Prenatal Autopsy Research on Diverse Congenital Anomalies: A Teaching Institutional Experience

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ABSTRACT

CONTEXT: According to estimates, 3-7% of the world's population suffers from congenital diseases, however the true percentage may differ substantially because cases in developing countries are sometimes not reported. Fetal autopsies are crucial for confirming fetal congenital anomalies despite antenatal diagnostic techniques. In order to categorize congenital defects systemically and correlate these lesions with radiological results, the current investigation is being conducted.

AIMS: The present study is undertaken to study and categorizing the various congenital anomalies according system wise involvement and to correlate these lesions with radiological findings wherever available.

SETTINGS AND DESIGN: Cross sectional study.

METHODS AND MATERIAL: The retrospective study was carried out at the Pathology department. The request form was used to collect clinical and radiological information, and each case was reviewed in accordance with protocol.

STATISTICAL ANALYSIS USED: SPSS software was used for the statistical analysis. Descriptive statistics like frequency, mean and median were calculated. Finally, anomalies were categorized system wise.

RESULTS: The study comprised 85 cases with a 1.9:1 male to female fetal ratio. The most frequently affected system was a central nervous system. An unusual case of Patau and Down syndrome was identified.

CONCLUSIONS: Fetal autopsy aids in the detection of a number of congenital malformations as well as the provision of information regarding the likelihood of these anomalies recurring in the future. Regular antenatal check-ups with specific diagnostic test help to avoid congenital anomalies in subsequent pregnancies.

Keywords: Congenital anomalies; Fetal autopsy; Cystic hygroma; Meningocele.

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INTRODUCTION

Congenital disorders are thought to affect 3-7% of the world's population, but actual rates vary greatly because cases in developing nations are rarely reported.[1]

Depending on the genetic component, the chance of these illnesses recurring ranges from extremely low to 25%.[2]

Congenital abnormalities in a baby not only have an emotional impact on the family, but they also make the parents anxious because they worry that they will occur again in subsequent pregnancies. So, every effort should be made to identify the etiology of fetal death so that appropriate genetic counseling can be given.[3,4]

Ultrasound examination is a very effective mode to detect major structural anomalies. However, it lacks the specificity for syndrome diagnosis. Thus fetal examination plays confirmatory role in prenatally detected chromosome anomaly (or) genetic metabolic disease.[5] Fetal autopsy supports USG examination in reaching an accurate diagnosis by either supporting or contradicting the ultrasound diagnosis.[2,6,7]

There are only few studies on fetal autopsy, especially concerning genetic etiologies of fetal loss.[3] Hence present study is undertaken to study and categorizing the various congenital anomalies according system wise involvement and to correlate these lesions with radiological findings wherever available.

MATERIALS AND METHODS

The present study done retrospectively at department of pathology, Adichunchanagiri institute of medical sciences, Mandya from 2018 to 2022. All post-mortem examinations were carried out with prior written consent. Clinical and radiological data was collected from the request forms. Each fetus was examined according to a predesigned protocol which included a photograph, whole body radiograph, and external and internal examination. Corresponding histopathological examination of the relevant tissue was carried out according to the requirement in individual cases. Wherever available placental examination was carried out. A chromosomal analysis was performed whenever fresh tissue was available. Comparison of the ultrasound diagnosis and post-mortem diagnosis were done to look for any disagreement where ever available. Finally, statistical analysis was done using SPSS software. Descriptive statistics like frequency, mean and median were calculated. Finally, anomalies were categorized system wise.

RESULTS

Present study included 85 cases of which 56 (65.8%) were male and 29 (34.1%) were female fetus with male to female ratio of 1.9:1. Most of the cases were from second trimester (89.4%). Fetal weight ranged between 50 and 1500 grams. Maternal age of these fetuses ranged between 18 and 38 years, however fetal anomalies were common in individuals of second decade (74.1%).

Out of 85 fetal deaths, 45 (52.9%) were from primigravida and 40 (47%) were from multigravida. Previous history of abortion was there in 19 cases, among which one case had a history of four repeated abortions, 3 cases had two abortions and remaining 15 cases had single abortion history.

Maternal risk factors were present in 6 cases which includes diabetes (2 cases), hypertension with preeclampsia (one case). Anhydramnios (2 cases) and oligohydramnios (one case).

