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Maternal Risk Factors and Birth Defects in Kirkuk City/Iraq

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Abstract
Background: Birth defects can be defined as those conditions that occur before or during birth. The purpose of this study was to find out the association between some maternal factors and birth defects, as well as to identify the socio-demographical characteristics of the child and the mother in Kirkuk city. **Methodology**: A non-probability, descriptive (convenient) sampling technique was used to select (60) children that attending visits to two locations (Azadi Teaching Hospitals and Kirkuk Rehabilitation Center) in Kirkuk city from the period November 11th 2015 to May 5th 2016. The children age ranged from birth to 12 years old. An interview questionnaire was used to collect the data. The data was analyzed by frequency, percentage, mean, standard deviation and chi-square. ($p \leq 0.05$) was considered statistically significant. Birth defects were grouped into cerebral palsy (CP), Erb's palsy (EP) and Spina bifida (SB). **Results:** A total of 60 children were included. Of these 40 (66.7%)had cerebral palsy, 13 (21.7%) had Erb's palsy and 7 (11.7%) had spina bifida. A significant association was found between some maternal risk factors, such as birth weight, maternal age at delivery, type of delivery, gravida, and birth defects. **Conclusions and Recommendations:** Some maternal factors can play a role in birth defects. Women need to attend antenatal care centers regularly to identify any abnormality. Further studies with larger samples are needed in the city of Kirkuk.
Keywords: Birth defect, Risk factor, Maternal, Congenital malformation

INTRODUCTION

Congenital anomalies and birth defects can be considering one of the most common causes of infant mortality and morbidity around the world [1]. Birth defects are defined as a series of structural, functional and metabolic disorders, which occurs at the time of birth [2]. Some of the birth defects may be life threatening, may impair function or interfere with the cosmetic value of an individual, hence an immediate management is required [3] The long-term disability caused by congenital anomalies may have a significant impact not only on a child's wellbeing and development but also on families, health care systems and societies [3], [1]. Birth defects can be identified prenatally at birth or at any point after birth [4]. It is estimated that 276 000 babies die within 4 weeks of birth every year, worldwide, from congenital anomalies and about 2% to 3% of all birth are associated with major anomalies.[5]In the United States, birth defects affect 1 in every 33 babies born each year and every 4 ½ minutes, a baby is born with a birth defect. That means nearly 120,000 babies are affected by birth defects each year[6].Most of the birth defects can occur in the first three months of pregnancy, while the organs of the fetus are forming, and some occur at the late stage of pregnancy [6]. Some of these defects are classified as major and may require surgical intervention and/or cause the death of the infant. Others are classified as minor, which are significantly detrimental to the quality of life and health of the patient[7].Birth defects can affect almost any part of the body (e.g., heart, brain, foot). They may affect how the body looks, works, or both. Birth defects can vary from mild to severe. The well-being of each child affected by a birth defect depends mostly on which organ or body part is involved and how much it is affected[1]. Depending on the severity of the defect and what body part is affected, the expected lifespan of a person with a birth defect may or may not be affected [6].Not all birth defects are preventable, but there are some procedures and things that can a woman follow or do before and during pregnancy to increase her chance of having a healthy baby. Prenatal care, which is health care received during pregnancy, can help find some problems early in pregnancy so that they can be monitored or treated before birth[8],[6]. Some other steps a woman can take to increase her chances of having a healthy baby, such as getting(400mcq) of folic acid every day, starting at least one month before getting pregnant; avoid drinking alcohol, smoking or drugs; having prescription before taking any medication; learn how to prevent infections during pregnancy and being assure that any medical condition are under control before being pregnant, because some conditions such as diabetes and obesity increases the risk of birth defects[6], [8].

The purpose of this study was to identify the demographical characteristics of the child, demographical and reproductive characteristics of the mother, as well as, to find out some maternal risk factors characteristics and to find out the association between some maternal risk factors and the birth defects such as (child birth weight, Age of mother at delivery, type of delivery, gravida, residence, place of delivery, BMI for the mother, monthly income, consanguineous, and attending health care centers).

