

## Original Research Article

# Prevalence and Frequency of Congenital Anomalies of the Central Nervous System among Saudian Population KSA-Najran

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### Abstract

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**Malformation of the central nervous system is among the most common of the major congenital anomalies. Exact incidence figures are difficult to determine as they vary with geographical location, the population group under the study and epidemiological technique used. The aim of this study is to evaluate the prevalence and frequency of central nervous system congenital anomalies in Maternal and Child Birth Hospital(MCH) in Najran Kingdom of Saudi Arabia. Prospective descriptive study was performed at all maternal referred to Maternal and Child Birth Hospital – radiology department were studied during the period from December 2016 to December 2017 and fetal with the central nervous system were identified. Maternal age, gestational age, parity and types of central nervous system anomalies were recorded in planning questionnaire for each fetus.**

**Keywords:** Sonography, Congenital anomalies, Central nervous System, Fetus

## INTRODUCTION

General nervous system anomalies (CNS) are among the most commonly diagnosed fetal anomalies. They frequently have a severe prognosis, which impacts on survival, appearance and future function in society. They are also a source of many questions regarding prenatal diagnosis and genetic background which enable estimation of recurrence risk. Central nervous system malformation occurs in about 5.3 per 1000 delivers their incidence is even higher if abortions and stillbirths are taken into account the severity of this pathology is extremely variable, ranging from conditions not compatible with postnatal life, such as anencephaly to transient conditions such as choroid plexus cysts (Chervenak et al., 1995; Asim et al., 2007). General central nervous system malformation can be classified as either Neural type defects or other malformations including Hydrocephalus. A neural type of defect which includes anencephaly, spina bifida and encephalocele account for half of the major anomalies and have the incidence that varies from 2 to 5 per 1000 births.

Anencephaly and spina bifida, with an approximately equal prevalence, account for 95% of cases and encephalocele for the remaining 5%. The causes of NTDs are unknown, but they are currently thought to be related to a relative deficiency in folic acid in the mother (Chervenak et al., 1995; Trish and Basky, 2004; Juriy et al., 2009).

Neural tube defects are multifactorial disorders. Chromosomal abnormalities, single mutant genes and maternal diabetes mellitus or ingestion of teratogens, such as antiepileptic drugs, are implicated in about 10% of cases. When a parent or previous sibling has had a neural tube defect, the risk of recurrences is 5-10%. Preconception supplementation of the maternal diet with folate reduces by about half the risk of developing these defects (Trish and Basky, 2004).

The screening or basic ultrasound examination of the anomalies of the fetal central nervous system is performed by transabdominal ultrasound. The examination should include evaluation of the fetal head

**Table 1.** Categorization of central nervous system anomalies among 84 fetuses undergoing Ultrasasonography

Type of anomalies	Frequency	Percentage
Hydrocephalus	38	45.2%
Corpus callosum agencies	2	2.3%
Anencephaly	2	2.3%
Encephalocele	2	2.3%
Fetal hydrous	2	2.3%
Microcephaly	2	2.3%
Michael-Gruber syndrome	2	2.3%
Spina bifida	4	4.7%
Choroid plexus cyst	16	19%
Preventricular white matter (PVNM)	14	16.7%
Total	84	100%

and spine. Ultrasound screening of fetal brain malformations is commonly performed in 19-21 week gestation. For the assessment of the fetal brain, the second trimester normally includes the following axial Planes: transthalamic, transventricular and transcerebellar. This has become the standard approach, however, some major developmental events occur in the second half of gestation period, including neuronal proliferation, migration and organization, and the same is true for acquired lesions such as hemorrhage and tumors, which usually occurs late in gestation. Therefore, although it is possible to detect most fetal brain tumors in the second trimester, proliferation, migration and organization disorders as well as acquired lesions can become apparent only in the third trimester (Dario and Paolo Volpe, 2014).

