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Research Article

Demographic Factors Associated with Congenital Malformations Among Young Infants in Fallujah Maternity and Children Hospital, Fallujah City, Iraq

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ABSTRACT

Background: Congenital anomalies are a major cause of infant morbidity and mortality in developing countries including our country. Registries and data on these anomalies are still primitive and poorly collated. In this study we aimed to assess the important demographic factors associated with the development of congenital anomalies.

Methods: This was a cross-sectional hospital-based study involving 880 infants in the 1st year of life registered in the birth defect unit in Fallujah Maternity and Children Hospital in the period between 1st of January 2017 to the 31st of December 2019. The prevalence rate, the pattern of anomalies and the factors associated with their occurrence were determined.

Results: The prevalence rate of the group enrolled in this study was 31/1000 total births, congenital heart defects was the commonest followed by central nervous system anomalies, 58% of the infants were males, 65% had ≥ 2.5 kg birth weight & 95% were singletons. Family history of congenital anomalies was found in 31.25% of cases. The largest group of mothers (55.7%) were 21-30 years old & 92.5% of fathers were less than 45 years old. Parental consanguinity reported in 64.3% of the total cases. Only 4.5% of mothers reported history of fever during pregnancy, and none of them had history of exposure to x-ray or teratogenic drug use. Gestational hypertension was reported in 10% of the total (880) mothers, hypertension and diabetes mellitus in 0.3%, while hepatitis C, hepatitis B, toxoplasmosis and epilepsy, each was reported in only one mother (0.1% of the total). Regarding the outcome of pregnancy, 66.6% were live births, 24.2% were abortions and 9.2% were stillbirths. History of previous abortions was reported in 22% of cases. Urban residents accounted for 63% of the families of congenitally abnormal infants while 37% were rural.

Conclusion: Congenital anomalies are still a major cause for concern and tension in Fallujah society, there is serious need to establish a surveillance and good statistical system for congenital anomalies and efforts should be made to raise awareness of their occurrence and the associated risk factors in Iraq and other developing countries.

Introduction

It is congenital anomalies have been recognized for centuries, a stimulating problem for research study because of the high frequency of their occurrence and the devastating effect they may have on the affected individuals and their families. Considerable variability in frequency in different population has been reported, from as low as 1.07% in Japan to as high as 14.3% in Fallujah, Iraq [1, 2]. This wide variability could be due to the different situation and level of health care and the methodologies used in different studies. The primary objective of this study was to determine the important demographic factors associated with congenital anomalies and the pattern of their occurrence among infants with birth defects in the 1st year of life registered in the Birth Defect Unit in Fallujah maternity & Children Hospital over a period of 3 years.

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Materials and Methods

This was cross-sectional hospital-based study involving young infants in the 1st year of life registered in the Birth Defect Unit in Fallujah Maternity and Children Hospital in the period between 1st of January 2017 to the 31st of December 2019. The Birth Defect Unit has been established at late 2011 when many reports drawn the attention to increases in congenital birth anomalies in Fallujah-Iraq blamed on teratogenic, genetic and genomic stress thought to result from depleted Uranium contamination following the battles in the town in 2004. The unit involves fetal medicine clinic, clinical genetics clinic, pediatric cardiology clinic, chromosomal laboratory and a unit for registration, documentation, data analysis and research studies. The unit issued several research studies and case reports, proving the existence of a striking increase in the incidence and severity of birth defects for children born after the year 2005 [2-17].

We enrolled all young infants in the 1st year of age in the study period including live births, miscarriage and stillbirths with congenital anomalies. All the data obtained were collected by face to face interview with the parents or with one of their 1st degree relatives according to formula of registration including variables and factors concerning the infants like name, sex, birth weight, type of the anomaly & it is ICD-10 classification code, and the parent's variables like name, age & occupation of both parents, degree of consanguinity between the parents, history of previous births with congenital anomalies, type of pregnancy (singleton or twins), outcome of pregnancy (abortion, live or stillbirth), presence of chronic maternal disease, history of exposure during pregnancy to fever, X-ray radiation or harmful drug use, number of previous abortions, residence of the family (rural or urban).

All the young infants involved in this study had been examined by the pediatrician, echocardiography, X-ray imaging, abdominal and cranial ultrasonography were performed when required. Echocardiography was performed by pediatric cardiologist, while ultrasonography was executed by the radiologists and senior sonographers. Due to the lack of the relevant facilities, genetic study was not performed, chromosomal study was done when needed.

The pattern of congenital anomalies was classified according to the International Statistical Classification of Diseases and Related Health problems 10th revision (ICD-10) version for congenital anomalies. Young infants with multiple congenital anomalies were grouped depending on whether those anomalies qualified as specific syndrome or not. If they were qualified as a specific syndrome, they were then categorized into that syndrome. If no syndrome could be classified by those anomalies and two systems were involved, both systems were recorded. When more than two systems were involved, it was recorded as multiple congenital anomalies. The total number of births in the hospital during the study period was 28.154, (40) were stillbirths and 28.114 were live births.