METHODOLOGY

Design of the study and sampling

A non-probability, descriptive (Convenient) sampling technique was used to select the sample. The study was

conducted on (60) children who attended visits in two locations (Rehabilitation Department of Azadi Teaching Hospital and Kirkuk Rehabilitation Center) in Kirkuk City, during the period November 11th 2015 to May 5th 2016. The children age ranged from birth to 12 years old.

Table (3-1): Study sample distribution

No.	Hospital Name	Total No.	Percentage %
1.	Rehabilitation department in Azadi Teaching Hospital	34	56.7
2.	Kirkuk Rehabilitation Center	26	43.3
Total		**60**	**100**

Data collection procedure

Prior to the actual collection of data, a formal administrative approval was obtained from College of Nursing /Kirkuk University and Kirkuk Health Directorate to facilitate the present study. The researcher visited both locations and had the interview with the child mother to complete the questionnaire.

Instruments of the study

Questionnaire

- An interview questionnaire was used to identify maternal risk factors that lead to birth defects. Formal consent was obtained from the child's mother to participate in the study, and the duration of each interview was between 10-15 minutes. The questionnaire comprised of four sections;
- The first section consisted of socio-demographic characteristics for the child which consisted of 7 items includes: age of the child, gender, weight, residence, type of delivery, place of delivery, type of birth defects.
- The second section consisted of socio-demographic characteristics for the mother which consisted of 7 items which include: maternal age, marital status, Body mass index (BMI), educational level of the mother, occupation of the mother, monthly income, and consanguinity.
- The third section consisted of reproductive history for the mother which consisted of 7 items which includes: maternal age at delivery of current child, gravida, parity, abortion, delivery of abnormal child rather than the current child, attending health care centers during pregnancy, if there are any medical conditions during pregnancy, such as diabetes mellitus (DM), hypertension (HT), heart disease and thyroid disorders.
- The fourth section consisted of maternal risk factors characteristics for current pregnancy which included; mothers having medication during pregnancy, smoking, drinking alcohol, taking narcotic drugs, if she had folic acid during pregnancy, accidents, x-ray and if there is any history of anomalies in the family and if she had ultrasound exam (U/S) during pregnancy and if she affected by infectious diseases during pregnancy. The question dichotomized into YES and NO.

Statistical analysis

Data were checked for completeness and accuracy. Coded data were computerized and analyzed using SPSS (version 20). So the study descriptive statistics were presented in frequency, percentage, mean and standard deviation whenever appropriate and cross tabulation to show the comparison of key variables by birth defects. The Pearson Chi-Square was used to assess the statistical significance of the association between birth defects and other variables. ($p \leq 0.05$) was considered statistically significant. Birth defects were grouped into cerebral palsy (CP), Erb's palsy (EP) and Spina bifida (SB).

