ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 68 . 16
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 5, Issue – 1, February - 2020, Page No. : 36 - 42

Anencephaly: Incidence and pregnancy outcome after prenatal diagnosis at a tertiary care Hospital

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Citation this Article: Dr Sonali Sharma, Dr Premlata Mital, "Anencephaly: Incidence and pregnancy outcome after prenatal diagnosis at a tertiary care Hospital", IJMSIR- February - 2020, Vol – 5, Issue -1, P. No. 36 – 42.

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Introduction: Anencephaly is a lethal neural tube defect which if diagnosed early gives option of termination of pregnancy. Continuation of pregnancy is allowed when there is late detection of the anomaly and delayed fetal anatomy scans. This study is done to find incidence and pregnancy outcomes after prenatal diagnosis of anencephaly.

Material and methods: All the cases diagnosed with anencephaly were included. After detail history and examination, women were given the option of pregnancy termination, when diagnosed within 20 weeks of pregnancy. After 20 weeks, they were counseled about the prognosis and followed till 37 weeks of pregnancy. Pregnancy outcomes were observed and results were analyzed.

Results: Incidence of anencephaly in our study was 1.85 per 1,000 births. Mean age of the women was 23.14±3.97 years. Mean gestational age at the time of diagnosis was 22±6.63 weeeks. In 51.4% anencephaly was diagnosed before 20 weeks so they were offered termination. 48.6% women were followed till delivery. Polyhydramnios developed in 44.4%. 16.7% had PPH, induction of labour was done in 55.6%. 88.9% women delivered vaginally. Mean gestational age and birth weight at delivery was 31.6±2.5 weeks and 1.378±0.408 kg respectively. A female preponderance was seen. 55.1% babies were born alive, 90% of them died within 24 hours.

Conclusion: An early fetal anatomy ultrasound scan will help us to diagnose anencephaly early and timely termination of pregnancy.

Introduction

WHO estimated that 276,000 neonatal deaths globally were attributable to birth defects, with neural tube birth defects (NTDs) being one of the most common and serious of these defects.[1]Anencephaly is a lethal neural tube defect where brain and cranial bones are grossly malformed. Cerebral and cerebellar structures are reduced or grossly malformed, but the hindbrain is present. This defect results when the neural tube fails to close during the third to fourth weeks of development, leading to fetal loss, stillbirth, or neonatal death.[2,3,4] Anencephaly remains an important and an apparently irreversible cause of pregnancy wastage, as there is no corrective treatment for this condition.

Anencephaly, like other forms of NTDs, generally follows a multifactorial pattern of transmission, with interaction of multiple genes as well as environmental factors, although neither the genes nor the environmental factors are well characterized. There may be a potential relationship between a parent's (both mother and father) occupation and the risk of anencephaly.[4] Stemp-Morlock noted a 5-fold greater risk for anencephaly among mothers exposed to agricultural pesticides during the early vulnerable period of pregnancy. Fathers exposed to pesticides while working in agriculture were found to have twice the risk of fathering an anencephalic baby.[5] Other environmental toxins noted to have a possible relationship with anencephaly and other NTDs include mycotoxins in contaminated cornmeal, arsenic, and well water with nitrate concentrations[4,6].The most important risk factor for anencephaly and other NTD is insufficient folic acid[7]. There are other risk factors found to potentially increase the incidence of anencephaly. Medications that are folic acid antagonists including: trimethoprim, valproate, carbamazepine, phenytoin, and Phenobarbital increase the risk[4]. Maternal hyperthermia induced by excessive use of hot tubs or maternal fever in early pregnancy may be associated with an increased risk of NTD[8]. Its prevalence at birth ranges from 1 in 5,000 to 1 in 2,000[3,9]. The prevalence at birth has great geographic variation, with especially high rates in the British Isles, China, Mexico, and Turkey[10].

