

OPHTHALMIA NEONATORUM IN KADUNA: A Case-control Study

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SUMMARY

Objective: To study the clinical pattern of ophthalmia neonatorum with the aim of identifying its risk factors.

Method: A case-control study of ophthalmia neonatorum (ON) was carried out in 5 hospitals in Kaduna metropolis in northern Nigeria. Two hundred cases were matched with two hundred controls. The male to female ratio was 1.1:1. The mean age of the patients was 8.9 days, and the range was from birth to 28 days.

Results: The age at the onset of the symptoms was birth to 27 days with a mean of 3.9 days. Most (74%) of the conjunctivitis cases were mild, while 26% were moderate or severe. Out of the 7 risk factors for ON assessed namely, maternal vaginal discharge during pregnancy, prolonged labour, place of delivery, maternal social status, prolonged rupture of the amniotic membrane, instrumental delivery, and maternal marital status, only 3 – maternal vaginal discharge, prolonged rupture of the amniotic membrane and place of delivery (in hospital) – were found to be statistically significant. The mothers of 63 of the cases had vaginal discharge during pregnancy as against 31 (15.5%) of the mothers in the control group ($P < 0.01$). Prolonged rupture of the amniotic membrane occurred in 24 (12%) of the cases and in 5 (2.5%) of the control group ($P < 0.05$). Sixty-nine (34.5%) of the cases were delivered at home while 98 (49%) of the control group were delivered at home ($P < 0.05$).

Conclusion: The risk factors that contributed to the development of the disease were found to be mainly maternal vaginal discharge during pregnancy, place of delivery, and prolonged rupture of the amniotic membrane.

Key words: conjunctivitis, ophthalmia neonatorum, vaginal discharge, risk factors

INTRODUCTION

Ophthalmia neonatorum (ON) presents as the inflammation of the conjunctiva of the neonate. It has

been defined as 'conjunctivitis that occurs within the first four weeks of life'.¹ Most babies that suffer from ON acquire the condition during vaginal delivery and this reflects the prevalence of sexually transmitted diseases.² In 1881, Crede recommended eye prophylaxis with topical application of 1% silver nitrate to prevent gonococcal ophthalmia.³ Today, different strategies for prevention are available.

Ophthalmia neonatorum is a common disease affecting neonates worldwide.⁴ The global incidence is not known, however, incidences of between 1 to 24 per 100 live births have been reported in different areas.⁴ In northern Norway, Dannevig et al.⁵ reported the incidence of chlamydial ON to be 8 per 1000 neonates. In many industrialized countries, ON is no longer a public health problem⁶ and so, some countries have chosen to stop prophylaxis at birth and to opt instead for early treatment. Denmark, Sweden, and the United Kingdom discontinued general prophylaxis for ON altogether, arguing that no substance is 100% safe for the purpose. In these countries the risk of contracting a sight-threatening infection with *Neisseria gonorrhoeae* is extremely low. However, in Florida, there was an increased incidence of gonococcal ON within 5 years of discontinuing Crede's prophylaxis (55 cases between 1984–1989).⁶ There was a similar rise in Sweden and Denmark.⁶ Growing populations, urbanization and increasing promiscuity are likely to cause a rise in the incidence of ON in developing countries. Maurin and Cornand⁷ found ON to be one of the main causes of corneal blindness in developing countries. Magulike and Ezepue⁸ found corneal diseases to be responsible for 21.74% of childhood blindness and ON was responsible for 6.67% of these. Abiose,⁹ in a study of paediatric ophthalmic problems in Nigeria, reported that 137 out of the 500 children studied had bacterial conjunctivitis. ON was responsible for nine of these cases.

The burden of visual loss from ON is better appreciated when the age of the individual concerned is considered; the blind years span the whole lifetime of the patient. The risk of gonococcal and chlamydial ON, in the absence of prophylaxis can be estimated from the prevalence of genital infections in pregnant women. The transmission rate to the newborn infants is about 30-

50% for *Neisseria gonorrhoea*^{10, 11} and 35% for *Chlamydia trachomatis*.¹² Apart from the organism harboured by the mother in the birth canal, other factors that may influence the development of ON include treatment of the mother during pregnancy, duration and site of exposure of the infant to the infectious agent, type and adequacy of prophylaxis, susceptibility of the infant's ocular tissues to the infectious agent and trauma.¹³

To the best of the author's knowledge, only few fairly recent works have been carried out on the risk factors for ON. These include those from northern Norway⁵ and Kenya¹⁴. Such recent works in Nigeria are those of Ernest et al.¹⁵ at Ilorin in the middle belt region of Nigeria, and Iroha¹⁶ at Enugu in eastern Nigeria.

