Association of Maternal Risk Factors to Congenital Anomalies among Infants: A Community Based Study in Rural Areas of Haryana, India

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Abstract

Objectives: The present study was aimed at assessing Association of Maternal Risk Factors to congenital anomalies of infants.

Material and Methods: This community based retrospective and cross-sectional study was carried out in 23 rural sub-centres of block Beri, district Jhajjar (Haryana, India) among 920 mothers. A predesigned pretested semistructured questionnaire was used to collect information. Univariate analysis along with logistic regression analysis was performed.

Results: The prevalence of congenitally malformations was 1.2%. Most common congenital malformations were cleft lip/palate (18.18%) and hydrocephalus (18.18%). Mothers with < 3 years gap between pregnancies had higher prevalence (1.7%) of congenital malformations in live births. Mothers with previous history of congenital malformation (8.3%) and abortions (13.6%) had higher prevalence of congenitally malformed babies with 2.6 and 4 times higher odds of having a malformed baby.

Conclusions: The study concluded that mothers with risk factors like extreme of ages, illiteracy, bad obstetric history, history of previous congenitally malformed baby are at increased risk of fetal congenital malformation.

Introduction

Congenital anomalies (also referred as birth defects) affect an estimated 1 in 33 infants and an estimated 303 000 newborns die within 4 weeks of birth every year, worldwide, due to congenital anomalies.[1] It accounts for 8-15% of perinatal deaths and 13-16% of neonatal deaths in India.[2] The true magnitude of birth defects in India is not known, though research on congenital malformations has reported varied prevalence 0.8% to 3.7%.[3-5] According to the annual report of Indian Council of Medical Research (2002-03) cardiovascular, musculoskeletal and genitourinary were the most commonly affected systems in a descending order of frequency.[6] The congenital anomalies are not only a leading cause of foetal loss, but also contribute significantly to preterm birth, childhood and adult morbidity along with considerable repercussion on the mothers and their families. The maternal factors like mother's age, educational level, occupation, socioeconomic status, maternal height, parity, birth spacing, bad obstetric history, diseases during pregnancy like anemia, hypertension, diabetes and health care services utilization by mothers bear significant associations with outcome of pregnancy. The present study was carried out to know the pattern of congenital malformations and their relationship with socio-demographic and above mentioned maternal risk factors as it is important to study this on regional basis.

Material and Methods

This community based retrospective and cross-sectional study was carried out in Community Development Block, Beri (District Jhajjar) after approval from institutional ethics committee from September 2012 to August 2013. Beri block serves as the field practice area of Department of Community Medicine, Pt. B. D. Sharma Post Graduate Institute of Medical Sciences, Rohtak. Out of the 25 subcentres, two subcentres- serve the urban population and the rest 23 subcentres cater services to rural population.

Considering the prevalence of high risk pregnancy as approximately 10%[7] and allowable error of 20% at 95% level of significance and 90% power, the sample size was calculated using the formula (n) = Z21-α/2+β p (1-p)/ d2, where Z = Value of area under the normal curve (1.96 for 2-sided test; 5% significance level), α = Level of significance (0.05), β = Power of the study, p = Prevalence (proportion-10%), d = Relative Allowable error (20%) and n= Sample Size. The calculated sample size came out to be 900. Mothers who delivered in the last one year were included in the study fulfilled the inclusion criteria of permanent residents of the area for at least last one year, had ANC records at subcentres and who had given informed written consent with a literate witness thereof. Women who could not be contacted even after two home visits, women who did not give consent, multiple births like twins and Maternal death were excluded from study.

A list of all the 23 rural sub-centers in the study area was obtained from the concerned Community Health Centres. All mothers who delivered in the last one year and had antenatal records were enlisted from the ANC, Birth and immunization register from subcenter. Out of enlisted mothers, 40 mothers were selected by simple random sampling from each subcenter. Though the calculated sample size was 900, a total of 920 (40X23) mothers were included in the study to make the sampling procedure more convenient. The investigator herself contacted these selected mothers at their home. All the subjects were fully informed about the purpose of the study. A written informed consent was obtained from the individual before conducting the interview. A pre-tested semi-

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Table 1: Distribution of risk factors among mothers (N=910)

Risk Factors*	Frequency	Percentage
Maternal age ≤ 19 years	34	3.7
Maternal age ≥ 35 years	15	1.6
Height ≤145 cm	8	0.9
Parity ≥ 4	33	3.6
Previous stillbirth	25	2.7
History of ≥ 3 abortions	23	2.5
Foetal mal-presentation	18	2.0
Previous birth with congenital malformations	15	1.6
Anemia during pregnancy	473	52.0
Hypertension during pregnancy	44	5.0
Diabetes mellitus during pregnancy	62	6.8

