

Congenital Anomalies in Desse Referral Hospital, the Amhara Region, Northeast Ethiopia

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Received: September 26, 2020; **Published:** January 23, 2021

Abstract

Introduction: Congenital anomalies are defined as structural and functional anomalies that develop during the organogenesis period. Basically, congenital anomalies cause morbidity and mortality. According to the literature, genetic and environmental factors play a major role in the formation of congenital anomalies during the body organs developing period.

Objective: The main objective of this study was to investigate prevalence of congenital anomaly in Desse referral hospital, the Amhara region, Northeast Ethiopia.

Methods: A cross sectional study design was used for this study. The sample size was all children with congenital anomalies during the study period. All children of 0 - 14 years old who visited the study hospital for medical care and treatment were screened for congenital anomalies. Children with confirmed diagnosis of congenital anomalies, and their mothers who volunteered and gave consents to participate in the study on behalf of their children were included in the study irrespective of their age and ethnicity. A structured closed and open-ended questionnaire was designed for the study. Descriptive analysis was done by computing frequency and cross tabulation. Significance level was considered when the p-value is < 0.05. The findings were compared to those of other similar prevalence studies on congenital anomalies in local and some countries of the world. The results were presented in the form of texts and tables.

Results: The overall prevalence of congenital anomalies were 4.4%. Out of the 160 children with congenital anomalies, 58.8% were male. The majority (54.4%) of the children were rural dwellers. Among the anomalies prevalence of neural tube, musculoskeletal system and syndrome disorders were 64.4%, 14.4% and 14.4%, respectively.

Conclusion: In this study, prevalence of congenital anomaly was higher. Therefore, the Amhara regional state health bureau should take public health actions.

Keywords: *Congenital Anomalies; Desse Referral Hospital; Neural Tube, Musculoskeletal System*

Introduction

Congenital anomalies are defined as structural and functional anomalies that develop during the organogenesis period. Congenital anomalies can be detected during birth or later in life [1-6]. Basically, these anomalies cause morbidity and mortality [7]. Adding to this, congenital anomalies can occur as isolated or multiple anomalies [8] and also, it can be minor or major anomalies [4,9]. Again, congenital anomalies can be external or internal [3,10]. Besides, it can affect any part of the developing organ system.

Congenital anomalies are believed to be caused by several etiologic factors. According to the literature, genetic, and environmental factors play a major role in the formation of congenital anomalies during the body organs developing period [11]. However, the causes of most congenital anomalies are still unknown [12,13].

In the past few years, around 7.9 million children were born with congenital anomalies, which account for about 6% of all births worldwide [14]. Yearly, more than 30% of babies death and 12.3 - 30% of peri-natal fetal deaths occur globally due to congenital anomalies [15,16] Nevertheless, prevalence of congenital anomalies varies from country to country [4,17,18].

Congenital anomalies are common health burdens in developing countries and are one of the major causes of infant and child disability, morbidity, and mortality due to inadequate care services and lack of surgical repairs [1,2]. Early recognition and response to congenital anomalies often prevents serious health problems.

In many parts of Africa, most of the infants do not have immediate access to congenital anomalies care and surgical services. In order to lower morbidity and mortality, proper assessment and treatment cares are necessary [19-22]. Furthermore, the study of congenital anomalies is important to give attention and to provide comprehensive care for people who have the congenital anomalies. However, in Ethiopia congenital anomalies are not detected and treated early.

Aim of the Study

The aim of this study was to assess prevalence of congenital anomalies in Desse referral hospital, Amhara region, Northeast Ethiopia.

Materials and Methods

Study setting

This study was conducted in Desse referral hospital, the Amhara region, Ethiopia. The hospital provide various types of inpatient and outpatient services including delivery services. The hospital also has specialty departments, which offer specialized healthcare services to neonates, infants, children, and adults. In addition, the hospital has full-time working pediatricians, surgeons, obstetricians/gynecologists, interns, midwives, nurses, and other healthcare professionals.

Study design, source population and study subjects

A cross sectional study design was used for this study. The source population was all newborn babies, neonates, infants, and children less than 14 years old with or without congenital anomalies for whom healthcare was provided by the hospital. The study participants were all newborn babies, neonates, infants, and children less than 14 years with confirmed congenital anomaly.

Selection of the study hospital

The hospital was selected purposively based on caseloads. The hospital has specialty units that carried out advanced investigations and provides specialized healthcare. The hospital has modern and enough instruments for advanced investigations. It also has specialized human resources capable of offering necessary and validated information. Therefore, chances of missing the identification of congenital anomalies at this hospital is minimal.

