ORIGINAL ARTICLE

FREQUENCY OF CONGENITAL MALFORMATIONS AND ASSOCIATED RISK FACTORS AT LIAQAT MEMORIAL HOSPITAL, KOHAT

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ABSTRACT

Objective: *to find out the frequency of various congenital malformations (CM) in the neonates born at Liaqat Memorial Hospital (LMH) Kohat and to find out their association with various risk factors.*

Methodology: *This cross-sectional study was conducted on neonates born to mothers admitted at LMH, Kohat from January to December 2011. Detailed information regarding CM and associated maternal risk factors were collected on a predesigned proforma and the data was analyzed by SPSS-17.*

Results: *Out of 9558 deliveries, 93 (0.97%) babies had various CM. Anencephaly (40.9%), hydrocephalous (29%), hydrocephalus with meningocele (10.7%) and hydrops fetalis (4.3%) were the commonest CM. Overall 60.2% (n=56/93) babies had <2.5 Kg birth weight. Mean age of mothers was 26.10 ± 7.406 years. Out of 93 mothers, 75(80.6%) were between 20-40 years of age. Fifty four (58%) mothers were multigravida and 25 (26.9%) were grand-multigravida. Majority (65.6%) had poor socioeconomic status (SES) and 63 (67.7%) mothers had no antenatal checkup before the final diagnosis. Consanguinity rate was 61.3% (57/93) and antenatal folic acid intake in 33.3% mothers. Toxoplasmosis was present in 5.3% (5/93) cases and syphilis in one case. Family history of congenital abnormality was present in 8(8.6%) cases and history of maternal passive smoking during pregnancy was positive in 3 (3.2%) of the mothers.*

Conclusion: *Anencephaly and hydrocephalous were the commonest CM. Poor SES, low intake of folic acid, high consanguinity rate, low antenatal check up rate and low literacy rate and family history for CM were the common associated risk factors of CM.*

Keywords: *Congenital Abnormality, Pregnancy, Hydrocephalus, Meningocele, Anencephaly.*

This article may be cited as: Gul F, Jabeen M, Khan AS. Frequency of congenital malformations and associated risk factors at Liaqat Memorial Hospital, Kohat. Khyber Med Univ J 2012;4(3):119-124

INTRODUCTION

The human reproduction is a complicated process and is prone to be adversely affected by various factors related to host and environment[1]. This may lead to congenital malformations (CM) in the newborn. A congenital physical anomaly is structural abnormality of any part of the body which may present at birth or become clinically manifest anytime later in life. These anomalies may arise from defects as a result of genetic mutations, aberrations in chromosomes and / or unfavorable intrauterine environment during antenatal period. The CM may range from minor lesions to major structural defects[2]. Figures from Europe showed a prevalence rate of 23.9 per 1,000 births for major congenital anomalies[3]. In USA, CM are responsible for 17.8% of all infant deaths[4].

Early recognition of CM may reduce the morbidity and mortality in children. Some congenital CM like tracheo-esophageal fistula, diaphragmatic hernia, choanal atresia and intestinal obstruction require urgent medical and surgical interventions for the survival of the patients[5].

Etiology of CM is multifactorial, however in 40-60% of cases the underlying cause is not known[6,7]. According to some estimates, various causes of CM include genetic conditions (chromosome and single gene causes) in 15%-25% of cases, environmental factors (maternal-related conditions, drug or chemical exposures) in 8%-12% and multifactorial inheritance in 20%-25% cases[8].

Surveillance and monitoring of CM is important for identifying patterns of malformations. A nationwide surveillance can recognize the disease burden in pre and

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Date submitted: March 25, 2012
Date Revised: September 05, 2012
Date Accepted: September 16, 2012

post-natal period & related risk factors and is helpful for strategic planning to improve the pregnancy related outcomes. However due to non-availability of national data with financial constraints and feasibility problems in conducting large scale study, this small scale hospital based study was planned to get an overview of pattern of congenital anomalies in a District Headquarter hospital. The aim of this study was to find out the frequency of various congenital abnormalities in the neonates born at Liaqat Memorial Hospital Kohat and to find out their association with various risk factors.

METHODOLOGY

This was a cross sectional analytical study conducted from January to December 2011 at Liaqat Memorial District Teaching Hospital, Khyber Medical University (KMU), Institute of Medical Science Kohat, Pakistan. All the mothers who gave birth to congenitally abnormal baby during study time period were interviewed and information regarding various risk factors was collected on a pre-designed proforma; while newborns (both alive & stillborn) with various CM were examined by the pediatrician and abnormality was noted. Data collected was analysed by SPSS window's version 17.

