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Fetal Autopsies and its Significance: A Tertiary Care Center Study

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Abstract

Introduction: Perinatal mortalityworldwide accounts for about 53/1000 total births [1], in which preterm births contribute to a major proportion, followed by other fetal, placental and maternal factors [2]. Hence, analyzing the perinatal deaths by a detailed postmortem examination is indispensable in identifying the specific disorder for which targeted strategies could be implemented for prevention in further pregnancies and counseling regarding the risk of recurrence. *Aims*: 1. To analyze the spectrum of etiologies which account for the fetal death. 2. To study the various congenital anomalies 3. To correlate the pathological diagnosis with antenatal ultrasound findings and karyotyping wherever feasible. *Materials and Methods*: Fetal autopsies were performed on all deceased fetuses received in the Department of Pathology over a period of 4 years from June 2012 to June 2016. A total of 65 cases were included in this retrospective study. The findings were correlated with available antenatal ultrasound findings and with karyotyping reports wherever feasible. *Results*: Of the 65 cases, the predominant cause of fetal loss was found to be due to MTP following congenital anomalies in 26 cases (40%), then by intrauterine deaths in 24 (36%), ARDS with perinatal asphyxia in 8 (12%), spontaneous abortionsin 5 (7%) and miscellaneous conditions in 2 cases (5%). Male fetuses were found to be more affected (62%) than females (38%). A 90% correlation between antenatal USG and pathological diagnosis was found. In 6 out of 65 cases which had karyotyping reports, 66% correlation was noted. *Conclusion*: The present study proves that an organized postmortem examination of the fetus helps in identifying the cause of death which along with appropriate antenatal history, radiological findings and karyotyping would give a definitive diagnosis and aids in estimating its risk of recurrence.

Keywords: Congenital Anomalies; Karyotyping; Perinatal Death.

Introduction

The fetal and neonatal (perinatal) mortality serve as the most sensitive indicators of maternal and neonatal care in the country [3]. The cause of fetal death worldwide is attributed largely to congenital anomalies accounting for 25-30% in developed countries and 10-15% in developing countries like India followed by placental factors, perinatal infections and associated maternal comorbidities [4]. The incidence of major congenital malformation is 3% and that of multiple congenital malformations is about 0.7% [5]. The recurrence risk of these disorders varies from negligibly low to 25%, depending on the genetic component in the aetiology of the disorder [6]. The growing awareness and wider availability of prenatal diagnostic modalities contribute to early identification of congenital anomalies and thereby ascertain timely intervention and aid in counseling parents regarding the risk of recurrence of similar events in future pregnancies [3].

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Materials and Methods

It is a retrospective study, conducted in the Department of Pathology. All deceased fetuses received from the Departments of Obstetrics and Neonatology

during a period of 4 years, from June 2012 to June 2016 were included in the study.

A total of 65 cases which contained fetuses from 22 weeks of gestation to newborns were included. In all the cases, an informed written consent was obtained from the biological parents.

A detailed anthropometric, external and internal examination and documentation of the same followed by enbloc removal of organs and their examination was done. Representative sections were taken from all the major organs including placenta and umblical cord and subjected to microscopic examination. Thus, arriving at the final histopathological diagnosis.

The findings were correlated with available antenatal ultrasound findings and with karyotyping reports wherever feasible and the accuracy was determined.

Results

A total of 65 cases were included in the study which comprise of fetuses from 22 weeks of gestational age to term babies who had expired due to various factors. Extensively autolysed and macerated fetuses we received were excluded from the study.

We analysed the maternal factors which might have caused the fetal death in terms of parity index and any associated comorbidities in the mother during pregnancy. The analysis showed following results in Table 1 and Table 2.

In our analysis, we found that male fetuses were more prone to perinatal deaths than females accounting for 61% (40 cases) and 39% (25 cases) respectively.

The clinical cause of death was studied in all the cases and showed a wide spectrum of causes shown in Table 3.