Method of termination of pregnancy includes Medical termination of pregnancy in 60 cases, 24 cases had spontaneous abortion and for one exploratory laparotomy was done due to intrauterine fetal death and rupture of right cornua of uterus.

Prenatal USG findings were available in 74 cases. USG were normal in 27 cases and the remaining 47 cases showed various anomalies.

Histopathological examination was done for all cases. It revealed congenital anomalies in 47 cases (55.29%) and 38 (44.7%) cases were unremarkable.

Out of 47 cases, majority (43 cases: 91.5%) showed external anomalies and 4 cases showed isolated internal anomalies. Commonest external anomaly was spina bifida (Fig. 1A and 1B), followed by Anencephaly (Fig. 1D), Exencephaly (Fig. 1C), club foot, macrocephaly, omphalocele (Fig. 1E), single umbilical artery and a case of phocomelia (Fig. 1F). Most of the cases showed multiple anomalies. Internal anomalies were as follows a case of absent kidney, transposition of great vessels, common artery supplying both the ventricles and ventricular septal defect.

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Fig. 1: Gross photograph of Spina bifida (A and B), Exencephaly (C), Anencephaly(D), Omphalocele (E) and Phocomelia(F)

On categorizing the anomalies into system wise involvement, central nervous system (CNS) was most common involvement followed by multisystem involvement which are summarized in Table 1.

Table 1: System wise distribution of cases

Sl. No	System wise	No. of cases
1	CNS	20(23.8%)
2	Multisystem	09 (10.6%)
3	Musculoskeletal	07 (8.2%)
4	GIT	03 (3.53%)
5	CVS	03 (3.53%)
6	Lymph-vascular	04 (4.7%)
7	Renal	01 (1.2%)
8	No abnormality	38 (44.7%)
-	Total	85

Table 2: Distribution of cases according to the autopsy findings

SI NO	Gross changes	Number of cases
1	Absent kidney	1
2	Anencephaly	4
3	Anencephaly & Spina bifida	1
4	Anencephaly, Spina bifida and omphalocele	1
5	Bilateral club foot	4
6	Common artery supplying both ventricles of the Heart	1
7	Cyclops,Proboscis , low set ears, webbing of neck, ill formed mouth	1
8	Cystic sac like structure seen in neck.	3
9	Exencephaly and cleft lip	1
10	Low set ears, cervical lordosis, syndactyly, Macrocephaly	1
11	Low set ears, wide palpebral fissure and broad epicanthic fold. Altered palmar crease and bent little finger	1
12	Macrocephaly, Low set ears, Short neck and Kyphoscoliosis	1
13	Macrocephaly, Low set ears, Short neck, Spina bifida and Kyphoscoliosis	1
14	Macrocephaly, Hyper extension of neck, Absence of cervical vertebra, Short neck, Omphalocele, Spina bifida and Kyphoscoliosis, left leg valgus deformity.	1
15	Scoliosis of upper thoracic spine	1
16	Phocomelia	1
17	Omphalocele	3
18	Polydactyly	1
19	Spina bifida	14
20	Spina bifida with Varus deformity	1
21	Single umbilical artery	1
22	Single umbilical artery with Syndactyly in right upper limb, Polydactyly in right lower limb and cyst in abdominal cavity.	1
23	Transposition of great vessels, Atrial septal defect	1
24	Ventricular septal defect with right ventricular hypertrophy	1
25	No abnormality	38

