Incidence of Birth Defects at Birth among Babies Delivered at Maternity and Children Teaching Hospital in Ramadi

Fakhri Jamil Al-Dalla Ali 1, Najdat Shukur Mahmood 2, Bilal Kh. Al-Obaidi 3.
[1]Ass.Prof. MBChB, MRCP (UK), Dept of pediatrics, Medical College, University of Anbar.
[2]Lecturer, MBChB, FICMS, Department of pediatrics, Medical College, University of Diyala.
[3]MBChB, DCH, Dept. of pediatrics, Maternity and Children Teaching Hospital in Ramadi.

Abstract

Background: Birth defects are an important contributor to infant morbidity and mortality among all racial/ethnic groups, and the 3rd leading cause of infant mortality after cancer and accidents in developed countries

Objective: To estimate the incidence of major and minor birth defects at birth and trying to identify some of possible associated factors.

Methods: Between the 1st of February/2009 and the end of October/2009, 1494 newborns were enrolled in this study in Al- Ramadi Maternity and Children Teaching Hospital was examined for birth defects. Full information regarding the mother, newborn, and some socio-demographic factors were recorded after interview of the mother, and full examination was done by the investigator.

Results: Forty-seven newborns (31.46/1000 total birth) had birth defects. The incidence of major anomalies was 16.73 /1000 total birth and minor 14.73/1000 total birth. Among total births, the most common system involved was genitourinary system (27.7%), followed by central nervous system (19.2%), musculoskeletal system (19.2%), oral anomalies (6.4%), skin (6.4%), and then the others. The incidence of birth defects was significantly higher in preterm infants, low birth weight infants, babies who were breech *in utero*, and in babies of mothers in both extreme age (below 20 and above 35 years), or had bleeding during pregnancy, urinary tract infection during pregnancy, and polyhydramnios or oligohydramnios.

Conclusion: The incidence of birth defects is alarmingly high in Al- Ramadi city. The catastrophically successive wars imposed on Iraq undoubtedly have played some role in this problem. Attention should be made for defects at birth in genitourinary system, central nervous system and musculoskeletal system, however defects of cardiovascular system, and internal gastrointestinal tract may be evident sometime after birth.

Keywords: Birth defects, Ramadi, West of Iraq.

Corresponding author: Fakhri Jamil Al-Dalla Ali E-Mail.anbarmedj@gmail.com

Introduction

Birth defects are defined as permanent change produced by an intrinsic abnormalities of development in a body structure during prenatal life[1], they are an important contributor to infant morbidity and mortality among all racial/ethnic groups[2], and the 3rd leading cause of infant mortality after cancer and accidents in developed countries[3,4].

Birth defects accounted for 490.000 deaths world wide in 1997, the great majority of these deaths were in the 1st year of life [5] .Studies have shown that between 2% and 3% of all infants have major congenital anomalies identified at birth[2].

Birth defects are either single primary defect or multiple malformations [6]. Single primary defects could be a deformity, malformation, or destruction[7].

Malformations either due to mono-genic defects in 7.5% of patients; in 6%, they are caused by chromosomal anomalies; in 20%, they are the result of mutagenic defects; and in 6-7% they result from known environmental factors such as maternal diseases, infections, and teratogens. In the remaining 60%-70% of patients, malformations are due to unknown etiologies[8].

Treatment and rehabilitation of children with birth defects is usually coasty and complete recovery is usually impossible [9], hence it is obligatory to find out causative and risk factors for birth defects and prevent them earlier[10].

Currently no nationwide birth defects monitoring in Iraq. In the last two decades there was a feeling of an increase in the number of cases with birth defects in Iraq as a result of sequele of environmental pollutions caused by the successive wars imposed on Iraq.

To our knowledge, there was no previous studies regarding birth defects in Ramadi, thus the aim of this study is a trial to identify the incidence of birth defects at birth among babies delivered at the Maternity and Children teaching hospital in Ramadi.

Patients and Methods

This is a cross-sectional study that was carried out at the Maternity and Children Teaching Hospital in Ramadi during the period from 1st of February/2009 to the end of October/2009. Because of the practical difficulties, two days per week selected for examination. The total number of all examined babies was 1494 (live and still birth).

History taking and physical examination were performed by one person (the investigator). A structured form was used for data collection which consists of two parts; maternal characteristics included age, education, diseases during pregnancy, residence and consanguinity while neonatal characteristics included fetal presentation *in utero*, outcome of pregnancy, gestational age, sex and birth weight.

Full physical examination was done to all newborns (live and still birth).

X-rays, echocardiography and ultrasonography were done when necessary for some babies.

The defect was considered as major if potentially life threatening and/or if not corrected, might impair the child's development or well being while classed as minor when affected non vital organs, had little or no functional effect and doesn't cause distress in the neonatal period[11].

