# Birth Defects in Newborns: A Prospective Observational Study from a Rural Tertiary Care Teaching Hospital of Central India

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### Abstract

*Introduction:* Worldwide, the incidence of congenital anomalies is estimated at 3–7%, but actual numbers vary widely between countries. There is a paucity of Indian literature on birth defects. *Aims and objectives: (*1) To Study the Proportion of birth defects in live births in a tertiary care teaching hospital in rural central India. (2) To follow-up these birth defects for a period of 2 months and to study the outcome. *Materials and methods:* In this prospective observational study every live birth was screened by clinical examination and further relevant investigations. Study subjects were all live births in the calendar year 2015. Telephonic follow-up was undertaken at 2 months of age. *Results:* A total of 4493 neonates were born, out of which 127 babies had birth defects. The total number of individual birth defects was 153 (3.4%). The most common system involved was cardiovascular system. *Conclusion:* Early detection is essential for proper management of these defects and offers the best chance for survival. Follow-up of babies' birth defects is highly recommended. Standard guidelines advocacy and policies at national level are needed. In resource-limited setting the novel way of telephonic follow-up is highly beneficial and economical.

**Keywords:** Newborns; Birth defects; Babies; India; Neonates.

## Introduction

Although the global incidence of congenital anomalies remains 3–7%, it may have geographic variations.[1] In the United States and Canada where congenital anomalies are diagnosed intrauterine and aborted, the incidence ranges from 2–5% of all live births.[2,3] Even in Asia, the magnitude of congenital anomalies varies with reported incidence at birth of 2.5% of infants in India. Early diagnosis and treatment of all birth defects is of clinical and public health importance. It is important to do epidemiologic surveys of congenital anomalies in developing countries like India that host a wide variety of environmental factors, socioeconomic status and ethnic groups with varying marital habits. In this context, our paper aims to study the proportion of birth defects in live births in a tertiary care teaching hospital in rural central India and follow them up for a period of 2 months for the outcome.

## Materials and Methods

This prospective observational study was conducted wherein every live birth was screened by clinical

examination. Suspected cases underwent relevant investigations (ultrasonography of abdomen and pelvis for newborns with suspected gut or renal anomalies, neuroultrasonography for suspected hydrocephalus. 2D echocardiography for suspected congenital heart diseases; etc.) All live births at the hospital from January 1, 2015 to December 31, 2015 were included the study.

A pre-designed, pre-tested questionnaire was used to collect socio-demographic information and clinical examination in all live births was done to screen for birth defects. Initial section of the study tool included socio-demographic details of family. Second section had questions regarding antenatal history, treatment received, weight and height, head circumference of the neonate. Third section had questions related to parental age, gestation, relevant description of the birth defect by the international classification of diseases (ICD-10). At 2 months of age a follow-up call undertaken which included discussion regarding the current health status of the baby, enquiry about the reports of any pending/newly done investigations, and immunization status.

## Results

Over the period of one year a total of 4493 neonates were born, out of which 127 presented with birth defects. The total number of individual congenital anomalies found in these neonates was 153. The proportion of birth defects among the inborn live births was 3.4%. Gender distribution showed male preponderance of 1.6:1. Interestingly, majority (39.37%) of anomalies were noted in neonates weighing more than 2.5 kg. About 39.36% of mothers giving birth to children with congenital anomalies were in the age group of 21–25 years. Only 3.94% of the mothers were aged more than 35 years and 14.17% of the mothers were below the age 20. Also, 86.62% of fathers giving birth to children with congenital anomalies were in the age group 24–40 years. Only 2.36% were more than 40 years, while 11.02% were younger than 24 year of age.

Most of the newborns had vaginal delivery (55.12%) as compared to Caesarean section (40.16%) and forceps (4.72%) deliveries. However, 15 babies died before the age of 2 months. The most common system involved was the cardiovascular system (30.7%) followed by the urinary (21%), musculoskeletal (13%), genital, gastrointestinal and central nervous systems (Fig. 1). Overall, congenital heart disease was the most common birth defect observed in our study. The next common birth defects were congenital hydronephrosis, polydactyly and congenital tallipes equinovarus, in that order.
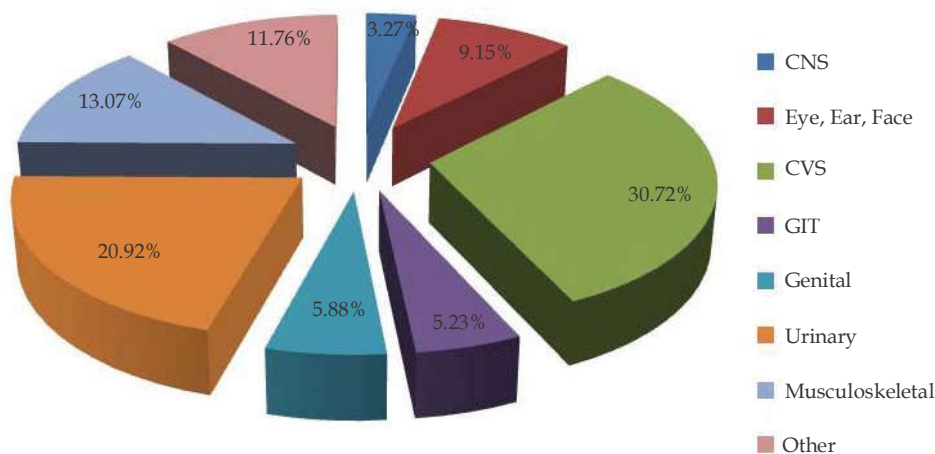


**Fig. 1:** Systemic distribution of birth defects; CVS- cardiovascular system, CNS- central nervous system.

## Discussion

In this hospital-based observational study the fraction of birth defects was found to be 3.4%. In our study male children outnumbered the female (60.63% and 37.80%, respectively), and the remaining 1.57% babies' gender was ambiguous.