*More than one risk factor may be there

Table 2: Types of congenital malformations in the study area (N=11)

Congenital malformation*	Number	Percentage
Cleft lip /palate	2	18.18
Hydrocephalus	2	18.18
Renal anomaly	1	9.09
Umbilical hernia	1	9.09
Duplicate/intestinal cyst	1	9.09
Imperforate anus	1	9.09
Extra thumb	1	9.09
Strawberry Hemangioma	1	9.09
Spina bifida	1	9.09
Talipes	1	9.09

*More than one congenital malformation

structured interview schedule was used which included information on socio-demographic profile, past obstetrical, medical and contraceptive history, details of latest pregnancy like antenatal care visits, Iron Folic Acid tablets consumption, time of pregnancy registration and complications during pregnancy like anemia, hypertension, diabetes, etc. The detailed obstetric history, along with presence of any congenital malformation in live single births were recorded. The health records available with the mother were also reviewed. Socioeconomic status of study population was assessed using Modified Udai Parikh scale for rural areas.[8]

Data analysis was done in SPSS (Statistical Package for Social Studies) for Windows version.20.0. Categorical data was presented as percentage (%). Pearson's chi square test was used to evaluate differences between groups for categorized variables. Binary logistic regression analysis (stepwise method) was used to evaluate the independent associations of various factors with congenital malformation. All tests were performed at a 5% level significance.

Congenital malformations were defined as structural or functional anomalies, including metabolic disorders, which are present at the time of birth.[1]

Results

In the present study, a total of 920 mothers who delivered in the last one year were included in the study. The response rate was 100%. There were 10 twin deliveries and 10 still births. Thus data of 900 live births were analysed for congenital malformations. The study found that the mean age of study participants was 24.4 years. Majority (96.6%) of study subjects belonged to lower socioeconomic status (middle + lower middle+ lower socioeconomic status) while higher socioeconomic status (upper-middle + upper socioeconomic status) constituted 3.4% of study subjects. Table 1 shows the prevalence of risk factors among mothers in the study area. The present study revealed that nearly half of the mothers were anemic during pregnancy (52.0%). The diseases like diabetes and hypertension during pregnancy with prevalence of 6.8% and 5.0% respectively were other common morbidities found among mothers.

Table 2 shows the pattern of foetal outcome in the study area. Most common congenital malformations were cleft lip/palate (N=2; 18.18%) and hydrocephalus (N=2; 18.18%).

Table 3: Association of maternal factors with congenital malformation in live births (N=900)

Maternal factors	Congenital malformation (N=11)	No malformation (N=889)	Chi square, p value
Mother's age ≥35year	1(7.1%)	13(92.9%)	4.129, p=0.159
Mother's occupation: working	0(0.0%)	215(100.0%)	0.495, p=0.076
Socioeconomic Status			1.230,p=0.304
Upper + Upper Middle	1(3.4%)	28(96.6%)	
Middle + Lower Middle + Lower	10(1.1%)	861(98.9%)	
Mother's height ≤145 cm	0(0.0%)	6(100.0%)	0.075, p=1.000
Parity ≥4	2(6.2%)	30(93.8%)	6.947,p=0.055
Birth spacing <3 Year	11(1.7%)	622(98.3%)	4.697, p=0.040
Previous history of ≥3 abortions	3(13.6%)	19(86.4%)	28.787, p=0.002
Previous history of congenital malformation	1(8.3%)	11(91.7%)	5.094, p=0.024
Foetal mal-presentation	1(6.2%)	15(93.8%)	3.411, p=0.180
Anemia during pregnancy	6(1.2%)	459(98.7%)	0.867, p=0.219
Hypertension during pregnancy	1(2.6%)	37(97.4%)	0.653, p=0.380
Diabetes during pregnancy	2(3.4%)	56(96.6%)	2.545, p=0.154
Early registration of pregnancy	5(0.8%)	583(99.2%)	1.336, p=0.347
<4ANC visits during pregnancy	6(1.8%)	320(98.2%)	0.386, p=0.755
Full course IFA tablets intake during pregnancy	2(0.5%)	413(99.5%)	4.867, p=0.04

Table 3 depicts the association of congenital malformations in the baby with maternal factors. The associations of variables like previous history of ≥ 3 abortions, birth spacing and previous history of congenital malformation were found to be statistically significant. However, there was no statistically significant relationship between congenital malformations in live births and other variables of mothers like maternal height ≤145cm, parity ≥4, foetal malpresentation, anemia, hypertension and diabetes during pregnancy.

