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Original Article

Prevalence, Timing of Diagnosis, and Types of Reported Congenital Anomalies Among Women Attending Antenatal and Postnatal Clinics in Iringa Municipality, Tanzania

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ABSTRACT

Background: Congenital anomalies (CAs) remain a significant cause of infant morbidity and mortality, with long-term health, social, and economic implications. Despite global recognition of their burden, early detection and structured preventive strategies remain limited in many low-resource settings, including Tanzania. This study was conducted to determine the prevalence, timing of diagnosis, and types of congenital anomalies among women attending antenatal and postnatal clinics in Iringa Municipality, Tanzania.
Materials and Methods: A descriptive cross-sectional study was conducted among 249 pregnant women and mothers with children attending antenatal and postnatal clinics. A simple random sampling method was used to select participants from the clinics, while data were collected by using structured questionnaires. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26 to compute frequencies and percentages, which were presented in tables, graphs, and charts.
Results: This study revealed that about 9 (3.6%) of children reported having congenital anomalies by their mothers involved in the study. All anomalies were identified postnatally, with no prenatal detections reported. The most frequently observed anomaly was clubfoot (33.3%), hydrocephalus, cleft lip/palate, and heart defects, each accounted for 11.1% of reported cases.
Conclusion: The fact that no congenital anomalies were reported prior to birth may highlight concerns regarding inadequate early detection of these anomalies, pointing to a lack in prenatal screening systems. It is recommended that the government and health stakeholders increase investment in early diagnosis and public health education about the importance of pre- and post-natal services.
Keywords: *Prevalence, Congenital anomalies, Antenatal, Postnatal, Tanzania*

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INTRODUCTION

Congenital anomalies (CAs), also referred to as congenital malformations or birth defects, are structural or functional abnormalities that occur and develop during intrauterine life [1]. CAs are a major contributor to fetal death, infant mortality, and morbidity [2]. Regarding various types of birth defects observed, previous studies have reported that the identified anomalies include cleft lip and palate, musculoskeletal disorders, and neural tube defects [3]. Previous studies have reported that the central nervous system (CNS) is the most affected body system, followed by the gastrointestinal tract (GIT) and musculoskeletal system (MSS). This pattern has been observed in other countries such as India, China, Tanzania, Nigeria, and Ethiopia, as well as the circulatory system in Korea, the cardiovascular system in the USA, the genitourinary system in Iran, the GIT in Nigeria, and orofacial anomalies in Ethiopia [4].

Congenital anomalies can result from various influences, such as nutritional deficiencies, economic stress, environmental pollutants, medications, and infectious agents, which are significant issues. To prevent CAs, it is crucial to understand these factors [5]. For the possible measures to prevent the anomalies of children during intrauterine development, the intake of folic acid supplementation and rubella immunization is recommended [6].

Worldwide, about 303,000 neonate deaths are reported, which are associated with congenital anomalies, and 7.9 million children are born with serious birth defects [7]. The burden of congenital anomalies is highest in developing countries, where approximately 95% of children with congenital anomalies are born each year compared with developed countries [8]. These outcomes are associated with inadequate access to quality health services, contributing to child mortality and placing substantial financial and emotional burdens on families [9]. In a year, approximately 3.2 million people become disabled as a result of birth defects [10].

Children with birth defects are at risk of developing physical, cognitive, emotional, and social problems throughout their lives. These conditions also increase healthcare costs because affected children often require long-term rehabilitation services, which may cause serious emotional stress and psychological harm to their mothers [11]. The study reveals that mothers often possess unsatisfactory awareness regarding CAs until they receive nursing education interventions from nurses during antenatal and postnatal care visits [3]. Poor health literacy and education across Sub-Saharan Africa (SSA) are significant barriers to navigating the health system, especially for those impacted by CAs that have not been given much attention in the health systems of developing countries. Long-distance travel on poor roads with inadequate public transport infrastructure poses a significant risk to vulnerable infants. By implementing state-sponsored insurance programs and government subsidies, the care for affected children could be greatly improved, especially when paired with telemedicine to enable remote care, which would help reduce expenses and travel needs [12].

