



Original Article

## Prevalence of Congenital Nasolacrimal Duct Obstruction and its related risk factors among newborns

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### Abstract

**Introduction:** Lacrimal drainage system disorders are among the most common ocular disorders faced by physicians. The prevalence of congenital nasolacrimal duct obstruction (CNLDO) is different in various studies, and the role of such factors as maternal and neonatal demographic characteristics have not been completely investigated in CNLDO. The present study aimed to assess the prevalence of CNLDO and its related factors in newborns in Sabzevar.

**Methods:** This cross-sectional study was conducted on 541 newborns in Shahidan Mobini hospital, Sabzevar, Iran from January to February 2015 after obtaining informed consent from their parents. Data were collected by interviewing mothers, filling out checklists, and physical examination of the newborns. Data analysis was carried out in Stata software using a logistic regression test at a 95% confidence interval.

**Results:** The prevalence of CNLDO was 22.6%. Purulent ocular discharge was the most common symptom (16.82%). There was a significant relationship between the neonate's head circumference and the incidence of CNLDO ( $P=0.01$ ); nonetheless, CNLDO in the newborns showed no significant association with weight, height, and Apgar score ( $P>0.05$ ).

**Conclusion:** Considering the significant prevalence of CNLDO in preterm and term neonates, as well as its variable prevalence rates reported in different studies and the absence of overlapping of various risk factors of such disorder, it is recommended to carry out more thorough studies from birth to 1 year of age.

**Keywords:** Prevalence, Nasolacrimal Duct Obstruction, Congenital Disorders, Term Birth, Risk Factors

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## Introduction

Lacrimal drainage system disorders are among the most common ocular disorders faced by physicians (1). Congenital nasolacrimal duct obstruction (CNLDO) is a common disorder, causing failure in the nasolacrimal duct drainage system (2). The CNLDO refers to a delay in the maturity of the lacrimal system, occurring due to the presence of mucous membranes at the entrance of the nasolacrimal duct; consequently, an obstruction appears at the site of the Hasner valve (3). This disorder which may be unilateral or bilateral (4) is usually characterized by persistent tearing and intermittent purulent mucous discharge from one or both eyes of an infant (5).

The obstruction is usually in the Hasner valve where the lacrimal duct drains into the nasal cavity (6, 7). The majority (90%) of these blockages resolve with conservative care during the first few months of life (8). The prevalence of CNLDO in studies in different regions ranged from 1.2%- 30%, and the most widely accepted incidence is 6% (7). Several surgical procedures to address recalcitrant CNLDO include lacrimal duct probing surgery, balloon catheter dilation of the nasolacrimal duct, and endoscopic intranasal surgery or dacryocystorhinostomy (8-9).

Bilateral and unilateral CNLDO cases were observed in 50%-75% and 25-50% of the cases, respectively. The risk factors for congenital abnormalities and CNLDO include maternal infections during pregnancy, exposure to radiation, drug use, and some occupational hazards (4). In addition, the role of such factors as the demographic characteristics of mothers and neonates has not been completely investigated in the case of CNLDO. Although children do not seem to be annoyed with epiphora and purulent discharge, these symptoms are often an important factor leading to parental concerns which can be eliminated in case of timely treatment.

In light of the aforementioned issues, the present study aimed to determine the prevalence of CNLDO and the role of such factors as maternal and newborn demographic characteristics, as

well as the symptoms of CNLDO in newborns in Sabzevar, Iran.

## Materials and Methods

This cross-sectional study was conducted on newborns in Shahidan Mobinabi Hospital, Sabzevar, Iran. According to the type of study and considering other similar descriptive studies, the sample size was calculated at 541 subjects. The study was carried out after being approved by the Research Council, obtaining the code of Ethics from the Ethics Committee of the Sabzevar University of Medical Sciences (MEDSAB.REC.1393.67) and informed consent from the parents according to the Declaration of Helsinki. The results were kept confidential and then published anonymously. Sampling was performed from January to February 2015. Mobini Hospital is the only women's hospital in Sabzevar and all deliveries are performed in this hospital; therefore, sampling was also conducted in this hospital and since all newborns in Sabzevar refer to the only hearing aid center in this city for screening 15 days after birth, sampling was carried out at this center. Newborns whose mothers were not willing to cooperate with the project, interview, and checklist completion, as well as the newborns who had been then diagnosed with conjunctivitis by their physician, were excluded from the study. Interns and nurses collected the data by interviewing mothers and filling checklists, as well as checking the newborns by looking at their eyes using a flashlight, and an ophthalmologist examined the suspected cases. The content validity of the checklist was evaluated by sending it to several faculty members and obtaining their comments. The checklist items included demographic characteristics of the mother, history of previous pregnancies and childbirths, demographic information of the neonate, and questions about neonatal eye symptoms, including tearing, history of purulent drainage from the eye, epiphora, redness of the eyelids, and stickiness of eyelashes.