Gestational assessment of the newborn was done according to new expanded Ballard scoring system[12] taking in to consideration the last menstrual period and ultrasound done before delivery. Babies considered as preterm when gestational age less than 37 weeks[13].

The weight of newborn was measured by using electronic scale measuring to the nearest 1 gram. The baby was considered to have low birth weight if the weight is equal or less than 2500 gram and normal weight if more than 2500 gram[12].

Distribution of birth defects was classified by the diagnostic standardization of congenital malformation from the *International Classification of Disease (ICD-10)* code[14]. Statistical analysis was done by using Chi Square test to compare differences between groups, P value less than 0.05 level is regarded as significant and highly significant when P value less than 0.01 level.

Results

The current study showed that 808(54.08 %) of the studied newborns were males while the others 686 (45.92 %) were females, 1478 babies (98.9%) were

live birth while still-births were 16(1.1%), normal birth weight were 1191(79.7%) and low birth weight were 303(20.3%), full term neonates were 1265(84.7%) while preterm were 229(15.3%).

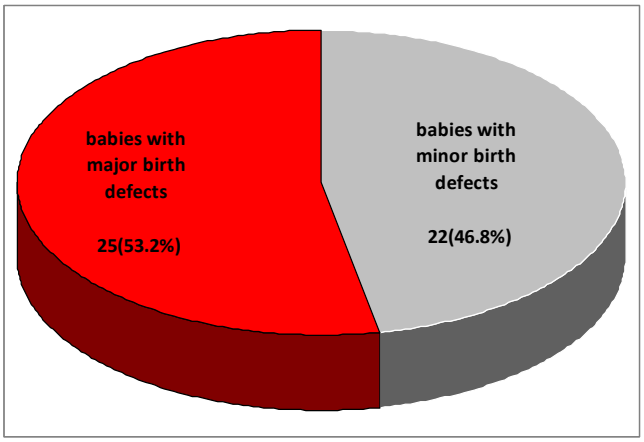
The number of babies with birth defects at birth were 47 with incidence of 31.46/1000 total birth, twenty five of them had major birth defects (16.73/1000 total birth) while 22 had minor defects (14.73/1000 total birth) (Figure 1).

Single defect observed in 43 case (91.5%) while multiple defects in 4 cases (8.5%). Cases with multiple defects included one case with right hydrocele and black not hairy nevus on the abdomen, one case was having unclassified anomalies (single nostril, microphthalmia, small chest and polydactyly), and two cases with Down syndrome.

This study showed that the leading system involved was genitourinary system (27.7%), followed by central nervous system(19.2%), musculoskeletal system(19.2%), then oral anomalies(6.4%), skin(6.4%), and to less extent chromosomal disorders (4.3%), gastrointestinal tract(4.3%), cardiovascular system(2.1%), eye(2.1%), nose anomalies (2.1%), and virtually unclassified anomalies(2.1%) as shown in (Table 1) .

The incidence of birth defects was statistically highly significant in low birth weight neonates, and preterm infants (P value < 0.01); however the association of birth defects was also significant but to less extent in babies whose mothers aged below 20 or above 35 years old, babies who were breech *in utero*, neonates of mothers who had bleeding, urinary tract infection during pregnancy and in babies of poly or oligohydramnic mothers (P value < 0.05). There was no significant association between birth defects and mother's education, maternal diabetes, maternal hypertension, residence, parental consanguinity, outcome of pregnancy, sex of the baby, (P value > 0.05).

Nevertheless the incidence of birth defects was higher in males, neonates whose parents had consanguineous marriage, and babies of mothers having hypertension, though this was statistically not significant (Table 2).



