

## STUDY OF FOETAL ULTRASOUND OF NEUROECTODERMAL ANOMALIES IN ANTENATAL MOTHERS.

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### Abstract

**Objectives:** This study was to evaluate the incidence, prevalence and various types of neuroectodermal anomalies of fetuses in antenatal mothers.

**Methods:** All pregnant women with intrauterine pregnancy of gestational age ranging from 12 weeks to Post-term cases were included for this study. We were studied on 21450 ultrasound scan of antenatal mothers, who were come for routine check up. Among them 50 fetuses anomalies were found.

**Results:** Data was analyzed by using simple statistical methods with the help of MS-office software. All data was tabulated, and percentage was calculated.

**Conclusions:** Neuroectodermal anomalies of fetuses were commonly seen in maternal age group of 30-40 years and prevalence was 0.23%. Anencephaly and hydrocephalus associated with spina bifida were seen in most of the CNS anomalies fetuses. Spina bifida in the lower lumbar region associated with a meningocele or myelomeningocele was the most common. Hence, ultrasound is an effective investigative modality for in utero screening of congenital anomalies. Ultrasound imaging in antenatal period practically gives an anatomical record of the developing foetus. So that early detection of anomalies especially in first and early second trimester helps in planning termination, interventions and further management of neuroectodermal anomalies foetus.

**Keywords:** Antenatal mothers, Ultrasound scan, Neuroectodermal anomalies

### Introduction

Diagnostic ultrasound is a sophisticated electronic technology, which utilizes pulses of high-frequency sound to produce an image. Diagnostic ultrasound examination may be employed in a variety of specific circumstances during pregnancy such as after clinical complications, or where there are concerns about fetal growth [1].

Congenital Neuroectodermal Anomalies are one of the most common anomalies occurring in the foetus. These anomalies are most often derived from the neural tube, rather than neural crest [2].

Foetal brain can be and has been prenatally imaged for a long time and prenatal diagnosis of brain anomalies is common [3]. The foetal central nervous system (CNS) develops during first trimester and the anatomy evolves over next two trimesters. Neural tube defects (NTDs) and other CNS malformations form the most common group of malformations detected prenatally and account for substantial

proportion of all congenital abnormalities [3,4]. Primary prevention for spina bifida and other types of NTDs is possible by periconceptional folic acid intake [5]. Secondary prevention is possible by prenatal diagnosis [5].

CNS develops from 3 to 20 weeks of intrauterine life. Almost all CNS anomalies are result of the insult in embryogenesis at some point of development. Ultrasound can diagnose many CNS anomalies in first and early second trimester. Some develop or become apparent in late pregnancy [6]. Earlier is the detection more is the time available for the clinician and parents to plan about the outcome of pregnancy. Lethal and severely life limiting disorders warrant early termination of pregnancy, whereas detection of minor anomalies helps everybody to be prepared for postnatal management [7]. Objectives of this present study were to evaluate the incidence, prevalence and different types of congenital neuroectodermal anomalies of fetuses in antenatal mothers.

## Materials & Methods

This present study was conducted in Department of Gynaecology with collaboration of Department of Radio-diagnosis ANMCH, Gaya, Bihar, and Department of Radio-diagnosis AIIMS, Patna, Bihar, India during a period from January 2016 to February 2019.

Entire subjects signed an informed consent approved by institutional ethical committee of Anugrah Narayan Medical College and Hospital, Gaya, Bihar was sought. Data was collected with irrespective of age from Department of Radio-diagnosis ANMCH, Gaya and Department of Radio-diagnosis AIIMS, Patna, Bihar. All the antenatal mothers were come in department of Radio-diagnosis for routine ultrasound check up. All pregnant women with intrauterine pregnancy of gestational age ranging from 12 weeks to Post-term cases were included for this study.

Exclusion Criteria of this study were pregnant women with gestational age less than 12 weeks and extrauterine pregnancies. A total 21450 ultrasound scan of antenatal mother were studied. Among them 50 fetuses anomalies were found.

