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Neonatal Conjunctivitis in Ilorin, Nigeria

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Summary

Ernest SK, Adeniyi A, Mokuolu OA, Onile BO, Oyewale B. Neonatal Conjunctivitis in Ilorin, Nigeria. *Nigerian Journal of Paediatrics* **2000; 27: 39.** Eight hundred and fifty three babies born in University of Ilorin Teaching Hospital over a six consecutive month period were screened clinically for the disease based on standard criteria. Those with conjunctivitis were investigated in order to determine the organisms responsible. The incidence rate in this cohort of babies born in the hospital but developed conjunctivitis within 28 days (mostly after discharge home) was 132 per thousand live births. Forty five babies (39.3 percent) had mild disease, 65 babies (58 percent) had moderately severe disease while only 3 babies (2.7 percent) had very severe form of the disease. Thirteen babies (11.6 percent) developed their disease within 24 hours of life. None of the cases was complicated by blindness, however a case of bilateral upper eyelid ectropion was recorded, among the babies. *Chlamydia trachomatis* was the most commonly isolated agent while vaginal discharge was the most significant maternal factor associated with conjunctivitis in the infants. Gonococcal organism was one of the least isolated agents among the babies with conjunctivitis. In the light and knowledge of the devastating and long term effects of improperly managed conjunctivitis, it was recommended that both local and national policies on the prevention of the condition be enunciated for immediate implementation.

Introduction

NEONATAL conjunctivitis remains an important cause of ocular morbidity of great health concern.[1,2] It was the leading cause of blindness among children dmitted to American School for the Blind at the beginning of the twentieth century and has been a notifiable disease in Great Britain under the Public Health Regulations since 1926.[2,3] Faal[4] reported an estimated 1.5 million blind children in the world by 1992 and that every year 0.5 million more become blind. Most of these children are in countries of Asia and Africa and majority of the blindness were due to neonatal conjunctivitis. Isenberg et al,[5] reported that between 1000 and 4000 children become blind annually in Africa.[5]

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A wide range of infectious agents particularly bacteria, have been implicated. These include: Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus viridans, Escherichia coli, Ureaplasma urealyticum, Pseudomonas species Klebsiella species, Diphtheroid, Streptococcus pneumoniae, non-heamolytic Streptococcus species, Micrococcus species, Aerobic *sporeformers,* Hemophilus influenzae, Chlamydia trachomatis *and* Brahamella catarrhalis.[6,7,8] However, differences occur from centre to centre depending on infant bacterial colonization which is affected by several factors, which include maternal vaginal flora, resident flora of the labour ward and the neonatal. Intensive care unit (NICU), instruments and health care givers.[8] Since the days of Crede, prevention has been recognised as a first level action in eradicating the disease, and this was clearly proven by the prophylactic use of one percent silver nitrate ophthalmic solution which effectively reduced the incidence from 10 percent to 0.3 perecent.[9] Since that time, several other ophthalmic agents have been employed in the prevention of neonatal conjunctivitis such as 0.5 percent erythromycin, 1 percent tetra-

cycline and more recently reported, 2.5 percent povi-done-iodine.[10]

For more than a decade, the use of ocular preparations for the prevention of neonatal conjunctivitis was discontinued in this hospital due to an assumption that the disease was uncommon. However, it was recently observed that an increasing number of babies were presenting with neonatal conjunctivitis in the NICU. In view of the fulminant nature of the disease and undesirable complications if not effectively managed, it became imperative that the epidemiology of the disease be studied in order to enhance the anticipatory care of the new born babies. Unfortunately, statistics about neonatal conjunctivitis in the tropical countries, including Nigeria, are still far from accurate and detail of aetiology even moreso.[11] To the best of our knowledge, no recent work has been done in Nigeria to evaluate the epidemiology of neonatal conjunctivitis. In view of the fact that reliable information on the epidemiology is critically needed, the magnitude and causes of neonatal conjunctivitis in University of Ilorin teaching Hospital was investigated as a first stage for achieving this objective.

