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Original Article

Congenital Birth Defects Contributing to Neonatal Mortality in Hospitalized Newborns

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Abstract

Objective: To determine the contribution of congenital defects towards mortality in hospitalized newborn babies.

Methods: This cross-sectional descriptive study was done at the Nursery of Mayo Hospital Lahore from 2019 to 2023. All electronic entries of neonatal mortality were reviewed. Neonatal Mortality having congenital defects was taken. Data was compiled, tabulated and analyzed on SPSS.

Results: 218 neonatal mortalities were reported to have obvious congenital defects, making 7.8% of total neonatal mortality. However, it had no uniform pattern in the last 5 years. It ranged from 12.5% to 5.2% annually. The most common congenital defects in Neonatal Mortality were suspected congenital heart disease (45%), CNS malformations, chiefly spinal dysraphism (16%), urogenital defects including ambiguous genitalia, pulmonary system including Diaphragmatic hernia and Syndromes. The most common primary diseases under treatment at the nursery leading to death in congenital defects were sepsis (43.1%) and Birth Asphyxia (25.7%). Gender variation had no significance on overall neonatal mortality.

Conclusion: Congenital defects have significant contribution towards neonatal mortality in the hospital nursery.

Key words: Neonatal Mortality, Congenital defects, Nursery.

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Introduction

Congenital defects/malformations are often seen in the nurseries. These defects are associated with significant morbidity and mortality.[1] WHO defines any pathological condition potentially which has arisen before birth in fetus, whether present at birth or later, structural or not, is a congenital defect.[2] It is estimated that 6% live births have congenital defects.[3] However in stillborn cases, the number rises to more than 50%. Neonatal mortality means any death during first 28 days of life (neonatal life).

Neonatal Mortality is rising on an alarming rate in Pakistan. The most up-to-date data available is 42/1000 live births Neonatal Mortality Rate (NMR) in Pakistan which accounts almost to 7% of all newborn deaths globally.[4] For almost a decade, Pakistan is at number one in newborn deaths across the globe. Every 22nd alive born here, died due to one or the other reasons in neonatal life. Much of the deaths are considered to be preventable. But still a significant number becomes inevitable owing to poor health resources and practices in the country. Causative factors for mortality include congenital defects or malformations, with birth defects being one of the top five reasons of neonatal deaths.[5]

Developed countries in spite of all advanced health facilities, face a significant portion of neonatal deaths in Neonatal Mortality due to congenital defects. The situation is even more serious in developing countries like Pakistan where antenatal screening and newborn screening facilities are already scarce. As the government of Pakistan seeks to attain Universal Health Coverage by 2030, the Sustainable Development Goals require to achieve a global target of 12/1000 live births neonatal deaths.[6] This hardly seems possible when congenital defects with reported mortality is the highest in Pakistan ethnicity worldwide.[7] A study is designed as a part of the Neonatal Mortality Audit to estimate the neonatal

mortality contributed by congenital defects in a hospital nursery. In today's era, understanding neonatal mortality should be our priority and curtailing its prevalence in true sense, is the real service to Pakistan.

Methods

A cross sectional descriptive study was conducted during the Neonatal Mortality Audit at the Nursery of Pediatric Unit 1, Mayo Hospital affiliated with King Edward Medical University Lahore. Nursery consists of Neonatal Intensive Care unit (NICU), High Dependency unit (HDU) and Special care Baby unit (SCBU). All available neonatal mortality entries in the electronic computerized software (NiNi e-log system) were reviewed in the last 5 years from 2019 to 2023. The objective of this study was to determine the congenital defects contributing to Neonatal Mortality in hospitalized newborns. Mortality in newborns having one or more obvious congenital defects was taken. The details of such deaths were noted with all possible variables including gender, primary diagnosis, nature of congenital defect suspected or identified, cause of mortality etc. on a tabulated sheet. Collected data was analyzed on SPSS version 26. Frequency of congenital defects in neonatal mortality is represented in a bar chart annually. Chi-square test was applied at 5% level of significance among relative frequencies of data.

