MAK HILL Publications
Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.6.533.536

OPEN ACCESS

Key Words
Congenital limb deformities, newborn health, epidemiology

Corresponding Author
M. Satya Revathi,
Department of Peadiatrics, Kim's and RF, Amlapuram, India
Email: satyarevathi14@gmail.com

Author Designation
[1-3]Assistant Professor

Received: 19 March 2024
Accepted: 26 April 2024
Published: 16 May 2024

Citation: K.V.N. Goutham Varma, M. Satya Revathi and Penmutsa Aditya Varma, 2024. Epidemiology of Congenital Limb Deformities in Newborn: Insights from a Cross Sectional Study. Res. J. Med. Sci., 18: 533-536, doi: 10.36478/makrjms.2024.6.533.536

Epidemiology of Congenital Limb Deformities in Newborn: Insights from a Cross Sectional Study

[1]K.V.N. Goutham Varma, [2]M. Satya Revathi and [3]Penmutsa Aditya Varma
[1]Department of Orthopedics, Kim's and RF, Amlapuram, India
[2]Department of Peadiatrics, Kim's and RF, Amlapuram, India
[3]Department of Orthopedics, KIMS, Amalapuram, India

Abstract
Congenital limb deformities represent a significant portion of birth defects globally, impacting both the quality of life and health outcomes of affected individuals. Despite their prevalence, comprehensive studies focusing on the epidemiological aspects of these deformities are limited. This cross-sectional study was conducted on a sample of 200 newborns to explore the incidence and patterns of congenital limb deformities. The study used a structured questionnaire and physical examinations to collect data, followed by statistical analysis to determine the prevalence and associated risk factors. The study found a prevalence rate of congenital limb deformities and identified several significant risk factors associated with maternal health and environmental exposure. This research provides critical insights into the epidemiology of congenital limb deformities in newborns, highlighting the need for targeted interventions and continuous monitoring to mitigate these birth defects.

INTRODUCTION

Congenital limb deformities in newborns are structural abnormalities in the musculoskel *et al* system present at birth that can significantly affect the limbs. These deformities can range from minor malformations to severe dysfunctions, potentially leading to long-term disability and psychological stress in affected individuals and their families. This introduction provides a detailed examination of the literature surrounding the epidemiology, causes and impacts of congenital limb deformities, aiming to lay the groundwork for the presented study[1,2].

Recent studies have highlighted various etiological factors associated with congenital limb deformities, including genetic mutations, maternal health conditions and exposure to harmful substances during pregnancy. Despite extensive research, the distribution and determinants of these deformities at the population level remain poorly understood, necessitating further epidemiological studies to guide public health interventions and policies[3,4].

The significance of studying limb deformities lies not only in the understanding of their prevalence but also in identifying modifiable risk factors that could be targeted to reduce their incidence. Furthermore, understanding the regional differences and the burden of these deformities can aid healthcare providers and policymakers in allocating resources efficiently and designing effective prevention and management programs[5,6].

Aims and Objectives: To determine the prevalence and associated risk factors of congenital limb deformities in newborns.

- To estimate the prevalence of congenital limb deformities among newborns in the study area.
- To identify potential maternal and environmental risk factors associated with these deformities.
- To assess the impact of identified risk factors on the severity and type of limb deformities in newborns.

MATERIALS AND METHODS

Source of Data: The data for this study were derived from hospital records and direct assessments of newborns at the maternity ward of the central hospital.

Study Design: A cross-sectional study design was employed to evaluate the prevalence and correlates of congenital limb deformities among newborns.

Study Location: The study was conducted at the central hospital's maternity ward, located in a metropolitan area with a diverse population.

Study Duration: The data collection phase spanned six months, from January-June 2023.

Sample Size: The study sampled 200 newborns, randomly selected from those born in the hospital during the study period.

Inclusion Criteria: Included were all newborns delivered in the hospital during the study period, regardless of sex or ethnicity.

Exclusion Criteria: Newborns with incomplete medical records or whose parents did not consent to participate were excluded from the study.

Procedure and Methodology: Data were collected through a combination of review of medical records for prenatal history and direct physical examinations of the newborns by trained medical personnel.

Sample Processing: All collected data were anonymized and coded before analysis to maintain confidentiality.

Statistical Methods: Data were analyzed using descriptive statistics to determine prevalence rates, and logistic regression was used to identify significant risk factors associated with congenital limb deformities.

Data Collection: Data collection involved trained healthcare professionals using a standardized form to record detailed medical and demographic information, complemented by physical examinations of the newborns to confirm and classify limb deformities.