Subjects and Methods

Subjects for the study were babies born at the maternity wing of the University of Ilorin Teaching Hospital (UITH) Ilorin during a 6 consecutive month period, 1st January to 30th June 1996. Babies were excluded if they (i) were born outside the maternity wing of UITH, (ii) had evidence of congenital anomalies of the ocular organs or of the nasolacrimal duct, and (iii) developed conjunctivitis after 28 days of life. All the babies were clinically examined for conjunctivitis. Diagnosis[2] was made if the following case definition by World Health Organization were met. Purulent eye discharge, red or hyperaemic conjunctivita and eyelid oedema/ swelling. Where they were present laboratory investigations were carried out. All labour and deliveries were monitored and effected under strict asepsis by labour ward staff. At delivery eyes were cleaned gently with sterile gauze but no chemoprophylaxis was instilled. All babies were then examined at least once in the lying-in ward or NICU before discharge from the hospital. Thereafter, they were seen once a week at either the immunization centre or the NICU. However, a few needed to be traced to the home for default of appointments. At discharge, mothers were given instructions (both verbal and written) in local languages, to bring their babies back to the NICU if any of the criteria for the diagnosis of neonatal conjunctivitis as in Table I, were present. All babies with conjunctivitis had conjunctival swabs taken for culture. Gram staining and Giemsa staining for the isolation of the causative agents were also done. The time of onset of eye symptoms and duration were noted and the severity of symptoms and signs were rated according to the design by Sandstrom et al[12] (Table I) as mild, moderate or severe.

Specimen Collection, Culture and Gram/Giemsa Staining

Sterile cotton tipped sticks were used for taking conjunctival swabs. These were immediately transfered to the Microbiology laboratory of the University of Ilorin Teaching Hospital for plating on culture media. Chocolate or blood agar plates were incubated in an atmosphere of 5 percent CO_2 at 37°C for both aerobic and anaerobic organisms for 72 hours before they were opened. Sensitivity disks for the antibiotics tested were applied in a standard way. Materials for Gram stain taken from the lower conjunctiva, smeared on glass slides and fixed using alcohol and mild heat. In addition firm scrapings were obtained from the same site for Giemsa staining subsequently at the Paediatric Research Laboratory.

Epidemioogical Evaluation

A design proforma was used to collate maternal biodata which included history of pregnancy, labour and delivery, maternal weight, height, age, parity, social and educational status, and presence or absence of factors that may predispose the neonate to infections. The proforma was administered by the principal investigator (SKE).

Data Analysis

Incidence rate was calculated mathematically using a scientific calculator EL-506P. Laboratory results were reviewed to determine the agents responsible for the disease. The significance of maternal factors/ characteristics in the development of neonatal conjunctivitis were tested for using the chi-square test and student t-test. Where factors were found to be significant, odds ratio and the 95 percent Confidence Limit was calculated using Epiinfo version 6 software. Analysis of Variance (ANOVA) was done for dependent variables to determine the factor playing key role.

Results

During the study period, eight hundred and fifty three babies were clinically examined (screened). One was excluded for probable nasolacrimal duct obstruction/stenosis. One hundred and twelve (112) babies had conjunctivitis giving a proportional morbidity of 131.5 babies per thousand live births. The organisms isolated were as follows: one organism was isolated from 101 babies each while two organisms were isolated from 9 babies each. Total number of isolates was 119. *Chlamydia trachomatis* 30.25 percent, *Staphylococcus areus* 15.13 percent, *Staphylococcus epidemidis* 15.13 percent, *Coliform* 10.08 percent, *Klebsiella spp* 8.41 percent *Pseudomonas aeroginosa* 6.78 percent, *Streptococcus pneumoniae* 1.68 percent, *Streptococcus feacalis, Heamophilus influenzae and Neisseria gonorrhoeae* 0.84 percent each. Two specimen yielded no isolate, hence the total number of One hundred isolates reported. The distribution of bacterial isolates is shown on Table II. Majority of the babies (68 percent) developed conjunctivitis within

Table I

Clinical Parameter used for the Diagnosis and Severity Rating* of Conjunctivitis

S/No	Parameters
1	Purulent eye discharge
2	Hyperaemic/Erythema of Conjunctiva
3	Eyelid oedema

