Neural Tube Defects at Prince Rashid Bin Al-Hassan Hospital

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ABSTRACT

Objectives: To determine the frequency of neural tube defects among patients who were delivered at Prince Rashid Bin Al-Hassan Military Hospital and to discuss possible ways to reduce them.

Methods: This descriptive review study of 11,852 medical records was conducted over a period of two years between the 1st of August 2005 and end of July 2007 at Prince Rashid Bin-Al-Hassan Military Hospital in Irbid-Jordan.

Results: During the study period, there were 17 cases of neural tube defects (1.4/1000 births), of these there were five cases of spina bifida (0.42/1000 births), three cases of encephalocele (0.25/1000 births), and nine cases of anencephaly (0.76/1000 births). The overall female to male ratio was 1 **:** 0.89. The most common neural tube defect was anencephaly (52.9%), and the commonest site of spina bifida was the lumbosacral region in 2/5 (40%). One case of encephalocele was associated with malformations while four cases (80%) of spina bifida were associated with other malformations.

Conclusion: The frequency of neural tube defects is high and probably on the decreasing in Jordan. We may be able to reduce such defects by recommending women of childbearing age to take daily Folic acid (400mcg) for at least three months before they become pregnant and throughout the first trimester.

Key words: Anencephaly, Neural tube defects, Spina bifida

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Introduction

Neural tube defects (NTDs) are congenital structural abnormalities of the brain and vertebral column that occur either as an isolated malformation, along with other malformations, or as part of genetic syndrome and are the second most common major congenital anomaly worldwide.[1] The exact cause of these defects is not known, however, they are currently considered to be "complex" disorders where both genetic and environmental factors play important roles in their causation. Nutritional factors such as diet and vitamins appear to be important contributors to the etiology of NTDs.[2]

Neural tube defects are among the few birth defects for which primary prevention is possible, prenatal screening and diagnosis are widely available, and prenatal therapy is being investigated.[3]

The incidence of NTDs has long been recognized to vary widely according to geographical distribution; ethnic background, maternal and various socio-economic factors.[4,5] Regions with the

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Table I. Frequency of NTDs by type of defect

Type of NTD	No.	%	Incidence/1000 deliveries	Male-Female ratio
Spina bifida	5	29.4	0.42	
-Meningocele	1	5.9	0.08	1.5:1
-Myelomeningocele	4	23.5	0.34	
Encephalocele	3	17.7	0.25	0.5:1
Anencephaly	9	52.9	0.76	0.8:1
All NTDs	17	100	1.4	0.89:1

NTDs: neural tube defects

Table II. Spina bifida –site of lesion (n=5)

Level	No.	%
Cervical	0	0
Dorsolumbar	1	20
Lumber	1	20
Lumbosacral	2	40
Sacral	1	20
Total	5	100

Table III. Spina bifida associated anomalies

Anomaly	No. of cases
Club foot	1
Hydrocephalus	1
Anencephaly	2

highest incidence include the Ukraine, China, and India.[6-8] There are few reports about the frequency of NTDs in Jordan and the Middle East.[9] Jordan lacks an ongoing surveillance system for congenital anomalies. However, the incidence of NTDs in Jordan is reported to be as high as 6.5 per 1000 live births based on a study carried out at King Hussein Medical Centre.[10]

The Frequency of NTDs is showing steady and significant decrease throughout the world including many parts of the Middle East.[11,12] This is largely attributed to the improvement of the socioeconomic conditions.[13] In societies where abortion is permitted, the frequency of live born NTDs has been greatly reduced by antenatal screening and termination of pregnancy.[14] Also a meta-analysis found that periconceptional folic acid supplementation reduced the incidence of neural tube defects by about 72%.[15]

In this study, we assess the frequency of NTDs among patients attending Prince Rashid Bin Al-Hassan Military Hospital in the North of Jordan.

Methods

Prince Rashid Bin-Al-Hassan Military hospital is the main referral hospital in the North of Jordan. It serves a population of about 800,000 and the maternity care unit receive about 400-500 deliveries monthly. The majority of our patients are of low and middle socioeconomic class; most of them never received folic acid supplements. The practice of cooking vegetables at high temperatures is common and I s believed to make the meals deficient in folic acid by destruction of folate.

We reviewed the obstetric data of all cases of NTDs delivered at this hospital between the 1st of August 2005 and the end of July 2007. During this period a total of 11,852 births took place at this hospital. The majority of our patients were un-booked cases and attended the hospital for the first time for delivery. The records of all mothers who delivered cases of spina bifida, anencephaly, and encephalocele at this hospital were reviewed and analyzed.

Results

During the study period (2005-2007), there were 11,852 hospital deliveries and 17 cases of NTDs. The overall frequency of NTDs was 1.4/1000 births. Of these, there were five cases of spina bifida (0.42/1000 births), three cases of encephalocele (0.25/1000 births), and nine cases of anencephaly (0.76/1000 births) as shown in Table I.

