

Review Of Etiology Of Neural Tube Defects: A Hospital Based Study

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Abstract

Objectives – This study was carried out to correlate etiological factors of spina bifida. **Material and Methods** – This study was carried out in the division of Paediatric Surgery, Department of Surgery, MY Hospital, Indore for a period of one year (October 2007- 2008). Total 52 cases of spina bifida admitted in the hospital were evaluated about maternal antenatal history, folic acid intake, birth order, family history & socio-economic status. **Results** – Out of the total 52 cases, 20 belong to 2nd birth order, 16 belong to 1st birth order, 10 belong to 3rd birth order, 5 belong to 4th birth order & 1 belong to 5th birth order. Maternal folic acid intake was not found in all cases during preconception & 1st month of gestation. Two mothers gave history of viral fever during 2nd month of gestation. Family history was not found in any case. All except 2 cases belong to low socio-economic status. **Conclusion** – Exact etiology of spina bifida remains unknown but inadequate intake of folic acid & low socio-economic status in country like India predisposes to the risk of spina bifida.

INTRODUCTION

Spina bifida (neural tube defects) results from failure of fusion of the caudal neural tube, and is one of the most common malformations of human structure. The possible causes of this disorder are heterogeneous and include chromosome abnormalities, single gene disorders, and teratogenic exposures. However, the exact cause is not known in most cases and etiology remains rather complex and poorly understood [1].

It is generally agreed that most cases are of multifactor origin, having a significant genetic component to their etiology that interacts with a number of environmental risk factors [23].

Environmental factors are also important as revealed in several epidemiological studies, the risk being higher among families of lower socio-economic status [4]. Other factors identified in previous studies include maternal use of anti epileptic drugs, maternal diabetes [5],

Hyperthermia [67] and obesity [8]. Maternal age, alcohol consumption, maternal exposure to excess vitamin A and Lead, febrile illness, heat exposure and tea usage in the first trimester may be causally associated with the pathogenesis of neural tube defects. Previous pregnancy wastage, parity and fetal birth weight have also been implicated as factors.

Certain parental occupations are also associated with an increased occurrence [9].

In this study, we studied children of all ages showing symptoms of spina bifida to know about environmental factors leading to the risk of spina bifida.

MATERIALS AND METHODS

This was a prospective study, conducted at MGM Medical College and MY Hospital, Indore, MP between October 2007 & 2008. All patients of spina bifida admitted in division of Paediatric Surgery, Department of Surgery irrespective of age at presentation, were included in study. The following five factors were taken into account: a) maternal folic acid intake b) maternal antenatal history of illness, c) birth order, d) family history & low socio-economic status. Parents were asked about all the factors & data was recorded. . The questions that were specifically asked to mothers for folic acid intake were: -

- 1) Did you take antenatal care and whether you have taken any multivitamin tablets (for blood production)
- 2) Do any health care worker ever provide you tablets for blood production in body?
- 3) Do you regularly take green leafy vegetables in diet?

4) Have you ever gone to Primary health centre for any investigation?

Total 52 cases of spina bifida were admitted in which 30 were males and 22 were females.

RESULTS

To understand the role of different positive risk factors, we conducted a study in 52 patients admitted in MY hospital, Indore.

Figure 1

Table 1: Incidence of risk factors

Risk factors	Number of patients with positive risk factor	% Of patients with positive risk factor
Inadequate intake of folic acid	52	100
H/o fever during 1 st trimester	2	4
Family history	None	0
Low socio-economic status	50	96

Total number of patients: 52

1. Spina bifida patients showed no significant association with birth order.

The evaluation of birth order was also conducted. The study showed that of the total of 52 patients, 38% fell in 2nd birth order, 31% in 1st birth order, 19% in 3rd birth order, 10% in 4th birth order and 2% were of 5th birth order (Table 2).