In a low risk pregnancy around midgestation, if the transventricular plane and the transcerebellar plane are satisfactorily obtained, the head measurements (head circumference in particular) are within normal limits for gestational age, the atrial width is less than 10.0 mm and the cisterna magna width is between 2–10 mm, many cerebral malformations are excluded, the risk of a CNS anomaly is exceedingly low and further examinations are not indicated (Filly et al., 1989). Wide research reported that CNS was the most common congenital anomalies (Mashuda et al., 2014; Obu et al., 2012). However Different studies was conducted to evaluate the congenital anomalies in Saudi Arabia, in western Saudi Arabia the CNS anomalies represent about (1.9/1000) live birth (Nadia et al., 2007), In Asir area the the major type of CNS Anomalies were myelomeningocele (70%) and encephalocele (23%) followed by anencephaly 4.7% and meningocele (1.6%) (Asindi et al., 2001). However there was reported that spina bifida and encephalocele together ranked first among all reported CNS congenital malformations in South western Saudi Arabia (Mohammed, 2005). The present Study was undertaken to identify the prevalence rate and frequency of central nervous system anomalies in

Maternity and Child Birth Hospital Najran KSA.

## MATERIAL AND METHODS

A retrospective descriptive cross-sectional study conducted in Maternity and Child Birth Hospital Najran KSA aimed to screen Fetal central Nervous system Ultrasonography during period from December 2016 to December 2017 to evaluate the prevalence of congenital anomalies. The study was based on the data from the archive through questionnaires and checklists which include demographic ultrasound finding and other prenatal and fetus information such as maternal age, parity, gestation age, type of CNS anomalies. The study considered all recorded anomalies of the CNS. During the period of the study, 84 patients with CNS abnormality were reported and they survived as the study population. The ultrasound examination was performed by professionals in obstetrical ultrasonography. CNS abnormality was diagnosed using high resolution ultrasound 3.5 MHz transabdominal and 7.5 MHz transvaginal. Fetal brain and spinal canal were all scanned with axial, cranial and sagittal section through transventricular, transelebral and the spinal canal plane. Ethical approval was obtained from the radiology department and hospital. Data were collected and descriptive analysis was done using SPSS version 20 (SPSS, Chicago, IL) to achievement index of frequency.

## RESULTS

Out of 2520 females underwent ultrasound examination in the MCH radiology department, Eighty four fetuses with CNS malformation was identified during the period of the study, giving a prevalence of 3.3%. Hydrocephalus 38 (45.2%) was the most common CNS anomalies followed by Choroid plexus cyst 16 (19%) while Spina bifida represent 4 (4.7%) other were Corpus callosum

**Table 2.** Categorization of maternal age

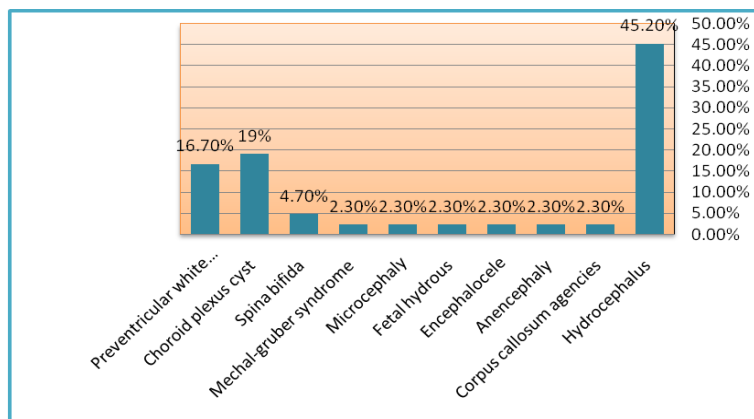
Variables		Frequency N=84	Percentage
Maternal age	<20	12	14.2
	20 <30	23	27.3
	30 < 40	39	46.6
	≥40	10	11.9