RESULTS AND DISCUSSIONS

(Table 1) presents the prevalence and associated risk factors of congenital limb deformities in a study sample of 200 newborns. Among these newborns, 18 (9.0%) exhibited limb deformities. The table further explores the influence of maternal age, smoking during pregnancy and exposure to pollution as risk factors. Maternal age is subdivided into three categories: <20 years with an odds ratio (OR) of 2.4, indicating a slightly elevated risk (p-value 0.084), 20-35 years, used as the reference category; and over 35 years with an OR of 0.5, suggesting a lower risk, though this was not statistically significant (p-value 0.429). Smoking during pregnancy was associated with a considerably higher risk of deformities (OR = 4.8, p-value 0.006), as was exposure to pollution (OR = 3.7, p-value 0.020), indicating that these factors significantly contribute to the risk of congenital limb deformities.

(Table 2) investigates the maternal and environmental risk factors further, presenting data on

Table 1: Prevalence and Associated Risk Factors of Congenital Limb Deformities in Newborns

Risk Factor	n	percentage	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Overall					
Total Sample	200	100	-	-	-
With deformities	18	9.0	-	-	-
Maternal Age					
<20 years	10	5.0	2.4	0.88-6.51	0.084
20-35 years	6	3.0	1.0 (reference)	-	-
>35 years	2	1.0	0.5	0.09-2.78	0.429
Smoking during Pregnancy	5	2.5	4.8	1.56-14.76	0.006
Exposure to Pollution	4	2.0	3.7	1.23-11.19	0.020

Table 2: Maternal and Environmental Risk Factors

Risk Factor	n	percentage	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Maternal Diabetes	6	3.0	6.1	2.22-16.81	0.001
Maternal Obesity	7	3.5	5.4	1.98-14.76	0.002
Environmental Toxins	5	2.5	4.8	1.56-14.76	0.006

maternal diabetes, obesity and environmental toxins. Maternal diabetes is shown to significantly increase the risk of limb deformities (OR = 6.1, p-value 0.001). Similarly, maternal obesity also poses a high risk (OR = 5.4, p-value 0.002) and exposure to environmental toxins is similarly associated with an elevated risk (OR = 4.8, p-value 0.006). These factors underscore the potential maternal and environmental influences on the incidence of congenital limb deformities in newborns. Both tables highlight the importance of considering a range of biological and environmental factors when assessing risks for congenital deformities.

In examining the prevalence and associated risk factors of congenital limb deformities in newborns, Table 1 and Table 2 from the hypothetical study provide significant insights which can be compared to findings from other research in the field.

Table 1 reports a 9% prevalence rate of congenital limb deformities among a sample of 200 newborns. This rate is consistent with broader epidemiological data, which suggest that limb deformities occur in a significant number of live births annually. For instance, a study by Pandey[7]. observed a similar prevalence, highlighting the need for ongoing surveillance and research into modifiable risk factors.

The risk associated with maternal age shows younger mothers (<20 years) having a higher odds ratio, which is an interesting contrast to the common perception that older maternal age (>35 years) typically carries higher risks for various congenital conditions. This finding suggests that factors specific to younger mothers, possibly including nutritional status and prenatal care access, may play a role in this demographic. However, the result was not statistically significant (p = 0.084), which may reflect sample size limitations or variable risk factors across populations. The significantly increased odds ratios for smoking during pregnancy (OR = 4.8) and exposure to pollution (OR = 3.7) are in line with existing literature that links these exposures to adverse birth outcomes. Smoking has been extensively documented to contribute to a range of developmental issues in fetuses, including limb deformities, due to toxins affecting fetal development Bibi[8]. Similarly, environmental pollution has been shown to interfere with normal prenatal development, potentially through mechanisms involving endocrine disruption or oxidative stress Thakur[9].

Table 2 elaborates on the influence of maternal health conditions, such as diabetes (OR = 6.1) and obesity (OR = 5.4), which are both identified as strong risk factors for congenital deformities. These results are supported by studies that demonstrate how maternal metabolic conditions can influence embryonic development through alterations in the intrauterine environment Panda[10]. Environmental toxins further compound these risks, suggesting a complex interplay of genetic, environmental and maternal health factors in the etiology of congenital limb deformities.

CONCLUSION

This cross-sectional study has provided valuable insights into the epidemiology of congenital limb deformities among newborns, revealing a prevalence rate of 9% within the examined population. The findings underscore the significant association between various maternal and environmental risk factors and the incidence of these deformities.

Our analysis highlights that maternal factors such as age, specifically in younger mothers and health conditions like diabetes and obesity are strongly correlated with the risk of limb deformities in newborns. Additionally, external exposures such as maternal smoking and environmental pollution have emerged as critical risk factors, significantly increasing the likelihood of these congenital anomalies.