The male: female gender distribution of 1.5:1 found in our study is comparable to the study conducted by Bakare et al. where the ratio was reported to be 1.55:1.[4] Male preponderance for congenital anomalies has been reported in many studies.[1,5,6] The male preponderance for congenital anomalies is thought to be due to their greater vulnerable to oxidative stress.[6]

**Table 1:** Follow-up of the babies with birth defects (after 2 months)

| Follow-up | Result | No. of babies | Percentage (%) |
|---|---|---|---|
| Current health status | Satisfactory | 58 | 51.8 |
| | Unsatisfactory | 4 | 3.6 |
| | Not applicable | 50 | |
| | Lost to follow-up | 47 | 41.6 |
| | Death | 3 | 3.0 |
| | **Total** | **112** | **100.0** |
| New report | Yes | 27 | 24.0 |
| | No | 85 | 76.0 |
| | **Total** | **112** | **100.0** |
| Immunization status | Up to date | 65 | 58.0 |
| | Not up to date | 0 | 0.0 |
| | Lost to follow-up | 47 | 42.0 |
| | **Total** | **112** | **100** |
| Outcome | Death after discharge | 3 | 2.6 |
| | Alive | 62 | 55.4 |
| | Lost to follow-up | 47 | 42.0 |
| | **Total** | **112** | **100.0** |
| Lost to follow-up | Yes | 47 | 42.0 |
| | No | 65 | 58.0 |
| | **Total** | **112** | **100.0** |

It is interesting to note that in this study, 44.1% of congenital anomalies were in lowbirth weight babies. Several studies report a significant association between low-birth weight and congenital anomalies.[6–8] Recently, Sarkar et al. reported that the incidence of congenital anomalies was significantly higher in preterm babies as compared to the full-term babies.[9] In our study, however, 78.74% of the newborns were delivered after 36 weeks of gestation and only 21.26% were preterm, less than 36 weeks of gestation. This could be attributed to the fact that our study was exclusively for "in-born" babies, most of whom were planned deliveries.

Furthermore, in our study, the mode of delivery also showed a difference among the neonates with congenital anomalies; they were more common for normal deliveries (55.12%) than for Cesarean section (40.16%) and forceps deliveries (4.72%). However, this is in contrast with another study where mode of delivery had a statistically significant association with congenital anomalies where Caesarean section was more common than normal delivery.[9]

As such, we have found that the frequency of congenital anomalies was highest in mothers aged between 21 and 24 years (39.36%). Suguna et al. also reported rising incidence of congenital anomalies with advancing maternal age.[10] But in our study, advanced age of the mother did not seem to influence the frequency of malformed babies. This, also, is in accordance with a similar study conducted by Taksande et al. in which it was observed that the mothers of babies with congenital anomalies were mostly (90.49%) between 20 and 30 years of age and that women less than 20 years had 1.11% babies with congenital anomalies, and in 8.40% babies with birth defects the mothers were more than 30 year-old.[11] Similarly, as reported by Agrawal et al., 68.75% mothers of newborns with congenital anomalies were in age group 20–35 years and only 12.5% cases were under 20 years.[12] Other researchers also published analogous findings in this regard.[13–15]

The frequency of congenital anomalies was highest in fathers aged 25–29 years. In this study no significant association was found between paternal age and occurrence of congenital anomalies. Interestingly, several studies have found advanced paternal age as well as younger age groups to be at risk of congenital anomalies. With regard to the pattern of congenital anomalies in our study, the most common single system involved was cardiovascular system. And, the commonest birth defect reported was congenital malformations of heart. This was found to be in accordance with the available literature.[11,16]

Follow-up has been the unique part of this study. Two-month time frame was specifically designed

to cover the parameter of immunization at 6 weeks of age in the follow-up; this provided us a useful indicator. However, on literature search we could not find any similar study that included follow-up, results of which could be compared with our study. The following specific parameters were collected for study during follow-up: current health status, new reports, immunization status, and outcome and lost to follow-up.

Overall, we would like to underscore the following:

(1) Despite having high incidence of congenital malformations, there are no well-accepted preventive measures in developing countries like India. It indicates that strong preventive measures, in that regard, are the need of hour.

(2) Increasing awareness about maternal care during pregnancy and awareness programs on congenital malformations need to be highlighted to decrease the incidence of congenital anomalies and the associated co-morbidities.

(3) Regular antenatal visits and prenatal diagnosis for prevention, early intervention and even medical termination of pregnancy should be systematically encouraged.

(4) Conventionally, ultrasound scans are generally done at the 20th week of gestation and 37th week of gestation. However, additional scans at 12th week, that are capable of diagnosing plethora of birth defects, need to be taken into available protocols.

(5) Role of fetal echocardiography in detecting cardiovascular birth defects should be emphasized for early diagnosis, effective intervention and better prognosis.

(6) The study strongly recommends the role of follow-up in studying the status of babies with birth defects and also brings forth the need of standard guidelines advocacy and policies at national level.

## Conclusion

The proportion of congenital anomalies was 3.4% among all live births in our hospital in the year 2015. The most commonly affected system is the cardiovascular system, followed by urinary system and musculoskeletal system. Early diagnosis and correction of the malformed babies could offer them the best chance for survival. Also, antenatal

awareness of both parents regarding optimal screening may reduce the overall incidence of these malformations. Further multi-centric studies are needed to substantiate these findings.

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