(Figure 1) Distribution of babies according to major and minor birth defects

Table 1: Distribution of birth defects according to the system involved

Birth Defect	No (%)	Incidence/1000 Total Birth	Birth Defect	No (%)	Incidence/1000 Total Birth
Genitourinary System	13(27.7)	8.7	**Skin Anomalies**	3(6.4)	2
Major			**Minor**		
Ambiguous genitalia	1	0.67	cutis aplasia	1	0.67
Bladder extrophy and epispadius	1	0.67	hemangioma on the right aspect of the neck	1	0.67
Minor			black not hairy nevus on the face	1	0.67
Unilateral undescended testes	6	4.01			
Bilateral undescended testes	1	0.67			
Hypospadius	2	1.34	**Chromosomal Disorders**	2(4.3)	1.34
Right hydrocele	1	1.34	**Major**		
Right hydrocele and black not hairy nevus on the abdomen	1	1.34	down syndrome	2	1.34
			Gastrointestinal Tract	2(4.3)	1.34
			Major		
Central Nervous System	9(19.2)	6.02	esophageal atresia	2	1.34
Major					
Anencephaly	2	1.34	**Ear**	2(4.3)	1.34
Hydrocephaly	3	2	**Minor**		
Myelomeningocele	2	1.34	bilateral microtia	1	0.67
Cranial meningocele	1	0.67	low set ear	1	0.67
Encephalocele and microcephaly	1	0.67	cardiovascular system	1(2.1)	0.67
			Major		
Musculoskeletal System	9(19.2)	6.02	left hypoplastic heart	1	0.67
Major					
Achondroplasia	1	0.67	**Eye**	1(2.1)	0.67
Omphalocele	2	1.34	**Major**		
Minor			bilateral cataract	1	0.67
Talipes varus	2	1.34			
Talipes valgus	1	0.67	**Nose**	1(2.1)	0.67
Bilateral polydacyly	1	0.67	**Major**		
Right hand syndactyly	1	0.67	bilatertal co anal atresia	1	0.67
Right hip dislocation	1	0.67	unclassified in one baby(single nostril,	1(2.1)	0.67
Oral anomalies	3(6.4)	2	microphthalmia, small chest, polydactyly)	1	0.56
Major					
Cleft lip and palate	2	1.34			
Cleft palate only	1	0.67			
			Total	47(100)	31.46

Table 2:Distribution of birth defects by neonatal and maternal characteristics

Characters	Birth defects + ve No(%) n= 47	Birth defects - ve No(%) n-1447	Incidene /1000 total birth	P value	Characters	Birth defects +ve No(%) n=47	Birth defects -ve No(%) n=1447	Incidene /1000 total birth	P value
Maternal characters					**Liquor**				
Age of mother(year)									
< 20	6(5)	114(95)	50	<0.05	Normal	40(2.8)	1372(97.2)	28.33	<0.05
20 – 35	33(2.6)	1232(97.4)	26.09		with polyhydramnios	4(7.3)	51(92.7)	72.73	
> 35	8(7.3)	101(92.7)	73.39		with oligohydramnios	3(11.1)	24(88.9)	111.1	
Mother education(year)									
Illiterates	9(3.4)	255(96.6)	34.09	>0.05	**Residence**				
Primary	24(3)	788(97)	29.56		Urban	18(2.8)	635(97.2)	27.56	>0.05
Secondary	2(4.9)	39(95.1)	48.78		Rural	29(3.4)	812(96.6)	34.48	
Higher education	12(3.2)	365(96.8)	31.83						
Gestational diseases and characters					**Consanguinity**				
					Positive	34(3.8)	868(96.2)	37.69	>0.05
					Negative	13(2.2)	579(97.8)	21.95	
Diabetes mellitus									
With DM	2(4.1)	47(95.9)	40.82	>0.05	**Neonatal characters**				
Without DM	45(3.1)	1400(96.9)	31.14						
					Outcome of pregnancy				
Hypertension									
With hypertension	3(5.9)	48(94.1)	58.82	>0.05	Singleton	45(3.3)	1327(96.7)	32.79	>0.05
Without hypertension	44(3)	1399(97)	30.49		Twin	2(2.1)	92(97.9)	21.27	
					More than 2	0(0)	28(100)	0	
Bleeding					**Gestational age (week)**				
With bleeding	5(7.4)	63(92.6)	73.52	<0.05	< 37	13(5.7)	216(94.3)	56.77	<0.01
Without bleeding	42(2.9)	1384(97.1)	29.45		≥ 37	34(2.7)	1231(97.3)	26.88	
Urinary tract infection					**Sex**				
With UTI	17(5.8)	278(94.2)	57.62	<0.05	male	29(3.6)	779(96.4)	35.89	>0.05
Without UTI	30	1169(97.5)	25.02		female	18(2.6)	668(97.4)	26.23	
Presentation					**Birth weight**				
Cephalic	38(2.9)	1277(97.1)	28.89	<0.05	Normal birth weight	27(2.3)	1164(97.7)	22.67	<0.01
Breech	7(5.4)	122(94.6)	54.26						
Transverse	2(4)	48(96)	40		Low birth weight	20(6.6)	283(93.4)	66.08	

Discussion

This study showed that the incidence of birth defects at birth is 31.46/1000 total birth. This rate is higher than that found in many developed as well as some developing countries, while it appears similar to that observed in some neighboring countries[15-30] (Table 3). However the expected rate in our study could be higher as some of the congenital malformations might not be evident at birth like cardiovascular, internal gastrointestinal tract, and renal anomalies. most of other studies made their observations on a follow-up basis over a period ranging from one week to several months.

