DOI: https://doi.org/10.53350/pjmhs2216140

ORIGINAL ARTICLE

Awareness of maternal folate intake and prenatal screening in reducing the incidence of Myelomeningocele: a cross sectional study

UROOJ FATIMA[1], SABAHAT GUL[2], IRUM QUDDUS[3], SYED HUSSAIN MEHDI[4]
[1]Assistant Professor, Department of Anatomy,, Sindh Medical College, Jinnah Sindh Medical University
[2]Associate Professor, Department of Anatomy, Quaid-e-Azam Medical College.
Professor, Department of Anatomy,, Sindh Medical College, Jinnah Sindh Medical University
Principal & Professor, Department of Surgery,Jinnah Medical and Dental College.
Correspondence to Dr. Urooj Fatima, Email: noshee05@hotmail.com

ABSTRACT

Aim: To determine the awareness of mother regarding folate supplementation and prenatal scan to reduce the incidence of Myelomeningocele.
Study design: Cross sectional.
Material and Method: The study consist of fifty cases of myelomeningocele. Cases were collected from Jinnah Postgraduate Medical Center (J.P.M.C.). The study was carried out in Dow Diagnostic and Research Laboratory (D.D.R.L). Patients were examined for the presence of cyst on the vertebral column. Diagnosis was further confirmed by MRI scans. Mothers were inquired about the intake of folic acid before and during pregnancy. They were also asked about the prenatal scans conducted to rule out the anomaly.
Results: Among fifty mothers only two (4%) took folic acid during pregnancy. Six (12%) mothers had prenatal ultrasound and they were aware of having the anomalous baby.
Conclusion: Myelomeningocele is a birth defect for which various risk factors are identified. The outcome of the study highlights the significance of perception of mothers about the prevalence of the disease in adevelopingnation like Pakistanand its prevention with supplementation of folic acidand early diagnosisthrough antenatalscreening.
Keywords: Myelomeningocele, anomaly, prenatal, cyst, diagnosis, antenatal screening.

INTRODUCTION

Neural tube defects (NTD)is one of the most common birth anomaly. The occurrence of NTDs is 1 in every 800- 1000 live births[1]. The incidence varies depending on the race, gender of baby, climatic conditions and several maternal issues. In Pakistan, it was found that the estimated prevalence of the disease lies between 38.6 and 124.1 per 10,000 births[2]. In untreated patients, the death rate is 65%–70% in the initial six months of life. The anomaly affects the neural tube in the initial stages of neurulation. On the basis of failure of closure of cranial or caudal neuropore, NTDs are categorized into cranial defects (anencephaly, craniorachisis) or spinal lesions (spina bifida)[3]. Myelomeningocele (MMC) is the most common form of spina bifida[4]. In United States it affects approximately 1.9 per 10,000 births[5]. It exhibits as a lesion occurring in the posterior element of spinal vertebra and cord[6]. It will cause sensory and motor deficit; which ultimately lead to bladder and bowel dysfunction and orthopedic malformations[7]. Approximately 14% of patients could not be able to reach the age of five years[8]. The most recurrent cause of death in such patients include infection in the pulmonary, cerebrospinal fluid and urinary tract, Chiari malformation, complication and also malfunctioning of the ventricular shunt[9].

Multiple factors are involved in the causation of the disease among which folate deficiency is one of the major risk factor[10]. Folic acid is essential for the formation of blood cellular components, synthesis of DNA and development of neural tube[11]. In order to decrease the risk of spina bifida the pregnant mothers are currently suggested for folic acid intake[12].The daily requirement of folic acid is 200ug for individuals more than eleven years of age, but during the initial twelve weeks of pregnancy it would increase to 400ug of folic acid[13]. Studies have shown that risk of having NTDs would be reduced to 72% by taking folate supplements[14]. Other than supplementation, folic acid can only be gained by taking foods which naturally contain folic acids like eggs, legumes, brussel sprouts, asparagus and baked beans[15]. To meet the daily consumption of 400µg, ample amount of these foods would be required which is usually not easy for every woman to accomplish. Furthermore, sufficient folate levels are substantial during the early phases of pregnancy for the development of neural tube which closes within 28 days of gestation when most of the women are unaware of their pregnancy[16]. Fortification could enhance the folic acid levels during early stages of pregnancy especially in those who are at a higher risk of having an affected child.In view of this several countries use necessary food fortification to make sure ample folate intake to pregnant women[17]. Mostly young mothers, those who belong from lower socioeconomic background and also those with unplanned pregnancies are relatively at a higher risk.