RESULTS

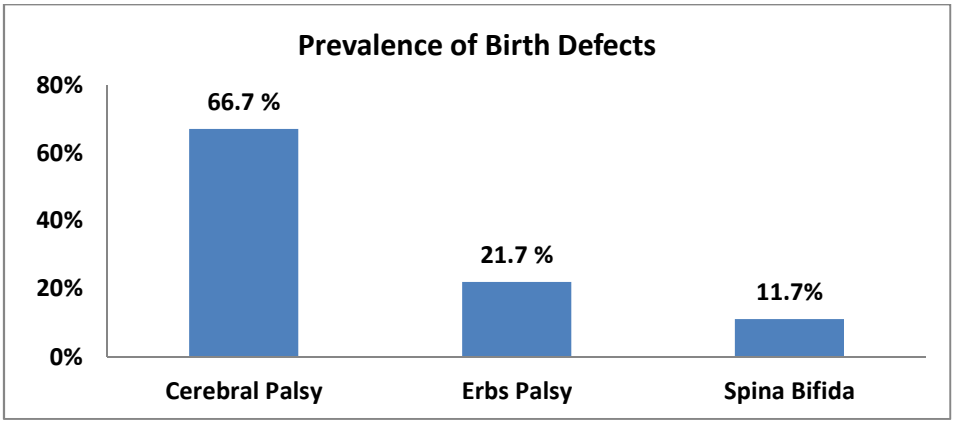

Figure (1) Prevalence of birth defects among the study sample

Figure (1) shows the prevalence of birth defects among the study sample as; (66.7%) for cerebral palsy (CP), (21.7%) for Erb's palsy (EP) and (11.7%) for Spina bifida (SP).

Table (1) Socio-demographic characteristic of the child

Items		Frequency(*f*)	Percentage (%)
Age of Child	<1 year	22	36.7
	1-3 year	18	30.0
	4-7 year	17	28.3
	8-12 year	3	5.0
Total		**60**	**100**
Mean ±SD=2.02 ±0.930			
Gender	Male	30	50.0
	Female	30	50.0
Total		**60**	**100**
Weight of the child	< 2.500g	23	38.3
	2.500-3.500g	27	45.0
	3.600-4.500g	8	13.3
	>4.500g	2	3.3
Total		**60**	**100**
Mean ±SD=1.82 ±0.792			
Residence of the child	Urban	56	93.3
	Rural	4	6.7
Total		**60**	**100**
Type of delivery	NVD	42	70.0
	CS	18	30
Total		**60**	**100**
Place of delivery	House	18	30
	Hospital	42	70
Total		**60**	**100**

The table (1) demonstrates the socio-demographic characteristics of the child (age, gender, weight, residence, type of delivery and place of delivery) it shows that (36.7%) of the children were less than 1 years old with a mean age and SD of 2.02 ± 0.930. Equal distribution for both gender (50%), and (45%) of them had a weight between (2.500-3.500gm) with a majority of them (93.3%) living in urban, and (70%) of them had delivered normal vaginal delivery in the hospital.

Table (2) Socio-demographic characteristics for the mother

Items		Frequency (*f*)	Percentage (%)
Age	<20 year	3	5
	20-30 year	32	53.3
	31-40 year	24	40
	>41 year	1	1.7
Total		**60**	**100**
Mean ± SD= 23.8 ±0.613			
Marital status	Married	55	91.7
	Divorce	2	3.3
	Widow	3	5
Total		**60**	**100**
Mother education -level	Illiterate	10	16.7
	Read write	12	20
	Primary graduate	21	35
	Intermediate graduate	6	10
	Secondary graduate	3	5
	Institute graduate	5	8.3
	College & above	3	5
Total		**60**	**100**
Monthly income	Sufficient	7	11.7
	Barely sufficient	43	71.7
	Insufficient	10	16.6
Total		**60**	**100**
Mother –occupation	Gov. employee	5	8.3
	Housewife	54	90
	Student	1	1.7
Total		**60**	**100**
Body Mass Index (BMI)	<18.5kg/m2	3	5
	18.5-24.9kg/m2	16	26.7
	25-29.9kg/m2	26	43.3
	≥ 30kg/m2	15	25
Total		**60**	**100**
Consanguinity	Yes	33	55
	No	27	45
Total		60	100

Table (2) demonstrates the socio-demographic characteristics of the mother (age, marital status, the level of education, monthly income, occupation, BMI, and consanguinity). With regard to the mother age, more than half (53.3%) of the mothers aged between (20-30) years old, and the majority (91.7%) of them were married. They have graduated from primary school (35%), (71.7%) of them came from barely sufficient socio-economic status and the majority (90%) of mothers being a housewife and (43.3%) of them being overweight and (55%) were consanguinity marriage.