Results

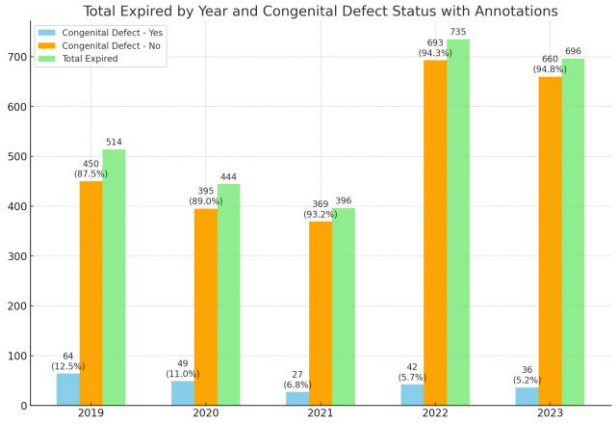
Total 2785 expiries were reviewed in the Neonatal Mortality Audit in the last 5 years elaborated in Graph 1 below. 218(7.8%) expired neonates were noted to have suspected congenital birth defects while undergoing treatment in the nursery and the remaining 2567(92.17%)

Table 1: *Gender Cross-tabulation with Primary Diagnosis in Congenital Defects Newborns contributing to Neonatal Mortality*

Year	Gender	Birth Asphyxia	Sepsis	MAS*	Prematurity	Multiple Diagnoses	Total	*P-value*
2019	Male	8	14	4	4	5	35	
	Female	7	13	3	4	0	27	
	Ambiguous Genitalia	0	2	0	0	0	2	
		15	29	7	8	5	64	**0.548**
2020	Male	6	12	1	2	0	21	
	Female	5	11	2	5	4	27	
	Ambiguous Genitalia	0	1	0	0	0	1	
		11	24	3	7	4	49	**0.622**
2021	Male	4	3	2	2	0	11	
	Female	4	5	0	4	2	15	
	Ambiguous Genitalia	0	1	0	0	0	1	
		8	9	2	6	2	27	**0.546**
2022	Male	5	8	2	5	2	22	
	Female	5	8	1	2	2	18	
	Ambiguous Genitalia	0	1	0	1	0	2	
		10	17	3	8	4	42	**0.926**
2023	Male	7	7	1	2	2	19	
	Female	5	6	1	2	0	14	
	Ambiguous Genitalia	0	2	0	0	1	3	
		12	15	2	4	3	36	**0.661**
Total	Male	30	44	10	15	9	108	
	Female	26	43	7	17	8	101	
	Ambiguous Genitalia	0	7	0	1	1	9	
	Total	56	94	17	33	18	218	**0.546**
		25.7%	**43.1%**	**7.8%**	**15.1%**	**8.3%**	100.0%	

**MAS Meconium Aspiration Syndrome*

neonatal deaths had no structural defect mentioned in their records. These defects varied widely. Congenital Defects were observed in different bodily systems of the newborns. Out of 218 neonatal mortalities, suspected congenital heart diseases were 100(45%) being the most common birth defect observed. Few of them were confirmed on echocardiography. The second most common defects were observed in the nervous system; 35(16%), chiefly ruptured meningomyelocele. Cases from urogenital system including ambiguous genitalia were 18(8.2%). Others were; 11 from pulmonary system including diaphragmatic hernias and remaining 52 were included in miscellaneous as they were syndromic in nature e.g., Down syndrome or complex known or unknown constellation of anomalies e.g., VACTER syndrome, etc. Congenital Defects were not diagnosed as a primary disease during their treatment in the nursery. In fact, not a single congenital defect was found reported as a cause of death in Neonatal Mortality Audit. However, contribution of birth defects to total Neonatal Mortality was seen to be as high as 12.5% in 2019. It was never below 5% annually during last 5 years. The primary diagnosis in these cases were cross-tabulated with gender, stratified in years and are shown in Table 1. No significance of gender variation with primary diagnosis was observed.