There were total 9558 deliveries out of which 93 were associated with various congenital malformations. The variables studied included maternal & paternal age, history of malformation in family, socioeconomic status (SES), folic acid intake, antenatal check up, consanguinity, ovulation induction, teratogenic drugs intake, antenatal TORCHS infections, history of radiation exposure, active & passive smoking and alcohol use during pregnancy. The impact of maternal & paternal education on their health and antenatal care was also studied. Due to high cost and non-affordability by patients, Karyotyping was not performed. Postmortem was also not performed as none of the parents allowed it.

RESULTS

Out of 9558 deliveries, 93 (0.97%) babies had various CM. Anencephaly (40.9%), hydrocephalous (29%), hydrocephalus with meningocele (10.75%) and hydrops fetalis (4.3%) were the commonest congenital malformations (Table I). Due to non-availability of echocardio-graphic facility in Kohat, 11 out of 9558 (0.12%) babies were sent to Peshawar for echocardiography to rule out suspected cardiac CM but all of them were lost to follow up.

Single anomaly was present in 79 (84.9%) cases and multiple anomalies were present in 14 (15.1%) cases. Overall congenital anomalies related to central nervous system (CNS) were the common most (86.02%) followed by musculoskeletal system (5.4%). Details of the systemic involvement are given in Table II.

Out of 93 babies born with CM, majority (59.1%) were females and 60.2% (n=56/93) babies had below 2.5 Kg birth weight (Table III). Mean age of mothers was

DISTRIBUTION OF VARIOUS EASILY IDENTIFIABLE CONGENITAL MALFORMATIONS

Congenital Malformations	Frequency (n=93)	%age
Anencephaly	38	40.9
Hydrocephalous	27	29.0
Hydrocephalous with meningocele	10	10.7
Hydrops Fetalis with ascites/ pleural effusion	4	4.3
Dolicocephaly Talipes Acquinovarus	2	2.2
Microcephaly	2	2.2
Meningocele & anencephalus	1	1.1
Encephalocele & small limbs	1	1.1
Hydrocephalus & spina bifida	1	1.1
Cleft Palate	1	1.1
Conjoined Twins & ambiguous genitalia	1	1.1
Cyclops & ambiguous genitalia	1	1.1
Hydronephrotic Kidney	1	1.1
Hydrothorax	1	1.1
Osteodystrophy	1	1.1
Small Limbs & Ascites	1	1.1
Total	93	100.0

Table I

THE FREQUENCY OF VARIOUS SYTEMS INVOLVED BY CONGENITAL MALFORMATIONS

Major Organ system involved*	Frequency (n=93)	%age
Central Nervous system	80	86.02
Musculosekeltal Deformaity	5	5.4
Gastroestinal System/Ascites	4	4.3
Respiratory System	2	2.15
Renal System	1	1.08
Conjoined Twins	1	1.08

* Primarily major system involved are given in this table. Some babies had multisystem involvement but are not mentioned in this table.

Table II

DEMOGRAPHIC DETAILS AND MAJOR CHARACTERISTICS

Baby Weight	**Frequency (n=93)**	**%age**	**Atenatal Care**	**Frequency (n=93)**	**%age**
1- 2.4 KG	56	60.2	Yes	30	32.3
2.5—4KG	35	37.6	No	63	67.7
>4KG	2	2.2	**Antenatal Maternal Infection**		
Baby Sex	**Frequency (n=93)**	**%age**	Toxoplasmosis	5	5.4
Female	55	59.1	Syphilis	1	1.07
Male	36	38.7	**Antenatal Drugs Used**	**Frequency (n=93)**	**%age**
Ambiguous genitalia	2	2.2	Antiepileptic	3	3.2
Father's age (year)	**Frequency (n=93)**	**%age**	Insulin	3	3.2
20-30	28	30.1	Oral hypoglycemic	1	1.1
31-40	40	43.0	**Smoking**	**Frequency (n=93)**	**%age**
>40	25	26.9	Passive smoking	3	3.2
Mother's age (year)	**Frequency (n=93)**	**%age**	Active smoking	0	0
13-19	12	12.9	**Socioeconomic Status**	**Frequency (n=93)**	**%age**
20-30	55	59.1	Poor (Monthly Income <Rs.10,000	61	65.6
31-40 >40	20 6	21.5 6.5	Middle class (Monthly Income Rs. (10,000-50,000)	32	34.4
Parity	**Frequency (n=93)**	**%age**	**Female education**	**Frequency (n=93)**	**%age**
0	16	17.2	Matric	10	10.8
1	16	17.2	below Matric	83	89.2
2-4	49	52.7	**Male education**	**Frequency (n=93)**	**%age**
5 and more	12	12.9	Matric	40	43.0
Cousin marriage	**Frequency (n=93)**	**%age**	below Matric	53	57.0
Yes	57	61.3	**Folic acid**	**Frequency (n=93)**	**%age**
No	36	38.7	yes	31	33.3
			No	62	66.7

Table III

26.10 ± 7.406 years and majority of mothers (80.6%) and fathers (73.1%) were between 20-40 years of age.