OBJECTIVES

Information on the risk factors for ON is scanty. This research was, therefore, conducted to study the clinical pattern of ON with the aim of identifying its risk factors.

MATERIALS AND METHODS

Case Definition

Cases were babies aged 0-28 days who had conjunctivitis with discharge in one or both eyes.

Control Group

The control group was also made up of babies aged 0-28 days without conjunctivitis or discharge from the eyes. These were matched for age and sex with the cases.

Exclusion criterion: Age >28 days at presentation.

All the babies used in the study were infants aged 0-28 days who presented with their mothers at the postnatal clinic, postnatal ward, paediatric out-patient or intensive care baby unit of:

1. Kawo Maternal and Child Health Clinic, Kaduna
2. Tudun Wada Maternal and Child Health Clinic, Kaduna
3. Kaduna State General Hospital (Dutse) Tudun Wada, Kaduna
4. Nigerian Army Reference Hospital, Kaduna (NARHK)
5. Ahmadu Bello University Teaching Hospital, Kaduna (ABUTH)

The study was carried out in these 5 health facilities located in different areas of the city. (1) and (2) are primary health centres, (3) is a general hospital, while (4) and (5) are tertiary level health centres. The study was carried out over a 3-month period, from 1st of February to the 27th of April 1998. Two hundred cases were seen during an intensive coverage of the above hospitals, through twice daily visits to clinic 1, 2 and hospital 3, and a daily visit to hospitals 4 and 5. The 200 cases were

matched with 200 other babies as control. Two cases which presented at the National Eye Centre, Kaduna were also included. The study was certified by the ethical committee of the National Eye Centre, Kaduna.

All the patients recruited into the study were seen by the investigator who took all the conjunctival specimens, after initial supervision by the laboratory scientist.

Laboratory procedures were carried out by the laboratory staff (microbiology laboratory scientist and laboratory assistants) of the microbiology laboratory of the National Eye Centre, Kaduna.

Informed consent of the parent or the carer was sought verbally. The nature and the objectives of the study were explained to the parent(s). Clinical history was obtained and recorded in each case using a semi structured questionnaire designed for the study and administered by direct interview. This included the history of the symptoms such as its duration, previous medication (traditional and orthodox).

Information about the general health condition of the baby was sought, e.g., history of fever, level of activity, irritability or lethargy, diarrhoea, vomiting and jaundice. Information about birth weight, and gestational age was also obtained from hospital records where available.

Ocular examination was performed to assess the severity of the conjunctivitis. This was scored using the Sandstrom's method,¹⁷ which based clinical severity of conjunctivitis on 3 features - lid edema, conjunctival discharge and hyperemia of the inferior palpebral conjunctiva. Each feature was scored 1+, 2+ and 3+ for mild, moderate and severe reaction respectively. A Gram-stained smear of lower conjunctival exudate was also examined for leucocytes and the average number of leucocytes observed per field in five oil immersion fields (OIF) was counted and graded as: 0 for 5, 1+ for 6-10, 2+ for 11-49 and 3+ for 50 or more cells per OIF. The highest possible total score was 12+. Total scores of 0 to 2+ were considered to be equivocal of conjunctivitis, but scores of 3+ were more definitive.

This was followed by a general physical examination of the baby for other systemic abnormalities.

Maternal history was then obtained. Information was sought on vaginal discharge during pregnancy, prolonged rupture of amniotic membranes, duration of labour, place and mode of delivery. Maternal socio-economic status was determined in each case using the World Health Organisation procedure for determining social score.¹⁸ This consists of the level of education, occupation and income of the head of the household and the number of people living in a room.

In each patient and each control baby, 2 conjunctival swabs were taken and a conjunctival epithelial

scrapping was carried out. A slide was prepared from one swab and stained using the Grams method. The second swab, for culturing, was carefully transferred into a transport medium (Transwab) and taken to the laboratory at the Microbiology Department of the National Eye Centre, Kaduna where it was inoculated into blood agar, nutrient agar and Mac Conkey agar. The chocolate agar plates were incubated in carbon dioxide using candle extinction jars to promote the growth of *Neisseria gonorrhoea*. The plates were incubated for 24 to 48 hours at 37°C. All the isolates were identified by standard methods. The epithelial scrapping was stained with Wright's (quick) Giemsa stain.