Sample size determination

The sample size was all children with congenital anomalies during the study period. All children of 0-14 years old who visited the study hospital for medical care and treatment were screened for congenital anomalies. Children with confirmed diagnosis of congenital

anomalies, and their mothers who volunteered and gave consents to participate in the study on behalf of their children were included in the study irrespective of their age and ethnicity. The study subjects was selected purposively.

Data collection method

A structured closed and open-ended questionnaire was designed for the study. It was drafted in English and translated into Amharic for easy and understandable communications with children's mothers. Data collection began after presenting ethical clearance and supportive letters to the study hospital manager and medical director. Nurses and midwives who were working in Desse referral hospital were recruited and trained for data collection. They interviewed the eligible study subjects face-to-face and collected the data. Principal investigator managed the overall supervision and coordination. The subjects who did not agree to participate in the study were excluded. The data was collected from January - June 30, 2015.

Data quality control and analysis

To manage the quality of the data, the questionnaires were designed carefully and standardized. Pediatricians and other medical doctors confirmed the diagnosis of children's congenital anomalies. The questionnaire was pretested from other similar setting before actual data collection began. Based on the pretest results the sections of the questionnaires were revised. After the completion of data collection, principal investigator checked and re-examined the entire data to further identify and resolve any errors. Data was entered and cleaned in SPSS version 23.

Before statistical analysis, the data was coded and categorized by primary investigator. Descriptive analysis was done by computing frequency and cross tabulation. To identify associations, analysis was carried out. In addition, bi-variate analysis was done. Significance level was considered when the p-value is < 0.05 . The findings were compared to those of other similar prevalence studies on congenital anomalies in local and some countries of the world. The results were presented in the form of texts and tables.

Ethical consideration

Written ethical clearance letter was obtained from Health Bureaus of the Amhara region, Ethiopia. The ethical clearance letter was submitted to the study hospital. After obtaining permission from the hospital manager and medical director, adequate information about the aim of the study was provided for children's mothers. The study subjects were assured that, they can withdraw from the study or have a right to refuse at any time of the study period, if they need to exclude themselves from the study. Then, volunteer subjects were requested for informed written consent. Data were collected after the study subjects agreed and gave written consents. Confidentiality was maintained for all identified information.

Results

A total of 3,600 children visited the study hospital for medical care and treatment from January - June 30, 2015. Of these, 160 were detected with congenital anomalies. The overall prevalence of congenital anomalies were 4.4%. Out of the 160 children with congenital anomalies, 58.8% were male and 41.2% female with the age range of 0 - 14 years old. About 94.4% of the children were 0 - 4 years old. The majority (54.4%) of the children were rural dwellers. Among the anomalies prevalence of neural tube, musculoskeletal system, and syndrome disorders were 64.4%, 14.4% and 14.4%, respectively. The range of mother's age was between 15 - 49 years. About 12.5% of mothers were above 35 years. Of the children's mothers, 90.6% were married. Around 30.8% of the children's mothers had no formal education. The children's mothers were Amhara (85.0%), Oromo (11.3%), Afar (1.3%), Agew (1.3%), and Tigre (1.3%) by ethnicity. By occupation, 71.3% of the mothers were housewives. The majority (60.6%) of children's mothers had middle socioeconomic status. The socio-demographic characteristics of the study participants are presented in table 1.

| Variables | Frequency | Percent | |
|------------------------------------|-------------------------------------|---------|------|
| Residence | Urban | 73 | 45.6 |
| | Rural | 87 | 54.4 |
| Children Age | 0 - 4 years | 151 | 94.4 |
| | 5 - 9 years | 4 | 2.5 |
| | 10 - 14 years | 5 | 3.1 |
| Child Sex | Male | 94 | 58.8 |
| | Female | 66 | 41.2 |
| Child Mothers Age | Below 20 years | 9 | 5.6 |
| | 20 - 35 years | 131 | 81.9 |
| | Greater than 35 years | 20 | 12.5 |
| Maternal Educational Level | No education | 62 | 30.8 |
| | Primary school (1 - 8 grade) | 57 | 35.6 |
| | Secondary school and higher | 41 | 25.6 |
| Marital Status | Married | 145 | 90.6 |
| | Never married | 9 | 5.6 |
| | Divorced/widowed | 6 | 3.8 |
| Religion | Christian | 56 | 35.0 |
| | Muslim | 103 | 64.4 |
| | Others | 1 | 0.6 |
| Children Mother Ethnicity | Amhara | 136 | 85.0 |
| | Oromo | 18 | 11.3 |
| | Afar | 2 | 1.2 |
| | Agew | 2 | 1.3 |
| | Tigre | 2 | 1.3 |
| Children mothers occupation | Employee (government, private, NGO) | 9 | 5.6 |
| | Housewife | 114 | 71.3 |
| | Farmer | 21 | 13.1 |
| | Merchant | 5 | 3.1 |
| | Jobless | 11 | 7 |
| Child mother socio-economic status | Low | 50 | 31.3 |
| | Middle | 97 | 60.6 |
| | High | 13 | 8.1 |

Table 1: Socio-demographic characteristics of the study subjects, Desse referral hospital, Amhara region, Northeast Ethiopia, 2020, (n = 160).