Anencephaly is lethal in all cases because of the severe brain malformation that is present. A significant proportion of all anencephalic fetuses are either aborted spontaneously or stillborn. If born alive the prognosis is exceptionally poor; death of a live child is unavoidable and most often occurs during the early neonatal period. A significant proportion of pregnancy is terminated following prenatal diagnosis of anencephaly.[11,12]

Prenatal ultrasonography and maternal serum alpha fetoprotein screening has resulted in prenatal detection of anencephaly in virtually 100% of cases. This prompted obstetricians and parents to consider elective pregnancy termination.[13] The decision about pregnancy termination is associated with parents' religious beliefs and restricted legal termination rules, in addition to other factors such as late detection of the anomaly and delayed fetal anatomy scans. Very few studies on anencephaly have been done in our state so in our study we aimed to find incidence and pregnancy outcomes after prenatal diagnosis of anencephaly.

Material and Methods

This was a prospective study done in the Department of Obstetrics and Gynaecology, S.M.S. Medical College, Jaipur during the period from January 2019 to December 2019. All the cases diagnosed with anencephaly and were willing to participate in the study were included. Detailed history and examination was done. They were asked about history of pre-conceptional folic acid intake and history of previous pregnancy with anencephaly. Baseline investigations in form of CBC, BGRh, RBS, TSH, Viral markers were done. Transabdominal ultrasound was performed in all cases to confirm the diagnosis and to assess gestational age, amount of liquor,or other associated malformations. Women were given the option of pregnancy termination, when diagnosed within 20 weeks of pregnancy after that they were counseled about the prognosis and followed till 37 weeks of

pregnancy; if labor did not start spontaneously, labor induction was done.

Outcome variables included gestational age at diagnosis, gestational age at birth, induction of labor, cesarean delivery, live births, stillbirths, shoulder dystocia, polyhydramnios, antepartum hemorrhage (APH), and postpartum hemorrhage (PPH). Rh Negative mothers were given injection Anti D. On discharge, participants were counseled regarding contraception and use of pre-conceptional folic Acid.

Results

A total 20,045 deliveries took place in one year from January 2019 to December 2019, out of which 37 women had anencephaly. Incidence of anencephaly in our study was 1.85 per 1,000 births.

Sociodemographic profile of the women admitted with anencephaly is shown in table 1. Out of 37 women with anencephaly, 28 (75.7%) were in the age group between 21 to 30 years. Mean age of the women was 23.14±3.97 years .This is because of the practice of marriage at younger age which is still prevalent in our state. Majority of the women were Hindu (89.2%), literate (64.9%) and belonged to middle socio-economic status. 46 % women were primigravida. Mean gravidity was 2±1.15.

Table 2 shows gestational age at the time of diagnosis of anencephaly was made. In 51.4% cases anencephaly was diagnosed before 20 weeks of pregnancy. Mean gestational age at the time of diagnosis was 22±6.63 weeeks. There was no history of pre-conceptional folic acid intake in 86.5% cases. (Table 3)

Mode of termination of pregnancy after diagnosing anencephaly is shown in table 4. In 19 women anencephaly was diagnosed before 20 weeks so they were offered termination. 5 women (26.3%) had spontaneous abortion and 14 were induced medically (mefiprine 200 mg day 1 followed by tab mesoprostal 800 microgm after 48 hours). In 18 women anencephaly was diagnosed after 20 weeks of pregnancy so they were counseled and allowed to continue till 37 as we have 20weeks as legal limit for termination of pregnancy. 7 women had spontaneous delivery, one had elective cesarean section for central placenta previa. Labour was induced in 10 women with intra-cervical PG E_2 gel application and augmentation of labour by oxytocin drip. Out of them 9 women delivered vaginally and one required emergency cesarean for failed induction.

