



A COMPARATIVE STUDY ON TEARING PATTERN OF PRETERM AND TERM NEONATES IN A TERTIARY CARE CENTRE AT EASTERN INDIA

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ABSTRACT **Background:** The preterm and term neonates secrete basal and reflex tear. The tear deficiency can cause various ocular and systemic effects of drugs, used topically. If there is any reduced reflex and basal tear secretion then it may mask the diagnosis of nasolacrimal duct obstruction.

Aims And Objectives: To evaluate basal and reflex tear production in preterm (post-conceptual age <37 weeks) and term (post-conceptual age ≥37 weeks) neonates.

Methods: 60 preterm and 60 term neonates were examined. Tear secretion was evaluated by applying Schirmer test strips at inferior fornix for 5 minutes before (reflex plus basal secretion) and after (basal secretion) applying topical anesthetic agent.

Results: Mean (± SD) basal tear secretion was 5.76 (±1.44) mm in preterm and 7.73 (±1.87) mm in term neonates. Mean (± SD) reflex tear secretion was 7.01 (±1.34) mm in preterm and 12.45 (±2.28) mm in term neonates.

Conclusions: Preterm neonates have reduced reflex and basal tear secretion than term neonates. In term neonates tear production is similar to that in adults.

KEYWORDS : Term Neonate, Preterm Neonate, Basal Tear Secretion, Reflex Tear Secretion.

INTRODUCTION:

Tear is uniform gel consisting of soluble mucus, which is secreted by goblet cells, mixed with fluids and proteins, secreted by lacrimal glands.^[1]

Tear film primarily protects ocular surface from microbes and toxic agents and maintains clear corneal surface. Optically uniform corneal surface is essential for central fixation and visual development, which develops during first 3 weeks of life.^[2]

The preterm and term neonates secrete basal and reflex tears.^[8] In preterm (28-37 weeks after conception) neonates, basal and reflex tear secretions are at low levels which substantially increase as they grow. By term, basal and reflex tear production becomes same as adult levels. The tear deficiency can cause various ocular and systemic effects of drugs, used topically and in long term it has consequences on ocular surface disorder.^[9, 10] If there is any reduced reflex and basal tear secretion then it may mask the diagnosis of nasolacrimal duct obstruction.

Compared with term neonates, the low level of tears in preterm neonates may allow topical eye medications to remain more concentrated, causing the cornea to become dry and opacified during ocular examination and treatment.

Diagnosis of nasolacrimal duct obstruction may be masked by decreased tearing function in preterm neonates and this explains the fact that congenital mucocele may not have excessive tearing or conjunctival discharge. So, a frequent presenting symptom of congenital mucocele (dacryocoele or aminocele) is an expanding mass.^[11]

During examination of preterm neonates for retinopathy of prematurity, cornea is fully exposed and may become dry faster. Based on the data provided by this study, examiners can anticipate that the cornea of preterm neonates will dry faster than term neonates, because of relatively less tear production and can be prepared for providing adequate lubrication to the cornea.

Our study to differentiate basal and reflex tear secretion will be helpful for diagnosis of certain diseases in neonates. In a case of familial dysautonomia lack of both basal and reflex secretion may be present.^[12] Congenital absence of the lacrimal gland affects reflex tear secretion

more than basal tear secretion.^[13] Hereditary congenital alacrima is a rare disorder, presented as reduced basal and reflex tear.^[14]

In this study we evaluated basal and reflex tear secretion of term and preterm neonates and determined the correlation of tear production with birth weight and postconceptional age.

AIMS AND OBJECTIVES:

1. To evaluate tear production in preterm (28-37 weeks after conception) and term (38-42 weeks after conception) neonates.
2. To differentiate basal and reflex tear secretion.

METHODS:

Total 120 neonates were examined in two groups. There were 60 preterm and 60 term (post-conceptual age ≥38 weeks) neonates in two groups respectively. It is a cross-sectional observational study for approximately 1 (one) year (April 2020 to March 2021). Ethical clearance was obtained from the institute Ethics Committee.

