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انسداد ولادی مجرای اشکی و ارتباط آن با متغییرهای ولادت: یک مطالعه مقطعی

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چکیده

زمینه و هدف: انسداد ولادی مجرای نزولکریمل ۶ تا ۲۰ درصد از نوزادان را تحت تأثیر قرار می‌دهد و معمولاً به دلیل کانالیزاسیون ناقص در دریچه هاسنر ایجاد می‌شود. در حالی که اکثر موارد خود به خود برطرف می‌شوند، عواملی مانند نوع ولادت، سابقه خانوادگی و ویژگی‌های مادر بر شیوع آن تأثیر دارند. ولادت طبیعی ممکن است از طریق فشرده‌سازی مکانیکی، انسداد باقی‌مانده را برطرف کند، در حالی که ولادت با سزارین با خطر بالاتر انسداد ولادی مجرای نزولکریمل مرتبط است.

روش بررسی: این مطالعه مقطعی شامل ۱۰۷ مریض اطفال مبتلا به انسداد ولادی مجرای نزولکریمل در شفاخانه تخصصی چشم روشنا در هرات بود. داده‌های مربوط به ویژگی‌های دموگرافیک، نوع ولادت، تعداد ولادت‌های مادر، سابقه خانوادگی و چشم درگیر، با استفاده از آمار توصیفی و استنباطی تجزیه و تحلیل شدند.

یافته‌ها: یافته‌های ما نشان می‌دهد که بین انسداد ولادی مجرای نزولکریمل و متغیرهای مربوط به ولادت ارتباط معناداری وجود دارد. ولادت طبیعی در تمامی گروه‌های سنی غالب بوده و متولدین با سن بالاتر از ۲۰ ماه (۹۴٫۱٪) در مقایسه با ولادت سزارین (۵٫۹٪) بیش‌ترین مبتلایان را تشکیل می‌داد (p=۰٫۰۳۴). فرزندان پسر عمدتاً از مادران مولتی‌پارا Multipara متولد شده بودند (۶۵٫۴٪) در حالی که دختران (۵۴٫۵٪) بیش‌تر به ولادت‌های اول‌باری Primipara مرتبط بودند (p=۰٫۰۳۸). سابقه خانوادگی مثبت ارتباط قوی با ولادت سزارین داشت (۶۵٫۴٪)، در مقابل ولادت طبیعی (۳۴٫۶٪) را تشکیل می‌داد (p<۰٫۰۰۱) و در ولادت‌های اول‌باری (۸۴٫۶٪) بیشتر از ولادت‌های مولتی‌پارا (۱۵٫۴٪) دیده شد (p<۰٫۰۰۱) و هیچ ارتباط معناداری بین چشم درگیر و نوع یا تعداد ولادت‌ها یافت نشد.

نتیجه‌گیری: این مطالعه بر نقش ولادت‌های سزارین و سابقه خانوادگی به عنوان عوامل خطر مهم برای CNLDO تأکید دارد و تعامل بین زمینه‌های ژنتیکی و متغیرهای مربوط به ولادت را برجسته می‌کند. این یافته‌ها الگوهای منطقه‌ای را روشن ساخته و اهمیت تحقیقات جمعیت‌محور و استراتژی‌های مراقبت صحی متناسب را نشان می‌دهد.

واژه‌گانِ کلیدی: انسداد ولادی مجرای اشکی، روش ولادت، سزارین، ولادت مهبلی، افغانستان.

ارجاع به این مقاله:

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Association of congenital Nasolacrimal duct obstruction and delivery-related variables: a cross-sectional study

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Abstract

Background: Congenital nasolacrimal duct obstruction affects 6–20% of infants, primarily due to incomplete canalization at the Hasner valve. While most cases resolve spontaneously, factors like delivery mode, family history, and maternal characteristics influence its prevalence. Vaginal deliveries may clear residual obstructions through mechanical compression, whereas cesarean sections have been linked to higher CNLDO risk.

Methods: This cross-sectional study included 107 pediatric patients with CNLDO at Roshana Eye Hospital in Herat. Data on demographics, delivery mode, birth frequency, family history, and affected eye were analyzed using descriptive and inferential statistics.

Results: Our finding showed a significant association between CNLDO and delivery-related variables. Vaginal births were predominant across all age groups, with infants older than 20 months showing the highest proportion (94.1%) compared to caesarean sections (5.9%) ($P = 0.034$). Male children were predominantly born to multiparous mothers (65.4%), while females were more associated with primiparous births (54.5%) ($P = 0.038$). A positive family history strongly correlated with caesarean births (65.4%) compared to vaginal deliveries (34.6%) ($P < 0.001$) and was more common in primiparous births (84.6%) than multiparous births (15.4%) ($P < 0.001$). No significant relationship was found between the affected eye and birth type or frequency.