In the 65 cases we examined, 39 fetuses (60%) were <28 weeks of gestational age, 20 (30%) were between 28-37 weeks of gestation and only 6 (10%) were >37 weeks of gestation which agrees with the statement that the most common clinical cause of death was MTP done following the anomaly scan during the second trimester of pregnancy.

We also found that most of the fetuses weighed <1.5kgs accounting to about 78% (51 cases), 15% (10 cases) of them weighed between 1.5-2.5kgs and only 7% (4 cases) were over 2.5kgs.

The antenatal USG findings were analysed elaborately and we obtained a wide range of congenital anomalies which included both single and multisystemic malformations, shown in Table 4.

Besides the available clinical, antenatal and radiological findings, the detailed histopathological examination of each fetus was crucial in all the cases and we could identify numerous congenital malformations of various organs and other causative factors of fetal demise on gross and microscopic examination, as shown in Table 5.

Out of the 65 cases, 6 of them had karyotyping done which confirmed 2 cases of Down's syndrome with 47,XY, +21 , Trisomy 21 and one case each of Edward 47,-, +18 and Patau syndrome 47,XY, +13.

The various congenital and acquired lesions seen the fetal autopsies on gross examination include Fetus papyraceous (Figure 1), Lumbar meningocele (Figure 2), Miliary Tuberculosis of lungs (Figure 3), Congenital diaphragmatic hernia (Figure 4), Agnathia Otocephaly Complex (Figure 5) and Univentricular heart (Figure 6). The various findings on microscopy include Ganglioneuroblastoma of adrenal gland (Figure 7), CMV Cytopathic effect (Figure 8), Exhuberant extramedullary hematopoiesis in lung vasculature (Figure 9) and Cystic renal dysplasia of kidney (Figure 10).

