Epidemiological Profile of Newborns with Positional Plagiocephaly in a Teaching Maternity Hospital

Perfil Epidemiológico de Recém-nascidos com Plagiocefalia Posicional em uma Maternidade Escola

Perfil Epidemiológico de Recién Nacidos con Plagiocefalia Posicional en una Maternidad Escuela

RESUMO

Objetivo: Investigar o perfil epidemiológico e os fatores associados à plagiocefalia posicional em recém-nascidos internados na Unidade de Cuidados Intermediários de uma maternidade de Alagoas, Brasil. **Método:** Estudo de coorte prospectivo com 37 recém-nascidos, utilizando medidas antropométricas cranianas para avaliar o Índice Craniano e o Índice de Assimetria da Abóbada Craniana. As análises incluíram testes de normalidade, comparação de médias e teste exato de Fisher, com nível de significância de 5%. **Resultados:** A plagiocefalia posicional ocorreu em 11 (29,7%) recém-nascidos, todos prematuros e, predominantemente, nascidos de parto vaginal (81,8%, p=0,013). **Conclusão:** Os resultados destacam a prematuridade e o parto vaginal como fatores significativos associados à plagiocefalia posicional, enfatizando a importância de estratégias preventivas, particularmente para bebês prematuros.

DESCRITORES: Plagiocefalia; Plagiocefalia não sinostótica; Epidemiologia.

ABSTRACT

Objective: To investigate the epidemiological profile and factors associated with positional plagiocephaly in newborns hospitalized in the Intermediate Care Unit of a maternity hospital in Alagoas, Brazil. **Method:** Prospective cohort study with 37 newborns, using cranial anthropometric measurements to assess the Cranial Index and the Cranial Vault Asymmetry Index. Statistical analyses included normality tests, mean comparisons, and Fisher's exact test, with a 5% significance level. **Results:** Positional plagiocephaly occurred in 11 (29.7%) newborns, all preterm and predominantly delivered vaginally (81.8%, p=0.013). **Conclusion:** The results highlight prematurity and vaginal delivery as significant factors associated with positional plagiocephaly, emphasizing the importance of preventive strategies, particularly for preterm infants.

DESCRIPTORS: Plagiocephaly; Non-synostotic plagiocephaly; Epidemiology.

RESUMEN

Objetivo: Investigar el perfil epidemiológico y los factores asociados con la plagiocefalia posicional en recién nacidos hospitalizados en la Unidad de Cuidados Intermedios de una maternidad en Alagoas, Brasil. **Método:** Estudio de cohorte prospectivo con 37 recién nacidos, utilizando mediciones antropométricas craneales para evaluar el Índice Craneal y el Índice de Asimetría de la Bóveda Craneal. Los análisis incluyeron pruebas de normalidad, comparación de medias y prueba exacta de Fisher, con un nivel de significancia del 5%. **Resultados:** La plagiocefalia posicional ocurrió en 11 (29,7%) recién nacidos, todos prematuros y predominantemente nacidos por parto vaginal (81,8%, p=0,013). **Conclusión:** Los resultados destacan la prematuridad y el parto vaginal como factores significativos asociados con la plagiocefalia posicional, enfatizando la importancia de estrategias preventivas, particularmente para los bebés prematuros.

DESCRIPTORES: Plagiocefalia; Plagiocefalia no sinostótica; Epidemiología.

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INTRODUCTION

Positional plagiocephaly (PP), also known as deformational plagiocephaly, is a cranial deformity characterized by asymmetry in the shape of the skull in infants, and is the most prevalent among cranial asymmetries, with rates ranging from 5% to 48% in newborns [1]. Clinically, PP presents as a unilateral flattening of the occipital bone, which can evolve into a parallelogram shape, resulting in craniofacial asymmetry and misalignment of the ears [2].

The implementation of the **Back to Sleep** campaign by the American Academy of Pediatrics (AAP) in 1992, which recommended the supine position as the ideal sleep position, was an effective strategy in reducing Sudden Infant Death Syndrome [3]. However, the adoption of this measure was accompanied by a substantial increase in the prevalence of cases of positional plagiocephaly [4].

The development of SP is closely related to the motor progress of infants in the first months of life, and it is estimated that up to 1 in 5 babies may have the condition [5]. Several risk factors are associated with PP, including prematurity, pelvic position during pregnancy and male gender [2].

