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Effect of newborn screening programs on congenital nasolacrimal duct obstruction

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ABSTRACT

Aims: To evaluate the effect of routine ophthalmological examination in babies with congenital nasolacrimal duct obstruction (CNLDO).

Methods: One hundred patients aged 1-12 months who presented to our clinic for routine ophthalmological examinations at the request of the Turkish Ministry of Health in 2022-2024 and who were diagnosed with CNLDO were enrolled in the study. The patients' demographic and clinical characteristics, mode of delivery, gender, laterality, and type of nutrition were determined.

Results: One hundred patients with a mean age of three months were enrolled. Sixty-five percent were aged two months or less, and 35% were older than two months. Fifty percent were female, and 50% were male. Normal delivery was present in 55% of the cases and cesarean delivery in 45%. Seventy percent of the patients were breastfed, while 30% received ready-made formula. Ninety percent of the patients were born full term, 85% had no other diseases, and 65% of patients had unilateral CNLDO, and 35% bilateral.

Conclusion: The Turkish Ministry of Health recommends routine ophthalmological examination for every baby at 0-3 months of age in order to diagnose diseases such as congenital cataract, strabismus and retinoblastoma that may result in early blindness. Babies who present within the scope of the screening program are diagnosed early in case of CNLDO. Babies diagnosed early have a higher chance of recovery without surgery.

Keywords: Congenital nasolacrimal duct obstruction, early diagnosis, Ministry of Health

INTRODUCTION

Congenital nasolacrimal duct obstruction (CNLDO) is the congenital obstruction of the drainage system in the nasolacrimal duct.[1] The prevalence ranges between 5% and 20%.[2] The cause is often a membranous obstruction that develops at the distal end of the nasolacrimal duct, where it opens into the inferior meatus nasi, or at the Hasner valve.[3]

Patients present with unilateral or bilateral watering and crusting in the eyes during the first year of life. In the presence of infection, they can also present with conjunctivitis, dacryocystitis, and periorbital cellulitis.[4]

Due to the effects of recurrent infections and epiphora, these babies are also at risk of amblyopia.[5]

Researchs show that 62.8-95% of cases resolve spontaneously within the first year. Cases detected early should be supported with lacrimal sac massage for easy opening of the obstruction. CNLDO can be treated with conservative approaches such as lacrimal sac massage in the first year of life, but may require surgical intervention in later years.[6]

The first interventional method used is probing. This is reported to be 87.2% successful when applied between two weeks and 41 months of age. Silicone tube intubation is frequently employed when probing is ineffective or if patients present later than that age. The success rate of silicone tube intubation varies between 62% and 100%.[7-9]

Screening programs are applied for diseases that are commonly seen in Turkiye and that have a high success rate if treated early. Newborn screenings are basically grouped under the titles of hypothyroidism, phenylketonuria, biotinylase deficiency, and cystic fibrosis, which are checked with capillary dried blood, hearing screening, critical congenital heart disease, developmental hip dysplasia screening, and eye screening with red reflex.[10]

Hearing screening has been implemented since 2005 within the scope of the Turkish Ministry of Health National Screening Program. Hearing loss rates have been significantly reduced as a result.[11]

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The red reflex test is an essential part of the newborn examination and is used to identify numerous pathologies that may be present in the visual axis, including cataract, corneal opacity, retinoblastoma, and retinal detachment. Dark spots in the reflex, decreased red or white reflex, and asymmetry in the reflex are indications for referring the baby to an ophthalmologist.[12]

This study was performed to draw attention to the fact that babies evaluated within the scope of the screening program and with CNLDO can be identified in the early months, that follow-up and treatment can be performed more regularly by creating awareness in families, and that babies might require fewer invasive interventions as a result of screening.

METHODS

The study involved 100 patients aged 1-12 months who presented to our clinic within the scope of the Ministry of Health eye screening program between 2022 and 2024 and who were diagnosed with CNLDO. Approval for the study was obtained from the Harran University Faculty of Medicine Clinical Researches Ethics Committee (Date: 21.10.2024, Decision No: 16/7), and it was conducted in accordance with the principles of the Declaration of Helsinki.

Diagnosis of CNLDO was confirmed by performing a fluorescein disappearance test on babies with watery and crusty eyes. The patients' demographic and clinical characteristics, type of delivery and feeding methods used, age, and laterality characteristics were examined. Birth times and additional diseases were recorded. Data analysis was performed on SPSS version 20 software.

RESULTS

The mean age of the 100 babies included in the study was 2.8 months. Sixty-five babies (65%) were aged two months or younger and 35 (35%) were older than two months. Fifty (50%) were girls and 50 (50%) were boys. Fifty-five babies (55%) were born by the spontaneous vaginal delivery and 45 (45%) by cesarean section. 70% were breastfed, 15% were given formula, 15% were breastfed and formula. Ninety percent were born at term (47-40 weeks), 5% were preterm, and 5% were post-term. Comorbid conditions were observed in 15% of the study population, predominantly manifesting as cardiovascular and respiratory disorders, while 85% of patients presented without concurrent medical conditions. Finally, 65% of cases were unilateral and 35% were bilateral (Table 1).

There were no statistically significant differences between the spontaneous vaginal delivery and cesarean section (CS) groups in terms of age (p=0.635), gender distribution (p=0.653), or laterality (p=0.587), with the overall distribution of demographic and clinical characteristics being comparable between the two groups (p=0.909). These findings are presented in detail in Table 2.

There were no statistically significant differences among the breastfeeding, formula feeding, and mixed feeding groups in terms of age (p=0.412), gender distribution (p=0.107), or laterality (p=0.486), with the overall distribution of demographic and clinical characteristics being comparable across the feeding types (p=0.106). These findings are presented in detail in Table 3.

