Association between caesarean delivery and childhood disease: evidence from multiple indicator cluster survey,Bangladesh

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**Abstract**

**Introduction**

The rate of caesarean delivery (C-section) has increased worldwide including Bangladesh over the past decades. As the C-section is a major surgery, it has a negative impact on mother and child health. However, research on this area in Bangladesh is sparse.Our objective was to inspect the association between C-section delivery and infantile disease (e.g. cough, diarrhoea, difficulty in breathing).

**Methods**  
We used multiple indicator cluster survey (MICS) data (2012-13). There were 7921 children under 2 years, of which the information of the mode of delivery (C-section vs. normal) was available for 2181 children. Important confounding factors were considered as age of child, child ever been breastfed, child had diarrhoea, child ill with cough, child's weight, child's length or height, division, sex(child), mother's education, religion of household head, wealth index quintile, age of woman, weight at birth. We used multivariable logistic regression and Poisson regression for analyse the data.

**Results**We found 38% children were born in normally and 62% children were born in C-section. Moreover, we observed 16.90% of caesarean section babies are in risk of having more diseases whereas normally delivered babies have 6.89% risk. The crude and adjusted Poisson analyses showed that the relative risk for the C-section was 1.06 (95% CI: 1.00-1.11) and 1.07(95% CI: 0.96-1.18), respectively. From the crude and adjusted logistic model, we found the crude and adjusted odds ratios for the C-section were 1.18(CI:1.00-1.11) and 1.10 (CI:.93-1.50) times higher than the odds ratio for the normal delivery, respectively, though the association was not statistically significant at 5% level of significance.

**Conclusion**

Our analysis shows that caesarean delivery is associated with increased rate of disease among children less than 2 years of age. We recommend increasing public awareness for the negative impact of the caesarean delivery in Bangladesh.

**Keywords:** Caesarean section; delivery type; disease; public awareness; cough; diarrhoea

Highlights:

What is already known?

#C-section and socioeconomics correlates of preference for institutional delivery were known previously.

What are the new findings?

#Association between disease and C-section is the matter of concern

What do the new findings imply?

# Findings indicate that program and policies need to address the increase rate of caesarean delivery

**Introduction**

A C- section is a surgical procedure which is often performed when a vaginal delivery would put the baby or mother at risk(1). It has been reported as an important operation in recent years which is closely related to maternal and perinatal risks and may have future pregnancies and long-term effects (2). C-Section is rapidly increasing in many developed and developing countries(3,4). A trend analysis based on data from 121 countries reported that, from 1990 to 2014, the average C-Section rates increased by 12.4% and the average annual rate increased by 4.4%(2).A 2004-2008 World Health Organization (WHO) survey recorded an average global rate of 25.7% in which C-Section, with 27.3% in Asia, 19.0% in Europe and 29.2% in Latin America(5,6). . As stated by WHO, there is no justification for any region to have a caesarean rate higher than 10 -15%, which weighs a serious reason for worry in most of the countries worldwide (7).

Babies born by CS are at risk of developing asthma(8–10),type 1 diabetes (8,9)crohn's disease(11), allergic diseases (9,10),immune deficiencies, and leukemia(10).As C-Section born individuals do not make contact at birth with maternal, vaginal and intestinal bacteria, this can lead to long-term changes in the gut microbiotathat can contribute to obesity (12). A US study found that individuals born by C-Section were15% more likely to become obese during follow up than those born by normal delivery(11,13).

(14) A study is performed to examine the relationship between mode of delivery and time to event with provider characteristics (i.e., covariates) in northern part of Bangladesh. (7). Also, studies about  socioeconomic correlates of preference for institutional delivery and caesarean sections has been performed(15).As the number of C-Section delivery is raising, it is important to study the consequence on the child health. To the best of our knowledge, there is no research has been conducted to determine the association between C-section and child disease in Bangladesh. Therefore,our aim was to investigate the relationship between the C-Section delivery and childhood diseases.