In addition, the mechanical pressures exerted on the skull during childbirth, especially in first-born babies, due to the more restricted uterine space and lower compliance of the vaginal canal, can contribute to the appearance of asymmetry [4]. Positional preference or prolonged positioning on a single side of the skull is also a significant factor in the development of occipital asymmetry [6].

PP can be caused by intrauterine constraint, compressive forces during childbirth or prolonged mechanical pressure in the extrauterine environment [5]. These posterior cranial deformities are often associated with the continuous application of pre- and post-natal mechanical forces on the newborn's head, resulting in structural alterations [7].

The diagnosis and management of PP depend on a detailed assessment, including the use of cranial anthropometric measurements to quantify the severity of the asymmetry [8]. The craniometer is a widely used instrument for measuring the diagonal lengths of each side of the head, providing objective data for clinical analysis [9]. Therapeutic interventions include conservative measures such as repositioning and observation, as well as more specific approaches such as the use of orthopedic helmets or, in severe cases, surgical procedures [2].

Epidemiological studies play a fundamental role in identifying risk factors and causes associated with PP. This data is essential for planning preventive strategies and interventions aimed at reducing prevalence and mitigating its impacts [10]. By describing the epidemiological profile of conditions such as PP, it becomes possible to target public policies and clinical strategies that contribute to the prevention and control of this condition in specific populations [11].

In this context, the aim of this study was to describe the epidemiological profile of newborns diagnosed with positional plagiocephaly in a maternity hospital in Alagoas, in order to provide support for the development of evidence-based preventive and therapeutic interventions.

METHOD

This study was designed as a prospective, epidemiological cohort, conducted in the Intermediate Care Unit (ICU) of a maternity hospital located in the state of Alagoas, Brazil,

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between October 2023 and March 2024. The protocol was previously submitted to and approved by the Human Research Ethics Committee of the State University of Health Sciences of Alagoas (UNCISAL), under opinion no. 6.756.677 and CAAE 70108623.1.0000.5011. The newborns were included in the study when their legal guardians signed the Informed Consent Form (ICF).

Newborns born in the maternity ward, with an indication for admission to the NICU and aged over 72 hours were included in the study. Exclusion criteria included neonates with congenital malformations or confirmed genetic syndromes, as these conditions could interfere with cranial measurements and the outcomes analyzed.

Data collection took place in two main stages. In the first stage, a documentary analysis was conducted of the medical records available at the maternity hospital, using a standardized instrument prepared by the researchers. The information collected included maternal and neonatal characteristics, such as gender, birth weight, gestational age, type of delivery and length of stay. To ensure the privacy of the participants, identifiable information was replaced by alphanumeric codes.

In the second stage, cranial anthropometric measurements were taken to assess the presence of cranial asymmetry. A craniometer and a tape measure were used, covering parameters such as cephalic perimeter, length, width and oblique distances (right and left anteroposterior diameters). To ensure that the process was standardized, all measurements were carried out by a single previously trained evaluator. These measurements were taken every 3 days, allowing cranial evolution to be monitored throughout hospitalization.

The data collected was entered into the Headshape application, a tool that calculates the most relevant indices for cranial deformities. The Cranial Index (CI) was used to measure the proportionality between the length and width of the skull, while the Cranial Vault Asymmetry Index (CVAI) was calculated based on oblique distances. The CVAI provided a quantitative value in percentage reflecting the degree of asymmetry, with cases of positional plagiocephaly being considered those with a CVAI of more than 3.5%.

For statistical analysis, the data was first tabulated in Microsoft Excel 2016 and then analyzed in SPSS software version 15.0. The variables were described using absolute frequencies, percentages, means, medians and interquartile ranges. The normality of the variables was checked using the Shapiro-Wilk test, while the homogeneity of the variances was assessed using the Levene test. For comparisons between means or medians, the Student's t-test was used for variables with a normal distribution and the Mann-Whitney test for those without a normal distribution. In both cases, the significance level adopted was 5% ($\alpha = 0.05$). Fisher's exact test was used to analyze the proportions, especially in situations with a low expected frequency (≤ 5).

Methodological robustness was reinforced by prior training of the team responsible for data collection, in order to minimize bias. In addition, a pilot study was carried out with 3 medical records in order to adjust the collection instrument and ensure its suitability to the reality of the study. The design strictly respected the ethical principles established by the Declaration of Helsinki, ensuring the integrity and protection of the participants. These methodological steps aimed to guarantee the validity and reliability of the data, enabling a detailed analysis of the epidemiological profile of positional plagiocephaly in newborns admitted to the NICU.