Congenital anomalies were more prevalent in multigravidae. Some (22%) of the mothers, had greater than five pregnancies; 28% had a history of 4 - 5 pregnancies; 31% had greater than one stillbirths and 35% had greater than one miscarriages. Of the children’s birth orders, 63% were 1st order, 38% were 2nd order, 24% 3rd order, 13% 4th order, 11% 5th order, and 11% greater than 5th order. During pregnancy, 13.8% of the mothers had no antenatal care follow ups, while 41.9% started antenatal visits at 1 - 3 months of gestational age and 44.2% at 4 - 6 months (See table 2).

| Variable | | Frequency | Percent |
|------------------------------|-------------------|-----------|---------|
| Gravidity/Parity | Prim gravid | 56 | 35.0 |
| | Multi-gravid | 104 | 65.0 |
| Total number of pregnancy | 1 | 56 | 35.0 |
| | 2 - 3 | 54 | 33.8 |
| | 4 - 5 | 28 | 17.5 |
| | > 5 | 22 | 13.8 |
| Preterm | None | 139 | 86.9 |
| | 1 - 2 | 21 | 13.1 |
| Spontaneous miscarriage | None | 125 | 78.1 |
| | > 1 | 35 | 21.9 |
| Still birth | None | 129 | 80.6 |
| | > 1 | 31 | 19.4 |
| Birth Order in multigravidas | 1 st | 63 | 39.4 |
| | 2 nd | 38 | 23.8 |
| | 3 rd | 24 | 15.0 |
| | 4 th | 13 | 8.1 |
| | 5 th | 11 | 6.9 |
| | > 5 th | 11 | 6.9 |
| Antenatal Care (ANC) | Yes | 138 | 86.3 |
| | No | 22 | 13.8 |
| Gestational age at first ANC | None | 22 | 13.8 |
| | 1 - 3 months | 67 | 41.9 |
| | 4 - 6 months | 71 | 44.4 |

Table 2: Some selected reproductive history of mothers who had children with congenital anomalies in Desse referral hospital, Amhara region, Northeast Ethiopia, 2020, (n = 160).

The prevalence of congenital anomalies varies between male and female children. The occurrence of congenital anomalies by sex are presented in table 3.

| Variables | Child Sex | | | | | |
|---|-----------|-------|-----------|-------|-----------|-----|
| | Male | | Female | | Total | |
| | Frequency | % | Frequency | % | Frequency | % |
| Neural Tube Defects | 60 | 58.25 | 43 | 41.75 | 103 | 100 |
| Orofacial Clefts | 2 | 28.6 | 5 | 71.4 | 7 | 100 |
| Masculo-skeletal System Defects | 17 | 73.9 | 6 | 26.1 | 23 | 100 |
| Cardiovascular System Defects | 2 | 66.7 | 1 | 33.3 | 3 | 100 |
| Syndrome Disorders (Down Syndrome, Edward Syndrome, TAR syndrome) | 13 | 56.5 | 10 | 43.5 | 23 | 100 |
| Genitourinary System Defects | 1 | 1 | 0 | 0 | 1 | 100 |

Table 3: Prevalence of congenital anomalies by sex in Desse referral hospital, Amhara region, Northeast Ethiopia, 2020, (n = 160).

As shown in table 4, among some selected congenital anomalies by type, neural tube defects (64.4%) was the most frequent anomaly, followed by musculo-skeletal system defects (14.4%) and syndrome disorders (14.4%).

| Variables | Frequency | % |
|---|-----------|------|
| Neural Tube Defects | 103 | 64.4 |
| Masculo-skeletal System Defects | 23 | 14.4 |
| Syndrome Disorders (Down Syndrome, Edward Syndrome, TAR syndrome) | 23 | 14.4 |
| Orofacial Clefts | 7 | 4.4 |
| Cardiovascular System Defects | 3 | 1.8 |
| Genitourinary System Defects | 1 | 0.6 |
| Total | 160 | 100 |

Table 4: Frequency of congenital anomalies in Desse referral hospital, Amhara region, Northeast Ethiopia, 2020, (n = 160).