In Ethiopia, it was noted that merely 52% of pregnant women had a solid grasp of the preventable risk factors linked to CAs, which is consistent with the results of a study conducted in Sri Lanka [13]. In Tanzania, around 9,791 deaths are linked to congenital anomalies, accounting for roughly 3.32% of all deaths, with a reported prevalence of 60.5 per 1,000 live births for these conditions [14]. The effects of these CAs go beyond the affected children, influencing family dynamics, economic stability, and different perceptions across communities [14]. Despite the efforts to improve prenatal screening and detection, preventive measures and structured educational programs have not yet been widely implemented to address the problem, particularly in areas with limited healthcare access [13]. Numerous studies conducted worldwide have indicated a lack of sufficient knowledge regarding congenital anomalies (CAs) and their possible causes. Certain communities hold different misunderstandings and beliefs regarding the origins of CAs [15]. Therefore, this study was conducted to assess the prevalence, timing of diagnosis, and types of CAs among women attending antenatal and postnatal clinics in Iringa Municipality, Tanzania. The findings aim to fill a significant knowledge gap by providing local evidence that can inform policymakers, healthcare managers, and clinicians in Tanzania, which can also be practical in other countries globally. Furthermore, the study aims to improve prenatal screening systems, boost public health education, and emphasize early detection and intervention approaches to decrease preventable infant morbidity and mortality.

MATERIALS AND METHODS

Study Settings

This study was conducted in healthcare facilities located within Iringa Municipality, which is characterized by urban demographics in the Iringa region, located in the southern highlands of Tanzania. As of 2022, the National Bureau of Statistics reported that Iringa Municipality has a population of approximately 202,490 people [16, 17]. It is one of the five district councils in the Iringa region of Tanzania, bordered to the north, east, and west by the Iringa Rural District, and to the south by the Kilolo District. The municipality is next to the Iringa Rural and Kilolo district councils. It is located between 7.7° and 7.875° south of the Equator and 35.620° and 35.765° east of the Greenwich Meridian [18, 19].

Research Design

A quantitative, descriptive, cross-sectional study design was employed to assess the prevalence of congenital abnormalities among pregnant women and new mothers in prenatal and postnatal care settings within Iringa Municipality.

Study Population

The study focused on pregnant women attending antenatal care to assess congenital anomalies before birth and mothers attending postnatal care to assess congenital anomalies after birth. The study involved only mothers who were in health facilities for antenatal and postnatal care. Pregnant women who were unconscious and seeking emergency attention from healthcare providers were excluded from the study.

Sample Size

The total sample size consisted of 249 respondents, obtained using Cochran's formula.

Cochran formula: $N = \frac{Z^2P(1-P)}{d^2}$

Where;

N = Minimum sample size

Z = Constant, standard normal deviation (1.96 for 95% Confidence level)

P = Estimated proportion of the population (50% or 0.5) to maximize sample size in the absence of precise prevalence data

d = margin of error (6.2%)

$$N = \frac{1.96^2 \times 0.5 \times (1 - 0.5)}{0.062} = 249 \text{ Participants}$$

Sampling Techniques

A multistage sampling approach was employed in this study. Initially, four healthcare facilities (two hospitals and two health centres) were randomly selected from all eligible health facilities providing antenatal and postnatal care services in Iringa Municipality. Thereafter, participant selection was conducted separately in each selected facility. On each clinic day, a list of mothers attending antenatal and postnatal services was obtained from the clinic registration book and used as the sampling frame. Eligible participants were assigned identification numbers, and simple random sampling was employed to select study participants. Specifically, identification numbers were written on pieces of paper, mixed thoroughly, and participants were selected through a lottery method without replacement until the required sample size for each facility was attained. Only mothers who met the inclusion criteria and voluntarily consented to participate were enrolled in the study.

Data Collection and Analysis

Data were collected using a structured, closed-ended questionnaire developed by the researcher, which comprised three main parts, including social demographic characteristics, prevalence of CAs, and types of reported CAs. The questionnaires were administered to participants during their visits to antenatal or postnatal clinics in the selected healthcare facilities. A pilot study was conducted among 25 mothers attending antenatal and postnatal clinics in a facility not included in the main study area to test the clarity and comprehensibility of the tool. Feedback obtained led to minor modifications in wording and sequencing. Reliability testing yielded a Cronbach's alpha coefficient of 0.82, indicating good internal consistency. Content validity was confirmed through expert review by three senior public health researchers at Ruaha Catholic University. The quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26 to compute descriptive statistics, including frequencies and percentages, which were presented using tables, graphs, and charts.

RESULTS

Demographic Characteristics of Pregnant Mothers and Mothers with Children

The study included 249 pregnant mothers and mothers with children who attended antenatal and postnatal clinics. Their ages were categorized into three groups: 20-35 years old, comprising the largest group with 210 participants (84.3%); above 35 years old, with 24 participants (9.6%); and below 20 years old, with 15 participants (6%).

