy and ROP proved that the duration of oxygen therapy (greater than 17 days) was associated with the susceptibility of premature infants to develop retinopathy (p = 0.020). The same observation was made by Ranjan., *et al*. in 2019 in India [27]. It therefore seems wise to place particular emphasis on the meticulous monitoring of oxygen therapy in our neonatal intensive care units.

Conclusion

Retinopathy of prematurity is a common pathology. It affects premature babies of both sexes with a male predominance. It occurs especially in very low birth weights and low gestational age and is mainly at stage 1 in zone 3 temporally. Thus, prematurity is a real risk factor for this pathology.

While the pathology is common in premature oxygenated babies (more than half) for a longer period of time, it is not less in those without oxygen.

Associated factors are low birth weight, low gestational age, red blood cells transfusion, intraventricular hemorrhage. It seems important to us to develop protocols and recommendations for systematic screening in order to reduce the frequency of this condition.

Conflict of Interest

None.

Bibliography

1. Nuzhat R., *et al*. "Role of nifedipine in comparison with salbutamol in the management of preterm labor". *Pakistan Journal of Medical and Health Sciences* 5.1 (2011): 63-66.

2. Alexis Pinel. "Evaluation du dépistage des enfants à risque de rétinopathie du prématuré de type 1 par l'algorithme WINROP dans une cohorte du Centre Hospitalier Sud Francilien [Thèse]". Sensory Organs (2015).

3. Liegl R., *et al*. "Retinopathy of prematurity: need for prevention". *Eye and Brain* 8 (2016): 92-102.

4. Fajoul I., *et al*. "Retinopathy of prematurity and associated factors in Lagos, Nigeria". *Paediatrics and International Child Health* 35.4 (2015): 325-328.

5. Abdoulaye Diawara. "Etude épidémiologique de la rétinopathie du prématuré à L'IOTA d'Avril 2008 à Novembre 2009. [Thèse]". Université de Bamako (2009).

6. Abdel H., *et al*. "Retinopathy of Prematurity: A Study of Prevalence and Risk Factors". *Middle East African Journal of Ophthalmology* 19.3 (2012): 289-294.

7. Beby F., *et al*. "Rétinopathie du prématuré: résultats de l'examen du fond d'œil chez 94 enfants à risque". *Journal Français d'Ophtalmologie* 27.4 (2004): 337-344.

8. Adébayo O., *et al*. "Retinopathy of prematurity in Port Harcourt". *ISRN Ophthalmology* 201.4 (2014): 481-527.

9. Onyango O., *et al*. "Retinopathy of prematurity in Kenya: Prevalence and risk factors in a hospital with advanced neonatal care". *Pan African Medical Journal* 29 (2018): 152.

10. Ashish A., *et al*. "Risk factors for retinopathy of prematurity in a district in South India: A prospective cohort study". *Oman Journal of Ophthalmology* 11.1 (2018): 33-37.

11. Chen Y., *et al*. "Incidence and Risk Factors of Retinopathy of Prematurity in Two Neonatal Intensive Care Units in North and South China". *Chinese Medical Journal* 128 (2015): 914-918.

12. Hartnett ME and Penn JS. "Mechanisms and management of Retinopathy of prematurity". *The New England Journal of Medicine* 367.26 (2012): 2515-2526.

13. Hakeem A and Mohamed G. "Retinopathy of Prematurity: A Study of Incidence and Risk Factors in NICU of Al-Minya University Hospital in Egypt". *Journal of Clinical Neonatology* 1.2 (2012): 76-82.

14. Ali AA., *et al*. "Retrospective cohort study shows that the risks for ROP included birth age and weight, medical conditions and treatment". *Acta Paediatrica* 106 (2017): 1919-1927.

15. Lomuto C., *et al*. "Epidemiology of Retinopathy of prematurity in public services from Argentina". *Archivos Argentinos de Pediatria* 108.1 (2010): 24-30.

16. Ragi RMF., *et al*. "Incidence of Retinopathy of prematurity in low birth weight". *Revista cubana ophthalmology* 23.1 (2010): 580-589.

17. Fortes F., *et al*. "Prevalence and risk factors for Retinopathy of prematurity: Study with 450 very low birth weight preterm infants". *Revista Brasileira de Oftalmologia* 68.1 (2009): 22-29.

18. Lala-Giteau Majzoub Saliba Pisella. "Etude épidémiologique de la Rétinopathie du prématuré : Les facteurs de risque au CHU de Tours". *The Journal français d'ophtalmologie* 30.4 (2007): 366-373.

19. Thouvenin D., *et al*. "Rétinopathie de la prématurité, Intérêt actuel de la surveillance des prématurés et nouveau-nés à risques". *The Journal Français d'Ophtalmologie* 15 (1992): 191-197.

20. Zhang HB., *et al*. "Les progrès du traitement prophylactique dans la Rétinopathie du prématuré". *International Journal of Ophthalmology-IJO* 11.5 (2018): 858-875.

21. Celebi A., *et al*. "The incidence and Risk factors for severe retinopathy of prematurity in the extremly low birth weight infants in Turkey". *Medical Science Monitor* 20 (2015): 1647-1653.

22. Ebtisam K., *et al*. "Incidence of Retinopathy of Prematurity in Bahrain". *Middle East African Journal of Ophthalmology* 22.3 (2015): 335-339.

23. Moraes AF., *et al*. "Incidence and risk factors for retinopathy of prematurity: a retrospective cohort study". *International Journal of Retina and Vitreous* 4 (2018): 20.

24. Leslie M., *et al*. "Importance of birth weight as a risk factor for severe retinopathy of prematurity when gestational age is 30 or more weeks". *American Journal of Ophthalmology* 157.6 (2014): 1227-1230.

25. Maroufizadeh S., *et al*. "Prevalence of retinopathy of prematurity in Iran: a systematic review and Meta-analysis". *International Journal of Ophthalmology-IJO* 10.8 (2017): 1273-1279.

26. Chunchong Y., *et al*. "Correlation of interactions between NOS3 polymorphisms and oxygen therapy with retinopathy of prematurity susceptibility". *International Journal of Clinical and Experimental Pathology* 8.11 (2015): 15250-15254.

27. Ranjan R., *et al*. "Curious case of retrolental mass: An unusual tele-screening artifact". *Indian Journal of Ophthalmology* 67 (2019): 415-416.