Table (3) Reproductive characteristics of the mother:

Items		Frequency(*f*)	Percentage (%)
Maternal- age -delivery	<20 year	11	18.3
	20-30 year	35	58.3
	31-40 year	14	23.3
Total		**60**	**100**
Mean ± SD= 20.5 ± 0.649			
Gravida	1-2	25	41.7
	3-4	26	43.3
	>5	9	15.0
Total		**60**	**100**
Para	1-2	31	51.7
	3-4	23	38.3
	>5	6	10.0
Total		**60**	**100**
Abortion	None	40	66.7
	1-2	19	31.7
	3-4	1	1.7
Total		**60**	**100**
Other-abnormal child	None	54	90
	1-2	6	10
Total		**60**	**100**
Attending Health Care visits	None attended	13	21.7
	Irregular attended	17	28.3
	regular attended	30	50
Total		**60**	**100**
Illness during pregnancy	None	51	85
	D.M	6	10
	H.T	2	3.3
	Heart disease	1	1.7
Total		**60**	**100**

Table (3) shows the mother reproductive characteristics (maternal age at delivery, gravida, para, abortion, other abnormal children, attending health care visits and illness during pregnancy). With regard to the maternal age at delivery, the table shows that (58.3%) of mothers were between (20-30) years old during delivery of the current child. The majority of the sample (43.3%) had (3-4) children, with half (51.7%) from (1-2) para and (66.7%) of them with none abortion. Ninety percent of the sample had no other abnormal child. Half of the sample (50%) were regularly attended health care visits with the majority (85%) of mothers had no illness during current pregnancy.

Table (4) Maternal characteristics of current pregnancy

NO.	Items	YES		NO	
		F	%	F	%
1.	Does the mother had medication during pregnancy	2	3.3	58	96.7
2.	Does the mother smoking during pregnancy	0	1.7	59	98.3
3.	Does the mother drinking alcohol during pregnancy	0	0	60	100
4.	Does the mother have addict medication during pregnancy	0	0	60	100
5.	Does the mother have the folic acid during pregnancy	44	73.3	16	26.7
6.	Does the mother exposed to accident during pregnancy.	2	3.3	58	96.7
7.	Does the mother exposed to the x-ray during pregnancy	1	1.7	59	98.3
8.	Is there any history of anomaly in the family	10	16.7	50	83.3
9.	Does the mother had U/S during pregnancy	54	90.0	6	10.0
10.	Does the mother have any infectious disease during pregnancy	25	41.7	35	58.3

This table shows maternal characteristics for the current pregnancy, it shows that the vast majority of the sample was non-smokers, non-alcoholics, and non-sedative or medication takers, none were exposed to accidents or x-ray. While the table shows that (73.3%) of the mothers took folic acid during the current pregnancy. In addition, (83.3%) of them had no history of an anomaly, and (90%) of the mothers had an ultrasound in the current pregnancy. While (41.7%) of them had infectious disease during the current pregnancy.