In the present study, mothers who consumed full course of IFA tablets during pregnancy had significantly less prevalence (0.5%) of congenital malformation as compared to mothers who did not consume full course of IFA tablets (1.9%). The present study also observed that those mothers who registered early (≤12 weeks of pregnancy) and visited health facilities ≥4 times during antenatal period had fewer occurrences of congenital malformations. However, these two relationships were found to be statistically non-significant.

On analysis with stepwise logistic regression method, it was observed that previous history of ≥ 3 abortions, complete course of IFA tablets intake during pregnancy and foetal mal-presentation had independent association with congenital malformation in live births. The mothers with previous history of ≥ 3 abortions had about four times more chances of

Table 4: Logistic regression analysis of variables with congenital malformation in live births (stepwise method) (N=900)

Variable	aOR	Confidence interval	p value
Previous history of ≥ 3 abortions	4.15	3.32-10.29	0.000
Previous history of congenital malformation	2.61	1.06-17.28	0.044
IFA tablets intake during pregnancy	0.78	0.03-0.99	0.046

having congenitally malformed babies (aOR: 4.15; CI: 3.32-10.29, p=0.000) than mothers with history of <3 abortions. The study observed that there are increased odds of re-occurrence of congenital malformations in mothers with previous history of congenital malformation when compared to mothers with no such previous history (aOR: 2.61; CI: 1.06-17.28, p=0.044). It was also seen in the study that mothers who consumed full course of IFA tablets had less chances of occurrence of congenital malformation in live births (aOR: 0.78; CI: 0.03-0.99, p=0.046) as compared to mothers who did not consume the full course of IFA tablets (Table 4).

Discussion

The present study revealed that nearly half of the mothers were anemic during pregnancy (52.0%). Similarly, NFHS- 3 data revealed that 57.9% pregnant women in India and 56% in Haryana were anaemic.[9] Singh et al reported the overall prevalence of anemia as 42%.[10] The prevalence of diabetes during pregnancy was 6.8% in our study. The prevalence of gestational diabetes has been reported to be in the range of 6.9 to 13.9%.[11-13] Hypertension was found out to be 5.0% among pregnant women in the present study. Almost, similar observation (6.9%) was quoted by Bharti et al while Sachdeva et al and Zareen et al had reported it as 15% and 14.8% respectively among rural women in hospital based studies.[14-16]

The present study found that mothers aged more than 35 years had higher prevalence of congenitally malformed babies when compared to mothers below 35 years of age. This association was found to be statistically significant. Sarkar et al,Taksande et al and Sheridan et al also concluded that prevalence of congenitally anomalous babies born was higher for mothers with advanced age and this association had statistical significance,[17,4,18] Increase in age brings with it lot many other chronic diseases in the mother which affect her state of immunity and impair her withstanding abilities. Moreover, non-disjunction and mutations increase with advanced age. In our study, congenital anomalies among live births were seen more commonly (3.3%) among multiparas in comparison to primiparas (1.8%). Similarly, Taksande et al[4] and Sarkar et al[17] reported an increase in occurrence of congenital malformations with increasing parity i.e. congenital malformations were more common in multipara mothers as compared to primipara. In the present study, another significant finding surfaced out that women with a gap of <3 years between pregnancies had significantly higher prevalence (1.7%) of congenital malformations in live births than those with a gap of ≥3 years (p=0.04). Chen et al studied the relationship between inter-pregnancy interval and congenital anomalies' and reported the same sort of observation i.e association of inter-pregnancy interval with congenital anomalies was found to be statistically significant.[19] Although nearly half of the mothers were anemic during pregnancy in the present study, the prevalence of congenital anomalies was equal in both in anemic and non-anemic mothers. This association was found to be non-significant statistically as well (p=0.219). It was also observed that prevalence of congenital malformation was a bit higher among hypertensive mothers (2.6%) and diabetic mothers (3.4%) as compared to non-hypertensive (1.2%) and non-diabetic mothers (1.1%). However, when subjected to analysis with chi square test, the associations of hypertension and diabetes during pregnancy with congenital malformations were found to be non-significant. Wahi et al in their study reported 1.6 % congenital anomalies in babies of mothers with GDM while no congenital anomaly was reported among controls13. Agarwal et al (1991) in their study observed that pre-eclamptic toxemia was significantly associated with occurrence of congenital malformations.[20]

Conclusions

Though the present study has limitation that it was retrospective and only the women who registered at the sub-centres were enrolled for the study, still it was an attempt to throw light on the pattern of congenital malformations and their associations with different risk factors in mothers. In order to improve the general health of the newborn and to reduce the cases of congenital malformations, it seems imperative to plan and make a policy for adoption of family planning methods by the most vulnerable. Apart from this, there is a need to render proper counseling, recognize dangerous pregnancies, ensure prompt management of mothers' diseases, and improve pregnancy care and mothers' health status and of course enhance all round efforts on women empowerment.

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