Conclusion: The study underscores the role of CS and family history as significant risk factors for CNLDO, highlighting the interaction between genetic predispositions and delivery-related variables. These findings provide insight into regional patterns and underscore the importance of population-specific research and tailored healthcare strategies.

Key words: CNLDO, Mode of Delivery, CS, Vaginal Delivery, Afghanistan

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Introduction

Congenital nasolacrimal duct obstruction (CNLDO) occurs when a thin membrane blocks the nasolacrimal duct's entrance into the nasal cavity, specifically at the site of the Hasner valve [1]. It is a common pediatric condition, affecting approximately 6% to 20% of infants globally [2,3]. The condition often resolves on its own, with the majority of cases (96%) achieving natural resolution by the time the child reaches one year of age [4]. It arises due to incomplete canalization of the nasolacrimal duct at Hasner's valve, leading to epiphora, recurrent dacryocystitis, and potential visual impairment if untreated [5]. While most cases resolve spontaneously, up to 10% of infants require medical or surgical interventions [6].

The mode of delivery is a significant factor influencing neonatal outcomes, and its role in the development of CNLDO has drawn growing attention. Vaginal deliveries, accounting for approximately 79% of global births, involve natural compression of the nasolacrimal duct, which may aid in clearing residual membrane obstructions [7]. However, this same mechanical force can occasionally lead to trauma, contributing to ductal obstruction [8]. On the other hand, cesarean sections (CS), which constitute about 21% of deliveries globally, bypass these mechanical forces but have been associated with a higher prevalence of CNLDO in several studies [9,10]. Research in Turkey found that infants born via CS are 3.75 times more likely to develop CNLDO than those delivered vaginally [7]. The association between CS and CNLDO is not universally consistent. While some studies report a significant link, others suggest no relationship between delivery mode and CNLDO prevalence [11,12]. These discrepancies may be due to genetic predispositions, demographic factors, or methodological differences in study designs [13].

Genetics is a well-established contributor to CNLDO. A positive family history increases the risk by up to 10-fold, as reported in both clinical and twin studies [14,15]. Genetic predispositions may explain why some infants delivered via CS present with CNLDO despite the lack of mechanical compression during delivery. Furthermore, maternal factors such as parity, age, and medical comorbidities influence CNLDO risk. Primiparity and younger maternal age have been associated with higher incidence rates, possibly due to closer medical monitoring and increased use of CS in first pregnancies [11,16]. Demographic variations further complicate the understanding of CNLDO. For instance, research from Iran identified neonatal gender, maternal education, and infections during pregnancy as significant risk factors [17]. Studies in the U.S. and Europe have highlighted racial and socioeconomic disparities in CNLDO prevalence [13,18,16].

In Afghanistan, where healthcare access and cesarean delivery rates vary widely, understanding the relationship between delivery mode and CNLDO is critical. This study, conducted in Herat, aims to investigate this association while considering clinical and demographic characteristics of affected infants. By integrating findings from global literature, this cross-sectional analysis seeks to clarify the roles of genetic, maternal, and delivery-related factors in CNLDO. Its findings aim to guide resource allocation and healthcare interventions in regions with a high burden of this condition.

Method

Study Design

This study was conducted descriptively and structured cross-sectionally.

Population

The study population included 107 pediatric patients diagnosed with congenital lacrimal duct obstruction who visited Roshana Eye Hospital in Herat City.

Sampling Method

A universal sampling method was utilized, incorporating all patients diagnosed with congenital lacrimal duct obstruction who met the inclusion criteria. Data collection occurred from March 24, 2022 to February 10, 2024. For each patient, comprehensive data were collected, including demographic details (age, gender, residence), type of delivery (vaginal or caesarean), birth frequency (primiparous or multiparous), family history, and the affected eye (right or left).

Sample Size

The sample size comprised 107 pediatric patients who presented with congenital lacrimal duct obstruction during the study period.

Inclusion Criteria

Patients were included if they had a confirmed diagnosis of congenital lacrimal duct obstruction based on clinical examination and medical history review.

Exclusion Criteria

Patients were excluded if they lacked a definitive diagnosis of congenital lacrimal duct obstruction or if key data relevant to the study variables were missing.