Inclusion Criteria: Medically stable term and preterm neonates.

Exclusion Criteria:

- a. Neonates, who have congenital anomalies.
- b. Neonates having any systemic or ocular disease which can affect the tear production.
- c. Neonates having medical conditions.
- d. Parents unwilling to give consent.

Procedure:

We recorded post-conceptual age (in weeks) and birth weight (in grams) of each neonate. Post-conceptual age was determined by maternal dates and if there was disagreement for more than 1 week, we used Ballard test^[12].

All neonates were examined in quiescent state (noncrying) on postnatal day 2 (from 24 hours to 48 hours after birth), 2 hours after feeding at various times during the day on supine neonates in moderate room light. A prepackaged standardized sterile Schirmer tear test strip was bent at the notch, and the rounded wick end was placed over the lower eyelid margin in the inferotemporal area^[13] of lower eyelid margin in such a way that there was no contact between the cornea and the filter strip. The eyes were allowed to close around the strip. After 5

minutes, wetting of the strips were measured and recorded in millimeters as "reflex plus basal secretion."

A drop of topical anesthetic agent (0.5% proparacaine hydrochloride) was instilled in each eye to measure basal secretion^[14]. After waiting 3 minutes, a standardized sterile Schirmer tear test strip was placed in the inferotemporal area of the lower eyelid margin. After 5 minutes, wetting was measured and recorded in millimeters as "basal secretion". The amount of reflex secretion was calculated from the difference between the measurement of basal secretion and reflex plus basal secretion.

RESULTS:

Total 240 eyes of 120 medically stable neonates (60 preterm and 60 term) were examined and data was collected and analyzed in this study.

Table 1:

	Preterm (Mean ±SD)	Term (Mean ±SD)	P value
AGE IN WEEKS	32.03±2.26	40.23±13.00	<0.0001
BIRTH WEIGHT (IN GRAMS)	1514.20±294.03	2863.80±563.00	<0.0001
BASAL TEAR SECRETION IN MM	5.76±1.44	7.73±1.87	<0.0001
REFLEX TEAR SECRETION IN MM	7.01±1.34	12.45±2.28	<0.0001
TOTAL TEAR SECRETION IN MM	12.76±2.64	20.16±4.11	<0.0001

Table 1 shows preterm neonates (n: 60) had a mean postconceptional age of 32.03±2.26 weeks and term neonates had mean postconceptional age of 40.2±13 weeks. Preterm neonates (n: 60) had a mean birth weight of 1514.2±294.03 grams and term neonates had mean birth weight was 2863.8±563.0 grams. This table also shows mean (± SD) basal tear secretion was 5.76 (±1.44) mm in preterm and 7.73 (± 1.87) mm in term neonates. Mean (± SD) reflex tear secretion was 7.01 (±1.34) mm in preterm and 12.45 (± 2.28) mm in term neonates. Mean (± SD) total tear secretion was 12.76 (±2.64) mm in preterm and 20.16 (± 4.11) mm in term neonates.

Table 2: Distribution Of Total Tear Secretion Of Preterm And Term Neonates On 2nd Day Of Their Life

TOTAL TEAR SECRETION RATE (MM/5 MIN)	<15 MM/5 MIN	>15 MM/5 MIN
TERM NEONATES	8(13.33%)	52(86.66%)
PRETERM NEONATES	42(70%)	18(30%)
P VALUE	<0.05	<0.05

Table 2 shows within 48 hours of birth, 86.66% of term neonates (n: 52) had normal total tear secretion rates (tear wetting greater than 15 mm/5 minutes), whereas only 30% of the preterm neonates secreted this amount of tears.

Table 3: The Effect Of Birth Weight On The Basal And Reflex Tear Secretion Of Preterm Neonates

BIRTH WEIGHT (GRAMS)	<1000	1000-1500	>1500	P VALUE
BASAL TEAR SECRETION (MM)	4.0±0.0 (N=2)	5.03±1.14 (N=29)	6.74±1.22 (N=29)	<0.05
REFLEX TEAR SECRETION(MM)	5.0±0.0 (N=2)	6.27±0.92 (N=29)	7.79±1.26 (N=29)	<0.05

Table 3 shows basal (r: 0.16, p < 0.01) and reflex (r:0.19, p<0.01) tear secretions yielded a significant correlation with birth weight reflex.