The most common NTD was anencephaly (52.94%) followed by spina bifida (29.41%) and encephalocele (17.65%). The overall female to male ratio was 1 : 0.89. The female to male ratio for spina bifida was 1 : 1.5, for encephalocele was 1 : 0.5 and for anencephaly was 1 : 0.8 (Table I).

The sites of spina bifida were lumbosacral in 2/5 (40%), dorsolumbar in 1/5 (20%), lumbar in 1/5 (20%) and sacral in 1/5 (20%) (Table II).

All cases of encephalocele were in the occipital region. In one case there were other malformations such as cleft lip and palate, polydactyly and polycystic kidney disease.

Table IV. Incidence of NTDs in some countries in the Middle East and other selected countries in the world

Location	Period(years)	Incidence No/1000
Shanxi Province-China[7]	2003	13.8
Ukraine[8]	2000-2002	2.1
United States[11]	1992-1998	0.95
Saudi Arabia[12]	2001-2005	0.76
Izmir-Turkey[16]	2000	1.5
Northern Iran[17]	1993-2002	2.8
British Columbia-Canada[18]	1997-1999	1.16
Jordan[10]	2002-2003	6.5

Table III shows the other congenital malformations which were present in four cases of spina bifida (80%); the most common malformations were anencephaly (two cases), club foot (one case) and hydrocephalus (one case).

Discussion

NTDs are serious birth defects of the brain and the spine. Anencephaly is defined as the absence of the membranous skull and the cerebral hemispheres. Encephalocele is defined as herniation of the brain through a defect in the skull. Spina bifida includes meningocele and meningomyelocele. Meningocele is defined as herniation of the meninges and the defect is covered by normal skin, whereas meningomyelocele occurs when both the meninges and the spinal cord herniate through the vertebral defects.

Nowadays, NTDs can be diagnosed by performing detailed anomaly scan between 18-20 weeks gestation or even before this date, so termination of pregnancy could be offered. However, the law in Jordan does not allow termination of pregnancy for congenital abnormalities. The recognition of the incidence of neural tube defects and its trend over the years may be very important for the health care programs. Our data may not represent the overall incidence of the NTDs, because the cases reported in this study included only those delivered at our hospital. Generally, babies born at home are not referred to the hospital after delivery. We believe that the overall incidence may be higher.

Table IV shows the incidence of NTDs in some countries in the Middle East and other countries in the world. These variations between different studies could be explained by the effect of different racial, ethnic and social factors in various parts of the world or different geographical, nutritional and socioeconomic factors. As shown in Table IV northern China Shanxi Province has reported the highest incidence of NTDs in the world.

In our study, we found that the overall frequency of NTD was 1.4/1000 births, very similar to the frequency of NTD in Izmir –Turkey,[16] and much lower than that reported previously in Jordan,[10] but is higher than other parts of the Middle East such as Saudi Arabia.[12] The frequency of NTDs in British Colombia-Canada was found to be 1.16/1000.[18] We noted female predominance in the rates of anencephaly and encephalocele which seems to be a universal feature.[11,17] Also we have noted that 62.5% of spina bifida and encephalocele cases were associated with other major congenital malformation. This rate is higher than the international rates and higher than that reported in other studies.[19,20] The most common site of spina bifida was in the lumbosacral region. The occipital encephalocele was the predominant site in these cases, this was also true of the Western studies.[19]

All the interventional studies have shown a significant protective effect of vitamins and folic acid supplements. The Medical Research Council multicentre, double-blind trial involving 33 centers in seven countries found that folic acid gave a 72% protection from NTDs when given to women who had previously had an affected baby.[15] Since then, observational studies demonstrated a reduced risk among women who took multivitamins supplements containing folic acid during early pregnancy.[21,22]

Since 1998, the US Food and Drug Administration has required folic acid fortification of cereal grains, also it became mandatory in Canada, and a marked decrease in prevalence rate of NTDs was observed after food fortification.[23] This was supported by a study from Canada which confirmed that the prevalence of NTDs had decreased by 46% since food fortification.[24] Another study from Nova Scotia showed a reduction of NTDs by more than 50%.[25]

In Jordan it is important to increase the awareness of women in the childbearing age, to the need to take vitamins that contain at least 0.4 mg of folic

acid daily before they become pregnant. Women with previously affected fetus/infant may need a higher dose of folic acid (5mg). This may be the only realistic option available to reduce the incidence of NTD in our country for the time being.

Conclusion

The frequency of NTDs is high and probably on the decreasing in Jordan. We may be able to reduce such defects by recommending women of childbearing age to take daily Folic acid (400mcg) for at least three months before they become pregnant and throughout the first trimester.

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