Table 5 shows pregnancy outcome after age of viability. Out of 18 women where pregnancy was continued, 8 (44.4%) developed polyhydramnios, 1 presented as APH (central placenta previa) and 3 women had atonic PPH which was medically managed. Mean gestational age at the time of delivery was 31.6 ±2.5 weeks and mean birth weight was 1.378±0.408 kg. There was female preponderance (61.1%) in our study. 9 babies were stillborn and 11 were born alive. 81.8% babies died within 24 hours and 18.2% died within 2-3 days.

Discussion

Prevalence of fetal anencephaly and neural tube defects shows a great geographic variation. In our study in a 1-yr period total number of birth was 20,045, out of which 37 pregnancies were diagnosed to have anencephaly fetuses. The occurrence of anencephaly was 1.85 per 1,000 live births. This prevalence is significantly higher compared with the reported prevalence in the literature. Obeid et al reported the prevalence as 3.52 per 10.000 live births in their study[12]. The prevalence of anencephaly was 104.4 per 10,000 births in China,[14] 0.5 – 0.6 per 1,000 in Singapore,[15] This significantly high

prevalence may be misleading as our hospital is a tertiary care center which caters large number of referrals. The prevalence in our study was lower than that observed by Emre Ekmekcia , Servet Gencda[16]

In our study median and mean age of the women was 22 years (range 18 – 35) and 23.14±3.97 years respectively. Mean age of the women in our study ((23.14±3.97 years) was lower than that observed by of Machado IN et al 2012,[1] S Al-Obaidly et al 2018[18] and Ekmekci et al 2019.[16] This may be due to practice of early marriage in our state. 46% women were primigravidas in our study. Our results were comparable with the result of Machado IN et al 2012[1] while in the studies done by S Al-Obaidly et al 2018[18] and Ekmekci et al 2019[16] primigravida were 21% and 13% respectively.

51.3% cases were detected before 20 weeks of gestation in in our study contrast to 17% cases where anencephaly was diagnosed before 18 weeks as observed by Al-Obaidly et al[18] Mean gestationl age where pregnancy was terminated in second trimester was 16.5±1.6 weeks. Mean GA of pregnancy termination was lower in our study than 23 weeks observed by Machado IN et al[1] this is because we have legal limit for termination of pregnancy as 20 weeks.

The mean gestational age at delivery was 31.6±2.5 weeks in our study which was comparable with that observed by Machado IN et al[1] and Ekmekci et al[16] and lower than that reported by Obeidi et al.[4] and Al-Obaidly et al[18] and Tan KBL et al[15]. Mean birth weight was 1.378±0.408 kg in our study which was lower than that observed by Al-Obaidly et al[18] and Tan KBL et al[15].

Polyhydramnios was a significant prenatal complication (44.4%) in our study. Our results were comparable with the observation made by Ekmekci et al[16], Jaquier et al[19] and Obeidi et al[12]. One patient presented with APH (central placenta previa) so she was taken for cesarean section. 3 women had PPH which was managed medically. Women with anencephaly are predisposed to PPH due to overdistension of uterus by polyhydramnios. Majority of the women (88.9%) delivered vaginally and 11.1% delivered by cesarean section. Our observation was comparable with that of Machado IN et al[1]. The cesarean rate in our study was much lower than that observed by Al-Obaidly et al[18], Ekmekci et al[16] and Jaquier et al[19].Shoulder dystocia is the most common complication during vaginal delivery as reported by various studies in the past, none of the women had shoulder dystocia in our study this could be because of the small sample size.

There was female preponderance (61.1%) in anencephalic offsprings in our study. Our results were consistent with previous studies[19,20] although Obeidi et al[12] in their study did not reveal this preponderance while Golalipour MJ et al[21] and Tan KBL et al[15] in their study observed male preponderance.