On microscopic examination majority of cases showed features of myelomeningocele (10 cases, Fig. 2A) followed by meningocele (7 cases), cystic hygroma (3 cases, Fig. 2B), single umbilical artery (3 cases) and a case of megacystitis.
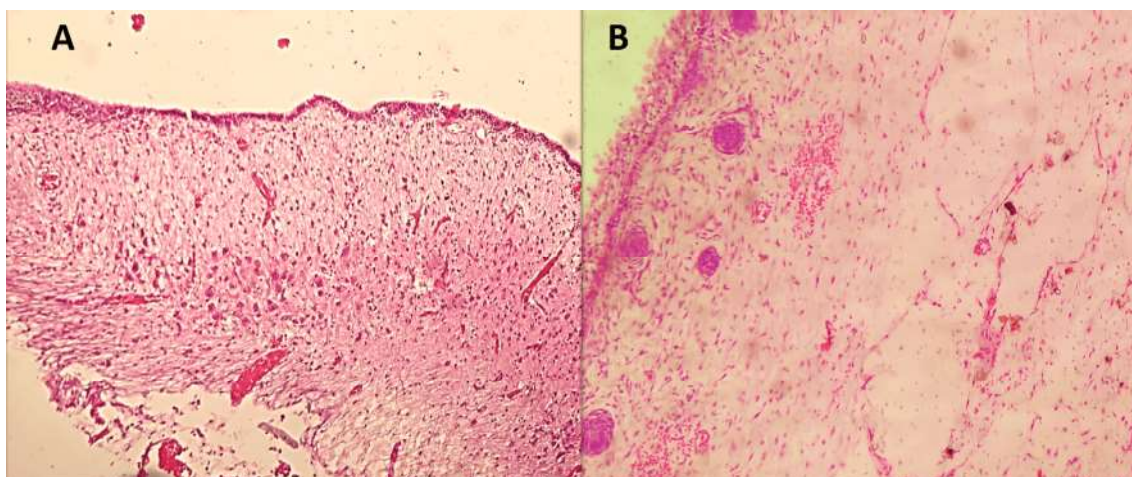
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Fig. 2 A and B: Microphotograph of Meningocele(A) and Cystic hygroma(B): H &E X100

As a result of the lack of placental tissue, placental investigation was not possible in all cases. A case of chorioamnionitis and placental insufficiency was observed in our study.

In two cases, karyotyping was available. A final diagnosis of Down syndrome and Patau syndrome (Fig. 3) was made using the combined results of a USG and a histopathological examination and confirmed by karyotyping results.
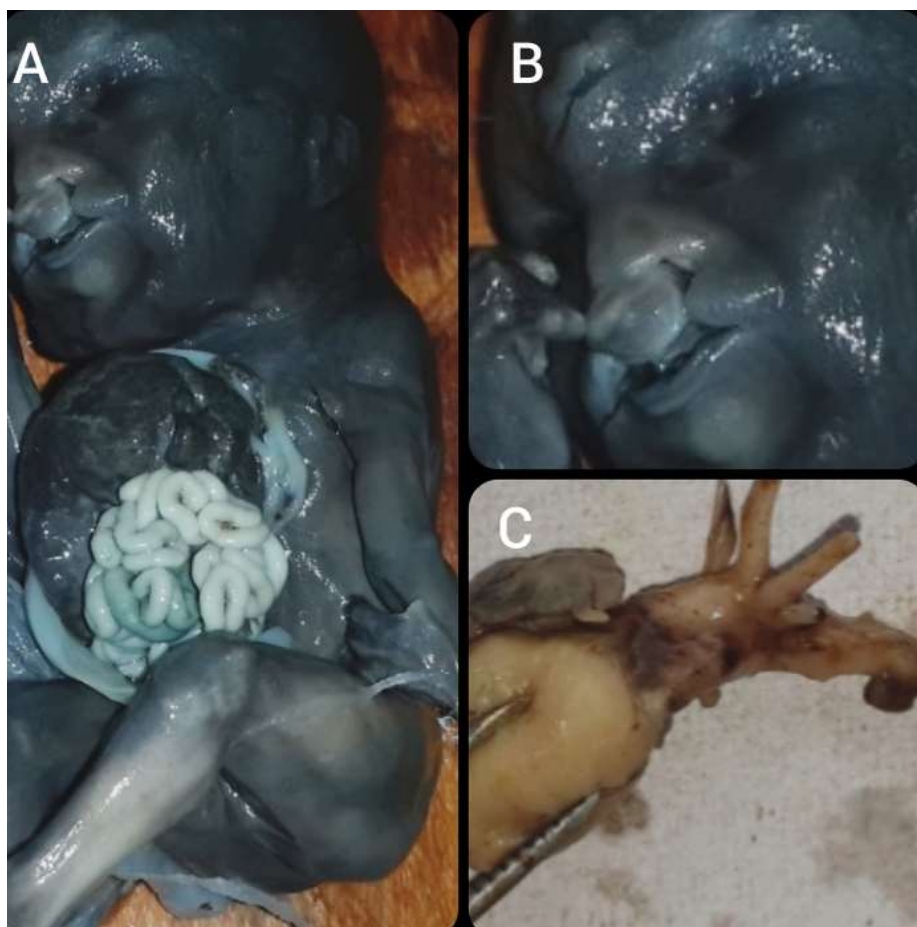

Fig. 3: (A) Gross photograph of Patau syndrome omphalocele with protrusion of liver and intestine coils, (B) cleft lip and cleft palate, (C) Coarctation of aorta