Results

This is cross-sectional retrospective study involving congenitally malformed infants in the 1st year of life registered in the Birth Defect Unit, Fallujah Maternity and Children Hospital during the period from 1st of January 2017 to the 31st of December 2019, the total number was 880 excluding the missed cases that may exceed 10% of the actual number due to the bad registration system in our country. The total number of hospital births during the study period was 28.154 and accordingly the prevalence of CM for the group enrolled in this study was 31.3/1000 total births.

Infant & parental socio-demographic factors of the study sample were classified according to the infant's gender, birth weight, kind of the defect, pregnancy type (singleton or twin) and family history of birth defects (Table 1) and parental age and occupation, presence or absence of consanguinity between them, outcome of delivery (live or stillbirth), presence of chronic maternal illness, history of exposure during pregnancy to fever, X-ray irradiation or harmful drug use, history of previous abortions and the residence of the family (rural or urban) (Table 2). Among the 880 infants enrolled in this study, 511 (58%) were males 353 (40%) were females and 16 (2%) had ambiguous genitalia. The age range was between one day and 12 months. Singletons and twins account for 837 (95%) and 46 (5%) respectively. 572 (65%) had birth weight of ≥ 2.5 kg, while 308 (35%) had birth weight of < 2.5 kg. Family history of birth defects was reported in only 275 (31.25%) of the cases.

Table 1: Infant variables associated with birth defects in congenitally malformed infants in the 1st year of life in number and percentage of the total number of study sample.

Infant variables	No.	Percentage % of total (880)
Gender		
Male	511	58
Female	353	40
Ambiguous	16	2
Birth wt		
≥ 2.5 Kg	572	65
< 2.5 Kg	308	53
Pregnancy type		
Singleton	837	95
Twin	46	5
Family history of birth defect		
Yes	275	31.25
No	605	68.75

In this study, 490 mothers (55.7%) were 21-30 years old, 258 (29.3%) were 31-40 years old, 119 (3.5%) were 15-20 years old and only 13 (1.5%) are more than 40 years old, while 814 fathers (92.5%) were less than 45 years old and 66 (7.5%) were ≥ 45 years old. The largest group of mothers, 836 (95%) were housewives, 24 were government employees, and 20 (2.3%) were college students. Regarding paternal occupation, 739 (84.7%) were free workers, 125 (14%) were government employees and only 16 (1.8%) were college students. Parental consanguinity reported in 566 (64.3%) of the total 880 cases. Only 40 mothers (4.5%) reported history of fever during pregnancy and there was no history of exposure to x-ray or teratogenic drug use.

Gestational hypertension was reported in 91 (10%) of the total 880 mothers, hypertension and diabetes mellitus in 3 (0.3%), while hepatitis C, hepatitis B, toxoplasmosis and epilepsy, each was reported in only one mother (0.1% of the total). Regarding the outcome of pregnancy, 586 (66.6%) were live births, 213 (24.2%) were abortions and 81 (9.2%)

were stillbirths. History of previous abortions was reported in 193 (22%) of cases, 112 (12.7%) had history of one abortion, 54 (6%) had two, 11 (1.3%) had three abortions and 16 (1.8%) reported history of ≥ 4 abortions. 553 families (63%) were residents of urban areas and 327 (37%) were rural. The congenitally malformed infants (880) were diagnosed and classified into 13 groups according to the affected system using WHO classification. The percentage was calculated from the total malformed number (880) and the per thousand figures from the total number of births in the 3 studied years (28.154) (Table 3).

Table 2: Parental variables associated with birth defects in congenitally malformed infants in the 1st year of life in number and percentage of the total number of study sample.

Parental variable	No.	Percentage % of total (880)
***Maternal age (yr)**		
15-20	119	13.5
21-30	490	55.7
31-40	258	29.3
> 40	13	1.5
***Paternal age (yr)**		
< 45	814	92.5
≥ 45	66	7.5
***Maternal occupation**		
Housewife	836	95
Employed	24	2.7
Student	20	2.3
***Paternal occupation**		
Free worker	739	84.7
Employed	125	14
Students	16	108
***Outcome of pregnancy**		
Live births	586	66.6
Stillbirths	81	9.2
Abortions	213	24.2
***Presence of parental consanguinity**		
Yes	566	64.3
No	314	35.7
***Maternal exposure during pregnancy to**		
Fever	40	4.5
X.ray	0	0
Harmful drug use	0	0
***Maternal chronic illness**		
Hypertension only	91	10
Hypertension & Diabetis Mellitus	3	0.3
Hepatitis C	1	0.1
Toxoplasmosis	1	0.1
Hepatitis B	1	0.1
Epilepsy	1	0.1
***Presence of previous abortions**		
1 abortion	112	12.7
2 abortions	54	6
3 abortions	11	1.3
≥ 4 abortions	16	1.8
***Residence of the family**		
Urban	553	63
Rural	327	37

The commonest detected anomalies in this study were the congenital heart diseases 41% of the 880 affected infants, followed by the central nervous system which accounted for 19%, musculoskeletal system (15.5%), multiple congenital anomalies (involving 3 or more systems) 11.7%, chromosomal aberration and genetic syndrome 8.3% and 6.5% respectively, ear, face and neck anomalies 4.8%, cleft lip & palate 4%, gastro-intestinal and urinary tract anomalies both were 2.6%,

miscellaneous defects 2.4%, genital system anomalies 2.3% and only 2 cases of conjoined twins (0.23%) of the total number were reported.

