

# CLINICAL AND BACTERIOLOGICAL STUDY OF NORMAL AND INFLAMMED NEONATAL CONJUNCTIVAE

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## ABSTRACT

Maternal vaginal and neonatal conjunctival flora were prospectively studied in a 117 mother baby pairs. The commonest isolates from both vaginal and conjunctival flora were *E. coli*, *Staphylococcus aureus* and *Klebsiella* species. In 85% of mother-baby dyads, isolates from vagina and conjunctiva were similar. The commonest bacterial isolates in neonates with conjunctivitis were *Staphylococcus aureus* (37.4%), *E. coli* (27.9%) and *Klebsiella* species (19.3%). Maternal coitus, infections, rupture of membranes and baby's birth weight and sex did not influence the occurrence of conjunctivitis.

**Key words:** Newborn, Conjunctivitis, *Staphylococcus aureus*, *E. coli*, *Klebsiella*.

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Conjunctivitis continues to remain a common cause for morbidity amongst neonates even today. During the past three decades, the reported incidence of neonatal conjunctivitis in India has varied from 0.5-33.0% of all births(1-4). In contrast, the reported incidence from the developed countries of the world has varied from 0.9-12.0%(5-6). Several western studies have been able to document a causal relationship between neonatal infections and maternal cervical flora at the time of delivery(7-9). Indian literature, however, has scanty information on this subject and the present study was designed to evaluate relationship of maternal cervical flora to the flora in the neonate's conjunctiva.

## Material and Methods

Women with term gestation admitted to the obstetric units in labor were enrolled into the study protocol. They were selected by the process of simple random sampling. Women delivering by cesarean section were excluded from the study. Thus 119 women and their newborn were enrolled into the study protocol. However, 2 mother-baby dyads were not available for microbiological and clinical evaluations at all time points and therefore only 117 dyads were included for the final analysis. An additional group of 60 hospital born neonates less than 7 days old with conjunctivitis were also studied to evaluate the flora in neonatal conjunctivitis.

In all mothers information with regard to infective complications, coitus in preceding one month of delivery, duration and nature of leaking, vaginal examinations during labor and membrane rupture—delivery interval data were obtained. Neonatal information included birthweight, gestation, Apgar scores and presence of conjunctivitis.

Clinical conjunctivitis in the neonate was defined as conjunctival hyperemia and discharge in one or both eyes. Neonates were followed for a period of 3 days for occurrence of conjunctivitis. No special eye care practices such as instillation of prophylactic antiseptics or antibiotics are carried out at our centre.

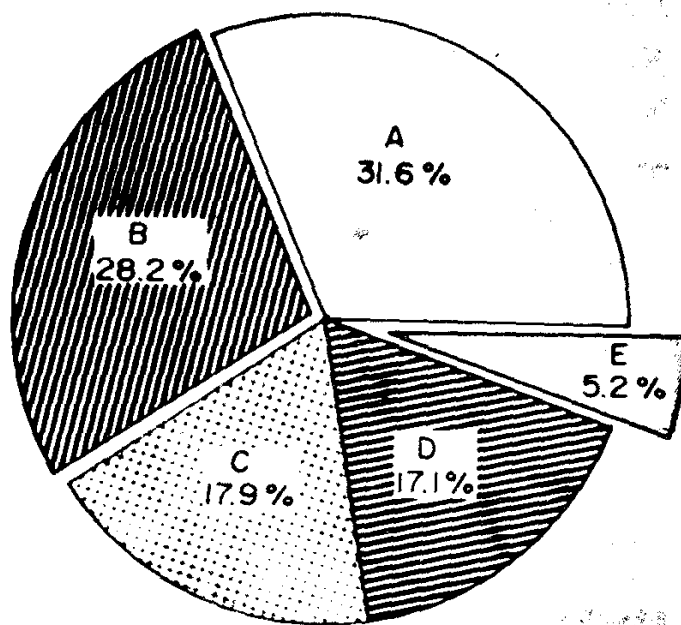
Maternal high vaginal swabs collected before delivery of baby were transported to the microbiology laboratory within an hour and inoculated onto blood agar and MacConkey's media and incubated at 37°C for 24 hours. The neonatal conjunctival swabs were taken from the inferior fornices of both eyes within 15 minutes of birth and again at 48-72 hours after birth. The swabs were transported in Stuart's medium and subsequently inoculated onto blood agar, MacConkey's medium and glucose broth and incubated at 37°C for 24 hours. In the present study isolation of only aerobic flora was attempted and the isolates were identified using standard techniques. Anaerobes and chlamydia could not be studied due to technical difficulties.

The maternal and neonatal variables were analysed using Chi square and Student 't' tests.

## Results

Only 2 of 117 neonates (1.7%) had clinical conjunctivitis at birth, but 67 (57.2%) had developed conjunctivitis by 48-72 hours of life. A majority (82.3%) of children developing conjunctivitis had a purulent discharge, while in the rest it was serous.

**Vaginal Flora:** Eighty of 117 mothers (68.3%) had isolates from their vagina. The Figure depicts profile of maternal vaginal flora in the present study. *E. coli*, *Staphylococcus aureus* and *Klebsiella* species



A: No growth; B: *E. coli*; C: *S. aureus*; D: *Klebsiella* sp., E: Others.

Fig. Profile of organisms in maternal genital tract.

accounted for almost two thirds of the aerobic isolates.