## Statistical Analysis

Data was analyzed by using simple statistical methods with the help of MS-office software. All data was tabulated, and percentage was calculated.

## Observations

In this present study, we were studied ultrasound scan of 21450 antenatal mothers. Out of 21450 antenatal ultrasound scan, we were found 50 cases that had CNS anomalies of fetuses. Hence, prevalence of CNS anomalies in this study was 0.23%.

Most of the cases of CNS anomalies 45(90%) were seen in maternal age group of 30-40 years. 2(4%) antenatal mothers were in age group of less than 20 years. And 3(6%) cases were in age group of 20-30 years.

**Table.1.** Age wise distribution of antenatal mothers.

Age group	No. Of cases	Percentage
<20 years	2	4%
20-30 years	3	6%
30-40 years	45	90%
Total	50	100%

**Table 2:** Showing the distribution of diagnosed anomalies of fetuses.

Anomalies		No. of cases (N=50)
Hydrocephalus N=22	Hydrocephalus+ spinabifida+ meningocoele/ myelomeningocoele	16(32%)
	Solitary hydrocephalus	6(12%)
Spina bifida + meningocoele/ myelomeningocoele		4(8%)
Anencephaly		15(30%)
Spina bifida without (any complication) any meningocoele/myelomeningocoele		2(4%)
ACC (agenesis of corpus callosum)		2(4%)
Microcephaly		2(4%)
Encephalocoele		1(2%)
Iniencephaly		1(2%)
Hydranencephaly		1(2%)
<b>Total</b>		<b>50(100%)</b>

Among 22 cases of hydrocephalus, there were 6(27.27%) of solitary hydrocephalus which had no other associated abnormality involving either the CNS or any other system. The liquor was also normal in these 6 cases, with no case showing polyhydramnios or oligohydramnios.

Out of the 22 cases of hydrocephalus, the remaining 16(72.72%) cases showed various associated features like spinabifida and meningocoele/ myelomeningocoele. Of these 16 cases, 13 cases showed spina bifida in the lower lumbar region associated with a meningocoele or myelomeningocoele, and 3 cases showed a thoracic meningocoele. The case with the thoracic meningocoele showed associated polyhydramnios, abnormally thin placenta and single umbilical artery.

And out of 50 cases, 2 cases showed spina bifida in the thoracolumbar region without any associated meningocoele or meningomyelocoele.

Hydrocephalus associated with spina bifida in 5 cases showed the characteristic lemon shaped skull and banana sign of cerebellum.

The spina bifida was noted at various levels. 4 cases showed spina bifida at the thoracolumbar region, 2 cases showed spina bifida at the mid thoracic region and the rest of the 16 cases showed defect in the lower lumbar region.

Of the 22 cases of spina bifida, 6 cases did not show any associated meningocoeles or myelomeningocoeles, 9 cases showed

myelomeningocele and 7 cases showed meningocele. 8 cases were associated with polyhydramnios, 5 cases showed typical lemon shaped skull, 7 cases showed banana sign of cerebellum. 1 case showed single umbilical artery.

Out of 50 cases, 15(30%) cases showed anencephaly. Of these cases, 5 cases were associated with polyhydramnios. One case with polyhydramnios was an interesting case of twins with one normal foetus and another foetus showing no foetal head.

### Discussions

Central nervous system malformations are an important problem of child neurology. The term malformation means any morphological abnormality of the CNS that dates to the embryonic or foetal period, regardless of the mechanism of its origin. Neural tube defects (NTDs) account for the most congenital anomalies of the central nervous system (CNS) and result from failure of the neural tube to close spontaneously between the 3rd and 4th week of embryonic development [8].