Correlation analysis of reflex and basal tear secretion with either birth weight was not significant for term infants (p > 0.05 for all analysis).

The mean value of measurements for tear production in both eyes of each neonate was used as no statistically significant difference was found between tear measurement values of right and left eyes of each neonate by unpaired t test (P>0.05).

DISCUSSION:

Basal and reflex tear secretion of 60 term and 60 preterm neonates were studied over a period of 1 year. On analysis of the data collected, the

following findings were noted. We found that 86.6% of term neonates and only 30% of preterm neonates had normal tear secretion (>15mm/5 mins) on the 2nd day of their life.

Apt and Cullen reported that 82% of full-term infants had normal tearing (at least 15 mm of wetting of the tear test strip in 5 minutes) at 1 day of age.^[23]

Patrik RK reported that normal tearing pattern (>15 mm of wetting of tear test strip) in 84 % cases in a case series of 212 term neonates and 10 preterm (34-36 weeks) neonates without ocular or nasal irritation.^[24]

Toker et al. reported that 87% of term and 20% of preterm neonates had normal adult tear secretion by 4 weeks after birth and tear secretion of term neonates was independent of either birth-weight or postconceptional age.^[16]

The preterm neonates had mean postconceptional age of 32.0 weeks and mean weight of 1514.2 grams. Their mean basal and reflex tear secretions were 5.7 mm and 7.7 mm, respectively. The term neonates had mean postconceptional age of 40.2weeks, mean weight of 2863.8 grams and mean basal and reflex tear secretions of 7.0 mm and 12.4 mm, respectively.

Apt and Cullen found that the incidence of normal tear secretion in the group of preterm neonates was proportional to body weight i.e. infants, weighing less than 1500 gm, 14% had normal lacrimation. Infants, weighing 1500 to 2000 g, 44% had normal tear secretion and infants, weighing 2000 to 2500 g, 63% had normal lacrimation.^[23] In our study we also found that both basal and reflex tear secretion of preterm neonates had correlated with their birth weight.

We found that the mean values of both reflex and basal tear secretion were significantly greater in term than the preterm neonates. We found that both basal and reflex tear secretion of preterms were correlated with postconceptional age and birth weight.

However, Spiegler and Mayer reported that mean value of basal tear production was 5.00 (± 3.00 SD) mm in 5 minutes, after administering a topical anesthetic eye drop in 50 term and preterm infants and "was independent of the absolute age of the babies, of birth weight, and of the degree of maturity."^[25]

The differences in tear production of the neonates may be due to variable time periods between birth and initial tear measurement, consideration of the crying and the noncrying state of the neonates, or inclusion criterion for postconceptional age and for birth weight.^[16]

Toker et al. found that tear secretion of term neonates was independent of either birth-weight or postconceptional age.^[16] We also noted that tear production in term neonates had no correlation with either postconceptional age or birthweight.

Thus, we can say that the findings of our study are similar to the findings of various other studies conducted on term and preterm neonates.

CONCLUSION:

Preterm neonates have significantly reduced reflex and basal tear secretion than term neonates. In preterm neonates reduced tear secretion can mask the diagnosis of a nasolacrimal duct obstruction. So, a frequent presenting symptom of congenital mucocele (dacryocoele or aminocoele) is an expanding mass. Preterm neonates with reduced tear secretion may need more frequent lubrication during ophthalmological examination and surgeries as their cornea will dry faster than that of term neonates. Our study to differentiate basal and reflex tear secretion can be helpful for diagnosis of certain diseases in neonates. In familial dysautonomia lack of both basal and reflex secretion may be present. The data provided by this study can permit earlier diagnosis of these disorders and appropriate management can be done.

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