Table 3: Incidence of birth defects in other regions of the World

Location	Incidence of BD* per 1000 Live birth	All birth
Al-Hasa / Saudi Arabia[15]	-	33.4
Giza / Egypt[16]	-	31.7
West of Saudi Arabia[17]	-	29.46
Bahrain[18]	27	-
Spain[19]	20.2	-
Atlanta/USA[20]	20.2	-
Sweden[21]	-	13
Britain[22]	-	12.9
Japan[23]	-	7.05
Tehran/Iran[24]	24.1	-
Oman[25]	-	24.6
UAE[26]	-	14.2
Singapore[27]	23.99	-
Maharashta/India[28]	-	12.2
Western area/China[29]	-	15.4
Korea[30]	-	18
this study(Al-Ramadi/Iraq)	-	31.45

* BD= Birth Defects.

The high rate of birth defects at birth in this study could be related to environmental pollutions resulted from the successive wars imposed on Iraq in the last 2 decades. The United States and NATO militaries used depleted uranium penetrator rounds in the 1991 Gulf war[31], and the 2003 invasion of Iraq[32].

The main problem of depleted uranium is that the aerosol produced during impact and combustion of depleted uranium munitions can potentially contaminate wide areas around the impact site leading to possible inhalation by human beings [33].

Multiple studies using cultured cells and laboratory rodents suggest the possibility of leukemogenic, genetic, reproductive, and neurological effects from chronic exposure [34].

A 2005 epidemiology review conclude increased risk of birth defects in offspring of persons exposed to depleted uranium [35].

Medical personnel of Basrah hospital in southern of Iraq have reported an increase in the incidence of congenital malformation among babies born in the decade following the 1991 Gulf war [36]. A medical survey in Fallujah city, Iraq reported an alarmingly high increase in birth defects following Fallujah battle in 2004 [37].

In this study major birth defects were detected in 25 newborns (53.2%) with incidence of 16.73/1000 total birth while minor birth defects were found in 22 newborns (46.8 %) with incidence of 14.73/1000 total birth. This result is nearly similar to that in Al-Hasa/Saudi Arabia[15] which reported 58% major defects and 42% minor defects. However, this result differs from that reported in the western of Saudi[17] with 93.9% major and 6.1% minor. The current study result showed that single defects were found in 43 cases (91.5%) and multiple defects in 4 cases (8.5%), which is different from that reported in Tehran/Iran[24] (65.5% single, 34.5% multiple), and Asir/Saudi Arabia[38] (8.8% single, 91.2% multiple). Our results also showed that the most common systems involved respectively were genitourinary system (27.7%), central nervous system (19.2%), and musculoskeletal system (19.2%), while in the western of Saudi Arabia[17] the most common systems involved in sequences were cardiovascular system (25.9%), genitourinary system (19.7%), and musculoskeletal system (15.7%).

In Atlanta/United State America[20] the incidence of congenital malformations according to systems involved per 1000 live birth were; cardiovascular system 8.8, genitourinary system 4.3, musculoskeletal system 2.3. In Singapore[27] the most common systems involved in sequences per 1000 live birth were; cardiovascular system 9.07, musculoskeletal system 4.98 , genitourinary system 3.12. The increment in the incidence of major birth defects, multiple birth defects and cardiovascular anomalies in these studies as compaired to this study is obviously related to the methodology, we depended mainly on physical examination at birth, while most of other studies were retrospective including all registered cases on follow-up bases. Most cases of cardiovascular system anomalies will not be evident at birth.

The incidence of neural tube defects in this study was 4.02/1000 total birth which was nearly similar to the incidence of Al-Ani study[39] (3.3/1000 birth), and in Afghanistan[40](3.0/1000 live birth), but more than that reported in other countries such as Saudi Arabia [41,42] were ranged from (0.82 to 1.6/1000 total birth), Tehran/Iran[24] (1.7/1000 live birth), Bahrain[43] (1.5/1000 total birth), Atlanta/United State America[20] (0.73/1000 live birth), and Al-Ain/ United Arab Emirates[44] (1.3/1000 total birth). This difference may be related to the lack of use of folic acid one month before conception in our region. Furthermore prenatal diagnosis and termination of pregnancy in developed countries may contribute to further reduction.

Regarding the associated factors, there was highly significant association between birth defects and both preterm and low birth weight babies which is comparable to that found by others [24, 25, 45]; in fact birth defects are a cause of prematurity and low birth weight rather than the reverse. Maternal age above 35 years and below 20 years was significantly associated with birth defects, similar finding was observed in Singapore[27]. However most other studies showed increased risk only above 35 years old, [25, 45, 46, 47]. Chromosomal defects are increased when maternal age above 35 years while non-chromosomal defects are increased in both extreme age[27].Results showed increase congenital anomalies in consanguineous marriages, though the association was not statistically significant, similar observation also seen in other studies[17, 25, 36, 48, and 49].

We conclude from this study that birth defects are alarmingly high as compared to many other countries. Probably this is related to the use of depleted uranium weapons by the united state and NATO militaries during the successive wars imposed on Iraq. Further studies are needed for registration of birth defects on follow up basis, and measurement of radiation in different parts of Iraq.

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