

# INCIDENCE AND RISK FACTORS FOR NEURAL TUBE DEFECTS IN PESHAWAR

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## ABSTRACT

**Background:** Neural tube defects are common and major birth defects. Their incidence varies according to the geographic conditions, race, sex of the baby and certain maternal conditions. This study was conducted to determine the incidence of neural tube defects and its risk factors in Peshawar.

**Material and Methods:** It was retrospective study of deliveries at Gynae A unit of Lady Reading Hospital Peshawar, from January 2004 to December 2004. Pregnant women with babies having neural tube defects were taken as subjects and those having normal babies as controls. They were interviewed and information recorded in a proforma.

**Results:** During the study period 3310 deliveries occurred, among which 46 were having neural tube defects. Twenty-one had hydrocephalus, 8 spina bifida with meningocele, 6 fetuses were anencephalic where as 11 had multiple neural tube defects. During pregnancy the majority of neural tube defects were diagnosed by ultrasonography 17 (15.21%). Twelve (26.08%) of these ladies had spontaneous vaginal delivery, 16 (34.7%) vaginal delivery after encephalocentesis and 5 (10.8%) had caesarean section. Uterine rupture occurred in 6.5% cases after prolonged obstructed labour. Of 46 women with affected babies, all had not taken folic acid in their first trimester.

**Conclusion:** Neural tube defects are not uncommon congenital anomalies in our set up. These can be prevented by intake of folic acid supplements preconceptionally.

**Key words:** Neural tube defect, Hydrocephalus, Spina bifida, Meningocele, Anencephaly.

## INTRODUCTION

Neural tube defects (NTDs) are common and major birth defects second in frequency only to congenital heart disease.<sup>1</sup> The incidence of different NTDs varies according to the geographic conditions, race, sex of the baby and certain maternal conditions.<sup>2</sup>

The common embryologic origin may explain the concurrence of anencephaly with sacral spina bifida or complete non-closure of neural tube.<sup>3</sup> Overall birth prevalence of NTDs in the absence of antenatal diagnosis and selective abortion in UK is about 3-4 per 1000 births.<sup>4</sup> It is more common in white than black and orientals and twice as common in female infants.

Non-genetic such as nutritional factors have a marked influence on its prevalence.<sup>5</sup> Obese women are at high risk of having a NTD baby especially spina bifida.<sup>6</sup> Indian and Pakistani women residing in UK have significantly lower concentration of red cell folate.<sup>7</sup> Serum B<sub>12</sub> is also lower in pregnancies with neural tube defects.<sup>8</sup>

Due to lack of balanced diet in our setup the incidence of NTDs is quite high although no reliable statistics are available. Another misfortune is lack of any screening program for antenatal detection of NTDs, hence majority of our patients are diagnosed either in labour or near term, since many such patients present with hydramnios. There is a high chance of recurrence of NTDs in successive pregnancies and proper preconception counseling is needed which is lacking in our setup. Routine screening by alpha fetoprotein (AFP) and/or ultrasound is not available in the second trimester, which is the most accurate.<sup>9,10</sup> The diagnosis of NTDs rely on detailed ultrasound examination of the fetus along with biochemical examination of amniotic fluid.<sup>11</sup> Screening is needed because of the medical risk, although financial costs of diagnostic procedures preclude them being offered routinely to all women, so selection is needed. The purpose of antenatal screening is to identify women who are at sufficiently high risk of having the abnormality.

The present study was conducted to find out the incidence, predisposing factors and

its most cost effective investigation in our region.

**MATERIAL AND METHODS**

This study was carried out for one year, from January 2004 to December 2004, in Gynae "A" Unit of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar, Pakistan. It was a Cohort study of pregnancies affected by neural tube defects, from January 2004 to December 2004. Women carrying a neural tube defect fetus were taken as subjects and those with normal babies as controls. Cohort members i.e. NTD fetus carrying women were interviewed and information was recorded in questionnaire form. They were specifically asked about the intake of folic acid and any other drugs. Past history of neural tube defect pregnancy was taken into account.

The type of neural tube defect in the current pregnancy was noted. The method, which diagnosed the neural tube defect was also noted and the complications which occurred in the present pregnancy.

**RESULTS**

Forty-six patients with neural tube defects were seen among 3310 deliveries during the study period. Twenty-one (45.60%) fetuses had hydrocephalus, 8 (17.39%) spina bifida with meningo-

coele, 6 (13.04%) anencephaly while 11 (23.91%) had multiple neural tube defects. NTD at different age groups are given in Table-1. Maternal age more than 40 years was seen in 11 (23.9%) patients. (Table-1)

During pregnancy majority of neural tube defects were diagnosed by ultrasonography 7 (15.21%), 6 (13.04%) were diagnosed by plain x-ray abdomen and 3 (6.52%) by AFP estimation. (Table-2)

Among 46 pregnant ladies with NTD fetuses, 8 were primigravida, 20 multigravida and 18 grand multigravida. Forty-four (95.65%) patients belonged to poor socio-economic class where as only 2 (4.35%) were of middle class. Two (4.35%) women had previous history of a fetus with NTD and 4 (8.6%) had consanguineous marriage. Intake of teratogenic drug, sodium valporate was noted in 1 (2.1%) of the cases.