Variables

The primary variables in this study are included:

- Demographics: Age, gender, and residence.
- Obstetric History: Type of delivery (vaginal or caesarean) and birth frequency (primiparous or multiparous).
- Family History: Presence or absence of a family history of congenital lacrimal duct obstruction.
- Affected Eye: Side of the eye affected (right or left).

Data Collection and Management

Data were collected through direct patient interviews, and clinical evaluations of patient. For each patient, relevant information regarding demographics, clinical findings, and obstetric history was recorded in a structured form. Efforts were made to ensure data accuracy and completeness, with information cross-verified through medical record reviews.

Data Analysis

Data were entered and analyzed using SPSS 27. Descriptive statistics were calculated to summarize the variables, and inferential statistical tests were performed to assess the association between congenital lacrimal duct obstruction and obstetric factors such as type of delivery and birth frequency. The significance level for statistical tests was set at $P < 0.05$.

Ethical Considerations

The study protocol was reviewed and approved by the Human Ethics Committee of the Bureau of Research and Development, Roshana Eye Hospital. Informed consent was obtained in writing from all participants before they were enrolled in the study. Participant privacy and confidentiality were maintained throughout the research process, in accordance with the Declaration of Helsinki and established ethical guidelines for research involving human subjects.

Results

Table 1 Shows Demographic Characteristics. The study included 107 pediatric patients, with a majority falling within the 10–19 months age group (59.8%), followed by those aged 0–9 months (24.3%) and more than 20 months (15.9%). Gender distribution was nearly balanced, with 48.6% males and 51.4% females. In terms of residence, a significant portion of the patients (71.0%) were from Herat, while the remaining 29.0% came from other provinces.

Table 1. Demographic Characteristics

		N	%
Age	0-9 months	26	24.3
	10-19 months	64	59.8
	More than 20 months	17	15.9
Gender	Male	52	48.6
	Female	55	51.4
Residence	Herat	76	71.0
	Other provinces	31	29.0

Table 2 Shows Clinical Characteristics. Regarding birth type, most patients (75.7%) were born vaginally, whereas 24.3% were delivered via caesarean section. Birth frequency revealed that 55.1% of the children were from multiparous mothers, while 44.9% were from primiparous mothers. A family history of the condition was present in 24.3% of cases, with the majority (75.7%) reporting no such history. When assessing the affected eye, 56.1% of patients had their right eye involved, while 43.9% had their left eye affected.

Table 2. Clinical Characteristics

		N	%
Birth type	Vaginal	81	75.7
	Caesarean section	26	24.3
Birth frequency	Primipara	48	44.9
	Multipara	59	55.1
Family history	Yes	26	24.3
	No	81	75.7
Affected eye	Right	60	56.1
	Left	47	43.9

Table 3 shows association between CNLDO with Mode of Delivery-Variables. Statistical analysis revealed significant associations between certain factors. Vaginal births were predominant across all age groups, with infants aged more than 20 months showing the highest proportion (94.1%) compared to caesarean sections (5.9%) (P = 0.034). Birth frequency analysis indicated that multiparous mothers were more likely to have children older than 20 months (76.5%) than primiparous mothers (23.5%) (P = 0.154). Gender comparisons showed that male children were predominantly born to multiparous mothers (65.4%), whereas females were more associated with primiparous births (54.5%) (P = 0.038).

Additionally, a positive family history strongly correlated with caesarean births (65.4%) compared to vaginal deliveries (34.6%) (P < 0.001) and was more common in primiparous births (84.6%) than multiparous births (15.4%) (P < 0.001). No significant relationship was found between the affected eye (right or left) and birth type or frequency, indicating no side preference related to clinical characteristics.

Table 3. Association between CNLDO with Mode of Delivery-Variables

		Birth type			Birth frequency		
		Vaginal	Caesarean section	P-value	Primipara	Multipara	P-value
		%	%		%	%	
Age	0-9 months	84.6	15.4	0.034	50.0	50.0	0.154
	10-19 months	67.2	32.8		48.4	51.6	
	More than 20 months	94.1	5.9		23.5	76.5	
Gender	Male	76.9	23.1	0.774	34.6	65.4	0.038
	Female	74.5	25.5		54.5	45.5	
Residence	Herat	72.4	27.6	0.208	47.4	52.6	0.414
	Other provinces	83.9	16.1		38.7	61.3	
Family history	Yes	34.6	65.4	<0.001	84.6	15.4	<0.001
	No	88.9	11.1		32.1	67.9	
Affected eye	Right	75.0	25.0	0.849	48.3	51.7	0.666
	Left	76.6	23.4		40.4	59.6	