**Conjunctival Flora:** Only 6 of 117 neonates (5.1%) had isolates from their conjunctiva at birth. At 48 h, however, 75 of 117 (64.1%) neonates had isolates from the conjunctiva of one or both eyes, and 67 (52.2%) had clinical conjunctivitis. Two hundred and thirty four conjunctival swabs were taken from 117 babies at 48 h. *E. coli* (22.6%), *Staphylococcus aureus* (14.7%) and *Klebsiella* species (11.1%) were the commonest isolates. The maternal vaginal and conjunctival flora of neonates with and without conjunctivitis are depicted in Tables I & II, respectively. There were no polymicrobial growths from any of the conjunctival cultures, but in three neonates, different organisms were grown from the right and left conjunctivae.

It was interestingly observed that 68 of

**TABLE I—Maternal Vaginal and Neonatal Conjunctival Flora in Normal Neonates (n = 50)**

Organisms	Maternal vaginal culture (n = 50)*		Conjunctival cultures			
			At birth (n = 100)*		At 48 h (n = 100)*	
	No.	(%)	No.	(%)	No.	(%)
<i>Escherichia coli</i>	8	(16.0)	2	(2.0)	8	(8.0)
<i>Staphylococcus aureus</i>	2	(4.0)	—	—	2	(2.0)
Coagulase negative staphylococcus	1	(2.0)	1	(1.0)	1	(1.0)
<i>Klebsiella</i> sp.	5	(10.0)	—	—	—	—
Micrococci	—	—	1	(1.0)	1	(1.0)
<i>Beta-hemolytic streptococci</i>	—	—	—	—	1	(1.0)
<i>Alpha-hemolytic streptococci</i>	1	(2.0)	—	—	—	—
<i>Acinetobacter</i> sp.	1	(2.0)	—	—	—	—
No growth	32	(64.0)	—	—	—	—

(\*n = total no. of swabs)

**TABLE II—Maternal Vaginal and Neonatal Conjunctival Flora of Neonates with Conjunctivitis at 48 h (n = 67)**

Organisms	Maternal vaginal culture (n = 67)*		Conjunctival cultures			
			At birth (n = 134)*		At 48 h (n = 134)*	
	No.	(%)	No.	(%)	No.	(%)
<i>Escherichia coli</i>	25	(37.3)	—	—	47	(35.0)
<i>Staphylococcus aureus</i>	19	(28.3)	—	—	31	(23.1)
Coagulase negative staphylococcus	2	(2.9)	—	—	4	(2.9)
<i>Klebsiella</i> sp.	15	(22.3)	2	(1.5)	26	(19.4)
<i>Alpha-hemolytic streptococci</i>	1	(1.5)	—	—	—	—
No growth	5	(7.5)	—	—	—	—

(\* n = total no. of swabs)

80 mother-baby dyads (85.0%) with isolates from vagina and conjunctivae (at 48 h) had similar bacterial isolates from

both sites.

One hundred and twenty seven neonates with conjunctivitis were available to

evaluate the aerobic flora in early neonatal conjunctivitis. In the 254 conjunctival swabs cultured, the commonest aerobic flora were *Staphylococcus aureus* (3.4%), *E. coli* (27.9%) and *Klebsiella* species (19.3%).

It was observed that maternal factors such as coitus, infective complications, rupture of membranes, vaginal examinations, parity or age and neonate's birthweight or sex did not influence the occurrence of neonatal conjunctivitis.

Over 90% of both gram positive and negative bacterial isolates were sensitive to gentamicin, soframycin and chloramphenicol.

## Discussion

During the past decade and a half, most studies have observed that amongst half the neonates developing conjunctivitis do so within the first 3 days of life(10), and 60-80% of them have had purulent conjunctivitis(5,10). The results of the present study are comparable with these observations.

Isolates of maternal genital tract at delivery have usually revealed multiplicity of organisms with anaerobes and micro-aerophiles constituting about 40% of isolates(7,11). In the present study in almost 32% of mothers no organisms were isolated. It is speculated that these may have been contributed by anaerobes and micro-aerophiles, whose isolation were not attempted in the study. Most studies during the past two decades have observed *E. coli*, *Staphylococcus aureus* and *Klebsiella* species to be the commonest aerobic isolates from the maternal vagina(7,12,13), as was also the observation in the present study.

Brook *et al.*(7) observed that at birth 40.3% isolates from the neonatal conjunctiva were anaerobes. They further observed that at 48 hours anaerobic isolates de-

creased by almost half and the aerobic isolates showed no quantities but qualitative change (*S. aureus* replacing *E. coli* as the predominant isolate.) In the present study there was a significant increase in aerobic isolates between birth (5%) and 48 hours (64%). In a more recent study, Isenberg *et al.*(9) observed that 75% of neonatal conjunctivae had isolates at birth, with lactobacilli (40.5%) and anaerobes (31.5%) being the commonest isolates and aerobes constituting only about 11% of isolates.

Most studies have demonstrated staphylococci to be the commonest aerobic isolates in neonatal conjunctivitis(1,3,4). In the present study too, of 127 neonates with conjunctivitis, *S. aureus* (37.4%) constituted the largest group of isolates. Several studies have demonstrated that neonatal conjunctivitis usually follows intrapartum contamination by secretions of the maternal cervix(7,8,16). In the present study too it was observed that in 85% of mother-baby dyads, the isolates from vagina and conjunctiva (at 48 hours) were similar, thus underscoring the importance of maternal genital tract flora in the causation of early neonatal conjunctivitis.

Various studies have demonstrated correlation between neonatal conjunctivitis and rupture of membranes, duration of labour, vaginal examinations, birthweight, gestation and sex of the baby(3,5-9). In the present study none of these factors were significantly associated with neonatal conjunctivitis (the role of gestation however, was not evaluated). It thus appears that neonatal conjunctivitis in the first few days of life is probably largely contributed to by maternal vaginal/cervical flora and could be easily treated by use of gentamicin, soframycin or chloramphenicol drops, to which most aerobic bacteria were sensitive.

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