RESULTS

The study analyzed 37 newborns, of whom 11 (29.7%) were diagnosed with positional plagiocephaly. Table 1 shows a comparison of the clinical characteristics of babies with and without plagiocephaly.

The presence of the condition was evenly distributed between the sexes, with 54.5% of cases in boys and 45.5% in girls, with no statistical significance ($p = 0.143$).

Table 1 - Comparison of the clinical variables of NBs with and without plagiocephaly.

Variables	PLAGIOCEPHALY				
	no		yes		
Gestational age	n	%	n	%	p-value
Term	11	42.3	0	0.0	0.015
Pre-term	15	57.7	11	100.0	
Type of delivery	n	%	n	%	p-value
Cesarean section	17	65.4	2	18.2	0.013
Vaginal	9	34.6	9	81.8	
Sex	n	%	n	%	p-value
Female	19	73.1	5	45.5	0.143
Male	7	26.9	6	54.5	

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Birth weight	n	%	n	%	p-value
< 1.500g	9	34.6	4	36.4	0.999
> 1.500g	17	65.4	7	63.6	
Length of stay	n	%	n	%	p-value
<7 days	4	15.4	2	18.2	0.994
>7 days	22	84.6	9	81.8	

Legend: Gestational age (weeks); weight (grams), Fisher's exact test.
Source: Prepared by the authors, 2024.

Analysis of perinatal characteristics revealed significant associations with gestational age and type of delivery. All the newborns diagnosed with plagiocephaly were premature, with a mean gestational age of 31.5 weeks. No full-term babies had the condition, and the association was statistically significant (p = 0.015).

The association between vaginal delivery and plagiocephaly was also significant (p = 0.013), with 81.8% of cases occurring among newborns born vaginally.

Assessment of birth weight and length of hospital stay showed no significant association with the occurrence of plagiocephaly (p = 0.999 for both variables).

Cranial anthropometric measurements, shown in Table 2, revealed statistically significant differences in skull length and width between the groups with and without plagiocephaly (p = 0.033 and p = 0.034, respectively).

Table 2 - Comparison of age, weight and cranial measurements of NBs with and without plagiocephaly.

Age CRON &	n	Average	Median	DIQ	p-value
No	26	19.5	12.0	17.5	0.122
Yes	11	23.1	20.0	5.0	
Current weight &	n	Average	Median	DIQ	p-value
No	26	1970.9	1705.0	1121.3	0.618
Yes	11	1670.9	1720.0	355.0	
Head circumference &	n	Average	Median	DIQ	p-value
No	26	31.1	30.0	2.0	0.778
Yes	11	30.3	31.0	1.7	
Length &	n	Average	Median	DIQ	p-value
No	26	17.6	17.7	2.4	0.033
Yes	11	16.4	16.0	2.3	
Width &	n	Average	Median	DIQ	p-value
No	26	20.0	14.9	2.7	0.034
Yes	11	16.0	17.0	2.5	
Anteroposterior diameter - Right &	n	Average	Median	DIQ	p-value
No	26	17.5	17.5	2.3	0.219
Yes	11	17.9	18.5	1.4	
Anteroposterior diameter - Left &	n	Média	Mediana	DIQ	p-valor
No	26	17.6	17.8	2.4	0.715
Yes	11	17.7	18.0	3.2	
CI (%)&	n	Average	Median	DIQ	p-value
No	26	83.6	84.2	1.6	< 0.001
Yes	11	100.0	100.0	8.9	
CVAI (%)&	n	Average	Median	DIQ	p-value
No	26	1.0	0.0	2.1	< 0.001
Yes	11	5.2	5.3	0.5	
GI#	n	Average	Median	DIQ	p-value
No	26	34.6	34.5	5	0.021
Yes	11	31.5	32.0	1.5	

Legend: Chronological age (days); Current weight (grams); Cephalic perimeter (cm); Length (cm); Width (cm); Anteroposterior diameter - Right (cm); Anteroposterior diameter - Left (cm); Cranial index (CI) (%); Cranial vault asymmetry index (CVAI) (%); Gestational age (GA) (weeks); Interquartile deviations (IQD), #Student t-test. & Mann Whitney test.
Source: Prepared by the authors, 2024.