The slides were viewed and read under the microscope with a magnification of x1000. Intracytoplasmic inclusion bodies of Halberstaedter-Prowazek were searched for in the epithelial cells by carefully going through the slides systematically. The Gram stained slides were similarly examined for Gram positive or Gram negative bacteria.

The microbiological report is not presented here. Initial treatment was commenced based on clinical assessment of the conjunctivitis. Cases suspected to be bacterial ophthalmia were treated with chloramphenicol eye drops while those suspected to be chlamydial were treated with oral erythromycin.

FOLLOW-UP

The mothers of the recruited babies were requested to bring the babies back for follow up 24 hours, 72 hours and one week after they were first seen, and finally at the end of the neonatal period. For those recruited at about 3 weeks of age or more, the final visit was at 6 weeks of age. Due to very poor compliance with the above follow-up schedule, however, the first (24 hrs) visit was omitted. At each visit, the patient was reassessed for persistence, cessation or reduction of symptoms. They were also examined with loupe for any complication, and necessary measures such as changing or discontinuing the antibiotics were taken.

The data collected were analysed on computer using the Data Base Management Software and Statistical Analysis Software (Dbase IV and EPI-Info 6) to determine the statistical significance of the findings.

RESULTS

During the 3-month period of the study (February to April 1998), a total of 2,675 live births were recorded in the 5 hospitals. Out of these, 198 cases of ophthalmia neonatorum were seen. During the same period, only 2 cases presented at the National Eye Centre, Kaduna and they were included in the study. None of the hospitals practiced prophylaxis against ophthalmia neonatorum.

The total number of cases of ophthalmia neonatorum seen in each hospital is presented in table 1.

Table 1. No. of patients seen at each hospital

Hospital	Cases		Control	
	No.	(%)	No.	(%)
1. Kawo	53	26.5	58	29.0
2. T/Wada	22	11.0	12	6.0
3. Dutse	65	32.5	80	40.0
4. NARHK	18	9.0	19	9.5
5. ABUTH	40	20.0	31	15.5
6. OTHERS (NEC)	2	1.0		
TOTAL	200	100.0	200	100.0

Distribution of Ophthalmia Neonatorum

Out of the 200 cases of ophthalmia neonatorum seen in all the hospitals, 115 were bacteriologically positive. The age range of the patients was 0-28 days with a mean of 8.99 (~ 9) days.

Age and Sex Distribution of Cases and Controls

Figure 1 shows the age at onset of the ophthalmia in the cases and the number of the control babies in each age group ($P > 0.05$). Similarly, figure 2 shows the sex distribution of the cases and the control group ($P > 0.05$). There were 106 males and 94 females, giving a male: female ratio of 1.1: 1.

One hundred and seventeen (58.5%) of the cases were delivered at the 5 hospitals, 11 (5.5%) were delivered in other hospitals, 69 (35%) were delivered at home, 2 were delivered in a chemist shop, and 1 (one) was delivered in a church.

CLINICAL FINDINGS

The main observable symptom of ophthalmia neonatorum which the mothers complained about was eye discharge. This may be associated with redness of the eye or swelling of the eyelid.

Duration of Symptoms

The duration of eye discharge ranged from 0 - 21 days, with a mean of 5.3 days.

Laterality

Symptoms were unilateral in 94 (47%) of the cases and bilateral in 106 (53%). Of the unilateral cases, 53 (26.5%) were affected in the right eye and 41 (20.5%) in the left eye.

Severity of Conjunctivitis

The severity score in 148 (74%) of the patients indicated mild conjunctivitis, while 46 (23%) had moderately

severe infection and 6 (3%) had severe conjunctivitis (see table 2).

Table 2. Pattern of ophthalmia neonatorum

Duration of symptoms (days)	0-21
Age at onset (days)	0-27
Laterality: Unilateral	94 (47%)
Bilateral	106 (53%)
Severity score: Mild	148 (74%)
Moderate	46 (23%)
Severe	6 (3%)

RISK FACTORS FOR OPHTHALMIA NEONATORUM

Seven risk factors, namely maternal vaginal discharge during pregnancy, prolonged labour, place of delivery (delivery outside health facilities), low maternal social status, prolonged rupture of amniotic membranes, instrumental delivery, and maternal marital status, were assessed in this study.