Prenatal detection of anencephaly by ultrasound is high and reliable at 10–14 weeks' scan[22,23]; however in 51.4% cases diagnosis was made before 20 weeks. In 48.6% anencephaly was diagnosed after 20 weeks. This was due to the fact that our centre being a tertiary care centre they were either referred after diagnosis or had first antenatal visit after 20 weeks. Lack of adherence to a universal structured foetal screening programme within the government and private sector and perhaps lack of public awareness might be potential causes of a late maternal presentation. In our study approximately 30% women were illiterate and belonged to low socio-economic status. Although anencephalic fetuses are non-viable and termination of pregnancy is the most logical approach; due to legal limit for pregnancy termination in our country, pregnancies are not being terminated commonly when diagnosed after 20 weeks of gestation.

Since the 1990s, folic acid supplementation (400 micrograms) has been shown to be beneficial in reducing the incidence of NTD by 50–70%, and much work has been done to educate as well as implement folate fortification of food in the United States and other parts of the world[24]. Locally, folic acid supplementation has been increasingly given to expecting mothers in the first trimester of pregnancy. Tan KBL et al[15] in their study observed decreasing incidence of total births of anencephaly from 0.54 per 1,000 livebirths in 1993 to 0.32 per 1,000 livebirths in 2002. This could be attributed to an increasing usage of folic acid supplementation in the first trimester of pregnancy as a result of raised awareness among obstetricians and increasing proportion of pregnancy terminations in second trimester because of the earlier and more accurate diagnoses made by USG, and decrease in the stigma of pregnancy terminations.[15] This is consistent with a report by Chan et al which showed that although the total prevalence of NTD in South Australia remained stable from 1966 to 1991, prenatal diagnosis and termination of pregnancy resulted in an 84% fall in birth prevalence[25].

Conclusion

The results of our study may assist in counseling parents more appropriately about the complications and outcomes of anencephaly pregnancies. We would recommend pre-conceptional folic acid supplementation atleast 3 months before planning a pregnancy and performing an early fetal anatomy ultrasound should be performed so that if anencephaly is diagnosed then parents can be timely counseled about the available options including the option of termination of pregnancy. This will reduce the economic burden and psychological stress of the parents.

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Legends Tables

Table 1: Sociodemographic profile of the women

Variables	Number	Percentage
Age (yrs)		
< 20	6	16.2
20-30	28	75.7
≥30	3	8.1
Mean ± SD	23.14 ± 3.97	
Religion		
Hindu	33	89.2
Muslim	4	10.8
Literacy		
Literate	24	64.9
Illiterate	13	35.1
Socio-economic status		
Low	12	32.4
Middle	21	56.8
Upper	4	10.8
Gravidity		
Gravida 1	17	46
Gravida 2	9	24.3
Gravida ≥3	11	29.7
Mean ± SD	2 ±1.15	

Table 2: Gestational Age at the time of diagnosis

Gestational Age (Weeks)	No of Cases	Percentage (%)
<12	0	0
12 - <20	19	51.4
20 - < 28 weeks	09	24.3
≥28 weeks	09	24.3
Mean ± SD	22 ± 6.6	

Table 3: Pre-conceptional folic acid intake

Pre-conceptional folic acid intake	No of cases	Percentage
Yes	05	13.5
No	32	86.5

Table 4: Mode of Termination of pregnancy

Mode of Termination of pregnancy	No of cases	Percentage
GA <20 weeks (n=19)		
Spontaneous abortion	5	26.3
Induction of abortion	14	73.7
GA ≥20 weeks (n=18)		
Spontaneous delivery	7	38.8
Induction of labour	10	55.6
Elective cesarean section	1	5.6

Table 5: Pregnancy outcome after age of viability

Pregnancy Outcomes (n=18)	No	%
Polyhydramnios	8	44.4
Antepartum hemorrhage	1	5.6
postpartum hemorrhage	3	16.7
Mode of delivery		
Vaginal	16	88.9
Cesarean section	2	11.1
Sex		
Female	11	61.1
Male	7	38.9
Stillbirth	8	44.4
Live birth	10	55.6
Death within		
Day 1	9	90.0
Day 2-3	1	10.0
Mean G A at Delivery (weeks)	31.6±2.5	
Mean birth weight (kg)	1.378±0.408	