**Methods**

**Study design**

We used 2012-13 multiple indicator cluster survey (MICS) data. It is based on a sample of 51,895 households (43474 rural, 8421 urban) interviewed with a response rate of 98.5% and provides a comprehensive picture of children and women in the seven divisions (Dhaka, Chittagong, Sylhet, Rajshahi, Rangpur, Barisal, Khulna) in Bangladesh. Districts were identified as the main sampling strata for the sample selection in 2 stages. A systematic sample of 20 households was drawn in each sample. From the interviewed households, 59,599 women (age 15-49 years) were identified and 51,791 were successfully interviewed with response rate 89.3%.

**Sample and data management**

Fig1 showed sample flow diagram of this study. The child age ranged from 0 to 24 months were included; 36197 women haven’t child and 15481 babies greater than 24 months were excluded from the analysis. Therefore, the sample included 7921 child and mother information for analysis. Among the 7921 children, the information of C-Section has only 2181 child and this 2181 child were our final sample of study.

**Outcome variable**

We have considered two outcome variables, such as,(i) disease (count) for Poisson regression and (ii) disease(binary, where 0 means lower disease[<3] and 1 means higher disease[ ≥3 ] ) for logistic regression.

Exposure variable:

Our exposure variable was type of delivery (caesarean section versus normal delivery), which is a binary variable.

**Potential confoundingvariables:**

We considered several confounding variables including, religion, breastfed status, sex (child), education (mothers), child Age (in months) , BMI (mothers), wealth Index, area, division, weight at birth (child) and fathers education.

**Statistical analyses:**

Logistic regression and Poisson regression models were used in this study. Using these two models, we have reviewed the variability of the results from two models. All statistical analyses were performed by SAS. In crude model,only the C-section variable was used and for adjusted model,other confounding variables with C-section were considered.

**Results**

Table1 represents percentage distribution of mother’s characteristics by type of delivery.Women who had undergone a caesarean delivery had mean age 25.37 years and women with normal delivery had mean age 25.10 years. From the religious point of view, of all women with caesarean delivery 1182(55.16%) were Muslim,140(6%) were Hindu ,7 (0.08%) were Buddhist,15(0.9%) were Christian. According to their residence area women who had undergone a caesarean delivery 2.09%(lowest) were from Barisal and 24.61%(highest) were from Dhaka. The highest percentage of CS delivery (22,93%) was observed for secondary completed or highereducated women than the illiterate (3.55%). Among women with caesarean delivery 4.25% had poorest wealth index whereas 29.30% had richest wealth index. Moreover, 2.33% women with CS delivery were underweight and 3.06% were obese.

In addition, according to the map in Figure 2, 65% C-section occurred in Dhaka and Khulna. In Rangpur about 50% C-section delivery were occurred, 55% were in Sylhet and Chittagong and 60% were in Rajshahi and Barisal.

Table 2 shows percentage of child’s characteristics by type of delivery. There were 7921 children under 2 years of age of which information was available for 2181 children. Of the 2181 children 1153(51.36%) were male and 1096(36.12%) children were between 0 and 12 months of age;out of whom 410(27.60%) were vaginal births and 686(33.05%) were born in C-section.

24 (1.21%) children were very small at birth born by vaginal delivery, while 41 (1.74%) children were very small for C-section babies at birth. 435 (20.23%) children born by vaginal delivery had more equal three diseases, while746 (36.50%) were for C-section babies. Disease (by count) variable from table 2 shows that more diseases occur in C-section babies than children born by vaginal delivery.

Fig 3 displays the frequency of disease (count) against number of babies. 34.79% babies have three types of disease while only 0.55% babies have all the diseases. Children with two illnesses are 32.20% and children with one illness are 10.59%. So there are 42.78% children with less than three diseases and 57.22% children with three or more disease. These things are also shown in fig4. Fig4 represents the frequency of disease (disease binary, where 0 means lower disease [<3] and 1 means higher disease [ ≥3 ] ) against number of babies.