Fig. 1: Fetus papyraceus

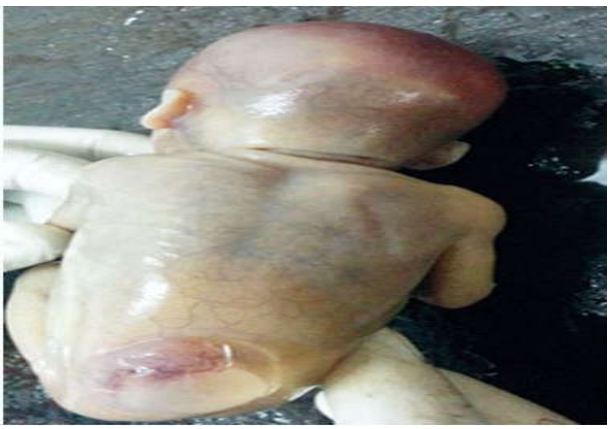

Fig. 2: Lumbar meningocele

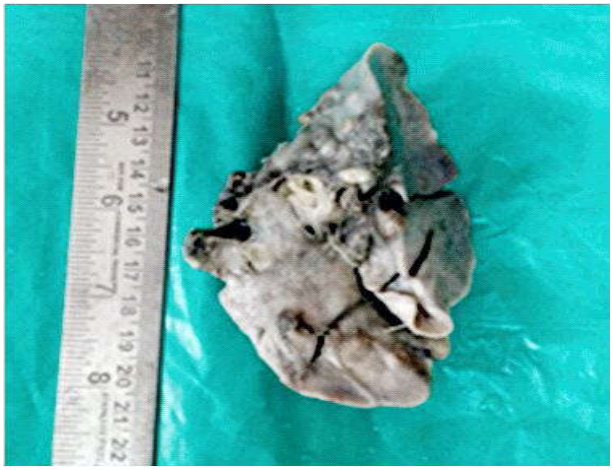

Fig. 3: Miliary Tuberculosis lung

Fig. 4: Congenital diaphragmatic hernia

Fig. 5: Agnathia Otocephaly Complex

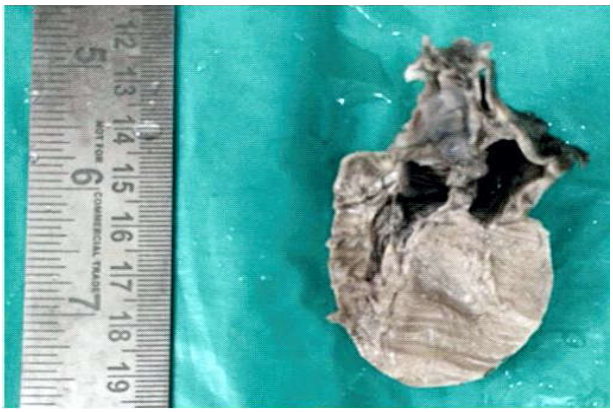

Fig. 6: Univentricular heart

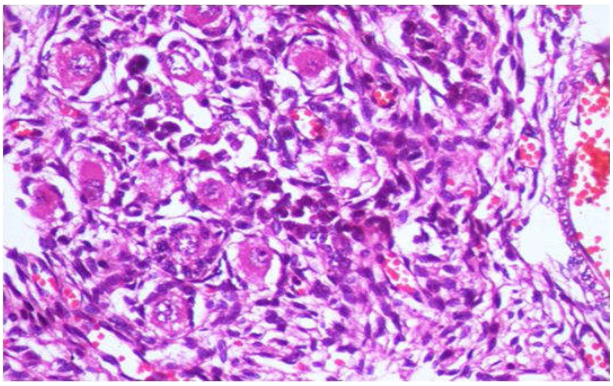

Fig. 7: Photomicrograph showing Ganglioneuroblastoma of adrenal gland (H&E, X 200)

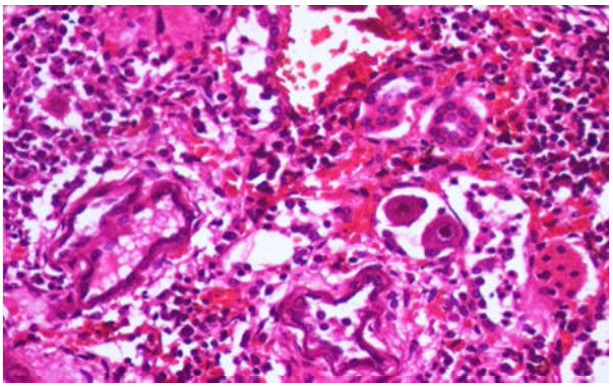

Fig. 8: Photomicrograph showing CMV cytopathic effect in kidney (H&E, X 200)

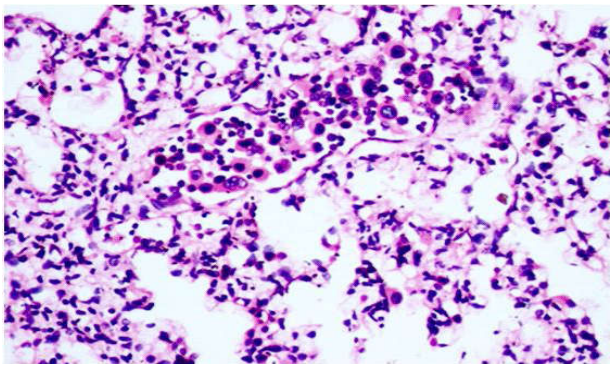

Fig. 9: Exhuberant extramedullary hematopoiesis in lung vasculature (H&E, X 200)

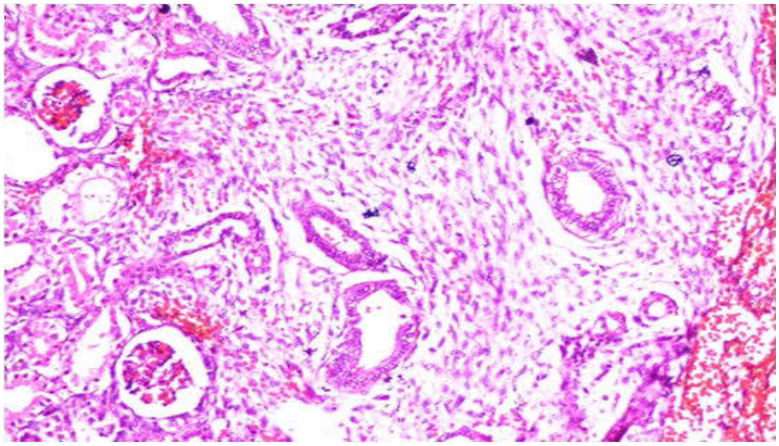

Fig. 10: Photomicrograph showing Cystic renal dysplasia of kidney (H&E, X 200)