Most participants, 105 (42.2%), have a secondary education level. Regarding marital status, a large number are married, totaling 180 (72.3%), Regarding occupation, 104 (41.8%) participants were self-employed. The majority of participants were recruited from postnatal clinics, with 147 (59%), compared to 102 (41%) from antenatal clinics, as shown in Table 1.

Table 1: Demographic Characteristics of Mothers in Antenatal and Postnatal Clinics (n = 249)

Demographic characteristics	Frequency(n)	Percent (%)
Age in years		
Below 20	15	6.0
20-35	210	84.3
Above 35	24	9.6
Education level		
Illiterate	13	5.2
Primary education	65	26.1
Secondary education	105	42.2
University/College	66	26.5
Marital status		
Single	69	27.7
Married	180	72.3
Occupation		
Homemaker	89	35.7
Self-employment	104	41.8
Farmer	38	15.3
Formal employed	18	7.2
Type of clinic attended		
Antenatal	102	41.0
Postnatal	147	59.0
Mother parity		
0 -1	153	61.4
2-4	91	36.5

Above 4	5	2.0
Average monthly income (Tsh)		
Below 300,000	205	82.3
300,000 –1,000,000	37	14.9
Above 1000000	7	2.8

Prevalence of Congenital Anomalies Among Mothers with Children in Postnatal Care Settings
The respondents who reported having children with anomalies were 9 (3.6%) mothers out of the study's participants, and 240 (96.4%) respondents who reported having no children with congenital anomalies, as shown in Figure 1.

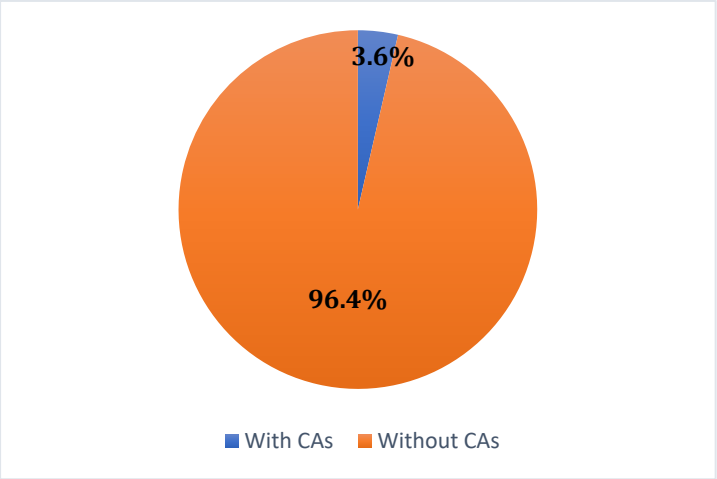

Figure 1: Prevalence of Congenital Anomalies (N = 249)

Diagnosis Time of Children with Anomalies
The diagnostic time for children with anomalies among all mothers who reported having a child with anomalies was after the birth of their children, as shown in Figure 2.

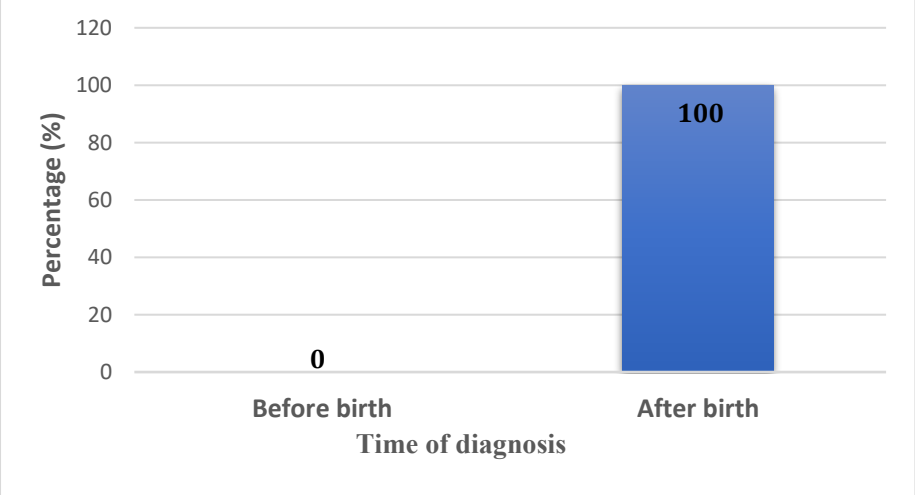

Figure 2: Diagnosis Time of Congenital Anomalies (N = 9)

The Number of Children with Anomalies Per One Mother
Among the respondents who reported having children with anomalies, only one child has anomalies, as shown in Figure 3.