The incidence of malformations (any type) in the population of babies who are small for the gestation term is 8%, in comparison to the population of infants of appropriate size for their gestational age where the incidence is 3.3% [9,10]. Neural tube defects are the most frequent (38.6% of all CNS malformations). Some CNS malformations may be associated with metabolic diseases, like agenesis of corpus callosum [8].

Maternal diabetes mellitus is an important risk factor for the development of CNS malformations. Foetal alcoholism, maternal age over 35 years, multiple pregnancy, oligohydramnion, hydramnion, maternal hyperthermia, use of valproate by epileptic women during pregnancy are important risk factors for the development of CNS malformations. Foetuses that are small for gestation age are also at high risk [8].

High prevalence of NTDs has been reported from the various parts of India [11,12]. The utility of periconceptional folic acid in prevention of NTDs has been documented long ago [13,14]. Implementation of food fortification with folic acid has shown a reduction in the incidence of NTDs [15,16]. However, in India, still NTDs continue to be the most common foetal malformation [17].

In this present study, prevalence of neuroectodermal anomalies was 0.23%. Most of the cases 45(90%) were seen in maternal age group of 30-40 years. And average gestational age for ultrasound diagnosis of anomalies was 22.45 weeks. It was probably due to late visit of the pregnant women to the hospital, as majority of the patients under this study was from a rural area with low socio-economic status. All the women diagnosed with foetal CNS anomalies were undergoing ultrasound for the first time.

In this present study, out of 50 anomalies, 15(30%) foetuses were anencephaly. Of these cases, 5 cases were associated with polyhydramnios. One case with polyhydramnios was an interesting case of twins with one normal foetus and another foetus showing no foetal head. 2(4%) cases showed spina bifida in the thoracolumbar region without any associated meningocele or meningomyelocele. Hydrocephalus associated with spina bifida in 5(10%) cases showed the characteristic lemon shaped skull and banana sign of cerebellum. Among 22 cases of hydrocephalus, most of the foetuses 16(72.72%) showed various associated features like spina bifida and meningocele/myelomeningocele. Of these 16 cases, 13 cases showed spina bifida in the lower lumbar region associated with a meningocele or myelomeningocele, and 3 cases showed a thoracic meningocele. The case with the thoracic meningocele showed associated polyhydramnios, abnormally thin placenta and single umbilical artery. And 6(27.27%) foetuses were of solitary hydrocephalus which had no other associated abnormality involving either the CNS or any other system. The liquor was also normal in these 6 cases, with no case showing polyhydramnios or oligohydramnios.

Christopher Verity, et al stated that hydrocephalus was complicated in most of the cases of lumbosacral meningomyelocele. Ultrasound shows hydrocephalus in about 90% of cases at birth. Usually it is associated with the Chiari II malformation, which is present in about 70% of cases of meningomyelocele and consists of downward protrusion of the medulla below the foramen magnum to overlap the spinal cord. Distortion of the medulla and midbrain can cause lower cranial nerve palsies and central apnoea (which may be misdiagnosed as epilepsy) [18].

In this present study, out of 50 cases, 2(4%) foetuses had with agenesis of corpus callosum and 2(4%) cases had microcephaly. Encephalocele, Hydranencephaly,

and Iniencephaly were seen one in each case. 14(28%) cases had history of consanguinity. 27(54%) cases had history of intake of Iron and Folic acid tablets. In the rest of the 23 cases, 12(24%) cases had no history of intake of Iron and Folic acid tablets. Others 11(22%) cases were not willing to communicate regarding the drugs intake.

Microcephaly is an abnormally small head circumference (< 0.4th centile on occipito-frontal head circumference charts), which is disproportionately small in relation to the rest of the body. The usual implication of this finding is that brain growth is not normal. And a small head circumference is detected in the neonatal period. Prenatal ultrasound allows diagnosis of agenesis of corpus callosum from 20 weeks gestation. When callosal agenesis is discovered on antenatal scan the prognosis is difficult to assess because the isolated lesion can be associated with normal development. A decision to terminate the pregnancy may depend on the demonstration of associated abnormalities.