Unfortunately our study showed very low literacy rate and majority of mothers (89.2%) and fathers (57%) were having education status of below matriculation. Majority of parents were from poor SES with 65.6% having monthly income of less than 10,000 Pakistani Rupees.

Fourteen (15.1%) mothers were primigravida, 54 (58%) were multigravida and 25 (26.9%) were grand-multigravida. The preponderance of various CM was seen between parity 2 to 4 (52.7%) with 17.2% contribution by the primiparous and only 12.9% by females of parity 5 or more. Sixty three mothers (67.7%) had no antenatal checkup before the final diagnosis. Consanguinity rate was 61.3% (57/93) and antenatal folic acid intake in 33.3% of patients. TORCHS screening showed Toxoplasmosis 5.3% (5/93) cases and syphilis in one (1.07%) case.

Four (4.3%) patients were taking treatment for diabetes mellitus (3 were using Insulin and one was on metformin). Three patients were epileptic; two of them were using carbamazepine and one was on sodium valprovate tablets. History of passive smoking was positive in 3 (3.2%) of the mothers and family history of CM in 8(8.6%) cases.

DISSCUSSION

Congenital malformations or birth defects may be detected soon after birth or later, depending upon the nature of the defect. As CM are significantly contributing to infant mortality and morbidity, developed countries have established accurate surveillance systems to find out the birth prevalence of congenital anomalies for effective preventive strategies[8,9]. The frequency of CM in our own hospital deliveries was 0.97% (9.7/1000 total births) which corresponds to 11.4/1000 total births reported by another local study from Liyari General Hospital[10]. Figures from Indian hospital based study showed frequency of 1.91% for CM in India[11]. However the figure is much lower from other international figures like 36.89/1000 total births from 1997-2009 reported from Alberta (Canada)[9] and 29.4/1000 live births reported from Iran[12]. The limitation of our study is that it is a hospital based only which is not representative of the coverage population. Hence our results cannot be compared with well designed international studies, based on collaborative and standardized surveillance system. Moreover, the metabolic defects (reported as 7.18% cases from Iran),[12] usually do not manifest at birth so our study may underestimate the magnitude of all CM in our set up. The variation in the figures from different settings may also be due to area specific risk factors like ethnicity, geographical distribution, consanguinity, socio-cultural and nutritional factors.

In our study, congenital anomalies related to CNS were the most common lesions followed by musculoskeletal system. These findings are favouring the results of a Turkish study showing CNS related anomalies as the commonest CM[13]. Figures from Europe showed congenital heart defects (CHD) as the most common CM followed by limb defects[3]. However CHD could not be documented in our study as echocardiography was not available in Kohat and 11 (0.12%) babies with clinical suspicion of cardiac congenital anomalies were sent to Peshawar for echocardiography but all of them were lost to follow up. One possible explanation of the low prevalence of CHD could be the fact that these lesions are diagnosed after the patients are discharged from the maternity wards[14]. Similarly, higher frequency of CNS related defects may be due to obvious nature and easy detection of these anomalies at birth[15]. In our study neural tube defects (NTD) were the common most CNS related CM. This observation is in accordance with other national and international studies[10,16,17].

As evident from our results, high consanguinity rate, poor SES, poor antenatal check up, poor intake of folic acid, low literacy rate among parents, multigravidity, low birth weight, maternal diabetes mellitus, antenatal infection, passive smoking, antenatal drug use and family history of congenital abnormality were the risk factors observed in patients with various congenital diseases. Looking for the causes and risk factors of CM is of utmost importance for adopting the effective preventive strategies. Although there are many causes of CM, however various CM are more prevalent in populations with consanguineous marriages suggesting some genetic contribution[18,19]. Due to financial constraints, karyotyping was not done in this study. Inter-cousin marriages are very common in countries with different religious and ethnic backgrounds[20]. Pakistan is having the world's highest prevalence rate of 61% for consanguineous marriages between first or second cousins[21]. In our study the consanguinity was present in 61.3% (57) of cases having various CM which is supported by a study from Iran, showing that CM were 3.5 times more frequent in consanguineous marriages as compared to non consanguineous marriages[22].