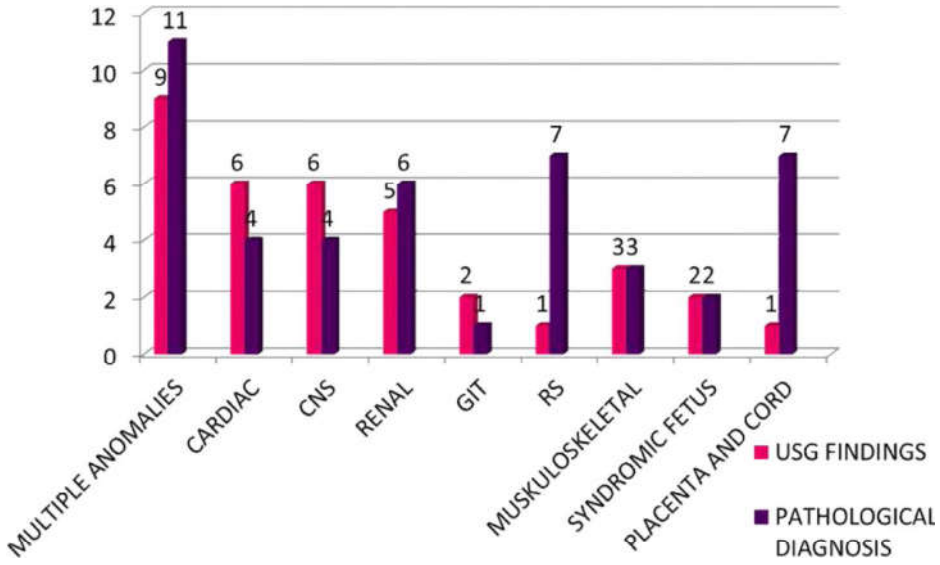

Fig. 11: Showing comparison of Antenatal USG reports with Autopsy findings

Table 1: Shows primigravida mothers having higher rates of poor pregnancy outcome

Parity Index of Mother	No. of Cases
Primi	35 (54%)
Second Gravida	18 (28%)
Third Gravida	12 (18%)
Total	65

Table 2: Shows spectrum of maternal comorbidities associated with fetal loss in our study

Condition	No. of Cases
No known comorbidity	51 (79%)
Bad obstetric history	4 (6%)
Gestational diabetes mellitus	2 (3%)
Hypertension	1 (1.5%)
Pre-eclampsia / eclampsia	2 (3%)
Hypothyroidism	2 (3%)
Epilepsy	1 (1.5%)
Uterine anomaly	1 (1.5%)
Rh negative mother	1 (1.5%)

Table 3: Shows MTP due to conception of an anomalous fetus to be the most common cause of fetal demise in our study

Cause of Death	No. of Cases
MTP (anomalous baby)	26 (40%)
Intra uterine death	24 (37%)
Spontaneous abortion	5 (8%)
Birth asphyxia / ARDS	8 (12%)
Perinatal infections	1 (1.5%)
Birth trauma	1 (1.5%)

Table 4: Spectrum of anomalies identified on Antenatal USG

Finding	No. of Cases
No anomaly detected	15 (22%)
Complex cardiac anomaly	6 (10%)
CNS anomalies	6 (10%)
Renal anomalies	5 (7.5%)
GIT anomalies	2 (3%)
Respiratory system anomalies	1 (1.5%)
Placenta and umbilical cord	1 (1.5%)
Multi-systemic anomalies	9 (13.5%)
Non-immune hydrops	2 (3%)
Multiple gestation with IUGR	2 (3%)
Muskuloskeletal system	3 (4.5%)
Syndromic fetuses (Down's syndrome)	2 (3%)
Intra uterine death	6 (10%)
Intra Uterine Growth Retardation	5 (7.5%)
Total	65