*Severity rating for each parameter: mild=+, moderate=++, severe=+++

Table II

The Distribution of 119 Bacterial Isolates in Cases of Neonatal Conjunctivitis

Aetiology	*Number*	*Percent*
Chlamydia tracjp.atos	36	30.25
Staphylococcus aureus*	18	15.13
Staphylococcus epidermidis*	18	15.13
Coliform*	12	10.08
Escherichia coli*	12	10.08
Klebsiella spp*	10	8.41
Pseudomonas aeruginosa*	8	6.41
Streptococcus pneumoniae*	2	1.68
Streptococcus faecalis	1	0.84
Hemophilus influenzae	1	0.84
Niesseria gonorrhoeae	1	0.84
Total	119	100

*Found as second isolates in some plates

Table III

Age of Onset of Eye Discharge

Age at Onset	*Number*	*Percent*
≤ 24 hours	13	11.6
25 – 72 hours	35	31.2
73 hours – 7 days	28	25.0
8 – 14 days	17	15.2
15 – 21 days	13	11.6
22 – 28 days	6	5.4
Total	112	100.0

Table IV

Age of Onset of Neonatal Conjunctivitis According to Aetiological Agent

Aetiological Agent	*Age of Onset (Days)*	
	Mean	(S.D)
C. trachomatis	5.0	3.8
S. aureus	9.5	4.2
S. epidermidis	9.1	5.0
Coliforms	4.0	2.0
E. coli	6.8	2.1
Klebsiella spp	9.1	3.5
Pseudomonas aeruginos	2.9	2.0
S. pneumoniae	7.0	2.0
S. faecalis	3.0	NA
H. influenzae	7.0	NA
N. gonorrhoeae	3.0	NA

NA= Not Applicable {only one isolate}

Table V

Clinical severity of symptoms/signs in neonatal conjunctivitis

Clinical	*Mild*		*Moderate*		*Severe*	
	n	*Percent*	*n*	*Percent*	*n*	*Percent*
Purulent discharge (n=112)	44	39.3	65	58	3	2.7
Hyperaemia of conjunctiva (n=10)	52	47.3	48	43.6	10	0.1
Eyelid oedema (n=42)	30	71.4	10	23.8	2	4.8

the first week of life, 11.6 percent developed the disease within 24 hours of delivery and 56.3 percent during the rest days of the first week, while only 32 percent developed the disease after the first week of life (Table III). The mean age of the onset of symptom in relation to the causative agent is shown on Table IV. Eye discharge was present in all the babies (100 percent), Hyperaemia of the conjunctiva was seen in 110 babies (98 percent) while eyelid oedema was observed in only 42 babies (37.5 percent). However, symptoms/ signs were severe in only 3 babies with eye discharge, 10 babies with conjunctiva hyperaemia and 2 babies with eyelid oedema (Table V).

The relationships of maternal characterists/ biodata with development of neonatal conjunctivitis are shown in Tables VI, VII and VIII.

Maternal age: Five (4 percent) babies among those who developed the disease were delivered to mothers aged below 20 years of age and 107 (95.54 percent) were mothers age above 20 years. Eight (1.08 percent) among those without the disease had mothers aged less than 20 years and 732 (98.92 percent) were born to older mothers. The Chi-squared was 7.4100 and P-value was less than 0.01. The Odds Ratio was 4.27 while the 95 percent confidence limit was between 0.314 and 2.585.

Parity: Sixteen mothers (14.29 percent) of ba-

Table VI

Maternal characteristics/Biodata and development of neonatal conjunctivitis

Characteristics	*Distribution*			
	Number	*Percent*	*No with NC*	*Percent*
Maternal age (Years)				
<20	13	1.5	5	38.5
20-30	764	89.7	81	10.6
31-40	72	8.5	23	31.9
>40	3	0.5	3	100.0
Parity				
Primiparity	184	21.6	16	8.7
Multipartiy	639	75.0	87	13.6
Grandmultiparity[≥5]	29	3.4	9	31.0
Educational Level				
Nil formal	59	6.9	26	44.1
Primary	187	75.0	20	10.7
Secondary	527	61.9	28	5.3
Tertiary	79	9.2	38	48.1
Booking status				
Booked	716	84	84	11.7
Unbooked	136	16	28	20.6
Antenatal Vaginal discharge				
Present	133	15.6	53	39.9
Absent	719	84.4	59	8.2
PROM				
Present	205	24.1	21	10.2
Absent	647	75.9	91	14.1
Meconium staining of Liquor				
Present	41	4.8	9	22.0
Absent	811	95.2	103	12.7
Mode of delivery				
Vaginal (SVD)	775	91.0	99	12.8
Abdomen (C/S)	77	9.0	13	16.9