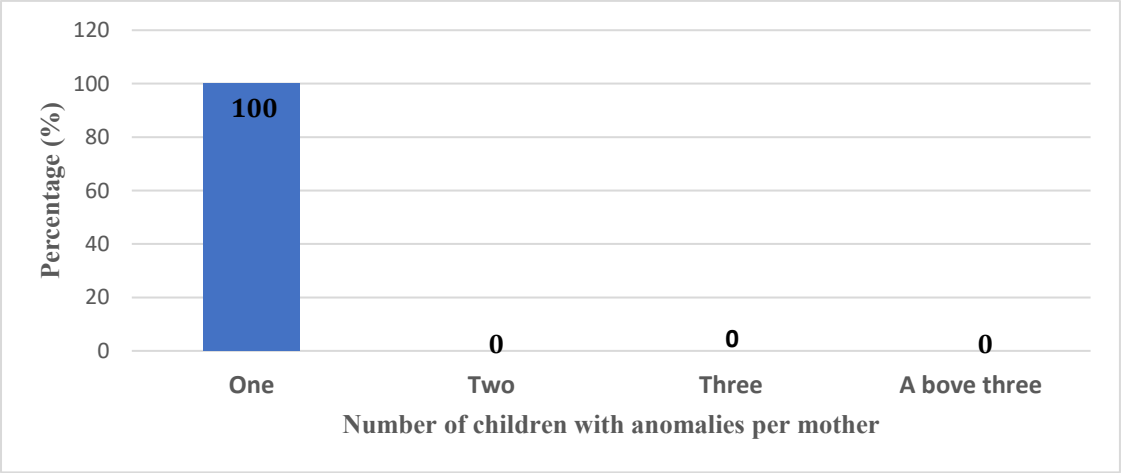

Figure 3: Number of Children with Anomalies Per Mother (N = 9)

The Distribution of the Types of Anomalies

Spina bifida, clubfoot, hydrocephalus, cleft lip and palate, heart defects, and various other anomalies were evaluated in pregnant women visiting antenatal clinics and mothers participating in postnatal clinics. The findings showed that clubfoot was the most common anomaly, affecting 3 (33.3%) children. This was followed by other anomalies, also affecting three children (33.3%). Hydrocephalus and heart defects were each identified in one child (11.1%), along with cleft lip or cleft palate, as illustrated in Figure 4.

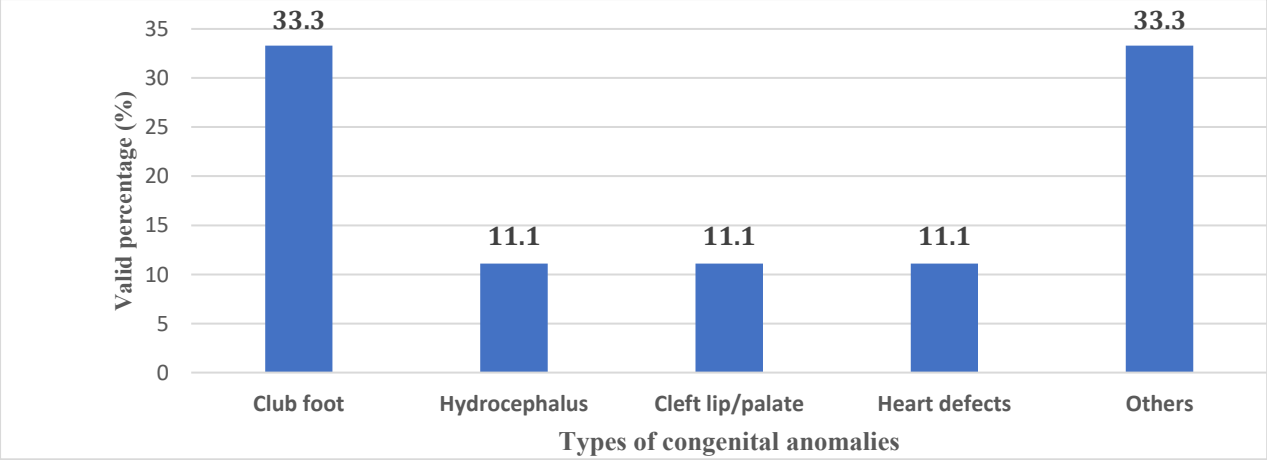

Figure 4: Distribution of type of congenital anomalies within the participants (N = 9)

DISCUSSION

The study reported that 3.6% of mothers have children with congenital anomalies. In comparison with other studies, the study conducted in Islamabad Hospital, a tertiary hospital in Pakistan, reported the highest prevalence of 9.5% [20]. Another similar study from Argentina, reported a lower prevalence of 1.69% for congenital anomalies among children [21]. Furthermore, a study examining childbirth at Abha Maternity and Children's Hospital in Saudi Arabia, reported a nearly similar prevalence with this current study of 3.21% congenital anomalies among examined children [5]. Another study in South Brazil found the lowest prevalence of children with congenital anomalies to be 1.5% among the assessed children [22].