MMC is usually revealed on ultrasound findings in the initial trimester of pregnancy[18]. It is essential to make a prenatal diagnosis of spinal dysraphism as it will be helpful to counsel the parents regarding the prenatal intervention, mode of delivery and postnatal care. In nowadays, the gold standard for the detection of spina bifida aperta is the ultrasonography. Three-dimensional ultrasound is required to reveal the location and size of the lesion. The signs of open spina bifida revealed on ultrasound are the “lemon sign” of frontal skull and “banana sign” of cerebellum[19]. These features are not present in the closed spina bifida as it does not have the same impression on cranial structure as that of the open spina bifida. It is an established fact that the site of the defect in case of spina bifida has great influence in its prognosis. Depending on the level of the defect, the individual could have motor and sensory deficit, incontinence issues, walking disabilities and cardiac and respiratory problems in late life[20]. Children having defect at lower level are more prone to walk in comparison with those having defect at higher level[21]. Furthermore, the site and the extent of lesion are mostly believed to be among the significant predictors of the potential to walk, as the cervical defects will lead to quadriplegia and the thoracic and lumbosacral defects usually results in paraplegia[22]. In this instance, parents who are at risk of having a bifid baby could be counseled prenatally, that if required, they would be referred to tertiary care hospitals with high expertise in surgical treatment.

The objective of this study is to assess the rate of awareness of mothers in regard to folate intake and detection

Received on 24-07-2021
Accepted on 14-12-2021

of bifid baby on ultrasound in Pakistan, a state having a less privileged health care system.

MATERIAL AND METHOD

The study comprises of fifty diagnosed cases of myelomeningocele. The patients were collected from Jinnah Postgraduate Medical Center (J.P.M.C.). The study was carried out in Dow Diagnostic and Research Laboratory (D.D.R.L.).It was a cross sectional study conducted from July 2017 to December 2017. Patients were examined for the presence of cyst on the vertebral column. MRI scans were also there for the confirmation of diagnosis. Patient's attendants were informed about the study and a consent form was signed by them. Only myelomeningocele patients were included in the study. Other cases of NTDs like anencephaly, encephalocele were not included. The age of the patients ranges from 0-10 years. Patients were selected regardless of race, sex and socioeconomic status, representing a diverse population belonging to different ethnical groups.Mothers were asked about the intake of folic acid during pregnancy. They were also investigated about the awareness of a bifid baby prenatally through ultrasound.

RESULTS

In the study it was seen that 2(4%) mothers took folic acid during pregnancy as shown in figure 1. It was also seen that 6(12%) mothers has prenatal ultrasound and were aware of having a bifid baby as shown in figure 2.

Figure 1: Maternal folate intake.

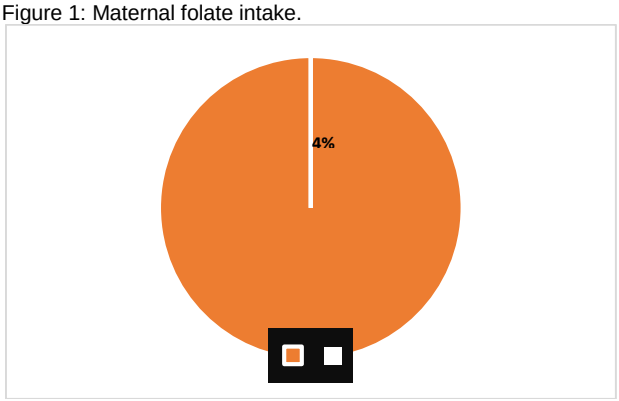
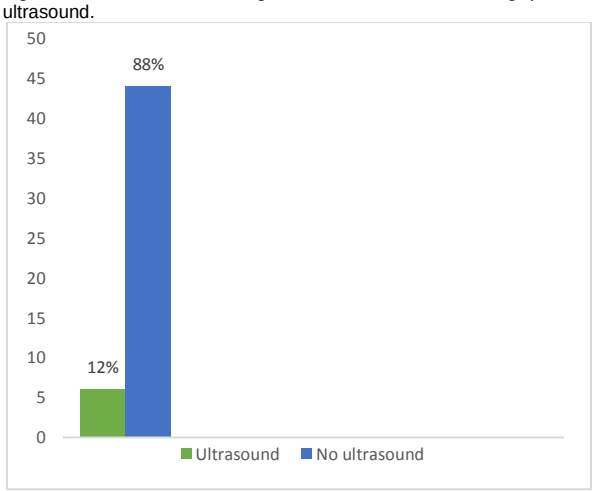