Sixty three (31.5%) of the mothers of the cases had vaginal discharge during pregnancy as against 31 (15.5%) of the mothers of babies in the control group ($P < 0.01$). Prolonged labour occurred in 16 (8%) of the cases and in 10 (5%) of the control group ($P > 0.05$). Sixty nine (34.5%) of the case babies were delivered at home while 98 (49%) of the control babies were delivered at home ($P < 0.05$). Sixty seven (34%) of the mothers of the

cases and an equal number of the mothers of the control babies had a low socioeconomic status ($P > 0.05$). Ninety nine (50%) and 34 (17%) of the mothers of cases had middle and high socioeconomic status respectively, while 116 (58%) and 17 (9%) of the mothers of the control babies had a middle and high social status respectively. No case of assisted (forceps) delivery was seen. Prolonged rupture of the amniotic membrane occurred in 24 (12%) of the cases and in 5 (2.5%) of the control group ($P < 0.05$). All the mothers of the case and control babies were married (see table 3).

Table 3. Comparison of risk factors for ophthalmia neonatorum in cases and controls with P-values

Risk Factors	No. of Cases	No. of Control Cases	P-value
Maternal vaginal discharge	63 (31.5%)	31 (15.5%)	$P < 0.01$
Prolonged labour	16 (8%)	10 (5%)	$P > 0.05$
Delivery at home	69 (34.5%)	98 (49%)	$P < 0.05$
Low maternal social status	67 (33.5%)	67 (33.5%)	$P > 0.05$
Instrumental delivery	0	0	
Prolonged rupture of amniotic membrane	24 (12%)	5 (2.5%)	$P < 0.05$
Unmarried mothers	0	0	
Total	239 (100%)	201 (100%)	

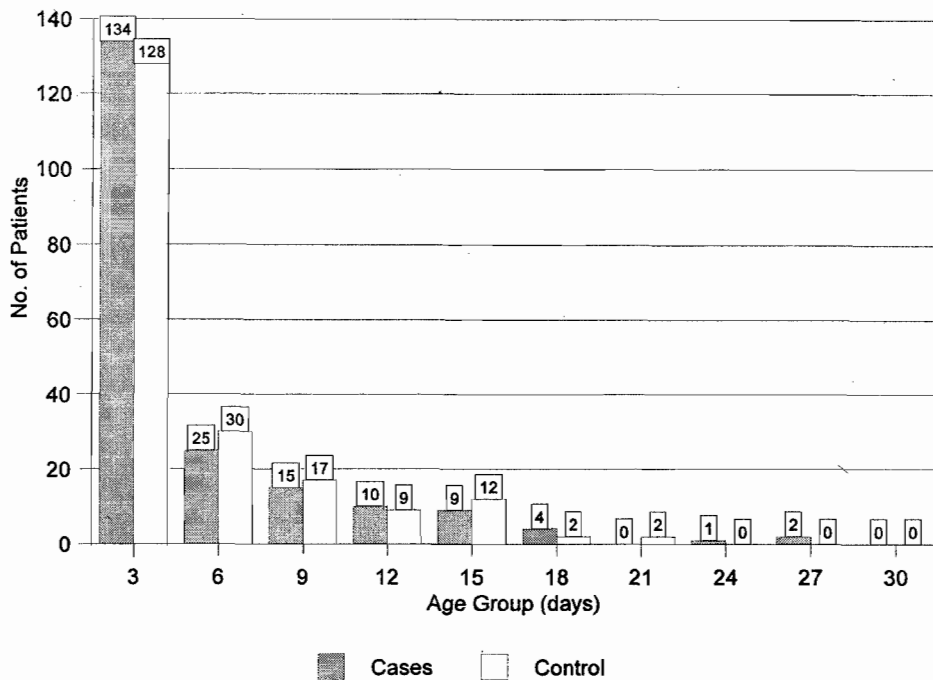


Figure 1. Age distribution of patients with ophthalmia neonatorum and matching with controls

