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Research Paper

Neural Tube Defects Among Newborn Babies

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ABSTRACT

Neural tube defects (NTDs) are a group of severe congenital anomalies arising from the incomplete closure of the neural tube during early embryonic development, typically within the first 28 days of gestation. These defects, which include conditions such as anencephaly, spina bifida, and encephalocele, represent a significant cause of neonatal morbidity and mortality worldwide. The etiology of NTDs is multifactorial, involving a complex interplay between genetic susceptibility, environmental factors, and nutritional deficiencies, most notably folate deficiency.Despite advances in prenatal screening and diagnostic imaging, NTDs continue to pose substantial challenges, particularly in low- and middle-income regions where access to maternal healthcare and nutritional supplementation may be limited. Emerging evidence suggests that, beyond folate, factors such as maternal metabolic status, exposure to teratogens, and epigenetic modifications may also contribute to the risk profile.Preventive strategies, including periconceptional folic acid supplementation and food fortification programs, have demonstrated a marked reduction in incidence rates; however, gaps in awareness and implementation persist. Early diagnosis through ultrasonography and biochemical markers enables informed clinical decision-making and enhanced perinatal management.This abstract highlights the importance of integrating public health approaches, combining nutritional interventions, genetic counseling, and education to mitigate the global burden of NTDs.

INTRODUCTION

Neural tube defects (NTDs) are serious congenital abnormalities that occur during the early stages of embryonic development. These defects arise when the neural tube, the embryonic structure that later develops into the brain and spinal cord, fails to close properly during the first few weeks of

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pregnancy. Because this process happens very early, often before a woman even realizes she is pregnant, neural tube defects remain an important public health concern worldwide.

The neural tube normally forms and closes between the third and fourth week of gestation. When this closure process is incomplete or abnormal, it can lead to structural defects affecting the brain, spine, or spinal cord. The most common types of neural tube defects include spina bifida, anencephaly, and encephalocele, each varying in severity and long-term impact on the child's health and development. Some forms may lead to lifelong disability, while others may be incompatible with life.

METHODOLOGY

1. Study Design

We designed this investigation as a prospective observational hospital-based study to evaluate the occurrence, maternal risk factors, and neonatal outcomes associated with neural tube defects in newborn infants. We focused the study on identifying patterns of congenital anomalies related to incomplete closure of the embryonic neural tube.

2. Study Setting

The research was carried out in the Department of Pediatrics and Neonatology of a tertiary care teaching hospital with an active obstetric unit. The institution handles a large number of deliveries annually and provides specialized neonatal care facilities, including neonatal intensive care services. The hospital also serves as a referral center for high-risk pregnancies from surrounding rural and urban regions.

3. Study Population

The study population consisted of newborn babies delivered in the hospital during the study period and diagnosed with neural tube defects immediately after birth or within the early neonatal period. Mothers who delivered these infants were also included for assessment of maternal risk factors.

4. Sample Size

A total of ___ newborns diagnosed with neural tube defects during the study period were included. The sample size was defined as the total number of confirmed cases identified through the hospital's neonatal unit and delivery registers within the specified study timeframe.

5. Study Duration

The study was conducted over a period of months (or years) from Month Year to Month Year, allowing adequate time to collect data on newborn outcomes and maternal health parameters.

6. Inclusion Criteria

Newborns were included in the study if they fulfilled the following criteria:

- Infants diagnosed with neural tube defects at birth or within the neonatal period.
- Cases confirmed through clinical examination and imaging methods.
- Newborns delivered in the hospital or referred within the first 7 days of life.

7. Exclusion Criteria

The following cases were excluded:

- Newborns with congenital anomalies unrelated to neural tube development.
- Infants with incomplete clinical records.
- Babies referred after the neonatal period.

8. Data Collection Procedures

Data were collected through structured clinical documentation and maternal interviews.

Information recorded included:

Maternal Factors

- Maternal age
- Nutritional status during pregnancy

- History of folic acid supplementation
- Consanguineous marriage
- Exposure to teratogenic medications or environmental toxins
- History of diabetes, epilepsy, or other chronic illnesses
- Previous pregnancy outcomes and congenital anomalies

Neonatal Factors

- Gestational age at birth
- Birth weight
- Sex of the newborn
- Type of neural tube defect
- Associated congenital anomalies
- Immediate neonatal complications

Clinical examination of the newborn was performed by pediatricians to identify structural abnormalities of the central nervous system.

9. Diagnostic Evaluation

Diagnosis of neural tube defects was confirmed using a combination of:

- Physical examination at birth
- Ultrasonography of the cranial or spinal region
- Radiological imaging, when necessary

Cases were categorized into different types of neural tube defects, such as:

- Spina Bifida
- Anencephaly
- Encephalocele

10. Outcome Assessment

Newborn outcomes were evaluated during the neonatal period and included:

- Survival status
- Presence of neurological deficits
- Need for surgical intervention.
- Associated systemic complications

Follow-up evaluations were conducted when possible to monitor early developmental progress.

11. Ethical Considerations

Prior approval for the study was obtained from the Institutional Ethics Committee. Written informed consent was obtained from mothers or legal guardians before collecting clinical data. Confidentiality of patient information was maintained throughout the study.

