Section: Obstetrics and Gynaecology

Case Series

NEURAL TUBE DEFECTS: IS THERE A NEED TO IMPLEMENT THE FORTIFICATION OF STAPLE FOOD WITH FOLIC ACID? A CASE SERIES AT TERTIARY CARE CENTER

Mahima Gawalkar[1], Surekha. S. M[2], B. H. Narayani[3], Vinaya G[4]

[1]*PG Resident (IIIrd Year), Department of Obstetrics and Gynaecology, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.*
[2]*Associate Professor, Department of Obstetrics and Gynaecology, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.*
[3]*Professor & HOD, Department of Obstetrics and Gynaecology, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.*
[4]*Assistant Professor, Department of Obstetrics and Gynaecology, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.*

Received *: 10/03/2024*
Received in revised form *: 25/03/2024*
Accepted *: 17/04/2024*

Corresponding Author:
Dr. Mahima Gawalkar
PG Resident (IIIrd Year), Department of Obstetrics and Gynaecology, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.
Email: mahima6.vg@gmail.com

DOI: 10.5530/ijmedph.2024.2.31

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (2); 159-162

ABSTRACT

Background: Neural tube defects, serious birth defects affecting the brain & spine, are a major, preventable public health burden. **Aim and Objectives:** 1) Periconceptional folic acid intake in any means to prevent NTDs in unplanned pregnancy. 2) To understand the need to implement the fortification of staple food with folic acid.
Material and Methods: Total of 10 cases (from March 2022 to March 2023 in KIMS, Koppal) with neural tube defects.
Results: Various presentations with neural tube defects were seen in this case series. Unplanned pregnancies and unawareness regarding benefits of folic acid supplementation leading to higher incidence of neural tube defects.
Conclusion: New efforts that is implementation of fortification of staple food with folic acid along with practicing primary prevention such as dietary folate intake, periconceptional folic acid intake are needed to implement a combined strategy to reduce the incidence of neural tube defects.
Keywords: Neural Tube Defects, Folic Acid, Fortification, Food.

INTRODUCTION

Neural tube defects constitute a heterogenous & complex group of congenital central nervous system anomalies that are caused by the closure failure of the embryonic neural tube by the 28th day of conception. They result in structural defects that occur along the neuraxis from the developing brain to the sacrum and often result in the exposure. Neural tube defects are serious birth defects, are a major preventable public health burden.

Globally, it is estimated that approximately 3,00,000 babies are born each year with neural tube defects,[1] resulting in approximately 88,000 deaths & 8.6 million disability adjusted life years.[2,3]

Most infants with spina bifida are live born and with proper surgical treatment and management, can survive till adulthood. However these children often have lifelong physical disabilities, including leg paralysis absence of control of urine and bowel, and learning difficulties.in addition, a large proportion of infants with spina bifida also develop hydrocephalus, which may lead to intellectual impairment and even premature death. Generally, these congenital malformations significantly increase the rate of mortality & disability in the neonatal period and the first year of life.[4,5]

The incidence in Indian subcontinent is much higher than in developed countries.[6,7] Neural tube defects are generally believed to be multifactorial in etiology involving both genetic & environmental factors. Factors identified as possible risk factors can be grouped as foetal factors and maternal factors. Foetal factors include environmental insults to the foetus in early pregnancy. Maternal factors include advanced age, history of miscarriage, a family history of twinning or neural tube defects. In addition, dietary factors, in particular, folate, drugs & the genes are associated risk factors.

MATERIAL AND METHODS

A total of 10 cases (from March 2022 to March 2023 in KIMS, Koppal) with neural tube defects were included.

CASE 1

28-year-old, G4P2L2A1, 33 weeks of gestation age with previous 2 LSCS, with scar tenderness
Scan report: Craniorachischisis.

CASE 2

25 years old, primigravida, 15 weeks of gestational age, scan report: anencephaly with omphalocele

CASE 3

32 years old, G4P1L1A2, with 26 weeks of gestation with previous 1 LSCS, scan report: Gastrochisis, altered curvature of spine and myelomeningocele, CTEV with clenched fist.

CASE 4

28 yrs old, G3P2L2 with 23 weeks old with previous vaginal deliveries has come for termination for pregnancy.
scan report: spina bifida with corpus callosal dysgenesis.

CASE 5

21 yrs old, Primigravida with 27 weeks old has come for termination of pregnancy.
Scan report: encephalocele with dandy walker malformation.

CASE 6

25 yrs old, G2P1L1, with 24 weeks of gestation with previous vaginal delivery,
scan report: encephalocele with omphalocele.

CASE 7

25 yrs old, G3A2, with 16 weeks of gestation with previous medically indicated termination of pregnancy.
Scan report: Acrania with cleft lip with cleft palate.

CASE 8
22 yrs old, Primigravida, with 22 weeks of gestation had come for termination of pregnancy.
scan report: spina bifida with Arnold Chiari malformation

CASE 9
27 yrs old, G4P1L1D2, with 18 weeks of gestation with previous vaginal delivery and reason for previous deaths – cardiac anomalies,
scan report: Spinal Deformities

CASE 10
35 yrs old, Primigravida with 36 weeks of gestation in active labor with 14 years of married life. (Elderly Primigravida with precious pregnancy, Spontaneous conception)
scan report: spina bifida with anencephaly.