Table (5) Association between some maternal risk factors and birth defects

Maternal risk factors	Birth Defects			Total F (%)	P ≤0.05
	Cerebral Palsy F (%)	Erb's Palsy F (%)	Spina Bifida F (%)		
Weight of child					
<2.500gm	20 (50)	1 (7.7))	2 (28.6)	23 (38.3)	**0.030**
2.500-3.500gm	16 (40)	7 (53.8)	4 (57.1)	27 (45)	
3.600-4.500	4 (10)	3 (23.1)	1 (14.3)	8 (13.3)	
>4600gm	0 (0)	2 (15.4)	0 (0)	2 (3.3)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Maternal age at delivery					
<20 year	9 (22.5)	0 (0)	2 (28.6)	11 (18.3)	**0.037**
20-30 year	25 (62.5)	6 (46.2)	4 (57.1)	35 (58.3)	
31-40 year	6 (15)	7 (53.8)	1 (14.3)	14 (23.3)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Type of Delivery					
NVD	28 (70)	12 (92.3)	2 (28.6)	42 (70)	**0.012**
CS	12 (30)	1 (7.7)	5 (71.4)	18 (30)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Gravida					
1-2	20 (50)	1 (7.7)	4 (57.1)	25 (41.7)	**0.035**
3-4	13 (32.5)	10 (76.9)	3 (42.9)	26 (43.3)	
5>	7 (17.5)	2 (15.4)	0 (0)	9 (15)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Residence					
Urban	37 (92.5)	12 (92.3)	7 (100)	56 (93.3)	**0.753**
Rural	3 (7.5)	1 (7.7)	0 (0)	4 (6.7)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Place of Delivery					
House	15 (37.5)	3 (23.1)	0 (0)	18 (30)	**0.113**
Hospital	25 (62.5)	10 (76.9)	7 (100)	42 (70)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Body Mass Index					
<18.5kg/m^2	3 (7.5)	0 (0)	0 (0)	3 (5)	**0.463**
18.5-24.9kg/m^2	12 (30)	2 (15.4)	2 (28.6)	16 (26.7)	
25-29.9kg/m^2	18 (45)	5 (38.5)	3 (42.9)	26 (43.3)	
≥30kg/m^2	7(17.5)	6 46.2)	2 (28.6)	15 (25)	
Total	40 (100)	13 (100)	7 (100)	60 (100)	
Monthly income					
Sufficient	4 (10)	2 (15.4)	1 (14.3)	7 (11.7)	**0.986**
Barely sufficient	29 (72.5)	9 (69.2)	5 (71.4)	43 (71.7)	
Insufficient	7 (17.5)	2 (15.4)	1 (14.3)	10 (16.7)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Consanguineous					
Yes	22 (55)	5 (38.5)	5 (71.4)	32 (53.3)	**0.346**
No	18 (45)	8 (61.5)	2 (28.6)	28 (46.7)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	
Attending Health Care					
Not attended	10 (25)	2 (15.4)	1 (14.3)	13 (21.7)	**0.414**
Irregular attended	10 (25)	3 (23.1)	4 (57.1)	17 (28.3)	
Regular attended	20 (50)	8 (61.5)	2 (28.6)	30 (50)	
Total	**40 (100)**	**13 (100)**	**7 (100)**	**60 (100)**	

Table (5) shows the association between some maternal risk factors and birth defects. The results found a significant association between type of birth defects and weight of the child at ($p<0.03$), it shows that (50%) of cerebral palsy was in children less than (2.500gm) and the Erb's palsy (15.4%) for the children more than (4.600gm).

In addition, a significant association was found between the mother's age at delivery and the type of

birth defects at (p<0.037). The results showed that (28.6%) of children with spina bifida was born for mothers less than (20) years old, (62.5%) of children with cerebral palsy was born for mothers aged between (20-30)years old and (53.8%) of them have borne for mothers aged more than (31) years old.

Regarding the type of delivery, a significant association was found with type of birth defects at (p<0.012). It was found that (70%) of cerebral palsy and (92.3%) of Erb's palsy was found among normal vaginal delivery and (71.4%) of spina bifida was found in caesarean section delivery.

In addition, a significant association was found between gravida and type of birth defects at (p<0.035). While the results showed no significant association between type of birth defects and residence, place of delivery, BMI, monthly income, consanguinity and health care attendance.

DISCUSSION

The present study of 60 children, who had attended the Rehabilitation Department in Azadi Teaching Hospital and Kirkuk Rehabilitation Center in Kirkuk City, was designed to find out the association between some maternal risk factors and type of birth defects such as (child birth weight, Age of mother at delivery, type of delivery, gravida, residence, place of delivery, monthly income, consanguineous, BMI for the mother, and attending the health care centers).