Discussion

Our findings revealed a significant association between cesarean section delivery and CNLDO, with 65.4% of cases linked to CS compared to 34.6% for vaginal births. This aligns with several studies that emphasize CS as a notable risk factor. Tavakoli et al. identified a 61% prevalence of CS among children with CNLDO, with a 55% increased risk for full-term CS deliveries compared to vaginal deliveries. Notably, children delivered via CS were more likely to require surgical interventions, such as probing or intubation, with failure rates higher for CS births (86.2%) than vaginal deliveries (13.8%), [8]. Similarly, Bilge reported a 3.75 times higher risk of CNLDO in CS deliveries and highlighted that preterm CS deliveries had lower gestational ages, exacerbating the risk [7]. In contrast, Eshraghi et al. found no statistically significant association between CS and CNLDO, although family history and low birth weight emerged as confounding factors [19]. However, Spaniol et al. demonstrated that primary CS increased relative risk by 1.7-fold, further corroborating your findings [10]. These mixed findings suggest that the influence of CS on CNLDO may be modulated by additional factors such as gestational age, neonatal health, and genetic predisposition.

Family History and CNLDO

A robust correlation between family history and CNLDO was identified in our study, with 84.6% of cases in primiparous mothers and 65.4% linked to CS deliveries. This is consistent with Eshraghi et al., who reported a 10.12-fold higher likelihood of CNLDO among children with positive family history [19]. Similarly, Alakus et al. observed a higher incidence of CNLDO in infants with familial predisposition, particularly in CS births, where 58.7% of cases were linked to CS compared to 20.7% for vaginal deliveries [12]. This association suggests a multifactorial etiology for CNLDO, where genetic susceptibility interacts with external delivery-related factors to influence outcomes.

Parity and CNLDO

Our finding highlighted parity differences, with multiparous mothers more likely to have older children (>20 months) with CNLDO (76.5%) compared to primiparous mothers (23.5%). While this was not statistically significant, similar trends have been noted in the literature. Bilge found that parity influences neonatal outcomes indirectly, potentially through cumulative maternal adaptations during subsequent pregnancies [7]. This is consistent with findings by Alakus et al., who noted that primiparity heightened susceptibility to CNLDO in infants with family history [12].

Gender and CNLDO

Our data indicated gender-specific trends, with male infants predominantly associated with multiparous mothers (65.4%) and female infants with primiparous births (54.5%). While gender predilection is often debated, Petersen and Robb reported no significant gender differences in a cohort of 50 infants [20]. Similarly, Noda et al. found equal prevalence in males and females in their Japanese cohort [21].

Recommendation

Based on the findings of this study, healthcare professionals should prioritize early screening for CNLDO in infants, especially those born via cesarean section or with a positive family history of the condition. Counseling should be provided to expectant mothers about the potential risks associated with cesarean delivery. Further, public health initiatives should emphasize the importance of routine neonatal eye examinations to ensure timely diagnosis and intervention. Future research should focus on larger populations and explore additional variables, such as socioeconomic and environmental factors, to refine understanding and guide preventive strategies for CNLDO.

Implications and Limitations

The associations found between delivery mode, family history, and CLDO highlight the multifactorial nature of this condition. While some findings align with existing literature, others, such as gender-specific and parity-related differences, offer novel insights requiring further validation. Notably, the absence of laterality preferences adds robustness to the notion that CLDO is a systemic developmental anomaly rather than one influenced by external forces on specific sides of the face.

A limitation of this study includes the reliance on cross-sectional data, which precludes establishing causal relationships. Additionally, the relatively small sample size might limit the generalizability of findings, particularly for subgroup analyses. Future studies should employ longitudinal designs and larger cohorts to confirm and extend these results.

Conclusion

This study underscores the significant associations between delivery type, particularly cesarean sections, and congenital nasolacrimal duct obstruction. The strong correlation with family history highlights the role of genetic predisposition in the condition's etiology. By analyzing regional patterns and maternal characteristics, this research emphasizes the need for population-specific strategies to address CNLDO. Enhanced awareness and early diagnosis can guide targeted interventions, reducing the burden of this common pediatric condition and improving patient outcomes. Future studies should explore larger populations and additional variables to further delineate these associations.

Conflict of Interest statement:

The authors have no conflicts of interest to declare for this study.

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Authors' contributions:

Sayed Aref Salehi, Said Farooq Hosaini, and Mohammad Masudi conceptualized the manuscript. Sayed Aref Salehi, Said Farooq Hosaini, and Mohammad Masudi wrote the original draft. Sayed Aref Salehi, Said Farooq Hosaini, and Mohammad Masudi reviewed and edited the manuscript.

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