Table 3: Type of congenital anomalies and percentage of total number & per 1000 figure of the total births.

Type of congenital anomaly	No. of cases	% of total (880)	/ 1000 of total births
Congenital heart diseases	361	41	12.8
Central nervous system	168	19	5.97
Musculoskeletal system	136	15.5	4.83
Multiple congenital anomalies	103	11.7	3.66
Chromosomal aberration	73	8.3	2.6
Genetic syndromes	57	6.5	2
Ear, face & neck	42	4.8	1.5
Cleft lip &/palate	36	4	1.38
Gastro-intestinal tract	23	2.6	0.82
Urinary tract	23	2.6	0.82
Miscellaneous	21	2.4	0.75
Genital system	20	2.3	0.71
Conjoined twins	2	0.23	0.07

Discussion

Congenital anomalies are among the major causes of childhood morbidity and mortality in many countries. In Fallujah it was the 4th common cause of death in the neonatal period, and the 1st in the post-neonatal [5, 6]. The objective of this cross-sectional retrospective study was to report on the pattern and the factors associated with the development of congenital anomalies among infants in the 1st year of life registered by the Birth Defect Unit in Fallujah Maternity and Children Hospital in Fallujah city, Iraq. Due to our study design, we were not able to determine a causal association of these factors with congenital anomalies, in addition, due to the limited facilities, genetic and metabolic disorders studies could not be performed.

In the current study we found that the rate of congenital malformations in male was 58% compared with 42% in females and only 2% born with ambiguous genitalia, which is consistent with other studies [18]. On the other hand, Abdi-Rad *et al.* reported a higher occurrence of congenital anomalies was found among females. In males 1.68% and in females 1.99%, but with non-statistically significant difference [19]. Another study showed that there is no significant association between gender of the babies and the development of congenital anomalies [20]. Significant association between low birth weight and congenital malformations has been well documented, while in our study only 35% born with body weight less than 2.5 kg and 65% of infants born with body weight equals or more than 2.5 kg and that was consistent with finding of another study conducted in Ogbomosho, Nigeria, singleton dominated twins pregnancy in our study (95 & 5% respectively), that was also consistent with the Nigerian study [21-26]. Previous family history of birth defects reported in only (31.25%) of the cases.

We did not find significant association between congenital anomalies and maternal age, febrile illnesses, hypertension, diabetes and epilepsy, the odds of delivering babies with congenital anomalies was higher in the age group 21-30 years (55.7% of the total number), that was not consistent with most studies and only 1.5% of mothers were above 40 years of age, one of them delivered identical twins with down syndrome, father's age was 53 years. High paternal age did not show significant association with the development of congenital malformations, 92.5% of fathers were less than 45 years old, that was also consistent with a study conducted in Tanzania, two fathers were 60 & 63 years old respectively, the 1st had baby with congenital heart disease (mother's age was 27) and the 2nd father's baby born with hand's anomaly (the mother was 39 years old) [27]. Parental consanguinity was reported in 64.3% of the cases which was consistent with our previous report [4]. Regarding pregnancy outcome, 66.6% were malformed live births, 24.2% were abortions and 9.2% were stillbirths. Parental occupation showed high association with the development of congenital anomalies, most of our patients are of low-income families.

In this study most of our patients were from urban residence inside Fallujah (63%) which may confirm the fact that the city was subjected to chemical and radiological contamination which was proven in our previous studies [2, 3]. In the current study, congenital malformations affecting the cardiovascular system were the most common (41%) which is consistent with our previous study, followed by the central nervous system anomalies (19%), similar to the observations of Zaid R. Al-Ani *et al.*, in Ramadi city (about 70 km to the west of Fallujah) and this could be due to the presence of pediatric cardiology clinic in the Birth Defect Unit, where most of the physicians in Fallujah city and the surrounding villages refer their patients. The same results were recorded in India and Malta studies [4, 28-30].

Limitations of the Study

The statistics and figures in this study did not represent the actual reality of birth defects in Fallujah Maternity and Children Hospital due to the bad statistical health system in Iraq, there are many missed cases, in addition to the severe shortage of the most important diagnostic facilities for genetic and metabolic diseases.

Conclusion

The high prevalence of congenital anomalies observed in this study necessitates serious attention and swift actions to solve the problem, we recommend that the official Iraqi health authorities should mobilize more resources in the public and private health sectors for optimal management of congenital malformations paying special attention to the preventive and early prenatal diagnostic measures. Premarital counseling is advised, especially in the presence of parental consanguinity and family history of congenitally malformed child. We also recommend that all neonates should be thoroughly examined and investigated for congenital malformations. An Iraqi obligatory registry of congenital malformations is needed.

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Conflicts of Interest

None.

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