Twelve (26%) patients had spontaneous vaginal delivery, 16 (34.7%) vaginal delivery after encephalocentesis, 10 (21.7%) breech delivery and obstructed hydrocephalic head which was drained vaginally or abdominally, 5 (10.8%) had caesarean section due to foetal distress. They were mostly having meningocoeles. Three (6.5%) patients had subtotal abdominal hysterectomy due to ruptured uterus. (Table-3)

**Table-1: Effect of age on the incidence of neural tube defects.**

Type of NTD	13-20 years	21-40 years	> 40 years	Total
Hydrocephalus	8 (17.30%)	8 (17.30%)	5 (10.80%)	21 (45.60%)
Spina bifida with Meningocoele	3 (6.52%)	2 (4.34%)	3 (6.52%)	8 (17.39%)
Anencephaly	1 (2.17%)	4 (8.69%)	1 (2.17%)	6 (13.04%)
Multiple NTDs	1 (2.17%)	8 (17.3%)	11 (23.91%)	11 (23.91%)

**Table-2: Method of diagnosis of neural tube defects.**

During Pregnancy			In Labour	At Birth
Ultrasonography	X-Ray	AFP		
7 (15.21%)	6 (13.04%)	3 (6.52%)	11 (23.90%)	19 (41.30%)

**Table-3: Mode of delivery in ladies having children with neural tube defects.**

Spontaneous Delivery	Normal Delivery with encephalocentesis	Breech Delivery and encephalocentesis	Caesarean Section	Hysterectomy
12 (26.08%)	16 (34.70%)	10 (21.73%)	5(10.86%)	3(6.52%)

**Table-4: Effect of intake of Folic Acid on neural tube defects.**

Folic acid intake	Neural tube defect	Normal pregnancy	Total
Yes	1	500	501
No	45	2810	2855

**Table-5: Presence of other risk factors.**

None	Consanguinity	Previous history of NTD pregnancy	Intake of drug	Maternal age >40
28(60.86%)	4 (8.69%)	2 (4.34%)	1 (2.17%)	11 (23.90%)

Complication rate was quite high in neural tube defect pregnancy; 8.6% had pregnancy induced hypertension, 4.3% placental abruption and 52% polyhydramnios.

Among 46 affected fetuses 17 were males, 28 females and one with ambiguous genitalia.

Of the 46 pregnant women with NTD only one had taken folic acid and that too was after her antenatal booking at 20 weeks. (Table-4). Other risk factors are given in Table-5.

Women who do not take folic acid are 8-9 times more prone to NTDs than those who take folic acid.

**DISCUSSION**

Incidence of NTDs in our study was 13.90 per 1000 deliveries where as in UK, USA, Denmark and Oman it is around 1-5 per 1000 deliveries.<sup>12,13,14</sup> This higher incidence in our study could be due to referral of complicated patients to our tertiary care hospital from all peripheral units, dietary deficiency of folate, multi-parity and consanguineous marriages. All these factors play some role in the high incidence.

Hydrocephalous accounts for 45.5% of all neural tube defects, 17.30% were spina bifida with meningocoele, 13% fetuses were anencephalic while 23% fetuses had multiple neural tube defects. As far as age is concerned women with age more than 40 years had higher chances of having neural tube defect babies. (Table-1)

Women who belonged to poor socio-economic class were more prone to have NTD babies; 95.6% of patients in our study were poor. This predisposition may be due to lack of proper diet, which may be deficient in folic acid. A survey was conducted in North Thames where Indian and Pakistani women of child bearing age (16-50) had significantly lower

concentration of red cell folate as compared to the general population.<sup>7</sup> In our study the relative risk was 8.29 for NTDs in women who had not taken folic acid. Incidence of neural tube defects was 15.7 per 1000 births in women who had not taken folic acid in the current pregnancy. Odd ratio was 0.12 and 95% confidence interval was (60.27, 1.15).

The sensitivity of ultrasound screening overall is higher than maternal serum AFP screening being 86% versus 72% for all defects and 75% versus 64% for spina bifida.<sup>15</sup> Primary ultrasound screening has 100% sensitivity for anencephaly while the sensitivity of serum screening was lower at 92%.<sup>15</sup>

AFP assay is not easily available everywhere in Pakistan especially Peshawar and is time consuming as well as expensive. Ultrasound is available every where, is cost effective and gives accurate diagnosis immediately. A study has demonstrated lack of value in performing AFP measurement to evaluate pregnancies in third trimester.<sup>16</sup>

Complication rate was quite high in patients who presented with neural tube defects in emergency. 6.5% patients had ruptured uterus due to obstructed labour because of hydrocephalic baby and underwent hysterectomy. Placental abruption was seen in 4.3% cases, which is a concomitant complication of hydramnios as 52% patients had polyhydramnios.

Intake of antiepileptic drugs such as carbamazepine or sodium valporate increases the risk of spina bifida by 1-1.5%,<sup>17,18</sup> in our study 2.1% of patients had history of intake of anti-epileptic drugs.

In our study 17 babies were male where as 28 females showing a female preponderance of 1:1.6 over males. Similar findings were seen by other studies as well.<sup>19, 20</sup>

## CONCLUSION

Neural tube defects are not uncommon in our setup. These can be prevented by folic acid supplements periconceptionally. Chances of neural tube defects also increase with advancing maternal age.

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