Figure 2

Table 2: Birth order of patients

Birth Order	Number of patients	% Of patients with birth order
1 st	16	31
2 nd	20	38
3 rd	10	19
4 th	5	10
5 th	1	2

Total number of patients: 52

2. Mothers of spina bifida patients revealed no intake of folic acid during preconception and first month of pregnancy.

To understand the role of folic acid intake during preconception and first month of pregnancy, we conducted the study on the mothers of these 52 patients. It was found that 100% of the mothers were positive, for there was no intake of folic acid in preconception and first month of pregnancy (Table 1).

3. Mothers of spina bifida patients didn't show any viral fever symptoms during gestation.

To further analyze any viral fever symptoms in mothers during gestation, the mothers were discussed about this symptom. It was found that only 2 out of 52 mother (4%) got viral fever symptoms during gestation.

4. Spina bifida patients have no family history.

To further check for any signs of family history in spina bifida patients, the family history of these patients was evaluated. Our study suggests that all of the 52 patients studied at MY hospital showed no family history of spina bifida (Table1).

5. Low socioeconomic status increases the risk.

It was found that 96% belonged to lower socio-economic status (Table 1).

DISCUSSION

Many reports on the associations between birth order and CNS defective children indicate a U-shaped curve with high risk for anencephaly or spina bifida in the first pregnancy, lower risk in the second pregnancy, and thereafter again an increasing risk [1011121314]. Other investigators report a higher defect frequency only in first born [151617]. Coffey and Jessop in their study [18] found no associations between birth order and anencephaly. Chung and Myrianthopoulos [19] found none for anencephaly or for spina bifida. In our study, 38% of case belongs to 2nd birth order. As such no significant association was found with birth order.

It is generally accepted that inadequate intake of natural folate, or its synthetic form, folic acid, before and during early pregnancy, is associated with an increased risk of spina bifida and anencephaly. Case-control studies, randomized clinical trials, and community-based interventions with vitamin supplements have shown that the failure to consume folic acid supplements or folic acid-containing multivitamins increases the risk of having an affected child by two-fold to eight-fold. [20] Our study also found that none of the mother received folic acid

Majority of women did not take antenatal care in initial period of gestation that was crucial. They gave the history that they have not taken any medicine regularly before and after they conceive; also as they belong to poor socio-economic status they were not taking regular green leafy vegetables in diet.

Only 16 patients were of 1st birth order, this also suggests that folic acid stores were depleted due to successive

pregnancy and this came out to be strongest risk factor in spina bifida

According to studies, a “flu” or “cold” syndrome or a febrile illness in the first trimester has been associated with a two-to threefold increase in risk for neural tube defects [21,22,23]. Heat exposure in general has been associated with an increased risk for neural tube defects [24]. Hot-tub use in the first trimester was associated with a threefold increase in risk, and any combination of hot tub use, febrile illness, or sauna use was associated with a six-fold increase in risk. Here we found that only 4% (2 mothers out of 52) of the mother got viral fever during 1st trimester. This study shows that viral fever symptom during gestation is not significant risk factor for spina bifida.

A family history of spina bifida or anencephaly is one of the strongest risk factors for these disorders. The risk for spina bifida or anencephaly, or both, in the siblings of affected individuals ranges from 3% to 8% and is consistently higher than that of the general population [25,26]. Our study reports that family history is not a significant risk factor as all of the patients didn't have family history of spina bifida (Table 1). It should be noted that even in patients with high birth order, their siblings were found to be normal.

Higher rates of NTDs have been reported in populations with lower socioeconomic status [9]. This could be due to deficiency of nutrients in mother & lack of awareness about antenatal care. All patients except two belong to low socioeconomic status. The 36 patients belong to rural areas where awareness about antenatal care is limited. Hence this factor seems to be important risk factor.

CONCLUSION

Nothing could be said exactly about etiology of spina bifida, no significant association was found between birth order & spina bifida

but inadequate intake of folic acid & lower socioeconomic status in country like India greatly increases the risk for spina bifida.

PREVENTION

All women of childbearing age should consume 400 micrograms of folic acid daily. Women desirous of pregnancy should take folic acid at least 1 month before conception and continue for first 3 months of pregnancy to reduce the risk of neural tube defect.

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