Figure 2: Bar chart revealing number of mothers having prenatal ultrasound.



DISCUSSION

Myelomeningocele is an established and crippling lesion of central nervous system (CNS) for which no absolute remedy is accessible. It has a huge impact on the social, psychological and financial aspect of the family as well as the community.
In the study it was found that out of fifty only two mothers (4%) took folic acid during pregnancy whereas forty-eight (96%) mothers did not take it. The mothers who took folic acid admitted that they had taken it during different phases of pregnancy. None of them took it preconceptionally as it was an unplanned pregnancy. Although it is advised to take folic acid before conception as neural tube closes within twenty-eight days of fertilization and at that time most of the women are unaware of the conceptus. Piro et al in 2020 accepted the fact that the incidence of MMC decreases with folate consumption[23]. In 1992 United States implemented essential fortification of folic acid after the suggestion by Public Health Service, that 400µg of folic acid should be consumed by all women of childbearing age. Further in 1998, fortification is mandatory in cereals and this measure resulted in decrease in the incidence of MMC[24]. Philippe et al in 2007 stated that in Canada, food fortification was made essential in white flour pasta and cornmeal and it had reduced the rate of MMC to a greater extent[25]. Eva et al in 2007 established the fact that the Chile government mandated folic acid in wheat flour in order to decrease the incidence of NTDs[26], as therapeutic abortion is considered unlawful in the state and the step has shown remarkable result in the decrease of the disease. Kancherla et al in 2017 stated that in Bangladesh the disease has a greater incidence as the women of child bearing age have inadequate intake of folate supplements and so the folate concentrations are quite low[27].

In the present study it was also seen that out of fifty only six (12%) mothers had prenatal ultrasound and they were aware of having a bifid baby. Bodin et al in 2018 stated that a prenatal screening program have been offered to all pregnant ladies after the establishment of new guidelines for prenatal diagnostics in 2004 in Denmark. With the introduction of this policy the incidence of spina bifida has been reduced as they may opt for therapeutic abortion[28]. Clemmensen et al in 2011acknowledged the fact that with the help of intracranial findings (lemon sign and banana sign) in the second trimester of pregnancy,the antenatal diagnosis of spina bifida could be established earlier[29]. Meller et al in 2017found out that in the first trimester of pregnancy, ultrasound detection is quite beneficial for diagnosing the major anomalies[18].

Traditionally, before twenty first century there were only two choices to the parents who were expecting bifid baby, either to abort or would have a postnatal closure of the defect. Since, a number of MMC defects are now revealed before birth which provides a feasibility to close these defects prenatally. The aim of the prenatal repair was the expectation to prevent further neurologic decline that happens with the passage of time in the fetal life. Heuer et al in 2017 stated that a fetal surgery was conducted in 23 weeks gestation in the state of Philadelphia. The child had a lesion beginning at T11. The outcome of the surgery was that the baby was born at 30 weeks gestation with an L4 functional level, herniation of hindbrain was reversed and hydrocephalus was absent[30]. It has been known through literature that ultrasound examination among high risk population during second trimester has shown about 95% of detection rate in case of MMC[31]. Fetuses with a prenatally diagnosed MMC should be delivered at a comprehensive perinatal medical center having an intensive unit for the neonate and also having facility for pediatric neurosurgery.

In Pakistan, public sector health care system is divided into primary, secondary and tertiary care hospitals on the basis of facilities available. Antenatal Iron Folic acid (IFA)

supplementation is provided free of cost through the primary health care services including the outreach of Lady Health worker program[32]. For prenatal screening every pregnant woman should attend secondary care unit having scanning facility, the diagnosed cases would then be referred to tertiary unit, to decide the mode of delivery followed by postnatal care and intervention. It has been seen through the present study that if the mothers are aware of the significance of folate intake and recognition of the lesion through screening at an earlier stage, the prevalence of the disease and its complications would have been reduced.