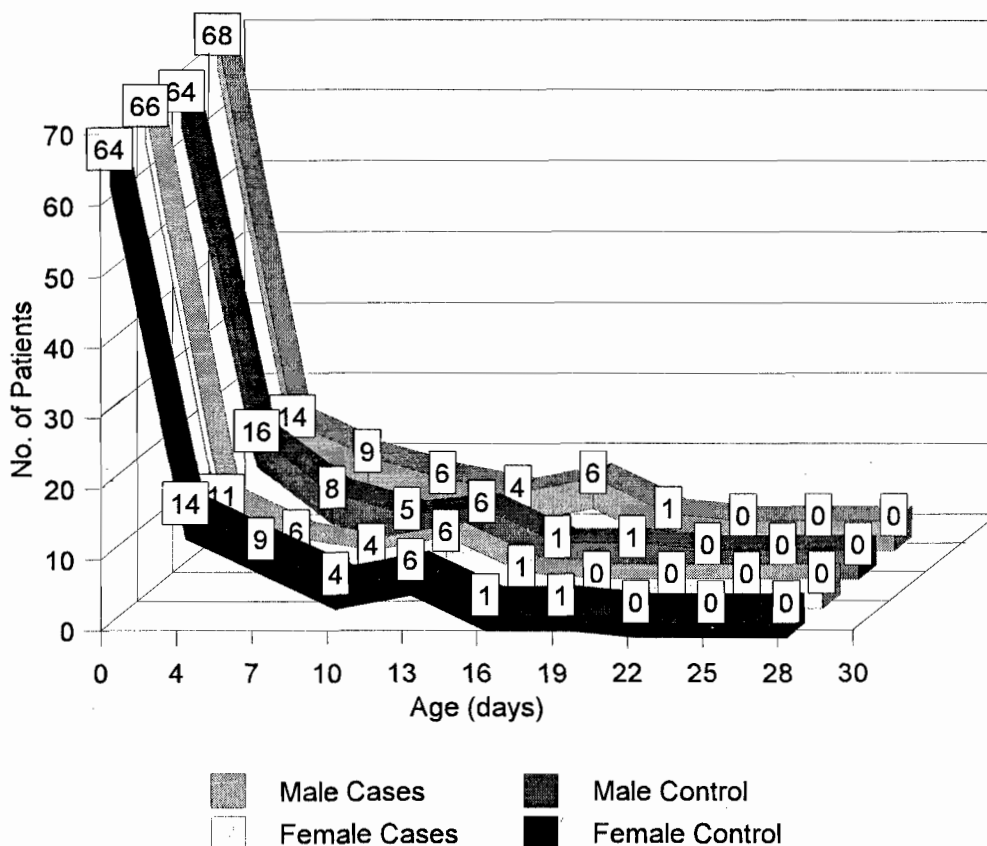


Figure 2. Sex distribution of cases and control

Follow-up

A total of 134 patients (67%) reported for follow-up. In 96% of these patients, the conjunctivitis had cleared by the first review (one week). All the patients with severe conjunctivitis, except one that absconded on admission, were followed up till the fourth review, by which time the conjunctivitis had cleared. In 6 of the patients, the topical drug had to be changed to gentamicin eye drops due to the persistence of the conjunctivitis and/or the result of antibiotic sensitivity to gentamicin.

Complications

No case of corneal complication was found in this study.

DISCUSSION

The slight male preponderant ratio of 1.1:1 found in the present study is in keeping, but less significantly so, with the findings of other researchers, who found a ratio of 1.5:1.^{5, 16, 19} Although the age at onset ranged from birth to 27 days, most of the patients presented within the first few days of life (fig. 1). This agrees with the findings of previous authors.^{16, 19} The mean age at onset in this study was 8.9 days. This is within the age range previously found by other researchers.^{13, 15}

The duration of the symptoms of ophthalmia neonatorum in this study ranged from 1-21 days. The effect of previous medication on duration of symptoms is not clear since 50% of the patients with positive bacterial isolates had applied some eye medication and 50% had not.

Only a slight difference existed between unilateral and bilateral cases in this study. Forty seven percent of the cases were unilateral while 53% were bilateral. Fifty percent of purely chlamydial ophthalmia neonatorum was unilateral.

Out of the 7 risk factors for ophthalmia neonatorum earlier enumerated, only three (maternal vaginal discharge in pregnancy, place of birth and prolonged rupture of the amniotic membrane) were found to constitute significant risk for the development of ophthalmia neonatorum.

Prolonged rupture of amniotic membranes

In a study conducted by Ugode,¹⁹ it was found that prolonged rupture of the amniotic membrane contributed significantly to the development of ophthalmia neonatorum. Other researchers^{5, 13, 14} found that it did not constitute a significant risk factor.