Another similar study conducted in Ethiopia, which was a three-year study, reported the highest Prevalence of congenital anomalies while the trend increased over time, the study reported the high number of cases in central nervous system 28.1%, gastrointestinal tracts 20.1% and musculoskeletal system 16.1% as the present study, on other hand the study reported that 15.07% had multiple defect and 84.92% had single anomalies [4]. Variations in diagnostic techniques, accessibility of hospital records, and differing interpretations of birth defect criteria can explain the differences in

the rates of birth defects among these countries [23].
The diagnostic time for children with anomalies among all mothers who reported having a child with anomalies was after the birth of their children. This situation shows the challenges of early diagnosis of genetic problems during pregnancy, especially due to the lack of quality ultrasound equipment in primary health centers [24]. However, the African cultural behavior has added great challenges, where in the African environment, the decision to continue with a problematic pregnancy is strongly influenced by social beliefs, family health education, and financial capacity [25]. The findings are also similar to the study conducted in Kenya, which revealed that if pregnant women were diagnosed with their fetus having a likelihood to be born with anomalies, they would prefer to terminate the pregnancy [26].
This current study reported clubfoot as the most common anomaly, affecting 33.3% of the children of all cases of CAs reported. Furthermore, hydrocephalus, heart abnormalities, and cleft lip or cleft palate were each reported by 11.1% of the cases. These findings correspond with other earlier studies conducted in Tanzania. For instance, a research at a tertiary care facility in northern Tanzania indicated a significant prevalence of inguinal hernia at 19%, followed by hydrocephalus at 18.6%, and neural tube defects (NTDs) alongside cleft lips, which were found at rates of 11.5% and 11.8%, respectively [27]. Supporting these findings, a systematic review and meta-analysis highlighted the increased prevalence of neural tube defects in eastern Africa compared to other regions worldwide [28]. The findings are also similar to another retrospective study carried out in a tertiary hospital found in northwestern Tanzania, in which heart defects were reported as the most prevalent anomaly at 48.8% of cases, while the occurrence of oral clefts was relatively low at 6.1% of all reported cases [14]. In general, these results are consistent with the existing research in Africa, emphasizing that neural tube defects remain a major health issue for newborns [25].

STRENGTHS AND LIMITATIONS

This study holds significant strength as it tackles a crucial health issue in Tanzania, particularly given the scarcity of data on congenital defects. Research has been conducted in antenatal and postnatal clinics in Iringa, meticulously examining the types and prevalence of these defects. The results can guide maternal and child health policies, support early testing, genetic counseling, and efficient resource planning, while contributing valuable knowledge to the national and international community. However, relying on self-reported information from mothers without medical tests can lead to not getting accurate information on congenital anomalies during pregnancy if the pregnant mother has not done the relevant tests.

CONCLUSION

The study revealed a prevalence of 3.6% of congenital anomalies among children in the community of Iringa Urban, while the most common type of anomaly is clubfoot, affecting 3 (33.3%) children. The absence of CAs reported before birth may raise a concern of a lack of early detection of these anomalies before birth, which reveals the shortcomings in prenatal screening systems.
It is recommended that the government and health stakeholders increase investment in early diagnosis equipment, such as better ultrasound machines, in primary health centers. Also, public health education about the importance of pre- and post-natal services should be provided in abundance to increase parents' understanding of the causes, effects, and ways to protect themselves against birth defects.

DECLARATIONS

Ethical Approval: Ethical approval was sought by Ruaha Catholic University (RUCU) with reference number RUCU/BEHSIT3/2025.

Informed Consent: Written informed consent was obtained from all participants prior to data collection.

Consent for Publication: Not applicable.

Conflict of Interest: The authors declare no conflict of interest.

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Authors' Contributions: Conceptualization, study design, methodology, resources, data collection and data analysis, writing original draft, and editing: AM.

Data Availability: The datasets generated and analyzed during this study are not publicly available due to ethical and confidentiality restrictions. However, they may be obtained from the corresponding author upon reasonable request, subject to approval by the relevant ethics committee.

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