PROM = Premature/Prolonged Rupture of Fetal Membranes
NC = Neonatal Conjunctivitis
SVD = spontaneous vaginal delivery C/S = Caeserian section

Table VII

Maternal Characteristics/Biodata and association with development of neonatal Conjunctivitis

Characteristics/Biodata	*X^2 or "t" Association*	*P-Value*	*OR*	*95%CL*	
Maternal age less than 20yrs	7.41	<0.01	4.27	0.319-2.585	S
Primiparity	4.070	<0.05	0.57	NN	S
Low Maternal Education	9.30	<0.005	1.88	0.206-1.056	S
Unbooked maternal status	7.86	<0.005	1.95	0.194-1.142	S
Vaginal discharge	98.430	<<<0.001	7.41	1.655-2.531	S
PROM	1.99	>0.1	-	-	NS
Meconium in Liquor	2.93	>0.05	-	-	NS
Mode of delivery	1.04	>0.5	-	-	NS

NA = Not applicable X^2 = Chi-Squared "t" = Student t-test
OR = Odds Ratio and CL = Confidence Limit or Interval
S = Significant and NS = Not Significant

bics with conjunctivitis were primiparous 96 (85.71 percent) were multiiparous while 168 (22.70 percent) were primiparous among mothers of babies without conjunctivitis and 572 (77.30 percent) were multiparous. Chi-squared was 4.0700, P-value was less than 0.05 however Odds ratio (OR) was 0.57.

Educational level: Forty-six (41.1 percent) of the 112 mothers whose infants had conjunctivitis had low education (Primary school education and below) while 66 (58.9 percent) had higher education. Among the 740 mothers of infants without conjunctivitis, 200 (27.03 percent had low educational status while 540 (72.9 percent) had higher education. Chi-squared X^2 was 9.3000, p-value was less than 0.005. The Odds Ratio (OR) was 1.88 and the 95 percent confidence interval was 0.206 to 1.056.

Booking status: Twenty-eight mothers of infants with disease (25 percent) did not book at the hospital for antenatal care (ANC) and 84 (75 percent) booked whereas 108 mothers of the infants without disease(14.6 percent) disease were unbooked and therefore had no antenatal care but 632 (85.4 percent) had ANC. The Chi-squared was 7.860, P-value was less than 0.005. The Odds Ratio was 1.95 and the 95 percent confidence limit ranged between 0.194 to 1.42. Table VII shows the result of ANOVA of dependent variables in the development of conjunctivitis. For maternal educational level F-statistic was 0.996, t-value was 0.998 and {-value was 0.680 while for booking status F-statistic was 5.057, t-value was 2.249 and P-value was 0.024.

Antenatal vaginal discharge: Fifty-three (47.32 percent) mothers of patient with conjuncivitis had antenatal vaginal discharge and 59 (52.68 percent) had none whereas 80 mothers of infants without conjunctivitis (10.81) had vaginal discharge during the antennal period and 660 (89.19 percent) had none.

Table VIII

Analysis of Variance [Anova] for Dependent Variables in The Development of Conjunctivitis

Variables	*F-statistic*	*t-value*	*P-value*
Educational Level	0.996	0.998	0.680
Booking status	5.057	2.249	0.024

P-value >0.05 is significant

Chi-squared was 98.4300 P-value was less than 0.001. Odds Ratio (OR) was 7.411 and the 95 percent confidence limit was between 1.655 and 2.531.

Premature Rupture of faetal Membrane: Among the 112 babies that developed conjunctivitis 21 (18.75 percent) of the mothers had PROM and 91 (81.25 percent) did not while 184 (24.86 percent) of the mothers of patients without conjunctivitis had PROM while 556 (75.14 percent) did not. The chi-squared value was 1.991 and P-value was greater than 0.1.