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Cranial indices also proved to be robust markers of the condition. The mean CI was 100% in the group with plagiocephaly, compared to 83.6% in the group without the condition ($p < 0.001$). The mean CVAI was significantly higher in the group with plagiocephaly (5.2% versus 1.0%; $p < 0.001$).

DISCUSSION

This study analyzed the epidemiological profile of newborns with positional plagiocephaly in a maternity hospital. The findings indicate that gender alone is not a relevant risk factor for positional plagiocephaly in the sample. Although the literature has reported a higher prevalence in male babies, the lack of significance in our study may be related to the small sample size, which limits the statistical power to identify subtle differences [4].

The association of plagiocephaly with prematurity is in line with previous studies, such as that by Mosca-Hayler et al. (2023), which highlighted the vulnerability of premature infants to cranial deformities due to bone immaturity and the greater malleability of the skull. This reinforces the need for prevention strategies, such as the implementation of care that promotes decubitus changes, at a certain time, to minimize pressure on just one area of the head [13].

The significant association between vaginal delivery and plagiocephaly is also relevant, reinforcing the hypothesis that vaginal delivery can expose the skull to greater pressures during passage through the birth canal [14].

Although no significant association was found between birth weight and length of hospital stay and the occurrence of plagiocephaly, the trend towards greater hospitalization in newborns with low birth weight and prematurity suggest the need for future studies with larger samples to better explore these associations, since these factors are recognized in the literature as predictors of a prolonged length of hospital stay, due to neonates' greater vulnerability to clinical complications [15].

The data from cranial anthropometric measurements are in line with the literature, highlighting their importance and reliability for diagnosing the condition, as they are relevant indicators for assessing asymmetry, classifying severity, as well as providing support for monitoring the condition and evaluating the effectiveness of interventions more objectively [16].

Mean cranial indices confirm the importance of quantitative assessment in the diagnosis and monitoring of positional plagiocephaly. These indices are reliable tools for analyzing deformity, which corroborate the importance of quantitative evaluation for the diagnosis and follow-up of positional plagiocephaly [17]. These measurements quantify the proportionality of the measurements and the degree of asymmetry, which reinforces their importance in the management of the condition [16].

The findings reinforce the need for preventive and educational strategies aimed at parents and health professionals. The introduction of repositioning programs and guidance on regular decubitus changes can be effective in reducing cases of plagiocephaly, particularly in premature newborns and those with prolonged hospitalizations [18]. It is crucial to note that the prevalence of the condition is closely linked to avoidable factors, such as inadequate positioning during sleep and long periods supine, as documented in the literature [19].

This study contributes to mapping positional plagiocephaly in at-risk populations and to strengthening neonatal practices. However, limitations such as the small sample size and the lack of longitudinal follow-up should be recognized. Future studies with greater representativeness and follow-up design are needed to validate the results and expand the conclusions about risk factors and the most effective interventions in the prevention and management of the condition.

CONCLUSION

The study showed significant associations between the condition and factors such as prematurity and type of delivery, with a higher prevalence among preterm and vaginal births. On the other hand, no statistically significant association was found between plagiocephaly and the variables gender, birth weight and length of stay, indicating that these factors alone have no determining influence on the development of cranial asymmetry.

These findings have social and clinical relevance, as they highlight the need for preventive and educational interventions to reduce the incidence of plagiocephaly in newborns. Strategies such as frequent repositioning and specific neonatal care, especially for premature infants, can minimize the risks associated with the condition. In addition, the dissemination of information among parents and health professionals is essential to promote practices that favor proper head alignment during the first months of life, a critical period for cranial development.

Understanding the epidemiological profile of positional plagiocephaly cases in this maternity hospital contributes to resizing neonatal care, allowing for more planned, personalized and effective care. This knowledge can be incorporated into public health policies aimed at preventing cranial deformities, with a positive impact on health outcomes and children's quality of life.

Future studies are essential to broaden the understanding of positional plagiocephaly, including analyses with larger samples and longitudinal follow-ups that investigate the impact of the condition on long-term motor and cognitive development. In addition, research evaluating the effectiveness of different management and intervention strategies can guide the implementation of evidence-based approaches, strengthening neonatal care and the training of health professionals in relation to plagiocephaly.

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