### Conclusions

This present study concluded that coenginal neuroectodermal anomalies were commonly seen in maternal age group of 30-40 years and prevalence was 0.23%. Anencephaly and hydrocephalus associated with spina bifida were seen in most of the CNS anomalies fetuses. Spina bifida in the lower lumbar region associated with a meningocele or myelomeningocele was the most common. Hence, ultrasound is an effective investigative modality for in utero screening of coenginal neuroectodermal anomalies. Ultrasound imaging in antenatal period practically gives an anatomical record of the developing foetus. So that early detection of anomalies especially in first and early second trimester of pregnancy helps in planning termination, interventions and further management of neuroectodermal anomalies.

### References

- Whitworth M, Bricker L, Mullan C. Ultrasound for fetal assessment in early pregnancy. *Cochrane Database of Systematic Reviews* 2015, Issue 7. Art. No.: CD007058.
- Fred Avni E, Fred E Avni. *Perinatal imaging: from ultrasound to MR imaging; with 31 tables*. Springer 2002;1st edn:199-200.
- Babu RS, Pasula S. Frequency of foetal anomalies in a tertiary care centre. *J Clin Diagn Res* 2013; 7 : 1276-9.
- Verma IC. High frequency of neural-tube defects in North India. *Lancet* 1978; 1 : 879-80.
- Prevention of neural tube defects: Results of the Medical Research Council Vitamin Study. MRC Vitamin Study Research Group. *Lancet* 1991; 338 : 131-7.
- Rumack C. *The Fetal Brain*. In *Diagnostic Ultrasound*, 4th edition. Elsevier Mosby Philadelphia, 2011; 1197-1244.
- Deepali Onkar, Prashant Onkar, Kajal Mitra. Evaluation of Fetal Central Nervous System Anomalies by Ultrasound and Its Anatomical Co-relation. *Journal of Clinical and Diagnostic Research*. 2014 Jun, Vol-8(6): AC05-AC07.
- Kunisaki S.M., Jennings R.W. Fetal surgery. *J. Intensive Care Med*. 2008; 23(1): 33-51.
- Padmanabhan R. Etiology, pathogenesis and prevention of neural tube defects. *Congenit. Anom. (Kyoto)*. 2006;46(2): 55-67.
- Heljić S., Bajric S. Neural tube dysraphism:meningomyelocele and related disorders. *Med. Arh*. 2002;56(3 Suppl 1): 5-7.
- Cherian A, Seena S, Bullock RK, Antony AC. Incidence of neural tube defects in the least-developed area of India: A population-based study. *Lancet* 2005; 366 : 930-1.
- Verma IC. High frequency of neural-tube defects in North India. *Lancet* 1978; 1 : 879-80.
- 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.
- ICMR Collaborating Centres, Central Technical Coordinating Unit, ICMR. Multicentric study of efficacy of periconceptional folic acid containing vitamin supplementation in prevention of open neural tube defects from India. *Indian J Med Res* 2000; 112 : 206-11.
- From the Centers for Disease Control and Prevention. Recommendations for use of folic acid to reduce number of spina bifida cases and other neural tube defects. *JAMA* 1993; 269 : 1233-8.
- Mills JL, Signore C. Neural tube defect rates before and after food fortification with folic acid. *Birth Defects Res A Clin Mol Teratol* 2004; 70 : 844-5.
- Anjurani Siddesh, Geetika Gupta, Ram Sharan, Meenal Agarwal & Shubha R. Phadke. Spectrum of prenatally detected central nervous system malformations: Neural tube defects continue to be the leading foetal malformation. *Indian J Med Res*. April 2017; 145: 471-478.
- Christopher Verity, Helen Firth, Charles French-Constant. Congenital abnormalities of the central nervous system. *J Neurol Neurosurg Psychiatry* 2003;74(Suppl 1):i3-i8