CONCLUSION

There is an intense necessity of community based health awareness strategies which should be introduced in all under developed countries with major implication tonutritional requirement like deficiency of folic acid. Antenatal diagnosis withhigh resolution fetal ultrasonography should be recommended and made available.

Conflict of interest: Nil

REFERENCES

1. Sun Y, Zhang J, Wang Y, Wang L, Song M, Khan A et al. miR-222-3p is involved in neural tube closure by directly targeting Ddit4 in RA induced NTDs mouse model. Cell Cycle. 2021 Nov 14:1-5.
2. Rehman L, Shiekh M, Afzal A, Rizvi R. Risk factors, presentation and outcome of meningomyelocele repair. Pak.J.Med.Sci. 2020 Mar;36(3):422.
3. Huang YS, Lussier EC, Olisova K, Chang YC, Ko H, Chang TY. Prenatal ultrasound diagnosis of neural tube defects in the era of intrauterine repair–Eleven years' experiences. Taiwan J Obstet Gynecol. 2021 Mar 1;60(2):281-9.
4. Rendeli C, Ausili E, Moroni R, Capriati M, Massimi L, Zanetti C. Neuropsychological profiles in children and young adults with spina bifida. Childs Nerv Syst. 2021 Jun;37(6):2033-8.
5. Bradko V, Hill J, Castillo H, Castillo J. Team Approach: Guideline-Based Management of Skin Injury in Individuals with Myelomeningocele. JBJS reviews. 2019 Mar 1;7(3):e1.
6. Kabagambe SK, Jensen GW, Chen YJ, Vanover MA, Farmer DL. Fetal surgery for myelomeningocele: a systematic review and meta-analysis of outcomes in fetoscopic versus open repair. Fetal. Diagn. Ther. 2018;43(3):161-74.
7. Tita AC, Frampton JR, Roehmer C, Izzo SE, Houtrow AJ, Dicianno BE. Correlation between neurologic impairment grade and ambulation status in the adult spina bifida population. Am J Phys Med Rehabil. 2019 Dec 1;98(12):1045-50.
8. Sayema SW, Khan RA. High Resolution Ultrasound in Children with Spinal Dysraphism: Role Revisited.
9. Salomão RM, Cervante TP, Salomão JF, Leon SV. The mortality rate after hospital discharge in patients with myelomeningocele decreased after implementation of mandatory flour fortification with folic acid. Arq Neuropsiquiatr. 2017;75:20-4.
10. Kancherla V. Folic acid to prevent spina bifida and anencephaly. In Factors Affecting Neurodevelopment 2021 Jan 1 (pp. 631-641). Academic Press.
11. Cieślik E, Cieślik I. Occurrence and significance of folic acid. Pteridines. 2018 Dec 31;29(1):187-95.
12. van Gool JD, Hirche H, Lax H, De Schaepdrijver L. Folic acid and primary prevention of neural tube defects: A review. Reprod. Toxicol. 2018 Sep 1;80:73-84.
13. Obarisiagbon OE, Ogboghodo EO. Folic acid usage and its associated factors among antenatal attendees in a tertiary health facility: Implications for child health. Ann. Afr. Med. 2020 Sep 4;3(1).
14. Yamamoto S, Wada Y. Awareness, use and information sources of folic acid supplementation to prevent neural tube defects in pregnant Japanese women. Public Health Nutr.. 2018 Mar;21(4):732-9.
15. Lamers Y, MacFarlane AJ, O'Connor DL, Fontaine-Bisson B. Periconceptional intake of folic acid among low-risk women in Canada: summary of a workshop aiming to align prenatal folic acid supplement composition with current expert guidelines. Am. J. Clin. Nutr. 2018 Dec 1;108(6):1357-68.
16. Mohammed BS, Kawawa AR, Wemakor A. Prevalence and determinants of uptake of folic acid in peri-conceptional period in a rural lower-middle-income country, Ghana. Basic Clin. Pharmacol. Toxicol. 2020 Mar;126(3):254-62.