Table 5: Spectrum of anomalies identified on histopathological examination

Finding	No. of Cases
No anomaly detected	16 (24%)
Complex cardiac anomaly	4 (6%)
CNS anomaly	4 (6%)
Renal anomaly	6 (10%)
GIT	1 (1.5%)
Respiratory system	7 (11%)
Placenta and umbilical cord anomalies	7 (11%)
Multisystemic anomalies	11 (17%)
Non immune hydrops	1 (1.5%)
Multiple gestation with IUGR	2 (3%)
Musculoskeletal system	3 (4.5%)
Syndromic fetuses (Downs syndrome)	2 (3%)
Exuberant extramedullary hematopoiesis in multiple organs leading to thromboembolism	1 (1.5%)
Total	65

Discussion

Fetal autopsies contribute significantly to the diagnosis of cause of perinatal deaths [7]. The primary motive behind conducting such autopsies is to look out for congenital malformations / maldevelopment of the various organs and structures in the fetuses which might have made them incompatible for life.

In our study, a total of 65 cases were examined during a period of 4 years. The maternal factors we considered (Table 1) showed that primi gravid mothers had more chances of delivering an anomalous fetus (54%) compared to multi gravida women. It also showed that there was association between existing maternal comorbidities and poor pregnancy outcome (Table. 2). These results match with the study by Naik V et al.

The fetal factors analysed showed male fetuses to be more commonly affected than females and agrees with the study by Prabhala et al. In 13 out of 65 cases (20%), intrauterine growth retardation was noted and rest 80% of them were adequate for gestational age.

The most common cause of fetal demise in our study was found to be due to congenital anomalies

accounting for 70.70% (46 cases), agrees with the study by Kapoor et al. Out of the various congenital anomalies identified, multisystemic anomalies were found to be predominant accounting for 17% of the cases, followed by anomalies of the respiratory system accounting for 11% of the cases which include newborn respiratory distress syndrome and congenital diaphragmatic hernia. Renal anomalies contributed to 10% of the cases comprising of uni/bilateral renal agenesis and congenital cystic renal dysplasia. These results did not correlate with the studies from other authors who found that CNS anomalies comprising of neural tube defects to be the most common congenital anomaly.

The histopathological diagnosis was analysed with the antenatal USG reports and found that there was a 90% correlation between the two, as shown in Figure 11.

The bar chart shows that USG findings were found to be more precise in detecing dynamic cardiac anomalies than autopsy. CNS anomalies in a few cases could not be picked up during autopsy due to extensive autolysis of the brain parenchyma at the time of examination. However, autopsy examination proved to be beneficial in several other circumstances, as in detecting renal anomalies like cystic renal dysplasia and in detecting placental and umbilical cord anomalies. In a total of 7 cases, 3 placental infarcts, 1 case of single umbilical artery, 2 with retroplacental hematoma and 1 with umbilical artery thrombosis was identified.

Though autopsy is the best method to detect cause of perinatal death, there has been a decline in autopsy rate due to issues surrounding retention of tissues and organs for diagnostic studies, teaching and research [12,13].

The various other options available for investigating the case include Post mortem imaging to study structural information of the central nervous system in fetuses and stillbirth neonates [14,15].

Conclusion

In the present study, the most common cause of fetal death was found to be due to congenital anomalies, in which the number of fetuses <28 weeks gestational age were proportionately more, due to MTP or spontaneous abortions. Male fetuses were more commonly affected than females. Multisystem anomalies were found to be more common. The autopsy diagnosis showed 90% correlation with antenatal ultrasound findings. Karyotyping aided in confirming genetic syndromes like Down's in a few cases. As fetal and perinatal mortality serves as a most sensitive index of neonatal and maternal care, critical analysis is essential in every condition.

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