The checklists questions were then asked from the mothers, and the newborns were examined

by looking at their eyes using a flashlight. In the event of asymptomatic cases, considering that some obstruction cases may not be symptomatic and undetectable by the age of 15 days, the researcher used the educational pamphlets for the mothers who received them after completing the checklist so that they visit the ophthalmologist who is in charge of the project in the event of late demonstrations. The suspected patients were referred to an ophthalmologist for final confirmation and visited for free. The neonate's eye examination was performed by an ophthalmologist using a flashlight, as well as applying pressure on the lacrimal sac and, if necessary, slit-lamp examination. Finally, definite positive cases were identified. Descriptive statistics (frequency tables and charts) and inferential analytical statistics (logistic regression) were used to analyze the data. All calculations were carried out using Stata software (version 11) at 95% CI.

## Results

A total of 541 (71.85%) mothers lived in cities, and 153 (28.3%) of them resided in rural areas. The majority of mothers (33.6%) were within the age range of 25-30 years. The mean birth weight of newborns was  $3174.2 \pm 450.2$  grams. The mean Apgar score was  $9.67 \pm 0.74$ . The mean scores of height and head circumference were reported as  $50.70 \pm 2.4$  and  $34.28 \pm 1.8$  cm, respectively. The findings of the present study indicated that out of 541 newborns, 122 cases suffered from CNLDO with a general prevalence of 22.6%. Weight, height, and Apgar score were not correlated with NLDO ( $P > 0.05$ ) (Table 1). Moreover, 11%, 27%, and 30% of newborns had epiphora from right, left, and both eyes, respectively (Table 2).

Obstruction of the lacrimal duct in the neonates did not show a significant relationship with weight ( $P = 0.22$ ) and height ( $P = 0.41$ ) ( $P > 0.05$ ). the prevalence of lacrimal duct obstruction was significantly correlated with head circumference ( $P = 0.01$ ) and age ( $P = 0.01$ ; Table 3). The maximum cases of such disorder were observed in mothers aged 30-35 years (16.1%). Consanguine marriage

was detected in 14.9% of parents. A total of 8.33% of neonates had a family history of CNLDO. The prevalence of CNLDO was not significantly correlated with occupation ( $P = 0.058$ ), family history of marriage ( $P = 0.40$ ), and family history of NLDO ( $P = 0.24$ ) ( $P > 0.05$ ). The results also pointed to the significant relationship of maternal age and location with the prevalence of CNLDO ( $P < 0.05$ ). The chance of CNLDO developments is reduced by approximately 5% with a one-year increase in maternal age (Table 4).

## Discussion

The present study aimed to assess the presence of CNLDO in 541 newborns in Shahidan Mobini Hospital, Sabzevar, Iran, on the 15th day of their birth. The results of the study revealed that the prevalence of CNLDO in infants was 22.6%, as compared to 17.1% in Saudi Arabia. Other studies have reported lower rates of CNLDOs, including 6% in the United States (7-10). This discrepancy in prevalence rate can be attributed to the sample size and age of the newborns at the time of checkup. Since the aforementioned studies investigated the newborns at different times, this factor can explain the disparity between the results of the above studies and those obtained in the present research.

The prevalence rate was reported based on a physician's examination before the age of one month in the current study. While such report was made based on infants who still have permanent epiphora at 6 months of age in Saudi Arabia reported in a study in Iran that newborns, with an average age of 3 months who still were symptomatic until the time of checkup despite drug therapy, were CNLDO positive (10).