17. Martinez H, Pachón H, Kancherla V, Oakley Jr GP. Food Fortification with Folic Acid for Prevention of Spina Bifida and Anencephaly: The Need for a Paradigm Shift in Evidence Evaluation for Policy-Making. Am.J.Epidemiol. 2021 Oct;190(10):1972-6.
18. Meller C, Aiello H, Otaño L. Sonographic detection of open spina bifida in the first trimester: review of the literature. Childs Nerv. Syst. 2017 Jul;33(7):1101-6.
19. Milani HJ, Barreto EQ, Chau LH, To NH, Moron AF, Meagher S, Da Silva Costa F, Araujo Júnior E. Prenatal diagnosis of closed spina bifida: multicenter case series and review of the literature. J. Matern. -Fetal Neonatal Med. 2020 Mar 3;33(5):736-42.
20. Bebbington MW, Danzer E, Johnson MP, Adzick NS. Open fetal surgery for myelomeningocele. Prenat. Diagn. 2011 Jul;31(7):689-94.
21. Ho P, Quigley MA, Tatwavedi D, Britto C, Kurinczuk JJ. Neonatal and infant mortality associated with spina bifida: A systematic review and meta-analysis. PloS one. 2021 May 12;16(5):e0250098.
22. Di Mascio D, Greco F, Rizzo G, Khalil A, Buca D, Sorrentino F et al. Diagnostic accuracy of prenatal ultrasound in identifying the level of the lesion in fetuses with open spina bifida: a systematic review and meta-analysis. Acta Obstet Gynecol Scand. 2021 Feb;100(2):210-9.
23. Piro E, Serra G, Schierz IA, Giuffrè M, Corsello G. Neonatal ten-year retrospective study on neural tube defects in a second level University Hospital. Ital.J.Pediar. 2020 Dec;46:1-6.
24. Liu HY, Liu SM, Zhang YZ. Maternal folic acid supplementation mediates offspring health via DNA methylation. Reprod.Sci. 2020 Apr;27(4):963-76.
25. De Wals P, Tairou F, Van Allen MI, Uh SH, Lowry RB, Sibbald B, Evans JA, Van den Hof MC, Zimmer P, Crowley M, Fernandez B. Reduction in neural-tube defects after folic acid fortification in Canada.NEJM. 2007 Jul 12;357(2):135-42.
26. Llanos A, Hertrampf E, Cortes F, Pardo A, Grosse SD, Uauy R. Cost-effectiveness of a folic acid fortification program in Chile. Health Policy. 2007 Oct 1;83(2-3):295-303.
27. Kancherla V, Ibne Hasan MO, Hamid R, Paul L, Selhub J, Oakley G, Quamruzzaman Q, Mazumdar M. Prenatal folic acid use associated with decreased risk of myelomeningocele: A case-control study offers further support for folic acid fortification in Bangladesh. Plos one. 2017 Nov 30;12(11):e0188726.
28. Bodin CR, Rasmussen MM, Tabor A, Westbom L, Tiblad E, Ekelund CK, Wulff CB, Vogel I, Petersen OB. Ultrasound in prenatal diagnostics and its impact on the epidemiology of spina bifida in a national cohort from Denmark with a comparison to Sweden. BioMed research international. 2018 Feb 1;2018.
29. Clemmensen D, Thygesen M, Rasmussen MM, Fenger-Grøn M, Petersen OB, Mosdal C. Decreased incidence of myelomeningocele at birth: effect of folic acid recommendations or prenatal diagnostics? Child Nerv.Sys. 2011 Nov 1;27(11):1951-5.
30. Heuer GG, Moldenhauer JS, Adzick NS. Prenatal surgery for myelomeningocele: review of the literature and future directions. Child. Nerv.Sys. 2017 Jul;33(7):1149-55.
31. Yachida N, Itsukaichi M, Haino K, Usuda T, Yoshimura J, Enomoto T, Yamaguchi M, Takakuwa K. Influence of route of delivery on perinatal outcomes in fetuses with myelomeningocele. Clin Exp Obstet Gynecol. 2019 Apr 10;46(2):277-9.
32. Kessani L, Kumar R, Rathore A, Khalid R. Associated factors and compliance with iron-folic acid therapy among pregnant women of Karachi, Pakistan. RMJ. 2018 Apr 1;43(2):319-23.