**Table 3.** Categorization of the parity

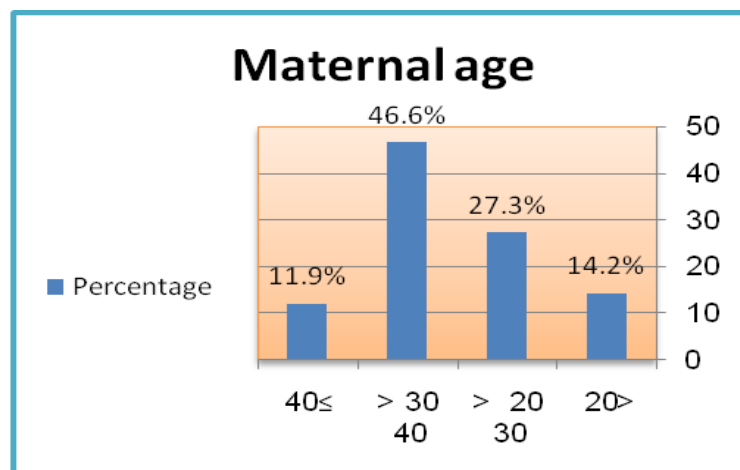
Variables		Frequency N=84	Percentage
Parity	Primipara	17	20.3
	Multipara	67	79.7

**Table 4.** Categorization of gestational age

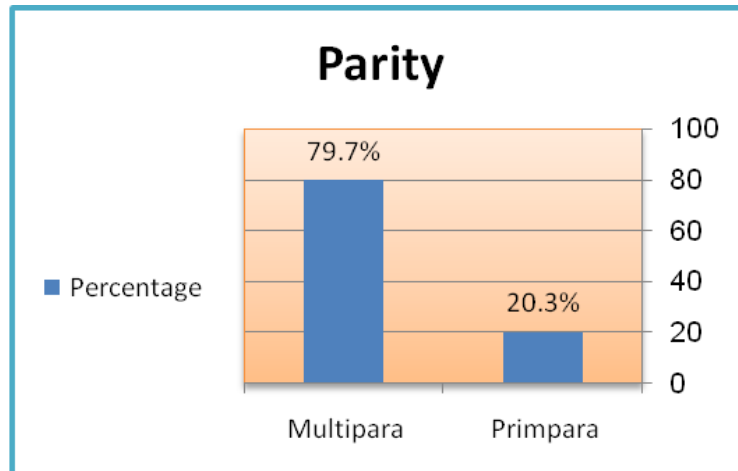
Variables		Frequency N=84	Percentage
Gestational age	2 <sup>nd</sup> trimester	45	53.6
	3 <sup>rd</sup> trimester	39	46.4



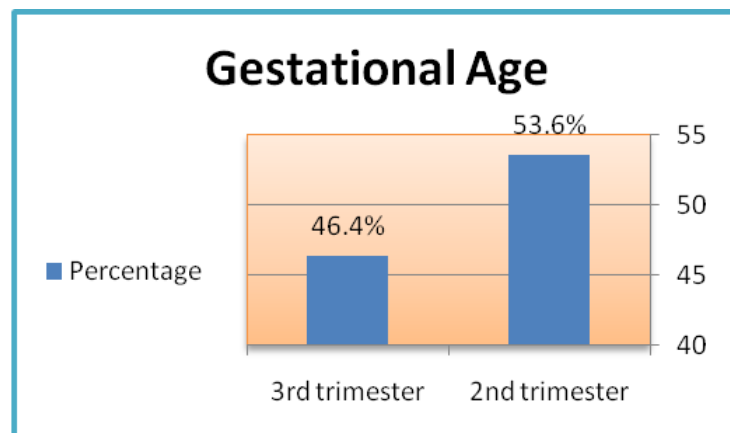
**Figure 1.** Shows distribution of central nervous system anomalies



**Figure 2.** Shows distribution of maternal age



**Figure 3.** Shows distributions of parity



**Figure 4.** Shows distributions of gestational age among 84 fetuses have central nervous system malformations.

agencies, Anencephaly, Encephalocele, Fetal hydrous, Microcephaly and Michael-Gruber syndrome represent 2 (2.3 %) check the table and figure(1). 45 (53.6%) of cases were detected during second trimester and 39 (46.4%) were detected during the third trimester found in table and figure (2). Twelve maternals were under 20 years old (14.2%), twenty three their age between (20 < 30) (27.3%), thirty nine their ages between (30 < 40) (46.6%) and ten maternals their age over 40 years old (11.9%). According to parity 17 (20.3%) maternal were Primipara, However 67 (79.7%) were multiparous.