There is no sign of obstruction due to the absence of tearing until a few weeks after birth (1). Based on the results of the present research, CNLDO was not significantly correlated with occupation, family history of CNLDO, family history of cConsanguine marriage among parents; nonetheless, the prevalence of CNLDO showed a significant relationship with maternal age and location.

**Table 1.** Distribution of demographic characteristics of mothers and newborns

characteristics of mothers		Subgroup	Total No. (%)
Age		<20	35 (6.5%)
		20-25	122 (22.6%)
		25-30	182 (33.6%)
		30-35	143 (26.4%)
		>35	59 (10.9%)
Maternal occupational		housewife	487 (90.02)
		Employed	54 (9.98)
Maternal education		Elementary	83 (15.34)
		Height school	130 (24.03)
		Diploma	219 (40.48)
		Associate Degree	20 (3.70)
		Undergraduate	85 (15.71)
		Master and higher	4 (0.74)
Location		Village	153 (28.3)
		City	388 (71.85)
Consanguineous marriage		negative	440 (81.33)
		positive	101 (18.67)
Family history of CNLDO*		negative	529 (97.78)
		positive	12 (2.22)
characteristics of newborns	Subgroup	Total	
		No. (%)	
Gender		Girl	273 (50.46)
		Boy	268 (49.54)
Weight (g)		<2500	17(3.1)
		2500-4000	517 (95.6)
		>4000	7 (1.3)
Length (cm)		<48	38 (7%)
		48-50	110 (20%)
		>50	393 (72%)
Head circumference (cm)		<33	52(16.27)
		33-35	241(27.36)
		>35	305(56.38)
Apgar		Mean	Std. Dev
		9.67	0.74

\*CNLDO: congenital nasolacrimal duct obstruction

**Table 2.** Frequency and Percent of ocular symptoms in newborns with congenital nasolacrimal duct obstruction (CNLDO)

characteristics of newborns		Subgroup	Total
			No. (%)
History OF purulent drainage from the eye		No	451 (83.4)
		OD*	40 (7.39)
		OS**	22 (4.07)
		OU***	28 (5.2)
Epiphora		No	473 (87.43)
		OD	27 (4.99)
		OS	11 (2.03)
		OU	30 (5.55)
Redness of the eyelids		No	530 (97.97)
		OD	5 (0.92)
		OS	3 (0.55)
		OU	3 (0.55)
Stickiness of eyelashes		No	497 (91.87)
		OD	18 (3.33)
		OS	9 (1.66)
		OU	17 (3.14)

\*OD: Oculus Dexter

\*\*OS: Oculus sinister

\*\*\*OU: Oculus Utreque

A total of 33.3% of newborns had a positive family history of CNLDO, and NLDO symptoms were observed only in one case. Consistent with the results of the present study, Kasaei et al. indicated no significant relationship between the family history and CNLDO in neonates (10). Nonetheless, the findings of the study by Fisaldi et al. in Saudi Arabia are inconsistent with those reported in the present study (7). The results of the current research suggested that the development of such problems in newborns is not significantly correlated with consanguine marriage and the role of inheritance. However, no other study was available to compare its results with those obtained in the current research, and it could be a unique characteristic of the present study and will also require further research in this field.

There was no statistically significant relationship among weight, height, and Apgar score ( $P > 0.05$ ). Despite the difference between the study by Kasaei et al. (10) and the present research, such comparison

seems inappropriate since their target group included only preterm neonates (mean gestational age of  $33.2 \pm 1.3$  weeks) with an average age of  $3.8 \pm 0.9$  months at the time of examination; however, the majority of neonates in the present study were term (21 preterm newborns in a total of 541 cases). The result can be justified by referring to the fact that since the majority of preterm neonates aged more than 15 days and were referred to this center for their specific care, including hearing assessments, even if they were already symptomatic, they were unlikely to have any indication upon examination; however, this seems to require further research.

In the present study, out of 541 suspicious newborns, there were 45 and 76 neonates with bilateral and unilateral CNLDO, respectively (27 and 49 neonates in the left and right eyes, respectively). Kasaei et al. reported that 69.2% and 30.8% of cases had unilateral and bilateral involvement, respectively (10). The same involvement rates were 57.4% and 42.6% in the study by Fisaldi et al. (7).