RESULTS

Various presentations with neural tube defects were seen in this case series.
Out of 10 cases, 6 cases were unplanned pregnancy, 1 case with previous medically indicated termination of pregnancy did not undergo periconceptional folic acid intake, other case of elderly primigravida with precious pregnancy and spontaneous conception in spite of periconceptional folic acid intake, no other drug intake ended up with foetus with neural tube defects suggest other causes of Neural Tube Defects.
The remaining 2 cases, occurring after 28 weeks, did not undergo termination of pregnancy (MTP) in spite of diagnosis in prenatal screening & continued the pregnancy.

Table 1: Gestational age on admission

Gestational age	NTDs
>28 weeks	2
24-28 weeks	3
<24 weeks	5

Table 2: Obstetric status on admission

Gestational age	GRAVIDA	
	Primigravida	Multigravida
>28 weeks	1	1
24-28 weeks	1	2
<24 weeks	3	2

Table 3: Periconceptional folic acid intake

Number of cases	Periconceptional folic acid tablets
9 cases	yes
1 case	no

DISCUSSION

The neural tube normally closes 28days after conception, while other major malformations develop within 12 weeks of gestation. Subsequently, folic acid supplementation should start from 4 weeks before to 12 weeks after conception to reduce the risk of major malformation in the foetus.[8]
The accumulating evidence has shown that maternal folate status is associated with increased incidence of NTD. The decreased levels could arise as a consequence of dietary deficiency, a genetic defect in the folate metabolism or both. Several specific drugs are known to affect folate metabolism or prevent the absorption of folic acid. These include sulfamethoxazole-trimethoprim (an anti-microbial), methotrexate (an anti-cancerous agent), aspirin (an anti-coagulant), sulfadoxine-pyrimethamine (an anti-malaria agent), sulfasalazine (an anti-ulcerative colitis) azathioprine (immunosuppresents), antacids, rifampicin (antituberculosis) & so forth.[9]
It has been reported that low vitamin B12 levels during pregnancy independently increase the risk for NTDs.[10] Oakley (2007) supported the fortification of enriched grain with folic acid & vitamin B12, as they can prevent most cases of NTDs.
Prevention of first occurrence is a more significant public health concern as it represents more than 95% of all NTD cases. It is not practically possible to modify genetic factors hence all efforts should be concentrated in direction of improving maternal nutrition especially folate status.

CONCLUSION

Women of reproductive age should be advised to take multivitamin supplements especially containing vitamin B12 along with 0.4 mg folic acid daily. Women with previously affected offspring who intend to become pregnant should take daily supplementation containing 4 mg of folic acid during the periconceptional period to reduce the risk of recurrence.
The possible use of periconceptional folic acid 1. Dietary intake 2. Periconceptional Supplementation 3. Fortification of food products.
In order to achieve a reduction in NTDs prevalence, new efforts are needed in all countries to implement a comprehensive strategy to increase folate status by dietary means, increase uptake of folic acid supplements periconceptionally & to increase availability and identification of fortified foods.

Mandatory fortification could improve folate status of all women of childbearing age, substantially reduce NTDs prevalence, & reduce socio-economic inequalities in NTDs prevalence.

Consequently, it is logical that the primary prevention of NTDs by the mandatory fortification of wheat flour and/or rice with folic acid presents a significant public health opportunity in reducing not only mortality & morbidity associated with NTDs, but also medical expenditure increased by our health care system.

It is not acceptable to rely on secondary prevention, by means of prenatal screening followed by a termination of foetus, when primary prevention is known to be possible, effective & available.

REFERENCES

1. Christianson AL, Howson CP, Modell B. Global Report on Birth Defects: The Hidden Toll of Dying and Disabled Children. White Plains, NY: March of Dimes Birth Defects Foundation; 2006.
2. World Health Organization. Global Health Estimates (GHE) – Cause-Specific Mortality; 2015.
3. World Health Organization. Global Health estimates (GHE) – Disease Burden; 2015.
4. Neural tube defects: A retrospective study of 69 cases. Asian. J Neurosurg 2019; 14:506-9.
5. Pinar H. Postmortem findings in term neonates. Seminars in Neonatology 2004; 9:289-302.
6. Prevention of neural tube defects: Results of the medical research council vitamin study. MRC vitamin study research group. Lancet 1991; 338:131-7.
7. Czeizel AE, Dudás I. Prevention of the first occurrence of neural-tube defects by periconceptional vitamin supplementation. N Engl J Med 1992; 327:1832-5.
8. Kondo A, Matsuo T, Morota N, Kondo AS, Okai I, Fukuda H. Neural tube defects: Risk factors and preventive measures. Congenit Anom (Kyoto). 2017 Sep;57(5):150-156. doi: 10.1111/cga.12227. Epub 2017 Jun 28. PMID: 28425110.
9. Russell et al. 1988; Hernandez-Diaz et al. 2000; Hernandez-Diaz et al. 2001.
10. Gupta R, Kumari P, Pandey S, Joshi D, Sharma SP, Rai SK, et al. Homocysteine and Vitamin B12: Other causes of neural tube defects in Eastern Uttar Pradesh and Western Bihar population. Neurol India 2018; 66:1016-9.