Place of delivery

Forty-nine percent of the babies delivered in the hospitals as against 34.5% of the babies delivered at home developed ophthalmia neonatorum. This may suggest a nosocomial infection. However, many of the mothers who delivered at hospitals 1, 2 and 3 may not have had antenatal care. Conversely, many patients who have had antenatal care often choose to deliver at home for economic reasons. The same reason accounts for delivery at chemist shops and perhaps in the church.

Unlike the findings of previous investigators,^{16, 19} more of the control babies in this study (49%) were delivered at home than the cases (34%). This high rate of home delivery may be the result of the limited financial resources. Isenberg et al.,¹⁴ however, did not find birth in an unhygienic environment to be a significant risk factor.

Vaginal discharge

Vaginal discharge during pregnancy is the most frequently identified risk factor in many studies. Isenberg et al.¹⁴ found that infants born to mothers with vaginitis were 5.1 times more likely to develop gonorrhoeal or chlamydial ON than babies born to mothers without vaginitis. In the present study, babies of mothers who had vaginal discharge during pregnancy (63 cases) were twice more likely to develop ON than babies from the control group (31 cases) $P < 0.01$. In a study by Ernest et al.,¹⁵ vaginal discharge was the strongest risk factor associated with ON development.

Marital Status

All the mothers in the present study were married.

Social status

The present study supports the findings of Ernest¹⁵ et al., which indicated that low maternal education did not contribute significantly to the development of ON, though the social status assessment in this study includes more than the education of the parents.

Prolonged labour

With prolonged labour occurring in the birth of 16 of the cases and in 10 of the control babies ($P > 0.05$), the present study indicates that prolonged labour does not constitute a significant risk factor in the development of ON.

Today, blindness from ON is rare in industrialized countries; this is because of the lower prevalence of sexually transmitted diseases (STD) in pregnant women and the administration of prophylactic treatment at birth.^{20, 21} The condition, however, still represents a serious health problem worldwide, with a risk of blindness, especially in Africa. The risk of blindness due to ON depends on the availability of medical care,

which is still a problem in rural areas of developing countries and in urban slums. As a public health measure it is important to prevent STDs and their consequences in pregnant women and in neonates. Preventing infection of the neonate by treating infection in pregnant women can only be carried out in places where medical care is well organized, so that pregnant women at risk can easily be screened for STDs and treated accordingly. However, screening for chlamydial infection in pregnant women is not easily implemented, and reinfection often occurs. In developing countries, general screening would be too costly. Also ignorance, poverty and difficult access to the few health facilities will make this difficult. The choice of different intervention strategies will depend on the prevalence of the causative STD agents in the population and on available financial, laboratory and diagnostic resources.

Routine prophylaxis with topical antibiotics such as silver nitrate, erythromycin or tetracycline ointment carries the risk of resistance, especially in patients with ON due to gonococcal infection. Povidone-iodine as a topical anti-infective appears to be an effective and cheap alternative. It may, therefore, be an ideal antiseptic for widespread prevention of ON, especially in developing countries. At a recent meeting of the Ophthalmic Society of Austria, povidone-iodine was considered to be the substance of choice for prophylaxis against ON in the newborn. Recently, povidone-iodine has been shown to be effective in preventing ON.²² Treatment results were comparable with those obtained with silver nitrate and erythromycin for gonococcal ON and superior in the prophylaxis of chlamydial ON. In addition, povidone-iodine offers added antiviral activity against both the human immunodeficiency virus and herpes simplex virus, produces no chemical conjunctivitis or antibiotic resistance, and is cheap.

Throughout the 3-month period of this study, when 198 cases were seen at the 5 hospital wards and clinics, only 2 patients presented at the National Eye Centre clinic and none at the Guinness Ophthalmic Clinic of ABUTH. This low rate of presentation in eye clinics may give a false impression to the ophthalmologists that the incidence of ON is decreasing. It is the belief of this author, however, that there is an urgent need for prevention of the disease by ocular prophylaxis.

CONCLUSION

The risk factors for the development of ophthalmia neonatorum were found to be mainly maternal vaginal discharge during pregnancy, place of delivery and prolonged rupture of amniotic membrane.

There is an urgent need for a national programme for the prevention of the disease by ocular prophylaxis which should be implemented at the state and local government levels.

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