Meconium staining of the Liquor: Nine (8.044) of the subjects with conjunctivitis had meconium staining of the amniotic fluid and 103 (91.96 percent) did not, while 32 (4.32 percent) of the 740 babies without the disease had meconium staining of the amniotic fluid and 708 (95.68 percent) did not. Chi-squared X^2 was 2.925, P-value was greater than 0.05.

Mode of delivery: Regarding the mode of delivery, 99 (88.39 percent) babies were delivered by spontaneous vertex (SVD) and 13 (11.61 percent) by caesarian section among those with disease while 676 (91.35 percent) of the 740 babies that were not affected were vaginally delivered and 64 (8.65 percent) were delivered by caesarian section. The chi-squared was 1.0357, P-value was greater than 0.5.

Discussion

This study showed that 112 cases of neonatal conjunctivitis were detected over a 6-month survey period. The incidence of 131.5 per thousand live births was remarkable in a centre where the use of ocular prophylaxis was discontinued for the presumed rarity of the disease. This incidence is lower than the 23.2 percent reported by Laga et al[13] from Kenya, East Africa, 17 percent reported from Gabon by Frost et el[14] and 22 percent reported from Cameroon by Buisman et al[15] in a centre where no prophylaxis was in use. However, it is comparable to reports of other studies elsewhere in Africa. Isenberg et al[5] reported an incidence of 13.1 percent after the use of povidone-iiodine, 15.2 percent after erythromycin prophylaxis and 17.6 percent after use of silver-nitrate prophylaxis at the Kikuyu Mission Hospital, Kenya. When compared with reports from the developed counties, the figure in this study is remarkably higher. Incidence from developed countries of the world range from 0-3 percent.[12]

The leading cause of conjunctivitis in this study was Chlamydia trachomatiis which accounted for about a third of all the cases, while N. gonorrhoea was responsible for only one case (0.84 percent). This observation is in agreement with reports from Kenya,[13] the Gambia,[16] and the United Kingdom,[17] but at variance with report from Sweden where Staphylococcus species topped the list. In this study the combination of Staphylococcus aures and Staphylococcus epidermidis was responsible for the disease in equal number of babies as Chlamydia trachomatis.

Maternal genital infection rate during pregnancy may be responsible for this difference. While it has been claimed that increase usage of barrier methods of contraceptive devices like condom might have contributed to the global reduction in the transmission of gonococcal organism, the same cannot be said of Chalmydia tranchomatis whose incidence is known to be increasing globally. This calls for a fresh investigation.[10 18] The incidence of other bacterial agents (non-gonococcal, non-chlamydia) has not changed remarkably around the world where studies were carried out. However, the type of bacteria varied from centre to centre depending on the resident pathogen in the neonatal units, the lying-in-ward and those carried by health care providers.

Contrary to widely held belief and reports that majority of cases of conjunctivitis seen within 24 hours of delivery were due to chemical causes,[1 6 7] pathogens were isolated from most of our patients. In this study there were 13 babies who developed conjunctivitis within 24 hours of delivery and pathogens were isolated from 11 of them. These were mostly Staphylococcus (aureus and epidermidis). Although Prentice et al[8] had argued that *Staphylococcus* can be present in neonatal conjunctivae without causing a disease, this argument becomes void in the presence of disease as was found in some of our subjects. The age of presentation became variable for different offending agents after 24 hours; for example the only case of N. *gonorrhoea* presented on the 3rd day of life whilst cases caused by C. *trachomatis* appeared between 2-26 days with an average of 5 days. The only case of gonococcal ophthalmia followed the widely observed pattern whereas those due to C. trachomatis appeared over a wide range of time in contrast to the 2nd week of life stated in various reports.[9 13 15 19] In this study, the mean ages at presentation or at which conjunctivitis developed was rather varied and atypical and may not be predictive for definitive etiological diagnosis.