Graph 1

Discussion

Congenital Birth defects are a significant contributor to our National Neonatal Mortality. Without reducing these, Neonatal Mortality remains a serious challenge in developing countries like Pakistan. It is an unavoidable curse, even in the developed world. While the developed countries have managed to curtail it to the lowest level, they still lack uniformity in the mortality rates.[8]

Heart, lung and neural tube defects are observed as three of the most common severe birth defects.[9] We found the same pattern in our study. Excretory system defects including urogenital defects were more marked than lung defects in our results. Lung defects could not be appreciated easily in our mortality audit. However, a large number of neonates terminally treated for pnumothorax might raise the suspicion of lung malformation or merely a complication of mechanical ventilation administered to them. Neural tube defects prevalence in Pakistan[10,11] (12-13/1000births) is found high than worldwide (1.4/1000births).[12] Similar trends were observed here and noted as the second commonest congenital defect. An interesting fact that parents and treating obstetricians were aware of these defects, owing to the anomaly scan but had not taken any mutual decision regarding termination of such gestations. Most of our social norms and beliefs promote termination of pregnancies as harmful and illegal under religious oppression.

Birth Defects contributed to Neonatal Mortality as high as 12.5% in 2019 and noted 5.2% in 2023 of our available data. There was no uniform pattern observed. Its decreasing trend over years is real? Or in high mortality numbers make it less reportable? There might be a chance of increase in assessing and documenting it in decreasing mortality handling at a busy nursery. Up to 2021, neonatal Mortality is around 500, a steep rise in total neonatal mortality is seen in 2022 and 2023, around 700. This steep rise actually depicts increased mortality in the first 24 hours of admitted neonates at nursery indoor after change in triage policy in the emergency department. Nowadays, a maximum stay of 4 hours is adopted for resuscitation and emergency handling of the neonates at Paeds Emergency department by Child Life Foundation for the last 2 years. Excluding such mortality in our data, the prevalence of birth defects in Neonatal Mortality remains well above ten, then 7.8% observed. 14.3% neonatal mortality in congenital malformations has been reported in another nearby busy neonatal unit of a tertiary care hospital in the city; Services Hospital Lahore by Naibzai ZK et al recently.[13] Pakistan bears a high burden of anomalies worldwide.[14-18] Hussain et al reported 7% birth defects in a data at Kharian Hospital,[14] Perveen and Tayyab witnessed anomalies 11.4% in deliveries at Karachi Hospital.[15] Study by Guvstavson is unique as it involved 4 different areas in Lahore to estimate the incidence of birth defects in community and astonishingly noticed 5% was the serious birth defects only.[16]

Estimated 3 million newborns die worldwide within 28 days of birth every year due to congenital disorders. Nine of ten children born with a serious congenital disorder are in low and middle-income countries.[19] Malformations in Pakistani ethnicity reported to be the worst worldwide.[7] This is the fact we are facing a difficult high national neonatal mortality rate 42%. Ten countries including Pakistan constitute 75% of Global Neonatal Death.[20] This sky rise mortality trend might not improve

without reducing deaths caused by congenital disorders. Inspite of increasing services regarding Maternal and Neonatal health day by day, still Pakistan stands at the worst pregnancy outcomes in low- and middle-income countries.[21] A significant portion of Neonatal Mortality seen with obvious congenital malformations was observed in this study, the number may be doubled or tripled if every newborn be screened essentially at the nursery for congenital anomalies. The newborns which had obvious congenital defects were included in this study. The newborns with inborn error of metabolism and concealed birth defects are still missing in this Mortality due to lack of essential Newborn Screening in our set up. Moreover, this hospital has only out-born newborns and no in-born neonates from attached delivery suites. The congenital defects which are cured or shifted for repair are not including in this study. A separate study is required for congenital defects outcome in Morbidity and Mortality at the nursery.

Conclusion

Congenital Malformations have significant contributions towards Neonatal Mortality at Hospital Nursery.

Ethical Approval: The IRB/EC approved this study via letter no. 373/RC/KEMU dated 19-09-2023.

Conflict of Interest: None

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Authors' Contribution: Role and contribution of authors followed ICMJE recommendations

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