12. Statistical Analysis

Collected data were entered into a structured database and analyzed using statistical software. Descriptive statistics were used to summarize maternal and neonatal variables. Frequency distribution and percentage analysis were applied to determine the prevalence of different types of neural tube defects and associated risk factors**.**

RESULTS AND DISCUSSION

The study observed pregnancies with a median gestational age of 18 weeks, with cases ranging from 12 to 24 weeks. During the study period, a total of deliveries were conducted. Among these deliveries, ten newborns were diagnosed with neural tube defects (NTDs). Based on these numbers, the incidence of NTDs in this population was calculated to be

Table 1 shows that out of 10 NTD babies, 60% were male and 40% were female and anencephaly was observed in 40% of the fetuses followed by spina bifida and meningocele.

Type of NTD	Number of fetuses	male	Female
Anencphaly	3	0	1
Acrania	2	2	0
Spinabifida	0	1	1
Encephalocele	2	0	2
Meningocele	1	1	0
Total	8	4	4

Table 1:

Distribution of type neural tube defect with sex

Table 2 shows sex, gestational age, NTD, and associated malformation observed in the fetuses.

Associated malformations were observed in only 2 (20%) cases. One was a female at a gestational age of 23 weeks who had anencephaly found to have esophageal atresia. Another male at 14 weeks of gestational age with acrania and meningocele was found to have an associated omphalocele.

Sex	Gestational age(week)	NTDs	Associated anomalies
female	21	Anencephaly	
male	27	Meningomyelocele	
male	18	Posterior encephalocele	
male	40	Anencephaly	Esophageal atresia
Female	32	Acrania,meningocele	omphalocele
male	19	Spina bifida, meningocele	
female	25	Anencephaly	
male	13	Posterior encephalocele	
male	21	Meningomyelocele	

Table 2

Sex, gestational age, neural tube defect, and associated malformation observed in the fetuses

Source;

Neural tube defects among a new born baby

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Various presentation with neural tube defects were seen in this case series. Figure 1 shows the presentation of one fetus with anencephaly and protruded eye ball. Figure 2 shows a different presentation like Fetus with rachischisis; whereas another presentation is shown in Figure 3 which depicts Anencephaly with omphalocele. In Figure 4 Fetus with meningomyelocele has been shown while in Figure 5 Fetus with posterior encephalocele is shown.

Fig 1: Anencephaly and protruded eye ball

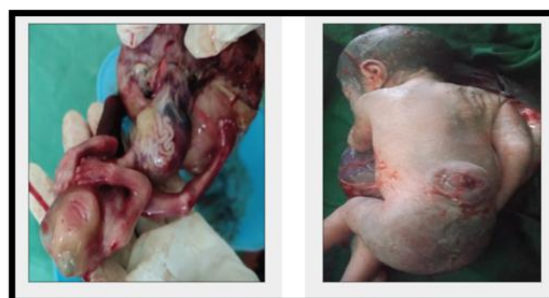

fig 2: Fetus with rachischisis

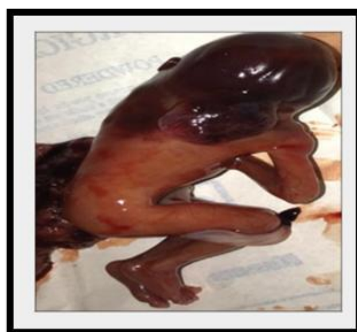

fig 3: Anencephaly with omphalocele

fig 4: Fetus with meningomyelocele

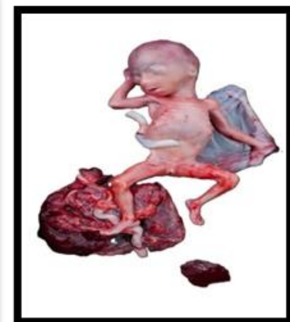

fig5: Fetus with posterior encephalocele

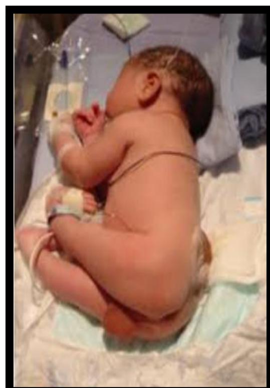
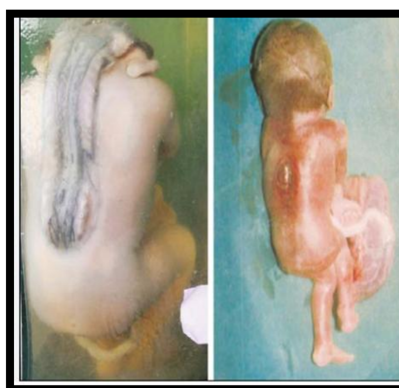

Fig 6: anencephaly fig 7: Meningomyelocele fig 8: Spina bifida

DISCUSSION

This finding highlights the relative rarity of NTDs in the studied population but also underscores the importance of early prenatal screening and preventive measures, such as folic acid supplementation. Identifying pregnancies at risk and providing timely interventions can significantly reduce the burden of NTDs and improve neonatal outcomes. Furthermore, understanding local incidence rates allows healthcare providers to tailor public health strategies and educational programs aimed at reducing congenital anomalies

CONCLUSION

I conclude that Serious but largely preventable birth defects Early pregnancy (first 28days) is the critical period. Folic acid deficiency is the main preventable cause Includes conditions such as anencephaly and spina bifida. Adequate maternal folic acid intake reduces the risk significantly. Prevention is more effective than treatment . Identifying pregnancies at risk and providing timely interventions can significantly reduce the burden of NTDs and improve neonatal outcomes. Furthermore, understanding local incidence rates allows healthcare providers to tailor public health strategies and educational programs aimed at reducing congenital anomalies Preventive strategies, including periconceptional folic acid supplementation and food fortification programs. Early diagnosis through ultrasonography and biochemical markers enables informed clinical decision-making and enhanced perinatal management.

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