Table 1. Descriptive characacteristics (%)

Category	Details
Age	2.8 months
Gender n (F/M)	50 (50%) 50 (50%)
Feeding	Breastfed; 70% Formula; 15% Breastfed and formula; 15%
Birth mechanism	SVD; 55% C/S; 45%
Comorbid conditions	15%
Laterally	Unilateral; %65 Bilateral; 35
Age of birth	<36 week; 5% 36-40 week; 90% >40 week; 5%

SVD: Spontaneous vaginal delivery, CS: Cesarean section, F/M: Female/male, p<0.05

Table 2. Comparison of the demographic and clinical characteristics of patients based on the mode of delivery

	SVD n (%)	CS n (%)	p
Number	55 (55%)	45 (45%)	0.909
Age	4.09±4.42	4.33±5.78	0.635
Gender (F/M)	30/25 (54.5/45.5)	20/25 (44.4/55.6)	0.653
Laterally			
Right	25 (45.5%)	20 (44%)	0.587
Left	15 (27.3%)	5 (11%)	
Bilateral	15 (27.3%)	20 (44%)	

SVD: Spontaneous vaginal delivery, CS: Cesarean section, F/M: Female/male

Table 3. Comparison of demographic and clinical characteristics of patients according to type of feeding

	Breastfed n (%)	Formula n (%)	Breastfed and formula n (%)	p
Number	70 (70%)	15 (15%)	15 (15%)	0.106
Age	2.78±3.48	1.33±0.57	1.33±0.57	0.412
Gender (F/M)	25 (35.7%)	10 (66.7%)	15 (100%)	0.107
	45 (64.3%)	5 (33.3%)	0 (0%)	
Laterally				
Right	25 (35.7%)	5 (33.3%)	10 (66.7%)	0.486
Left	20 (28.6%)	0 (0%)	5 (33.3%)	
Bilateral	25 (35.7%)	10 (66.7%)	0 (0%)	

F/M: Female/male

DISCUSSION

The findings of this study highlight the importance of early diagnosis and conservative treatment. By implementing routine ophthalmological examinations as part of the screening program, a significant proportion of cases can be identified and managed within the first few months of life. This early intervention can lead to higher rates of spontaneous resolution and reduce the need for more invasive surgical interventions, which has the potential to improve patient outcomes, reduce healthcare costs, and alleviate the burden on the healthcare system.

CNLDO is the most common cause of epiphora in infancy. In terms of clinical presentation, the distribution pattern of this condition demonstrates notable variability in its laterality. The condition is mostly unilateral, although bilateral occurrence has also been reported in 14-33.8% of cases.[13,14] The incidence of unilateral CNLDO was also significantly high among our own cases. Our findings regarding laterality align with established literature, though with some notable distinctions. Some studies have described CNLDO as more common in premature babies, since the nasolacrimal canal completes its development late.[15] However, premature babies constituted only 5% of our cases. This pattern challenges the usual link between prematurity and CNLDO, suggesting that other developmental factors might play a bigger role in its occurrence. The low number of premature infants with CNLDO in our study could be due to advancements in prenatal care and monitoring, though this idea needs further confirmation through larger, multi-center studies. Additionally, the fact that most cases in our cohort were term infants hints that nasolacrimal duct development might depend on more than just gestational age, such as genetic factors, environmental influences, or other developmental aspects that are not yet fully understood.

A higher incidence of CNLDO has been reported in some studies in babies born by cesarean section compared to the spontaneous vaginal delivery. Postpartum pressure differences may facilitate the rupture of Hasner's membrane. Similarly to the present study, some publications involving larger case series have observed no relationship between type of delivery and CNLDO.[16] Our findings, in line with larger case series, indicate that the mode of delivery may not play a significant role in the occurrence of CNLDO. This highlights the need for further research into the embryological and anatomical development of the nasolacrimal system.The comparable distribution of CNLDO cases between cesarean section (45%) and spontaneous vaginal delivery (55%) in our cohort (p=0.909) suggests that delivery-related pressure differences may not play as significant a role as previously hypothesized.

Our literature review revealed no previous studies examining the relationship between breastfeeding and CNLDO. In our study, we found that feeding method did not appear to influence CNLDO development, with most babies being breastfed (70%), while equal numbers were either formula-fed (15%) or received both breast milk and formula (15%) (p=0.106). The high number of breastfed infants in our study likely mirrors typical feeding choices in our community rather than suggesting any direct link to CNLDO. However, it would be valuable to study how different feeding actions, such as sucking patterns and pressure changes around the eye area during feeding, might affect the condition. While nutrition itself may not directly affect CNLDO development, breastfeeding's immune-boosting properties might help reduce related infections, though we need more research to confirm this idea.

In agreement with the literature, CNLDO was unilateral in the majority of our cases. No difference between gender distributions has also been reported.[17] The average age for CNLDO has been variously reported as 3.4 months, 17.6 months, and 1.7 years.[18-20] The average age of our patients was 2.8 months, while in a previous international study the average age was five weeks.[16] The success rate of conservative treatment when started early is quite high. When lacrimal sac massage is performed in the first nine months, success rates of up to 89.8% have been reported.[21]

Limitations

This study has several notable methodological limitations that warrant consideration. First, the relatively small sample size may limit the statistical power and generalizability of our findings. Additionally, the single-center design of this investigation may introduce institutional bias.

CONCLUSION

CNLDO can now be diagnosed earlier thanks to the screening programs implemented by the Turkish Ministry of Health. This means that patients can receive regular follow-up and treatment and can recover with conservative treatment.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Harran University Faculty of Medicine Clinical Researches Ethics Committee (Date: 21.10.2024, Decision No: 16/7).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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