Majority of our patients were poorly educated and belonged to lowered-SES. Education is an important marker of SES and is responsible for individual's choice and access to health facilities[23]. In Pakistan, among uneducated women, 78% received no antenatal care during pregnancy[21]. Lower maternal education status has been associated with higher risk of NTD[24]. In our study out of 93 women, only 10.8% of females & 43% of husband were having education up to matriculation. Lack of education is indirectly responsible for lower SES of the people and thus adversely affecting the living conditions, medical care, and lifestyle. Lower SES is often associated with other factors responsible for poor health related outcomes[25]. Lower SES and lack of parental education lead to poor antenatal care and it is now a well established fact that lowered SES is associated with an increased prevalence of various CM[9].

Antenatal care can not only prevent the occurrence of CM but will also help in the early diagnosis and management of pregnancies being complicated with lethal CM. In Pakistan, 70% of all pregnant women are deprived of antenatal care and only 30% of women utilize antenatal care services[21]. Another study showed that 95% of pregnant ladies received antenatal care from LHV or nurse and only 5% were provided antenatal care by doctor[26]. Our study showed that only 32.3% of women giving births to children with CM had received any kind of antenatal care. Our figures of antenatal care and folic acid intake were almost similar and only 33.3% of mother had taken folic acid during pregnancy. Similar results were reported by Shawky RM et al showing only 31.8% rate of antenatal care and 27.5% of antenatal folate use among mothers with congenitally malformed children[27]. It has been documented that folic acid use during the peri-conception period can reduce the NTD rate in the newborn babies and early diagnosis of NTD on antenatal visit with pregnancy termination advice helps in reducing the perinatal morbidity and morbidity[28].

Advancing maternal age at time of conception is also contributing to increased frequency of CM. It has been suggested that increasing age of the mothers is associated with an increase in chromosomal meiotic errors and probably is the only non genetic risk factor for trisomies in human beings[29,30]. Mean maternal age in our study was 26.10±7.4 years with only 6.5% of mothers were above 40 years of age. Our results are similar to Tootoonchi P et al[5] (25.69±5.54 years) and Tomatir AG et al[13] (8.7% >35 years age) but are contrary to Shawky RM et al[27] who showed that 59.96% of mothers were having age of >35 years. Besides maternal age, multiparity and multigravidity are also associated with increased prevalence of CM[27,31]. Almost 85% of mothers in our study were multigravida which is consistent with Qazi G[32] having 2/3rd of CM in multigravida. However Perveen F et al showed more CM in primipara mothers[10].

In our study, about 60% of babies with CM were having birth weight of <2.5 Kgs. Our findings are consistent with another local study showing 43.5% infants having CM with birth weight of < 2.5 Kg[32]. Studies have shown that CM are associated with intrauterine growth retardation (IUGR) and low birth weight. The IUGR could be a primary predisposing factor or secondarily due to CM or both may coexist with some common etiologic factors[33]. No active smoking was present in our study, however passive smoking during pregnancy was present in 3.2% cases. This is now an established fact that the risk of congenital malformation is signiûcantly increased by passive/ secondhand smoke exposure during pregnancy[34]. Other risk factors like teraotgenic drugs use were not that frequent in our study.

Overall the frequency of CM is low as compared to international figures. However, the study is mainly focused on the visible CM among the newborns in the labour unit and possibly missing other important CM like metabolic defects and cardiac lesions which are usually diagnosed later on. Commonest congenital malformations in our study were neural tube defects. Poor SES, poor literacy rate, low antenatal check up rate, low intake of folic acid, high consanguinity rate, and family history for CM were the common associated risk factors of congenital abnormalities. Large scale population based study on various CM is required to measure the magnitude of the problem and also to find out the etiology of these CM in our set up.

LIMITATIONS OF STUDY:

This was a hospital based study and hence is not the true representative of the whole population. High cost of karyotyping and non-availability of echocardiographic facility in Kohat were the main limitations of the study that could account for possible under-diagnosis of various congenital malformations.

ACKNOWLEDGEMENT

We acknowledge the efforts of our participating investigators, Dr. Shifa Mahroz, Dr. Mehr Ali, Dr. Khalid Mehmood and Dr. Sajid Munir for their contribution during the study project.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

FG: Conception and design, Data collection, Analysis and interpretation of data, Drafting the manuscript

MJ: Data collection, Drafting the manuscript

ASK: Critical revision, Final Approval of the manuscript

CONFLICT OF INTEREST

Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE

NONE DECLARED