The results of all three studies are in agreement with those obtained in the present study. It seems that there is no significant difference between various studies in terms of the frequency of unilateral and bilateral CNLDO cases. Nonetheless, inconsistent with the results of the present study, Dupinet et al. and Edwin L.Kendig stated that most infants in the United States had left eye involvement (11).

This disparity between the results of the present research and those obtained in the aforementioned studies could be ascribed to the fact that the results of the present study were reported based on suspicious cases, while cases were diagnosed as definitive in other studies (11).

Therefore, the outcome of involvement in each of the eyes is not clear in case of examining by a

physician. In general, the most common ocular complaint in the present study was the presence of purulent ocular discharge (16.22%), followed by epiphora.

Among the limitations of the present study, we can refer to the fact that information about the assessed variables was obtained by taking patients' histories. To resolve this problem, the researcher, in the first step, used an appropriate history-taking approach so as to differentiate between what is intended by the research and what mothers stated.

Since the present project is a cross-sectional study, the conclusion was made inevitably based on the information provided by mothers in the history note, and this problem in statistical analysis was overcome taking into account the relative error rate.

**Table 3.** Demographic characteristics & the incidence of CNLDO in the logistic regression model (OR Crude)

variables	Characteristics of Subgroups	case	noncase	OR Crude	95% Conf. Interval		p-value
Gender		62(23.1)	203(76.9)	1.068	.714	1.599	.748
		60(22)	213(78)	1			
(Weight (g				1.000	1.000	1.001	.226
(Length (cm				1.035	.953	1.124	.417
(Head circumference (cm				1.159	1.027	1.307	.017
Age				.952	.916	.989	.013
Maternal occupational	Housewife	106(21.8)	381(78.2)	.661	.355	.192	.192
	Employed	16(29.6)	38 (70.4)				
Maternal education	Elementary	14(16.9)	69 (83.1)	.748	.347	1.608	.457
	Height school	38 (29.2)	92 (70.8)	1.522	.809	2.864	.193
	Diploma	45 (20.5)	174 (79.5)	.953	.521	1.743	.875
	Associate Degree	6 (30)	14 (70)	1.579	.535	4.661	.408
	Undergraduate and higher	19 (21.3)	70 (78.7)				
lodging	Village	46 (30.3)	106 (69.7)	1.787	1.166	2.740	.008
	City	76 (19.5)	313 (80.5)				
Consanguineous marriage	Negative	95 (21.6)	345 (78.4)	.755	.460	1.239	.266
	Positive	27 (26.7)	74 (73.3)				
Family history of CNLDO*	Negative	118 (22.3)	411(77.7)	.574	.170	1.940	.372
	Positive	4 (33.3)	8 (66.7)				

**Table 4.** Demographic characteristics and the incidence of CNLDO in the logistic regression model (adjusted)

variables	Characteristics of Subgroups	OR adjusted	95% Conf. Interval		P-value
Gender		.986	.640	1.517	.947
	Weight (g)	1.000	1.000	1.001	.307
	Length (cm)	.970	.874	1.077	.568
	Head circumference (cm)	1.212	1.045	1.404	.011
	age	.948	.909	.989	.014
Maternal occupational	Housewife	.495	.239	.058	.058
	Employed				
Maternal education	Elementary	.695	.272	1.773	.446
	Height school	1.618	.770	3.403	.204
	Diploma	1.032	.520	2.049	.928
	Associate Degree	1.837	.577	5.848	.304
	Undergraduate and higher	.695	.272	1.773	.446
lodging	Village	2.279	1.396	3.722	.001
	City				
Consanguineous marriage	Negative	.792	.459	1.368	.404
	Positive				
Family history of CNLDO*	Negative	.470	.131	1.685	.246
	Positive				

\*CNLDO: congenital nasolacrimal duct obstruction

## Conclusion

The present study evaluated the relationship between CNLDO and multiple variables that may have contributed to this problem. The results pointed to a significant relationship between such diseases and some neonatal factors, including head circumference.

According to the studies and considering their inconsistent results, as well as the role of different risk factors for the incidence of congenital nasolacrimal duct obstruction, a one-year comprehensive study should be conducted on newborns from birth to 12 months of age.

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## Conflicts of interest

There is no conflict of interest.

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