DISCUSSION

Fetal loss is a common clinical issue, and the family needs to know the reason for the loss of the child. Fetal autopsy significantly contributes to the diagnosis of intrauterine fetal death and congenital anomalies.[3] Now a day, fetal autopsies are declining due to recent advances in imaging techniques that are able to detect the majority of anomalies, however fetal autopsy remains the gold standard to confirm these anomalies.[2,3,8]

Fetal autopsies also help in predicting the recurrence risk and there by helps in counselling the parents in preventing similar mishaps in subsequent pregnancies.[2]

In the present study 85 cases were included with male to female ratio of 1.9:1. Our results were concordant with study done by Pusha B et al[8], PA Boyd et al.[9]

In the present study USG findings were available for 74 cases. Of which 27 cases (36.5%) showed normal USG and corresponding autopsy findings were also normal. 47 cases showed changes in USG. Out of 47 cases, for 45 cases (60.8%) fetal autopsy revealed additional changes and for the 2 cases (2.7%) findings in USG were not identified on fetal autopsy. This is in similar to study done by Shankar P et al[3] and Andola et al.[10] In contrast, study done by Grover et al[11] and Vankataswamy et al[2] showed discordant cases of 25 and 33 percent.

CNS was the major system involved followed multisystem and musculoskeletal system which was similar to Pusha B et al[8], PA Boyd et al[9], Venkataswamy et al[2], and Groover et al.[11]

Majority of the anomalies were identified on gross examination of fetus hence microscopic examination of fetal organs is of limited usefulness in fetuses with malformations.[3,12] In present study 60 cases were unremarkable histology and 25 cases showed microscopic changes.

In the present study, Maternal causes for fetal loss were as follows chorioamnionitis, Anhydramnios, maternal hypertension with placental insufficiency and rupture of right cornua of uterus.

Histopathology, especially of placenta, is of great importance in cases without malformations and may provide cause of fetal death.

We could able to get chromosomal karyotyping for 2 cases. One case was Trisomy 13 (Patau syndrome) which is rare and most severe autosomal trisomy which occurs one in 15000 live birth and it is associated with multisystem abnormality.[13-16] This case was diagnosed in 24-year-old primi with 19 week of gestation with radiologically diagnosed as anomalous baby with multiple anomalies and for this karyotyping was done to confirm the diagnosis of Patau (Fig. 3). On gross there was cleft lip (Fig. 3B), short webbed neck, swelling in neck, low set ears, omphalocele with protrusion of liver and intestine (Fig. 3A), absent forearm bones, absent digits, coarctation of aorta (Fig. 3C) and single umbilical artery. On microscopy there was Cystic hygroma. (Fig. 2B)

Another case presented in 35-year-old with previous abortion history. On examination low set ears, wide palpebral fissure, broad epicanthal fold, single palmar crease, bent little finger of right hand and single umbilical artery was noted which was consistent with Down syndrome. Incidence of Down syndrome 1 in 1000 to 1 in 7000 live birth. Incidence increases with increase in maternal age so all women should be screened by noninvasive methods and definitive diagnosis is made by karyotyping and molecular cytogenetic.[17]

Phocomelia is a rare congenital defect defined by absence of intermediate segments of extremities.[18,19] We had a case of phocomelia (Fig. 2F) in a 28-year-old multiparous women with previous history of abortion. There was no significant history of drug intake or radiation exposure.

The rate of autopsies has been declining recently, despite the fact that it is the best way to determine the cause of fetal death.[3,20]

The cause of fetal loss can be determined by fetal autopsy, which is useful for the couple's genetic counselling. This retrospective analysis of 85 instances supports this claim and also helps in documenting the relative occurrence of various congenital anomalies.

CONCLUSION

Some of the anomalies will still go unnoticed even with the development of better imaging technology and skilled sonologist. Fetal autopsy plays a role to giving an additional information that can be minor or major which might modify the recurrence risk in subsequent pregnancy compared to abnormalities detected by imaging technique alone. Since, Fetal autopsies are not routinely practiced in India, there is need to create awareness among Obstetricians and Pediatricians about the need of fetal autopsy

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and placental histology to identify and confirm congenital malformations and to prevent further mishaps with proper genetic counseling.

Hence, the current study reemphasizes the necessity of prenatal autopsy even in the era of improved imaging techniques.

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