## DISCUSSION

Sonographic examination is the choice modality and an effective method for diagnosis. It has been used for more than three decades as the main modality to help diagnose fetal CNS anomalies (Kazmi et al., 2006). Abnormality in the development of the CNS IS common,

up to 75 % of fetal deaths and 40% of deaths in infancy are due to CNS malformations (Barkovich et al., 2005). The objective of this study was to identify the prevalence and frequency of CNS anomalies in Saudian population Najran, KSA.

The prevalence of CNS congenital anomalies in our study is 3.3%, which is slightly higher than reported in general population from 2-3% (Kinsman et al., 2011). The globally different study reported that CNS anomalies were the most common type of congenital anomalies (Fatema et al., 2011; Sunethri et al., 2011). However recent study Saudia Arabia reported that congenital anomaly of the CNS was the most common type of congenital anomalies (Nayab et al., 2010; Bahauddin et al., 2008) in other studies in Saudia Arabia it was represented the CNS was the second and third types of congenital anomalies (Mashuda et al., 2014; Uma Shankar and Sabita, 2016). In our study there was an increased prevalence of the CNS malformation in Southern Saudi Arabia, Najran this may be due to Consanguineous

marriage in this area.

CNS anomalies could be grouped into several entities, including neural tube defects and associated spinal cord malformations (myelomeningocele, meningocele, encephalocele), disorders of structural specifications, disorders of the posterior fossa, brain stem, and cerebellum, disorders of brain growth and size, and disorders of skull growth and shape (Kinsman et al., 2011) current study reported that hydrocephalus was the most common CNS congenital anomalies presented in MCH (41.6%) followed by choroid plexus cyst (22.2%) and pre-ventricular white matter which represented (13.9%), spina bifida represent (5.6%). While corpus callosum agencies, anencephaly, microcephaly, encephalocle, fetal hydropus and Michal Gruber syndrome together represented about (2.8%) of all cases. However different in reported type of CNS malformation in different area of Saudi Arabia. In Asir are the Hydrocephalus present in 39 (86.7%) 45 infant with myelomeningocele while encephalocle presented about 23.4% while anencephaly represented about 4.7%. Infant with anencephaly and spina bifida, where not revert to this hospitals (Asindi et al., 2001). Moreover the hydrocephalus, anencephaly and Encephalocele equally were represented about 10.7% of CNS congenital anomalies in recent study in Saudi Arabia (Uma Shankar and Sabita, 2016).

Maternal age is an important parameter in the birth of a congenitally malformed fetus. Some of the most devastating adverse outcomes in older pregnant women are anomalies associated with chromosomal aberrations, especially aneuploidies, which occur in about one in 50 births to women at age 40. However Young mothers especially below 15 yrs age are also at increased risk of anomalous babies probably due to impaired "uteroplacental perfusion" of nutrients and higher prevalence of anemia and other micronutrient deficiencies in young primipara (Hollier et al., 2000; Hook, 1981; John, 1991). The mean age of mother in the present study was (30-40Yrs) our study represent that strong association between advance mother age and CNS anomalies the age (46.6%) of mother in the present were between 30 to 40, and mother below 20 years old were represented (14.2%) and above 40 were about (11.9%).

With revolutionary technological improvements the resolution of ultrasound imaging has greatly increased. Together with the experience of the operator, the possibility of "seeing the fetus" is presently emphasized and it is possible, especially with second trimester (19–22 weeks) ultrasound, which has the aim to evidence structural abnormalities (Antonsson et al., 2008). However, in the present study (53.6%) of the causes was represented in the 2nd trimester (46.5%) of the causes represented in the third trimester.

Regarding parity finding of the present study reveals that multiparity was correlated with increased risk of

central nervous system congenital anomalies (79.7%) however propriety representatives (20.3%). However Muga et al (2009) found an association between multiparity and CNS congenital anomalies that birth order 4 contribute (55.2%) (Muga et al., 2009).

## CONCLUSIONS

Data from this study show that the prevalence of central nervous system anomalies in Najran Saudi Arabia was 3.3%, were the most common congenital anomalies noted in the study was Hydrocephalus with a frequency of (45.2%), also researchers found that most congenital anomalies were detected during the second trimester with a frequency of (46.4%) and which associated with multiparity women.

## RECOMMENDATIONS

Based on the recent study, researchers recommended that a longitudinal prospective study on prospective of central nervous system anomalies among fetuses will be conduct.

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