Eye discharge was the most constant and most reliable clinical presentation. It was seen in all the patients diagnosed with neonatal conjectivitis. Occassionally, it was the only criterion present for making a clinical diagnosis. This agrees with reported findings from Sweden[19] and USA.[6 7] However, in this

study severe cases were not common. This may be due to the higher frequency of C trachomatis as the etiological agent rather than N gonorrhoea which tends to present with more purulent discharge. Most of the cases earlier reported by Crede were of very severe clinical presentation and almost exclusively due to N. gonorrhoea.[9]

Maternal age less than 20 years (teenage mother) was found in this study to be a strong associating factor. This is consistent with previous reports.[22] Teenagers are more likely to be unmarried though in this present study all women who delivered in this hospital claimed to be married. The stigma associated with single parenthood and a consideration of being regarded as prostitutes may have influenced their answers to this question. In addition, teenage mothers are more likely to belong to the low social class that make them unable to afford booking for antenatal care. They are likely not to have much experience in child caring and may delay in seeking medical opinion on issues. A higher incidence of sexually transmitted diseases has been found among teenagers compared to other women and they are less likely to be willing to use contraceptive devices.[21 22]

The strongest associations of neonatal conjunctivitis were found with presence of vaginal discharges in the mother. The presence of discharges in mother may be regarded as evidence of maternal genital infection (though the specific type of infection still requires evaluation). Our study showed that babies from mothers with antenatal vaginal discharge were eight times more likely to develop conjunctivitis. This was consistent with other previous reports.[5 13] The presence of discharge increases the propensity of getting infecting organism into the infants conjunctiva (especially during passage through the birth canal) where the number of organisms can multiply rapidly. Some factors that may be conducive for thriving of parthogens include (PROM) and meconium in amniotic fluid More than 50 percent of patients with either of these factors were also found to have significant antenatal vaginal discharge which increased the chance of easy colonization of the baby even before delivery through ascending aminiotic fluid infection. Meconium is a good culture medium that may promote bacterial growth.[7]

The association of low maternal education with development of conjunctivitis is comparable to the findings in American studies.[1 7] This may be due to poor hygiene, poor knowledge of personal health and poverty which may disallow mothers from booking for antennal care. Maternal educational level is also likely to affect the knowledge of mothers about the importance of antenatal care. However, maternal educational level showed no statistically significant effect on development of neonatal conjunctivitis. Antenatal booking status was more strongly associated with the development of conjunctivitis in this study. This seems logical as education does not translate to freedom from disease; one must utilize available health facilities and health knowledge. Likewise a high social status does not directly forestall developing a disease. However, booking in a good centre for antenatal care can mean to staying healthy; through disease survaillance, early detection and institution of appropriate treatment for mothers and prophylaxis /treatment for babies. Therefore, in the development of neonatal conjunctivitis, maternal education and low social status would not matter if mothers were booked for antenatal care. Booking for and receiving antenatal care stands as a central factor in avoiding the development of neonatal conjunctivitis.

Other tested predipositions like meconium staining of the liqour and PROM were not significantly associated with development of neonatal conjunctivitis. The reason may be because such affected babies characteristically received antibiotics as early as possible in our centre for before infections became clinically evident. This may curtail the development of conjunctivitis. The outcome of this work carried out among a cohort of neonates delivered at the UITH shows clearly that neonatal conjunctivitis is still a serious problem in our zone of the country. We presume that our finding is probably an important (national) index of the extent of the problem which calls for critical attention. Although the exact incidence of visual defects or impairments in the Nigerian Child is not known, the fact is that blind children and adults begging for alms on Nigerian streets is neither rare nor uncommon. The role of neonatal conjunctivitis in addition to measles, trachoma, vitamin A deficiency in causing visual disability among Nigerian children informs a call for attention in this respect. Because of the universally proven efficacy of prophylaxis in preventing neonatal conjunctivitis and possible social and economic sequalae there is an urgent need to initiate and implement a national policy on ocular prophylaxis enforceable at the regional and Local government levels throughout Nigeria. In addition, the proportions of the disease caused by C trachomatis identified by this study strongly suggests that maternal genital tract infection with the organism is probably also very high. Hence, such national or regional policy on prevention should include not only ocular prophylaxis for neonates, but also appropriate screening and treatment for mothers who may be infected with C. *trachomatis* during the ante-natal period. It is established that such mothers run the risk of developing complications like perihepatitis or pelvic inflammatory disease and consequently infertility.[20]

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