The current study have found a significant association between some maternal risk factors such as birth weight, maternal age at delivery, type of delivery, gravida, and the birth defects, while other factors such as residence, place of delivery, BMI, monthly income, consanguineous and attending the health care centers have found no association. One-third of the study samples were aged less than one year with a majority of them having a weight from (2,500-3,500gm). However, more than one-third had a weight less than (2,500gm) and there was a significant association at (p<0.030) between birth weight and maternal risk factors. Infants with congenital malformations have on average lower birth weight than infants without malformations with some exceptions, and morbidity of birth defects are more among low birth weight infants [8], [9], [10].

In relation to the age of the mothers, the result showed that half of them were from (20-30) years old. Maternal age is an important parameter in the birth of a congenitally malformed fetus. For this reason, females who are older than 35 years of age need to be examined more carefully since the risk of birth of a congenitally malformed fetus will increase. Current study result was consistent with the result of two studies conducted in Iraq, the first was by the Ministry of Health (MOH, 1994), which found the age group of mothers between (20-34) years old was (59%) from (23105) sample of women in a survey population [11], the same result was found in the second study by Abbas, (2008) [12] Advanced maternal age >35 years old reported to be the most risk factor for birth defects [13], [14].

According to the type of delivery, the majority of the study sample had normal vaginal delivery. A significant association was found between the type of delivery and birth defects. Most of the study sample who had NVD had Erb's palsy and the possible explanation for this may that deliver through vaginal route could traumatize and expose the neural tissue to bacteria normally present in the birth canal than deliver by caesarean section.

A significant association was found between parity and birth defects at (p<0.035). Women who were multiparous (3-4) had more chance to have fetuses with birth defects. This result was inconsistent with the result of Singh, (2009)[15] who reported an increase in the frequency of CNS anomalies in primi and fourth gravida mothers, while the current result was incomparable to what reported by Taboo, (2012)[14] increasing birth defects among primigravid mothers than multiparous. Despite larger group (71.1%) of the current study sample being mostly from barely sufficient income (middle class), there was no association between socioeconomic status and birth defects. The socioeconomic level may represent a selective risk factor for specific congenital malformations [16],[17]. The WHO, (2015)[8]reported that although low income may be an indirect determinant, congenital anomalies are more frequent among resource-constrained families and countries. It is estimated that about 94% of severe congenital anomalies occur in low- and middle-income countries, where women often lack access to sufficient, nutritious food and may have increased exposure to agents or factors such as infection and alcohol that induce or increase the incidence of abnormal prenatal development.

Although two-fifths of the present study was overweight, there was no significant association between BMI and birth defects. Previous studies found that maternal obesity is a higher risk for some birth defect [18], [19]. More than half of the present study sample was consanguineous marriage, but there was no association between consanguinity and birth defects. consanguineous marriage has been repeatedly found to have an association with birth defects [20], [14]. Among maternal risk factors, folate supplementation, cigarette smoking and exposure to x-rays occupy a significant position. Neural tube defects, which include spina bifida and encephaloceles, have long been linked to folic acid supplementation. Folic acid is important for a normal brain and spinal cord development during the first 4 weeks of gestation. Several studies have shown that folic acid reduces the occurrence of some congenital anomalies e.g. neural tube defects, oro-facial clefts, limb reduction defects, congenital heart defects [19], [20], [1] The current study result showed that half of the study sample were regularly attending the antenatal

care unit and having folic acid with not being smoker or drinking alcohol. While more than one-fifth of them had irregular attendance. This result is opposite to a study result that found (55%) of the sample attending antenatal care irregularly [12]. Effective antenatal acre improves maternal health through early detection, prevention as well as treatment of medical and obstetrical complications during pregnancy [8].

CONCLUSION AND RECOMMENDATION:

Conclusion

Based on the result of the current study, a significant association was found between some maternal factors such as birth weight, maternal age at delivery, type of delivery, gravida and the birth defects.

Recommendation

The necessity to increase the awareness of the pregnant women regarding attending antenatal care centers regularly from the start of pregnancy to discover any abnormalities. Further studies with larger samples are needed to be conducted in Kirkuk city.

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