Gravidity was associated with congenital anomalies (p-value = 0.001). Similarly, birth Order of children (p-value = 0.000) were significantly associated with the occurrence of congenital anomaly. In contrast, cigarette smoking during pregnancy (p-value = 0.311) and drinking alcohol during pregnancy (p-value = 0.611) were not associated with congenital anomaly (See table 5).

| Variables | N | Mean | Std. Deviation | Pearson Correlation | P-value |
|------------------------------------|-----|------|----------------|---------------------|---------|
| Gravidity | 160 | 1.65 | .478 | .072 | 0.001 |
| Education level | 160 | 1.93 | .919 | -.043 | 0.134 |
| Cigarette smoking during pregnancy | 160 | 1.99 | .079 | -.067 | 0.311 |
| Drink alcohol during pregnancy | 160 | 1.89 | .309 | .096 | 0.611 |
| Birth order of baby | 160 | 2.40 | 1.563 | .236** | 0.000 |

Table 5: Some selected variables associated with congenital anomalies in Desse referral hospital, Amhara region, Northeast Ethiopia, 2020.

Discussion

The prevalence of congenital anomalies in this study was 4.4%. The present study prevalence is higher than those of studies conducted in the University of Gondar by Tessema and Abuhay [23] and Addis Ababa and the Amhara region by Taye., *et al.* [1,2]. However, the prevalence in this study was nearest to the study carried out in Artic Russia [12]. These differences may be due to differences in study design, population differences and variations in terms of exposure to risk factors. Infact, some studies indicated that prevalence of congenital anomalies differs from country to country [3,24].

The present study prevalence indicates that the frequency of congenital anomalies in the community is increasing. This higher prevalence of congenital anomalies could be due to the exposure of children’s mothers or fathers or both mothers and fathers to various etiologic factors, which require actions. Furthermore, the high prevalence of congenital anomalies is a serious problem for the country and health services. Therefore, planning control methods is very necessary, as well as creating awareness in communities to use folic acid and multivitamins before and during pregnancy are important to decrease the occurrence of the congenital anomalies.

In addition, the current study suggests that public health interventions are essential to reduce the occurrence of congenital anomaly. Hence, health service managers and health service providers should plan to teach the community about the risk factors of congenital anomalies in the community.

In this study, the most frequent congenital anomalies were neural tube defects, followed by musculoskeletal system and syndrome disorders. This high prevalent rate of neural tube defects could be due to no or low use of folic acid before and during early pregnancy. Similarly, studies from Tanzania [25], China [18] and Palestine [26] reported that neural tube defects were the most frequently occurred anomalies. This variation could be due to genetic differences between populations. In addition, this could also be due to that women in the reproductive age groups did not take folic acid before and during early pregnancy periods.

In the present study, musculoskeletal system anomalies were the second most prevalent anomalies. However, Muga., *et al.* [27] in Kenya, reported that musculoskeletal system anomalies were the most prevalent anomalies, followed by the neural tube defects. This differences in prevalence may be due to risk factors that existence in the communities.

In the current study, male children were affected by neural tube defects and musculoskeletal system anomalies more than female children. This study was inline to those studies conducted in Tanzania, Nigeria and Zhang [18,24,25,28]. This may be due to that chromosomal abnormality and/or mutation in genes occur frequently in males than females.

As observed in this study, majority of children with congenital anomaly were born from Muslim mothers. This could be due to consanguineous marriage. In addition, most children with CAs were born from mothers who lived in rural dwellers. This may be due to the presence of higher etiologic factors and life-style differences between rural and urban areas.

In the present study, majority of the mothers were multigravidae compared to primigravidae mothers. This finding was similar to those studies carried out in Nigeria and India [24,29]. This suggests that congenital anomaly has associations with multigravidas. Likewise, in this study, children's birth orders were associated with congenital anomalies.

In summary, the present study showed that prevalence of congenital anomalies in the community around Desse referral hospital was higher. To conclude, the strength of this study was that it uses primary data and adequate sample size to evaluate the prevalence of anomalies in the study hospital. However, due to financial constraints, it was limited to hospital-based study.

Conclusion

The present study findings indicated that there is an increasing burden of congenital anomalies in Desse referral hospital, Ethiopia. Neural tube defects, musculoskeletal congenital anomalies and syndrome disorders are common prevalent congenital anomalies. Gravidity and children's birth orders showed significant associations for the occurrence of congenital anomalies.

Conflict of Interest

The author has no conflict of interest.

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Volume 10 Issue 2 Febuary 2021

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