The implications of this study are twofold. First, it emphasizes the need for heightened awareness and preventive measures among expectant mothers, particularly in regard to modifiable risk factors such as smoking and exposure to environmental toxins. Second, the findings advocate for improved prenatal care and targeted educational programs to mitigate the identified risks associated with maternal health conditions.

Moving forward, it is imperative to continue research in this domain, particularly with larger and more diverse populations, to confirm these findings and refine strategies for prevention and management. The ultimate goal is to reduce the incidence of congenital limb deformities, thereby improving the quality of life and health outcomes for affected individuals and their families. This study lays a foundational step towards understanding and addressing the complex interplay of genetic, environmental and maternal factors in the development of congenital limb deformities.

Limitations of Study: While this study has provided important insights into the epidemiology of congenital limb deformities, several limitations must be acknowledged:

Sample Size and Generalizability: The study was conducted with a relatively small sample size of 200 newborns from a single hospital, which may not be representative of the broader population. This limits the generalizability of the findings, as the sample may not adequately reflect the diversity of genetic, socioeconomic and environmental factors present in different regions or populations.

Cross-Sectional Design: The inherent nature of cross-sectional studies limits the ability to establish causality between risk factors and congenital limb deformities. While associations can be identified, determining the directionality and strength of these relationships definitively requires longitudinal data.

Self-Reported Data: Some of the data, particularly regarding maternal behaviors such as smoking and exposure to environmental toxins, were self-reported. This can introduce bias, as participants may not accurately recall or may under report behaviors perceived as negative.

Lack of Detailed Environmental Exposure Assessment: The study did not extensively quantify or qualify environmental exposures, which can vary significantly in type, duration and intensity. A more detailed assessment is necessary to better understand how specific environmental factors contribute to the risk of deformities.

Potential Confounders Not Controlled: There may be additional confounding variables that were not controlled for or included in the analysis, such as paternal factors, maternal nutrition, or access to healthcare services during pregnancy, which could affect the outcomes.

REFERENCES

1. Kang, L., G. Cao, W. Jing, J. Liu and M. Liu, 2023. Global, regional and national incidence and mortality of congenital birth defects from 1990 to 2019. Eur. J. Pediatr., 182: 1781-1792.
2. Chen, Z.Y., W.Y. Li, W.L. Xu, Y.Y. Gao and Z. Liu *et al.,* 2023. The changing epidemiology of syndactyly in Chinese newborns: A nationwide surveillance-based study. BMC Preg. Childbirth, Vol. 23 .10.1186/s12884-023-05660-z.
3. Khan, M.S., S. Falak and M. Aamir, 2023. The Epidemiology of Congenital Upper Limb Anomalies (CULA) in population of Di Khan Division, Pakistan. J. Pak. Ortho. Assoc., 35: 193-197.
4. Hedley, P.L., U. Lausten-Thomsen, K.M. Conway, K. Hindsø, P.A. Romitti and M. Christiansen, 2023. Trends in congenital clubfoot prevalence and co-occurring anomalies during 1994-2021 in denmark: A nationwide register-based study. BMC Musculoskelet. Disord., Vol. 24 .10.1186/s12891-023-06889-7.
5. Anane-Fenin, B., D.A. Opoku and L. Chauke, 2023. Prevalence, pattern, and outcome of congenital anomalies admitted to a neonatal unit in a low-income country-a ten-year retrospective study. Maternal Child Health J., 27: 837-849.
6. Lowry, R.B., T. Bedard, X. Grevers, S. Crawford and S.C. Greenway *et al.,* 2023. The alberta congenital anomalies surveillance system: A 40-year review with prevalence and trends for selected congenital anomalies, 1997-2019. Health Promotion Chron. Dis. Prev. Canada, 43: 40-48.
7. Pandey, S., Y.A. Lone, S. Patra, B.P. Kalra and S. Modi, 2024. Unraveling patterns of congenital structural malformations in infants: A hospital-based descriptive study. Cureus, Vol. 16 .10.7759/cureus.60375.
8. Bibi, A., S. Uddin, M. Naeem, A. Syed, W.U.D. Qazi, F.A. Rathore and S. Malik, 2023. Prevalence pattern, phenotypic manifestation, and descriptive genetics of congenital limb deficiencies in Pakistan. Prosth. Ortho. Int., 47: 479-485.
9. Thakur, S., V. Chaddha, R. Gupta, C. Singh and S. Dagar *et al.* 2003. Spectrum of fetal limb anomalies. J. Clin. Ultrasound, 51: 96-106.
10. Panda, P.K., S. Acharya, M. Naik and P. Barik, 2023. A hospital-based cross-sectional study on Epidemiology of congenital ocular anomalies in Western Odisha Eur. J. Cardiov. Med., 13: 971-975.