A crude model (only C-section variable in the model) and adjusted model (C-section & other covariates in the model) for Poisson regression analysis is shown in Table 3. The crude and adjusted analyses showed that the relative risk for the C-section was 1.06 (95% CI: 1.00-1.11) and 1.03(95% CI: 0.99-1.08),respectively, indicates that children were born in C-section compare to the normal delivery are at increased risk for developing childhood disease. However, the association was not statistically significant in the adjusted model (p-value=0.14).

From the crude and adjusted logistic model (Table4) , we found the crude and adjusted odds ratios for the C-section were 1.18(CI:1.00-1.11) and 1.10 (CI:.93-1.50)times higher than the odds ratio for the normal delivery, respectively, though the association was not statistically significant at 5% level of significance.

**Discussion**

. In the modern obstetric care, C-section is becoming more important for the evaluation of relevant experience, with consequences for maternal and newborn healthbut there are some negative health outcomes too. This study is to compare the vaginal delivery and caesarean delivery with respect to childhood diseases. From our findings, we have seen that there was the highest rate of caesarean section in Dhaka division compared to other divisions of Bangladesh. On the other hand, Barisal had the lowest caesarean rates over the country. Among the educated women,the highest rate of C-section is occurred among secondary incomplete women (27%). So This study also emphasized education as a strong predictor of a high C-section rate. This result is consistent with some other studies(1,2). Since education is directly related to the autonomy of women, educated women can decide to give birth through a C-section. Also some studies reported no visible link between women's preference for C-section and their level of education(3,4).

Now you can explain why higher educated women go for more CS delivery?

Also, we have seen that in poor families most of the time they prefer normal delivery (5.61%) rather than caesarean section and the opposite that is caesarean section is chosen by the middle (7.92%) and rich (29.90) families..In developing countries due to poverty most of the families chose normal delivery rather than caesarean section.Because caesarean section costs more compared to normal delivery as expensive drugs and medicatons are needed during the surgery. A survey of 42 Demographic and Health Surveys in sub-Saharan Africa, south and southeast Asia, and Latin America and the Caribbean showed that caesarean rates were extremely low among the very poor countries: For the poorest 20% of the population in 20 countries C-section were below 1% and for 80% of the population in six countries were below 1%(5)

Most of the population is not included in c Section in the poorest countries, mostly in sub-Saharan Africa, and in some middle-income countries, more than half of the population has an increasing rate of medical needs(5).

Explain why?

Earlier studies showed a strong association between C-section and child disease, such as asthma(8–10), and type 1 diabetes (8,9), Crohn's disease(11), allergic diseases (9,10),immune deficiencies, leukemia(10), gastrointestinal problems and neurological growth problems(16). Our findings indicate association between C-section and diarrhea, breathing problem and cough disease.

Caesarean children are more likely to have disease related to immune function(12).

Earlier studies showed a strong association between C-section and child disease, such as asthma(6–8), and type 1 diabetes (6,7), Crohn's disease(9), allergic diseases (7,8),immune deficiencies, leukemia(8), gastrointestinal problems and neurological growth problems(10). Our findings indicate association between C-section and diarrhea, breathing problem and cough disease.

In addition, other studies demonstrated that ,Women experiencing the CS delivery without a clear intimation for the process have a risk of major morbidity including cardiac arrest, hysterectomy, puerperal infection, thromboembolism, wound hematoma,anaesthetic complications than those undergoing planned vaginal delivery(11,17). In our study we don’t find any such relation.

**Conclusion**

The above discussion points to the fact that delivery with C-section is a complex health issue. Our analysis shows that caesarean delivery is associated with increased rate of disease among children less than 2 years of age. Also we can say that childhood disease were associated with an intrinsic risk for short-term severe maternal outcomes such as C-section, breastfed, maternal education, Wealth index. Moreover our findings suggest that among all women obese are more likely to had delivery by C-section.

**Abbreviations**

|  |  |
| --- | --- |
| BMI | Body mass index |
| CI | Confidence intervals |
| OR | Odds ratios |
| WHO | World Health Organization |
| SD | Caesarean delivery |
| C-section | Caesarean section |
| VD | Vaginal delivery |

Abbreviations

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Competing interests

Availability of data and materials

Author details

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**Supplements**