

Caesarean Delivery- a Pressured Choice for Women: A Meta-Analysis of 23 Cross-Sectional Studies

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Abstract

The aim of this study is to investigate the associated factors which influence women to choose caesarean delivery or C-Section (CS) and to quantify the contribution of these factors. This meta-analysis indicates that for maternal age at birth, age group 20-29 years is 1.45 times more likely to choose CS as compared to the age group ≤ 19 years [OR= 1.45; Overall effect $Z=4.57$, $p<0.01$], for mother's education level educated mothers are 8.86 times more likely to choose CS as compared to the uneducated mothers [OR= 8.86; $Z=4.10$, $p<0.01$]. For marital status OR=1.40; $Z= 1.34$, $p=0.18$, for residence OR= 1.02; $Z=0.11$, $p= 0.91$, for mother's employment status OR= 0.97; $Z=-0.12$, $p= 0.90$ and for receiving Antenatal Care between 1-3 times versus 0 time OR= 2.11; $Z=1.84$, $p= 0.07$. Mother's economic status [OR= 1.41; $Z=3.43$, $p<0.01$], whether previous CS [OR=9.39; $Z=2.24$, $p=0.03$] and type of delivery facility [OR= 0.67; $Z=-2.03$, $p= 0.04$] are found to be significant factors for choosing CS over normal delivery.

Keywords: Caesarean delivery, pressured choice, women, odds ratio, random effects model, meta-analysis.

I. Introduction

Caesarean delivery or Caesarean section (CS) is one of the most frequently performed surgical procedures on women globally. CS sometimes can save the life of mother and baby during pregnancy and labour at the cost of putting the mothers and babies at needless risk, increasing the likelihood of infection, excessive bleeding, organ damage and blood clots, as well as a significantly longer recovery time for the mother. The rate of caesarean delivery has been increased sharply worldwide such as in Dominican Rep., Brazil, Egypt, Maldives and United States are 58.1%, 55.5%, 55.5%, 41.1% and 32.9% respectively and this rise is not fully based on clinical needs¹. In Bangladesh the rate has been increased from 4% to 31% between 2004 and 2016 and the rate increased to 51% between 2016 and 2018 according to a Save the Children report while only 10% to 15% of the deliveries are medically indicated to international recommendations². It is estimated that 18.5 million CS are conducted annually worldwide and one-third of those is done without clinical need and is described as "unnecessary"³.

Until the early 20th century the CS was performed mainly on dying or already dead parturient as the severe bleeding and infections associated with the surgical process in maternal death rate was almost 100%⁴. Clearly CS is a lifesaving procedure however, in recent days the rate of CS is increasing sharply and more importantly not all the CS performed are based on medical need. Nowadays the CS is performed in large number because there is an idea established to women that CS is a modern technique to have baby against normal/vaginal delivery is laborious, time consuming, and the delivery facilities (Government or private hospitals) are not favorable for normal delivery. Despite vaginal delivery is a safe mode of delivery, fulfillment of maternal instinct, a natural process with a pleasant tending, and C-section is a procedure associated with future complications, the rate of

CS is increasing sharply which is needed to be addressed⁵. The main objectives of this study are to identify the associated factors which influence or force women to prefer caesarean delivery and to quantify the contribution of these factors in decision making through meta-analysis.

II. Data and variables

In this meta-analysis, 23 cross sectional studies⁶⁻²⁸ are selected from the electronic databases- PubMed, Science Direct and Google Scholar published between January 2000 and June 2018. The influencing variables considered in this meta-analysis includes-maternal age at birth, mother's education level, marital status, residential status, mother's employment status, antenatal care, birth order, mother's pregnancy intension, mother's economic status, mother's preference towards CS, previous CS, delivery facility (Government or private hospitals) and doctor's suggestion towards CS. Type of delivery mode- vaginal birth or Caesarean Section (CS) is considered the dependent variable of this study.

Search Strategy

Studies published between January 2000 and June 2018, have been identified through PubMed, Google Scholar and Science Direct using advanced search strategy with the following combined text heading as ("Increasing caesarean section") or ("Increasing C-section" and "Health facility") or ("Caesarean section" and "Receiving Antenatal Care (ANC)") or ("Caesarean section" and "Mothers preference"). We also examined the references from these studies to identify other relevant studies.

Inclusion criteria

The inclusion criteria for this meta-analysis are- original research, published in English, cross-sectional studies, women with live birth through CS or Vaginal delivery, presence of

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a comparison group, study results, indicators of statistical significance, studies only for women age group 15-49 years.

Exclusion criteria

Our search strategy yielded 753 articles of which 351 were from PubMed, 137 from Google Scholar and 265 were from Science Direct. Among the articles selected on the basis of time, title and abstract, 218 articles were excluded for other than the English Language (13), not full text (15), not original research articles (87), and review articles (103). Additional articles were included by hand search and from articles reference list (25), 327 papers were screened for full-text evaluation. Out of those 304 studies were excluded for not reporting CS status (220), not relevant information about delivery mode (59), duplication (25). Finally, 23 studies were selected for this meta-analysis. Details of process of selecting articles are displayed in Fig. 1.

III. Statistical Analysis

This meta-analysis is carried out using 23 cross-sectional studies and the statistical analysis has been employed statistical environment R (Meta package) and Microsoft Excel spreadsheet for data input. Odds ratio (OR) is used as an effect measure²⁹ and random effects model³⁰ is used to pool the effects. Random effects model has chosen as

there exists substantial heterogeneity among studies. In this meta-analysis, Q statistic is calculated to find the presence of heterogeneity among the studies, and I^2 is calculated to quantify the percentage of variation among the included studies³¹. Funnel plot is used in this meta-analysis to check publication bias if any³².

IV. Results and Discussion

This meta-analysis is conducted using 23 cross-sectional studies and random effects model is employed to combine the pooled effects using odds ratio. Six factors are found to be statistically significant (Table 1) at 5% level of significance based on overall effect (Z test). These factors are-maternal age at birth, mother's education level, economic status, mother's preference towards CS, previous CS and delivery facility. Antenatal Care is found to be significant at 10% level of significance while other factors such as marital status, residence, mother's employment status, birth order, mother's pregnancy intension are found to be insignificant. The pooled estimate for maternal age at birth under random effects model has been found to be 1.45 times more likely for age group 20-29 years to choose CS as delivery mode as compared to the age group ≤ 19 years [OR 1.45; 95% CI (1.24, 1.70), $p < 0.01$].

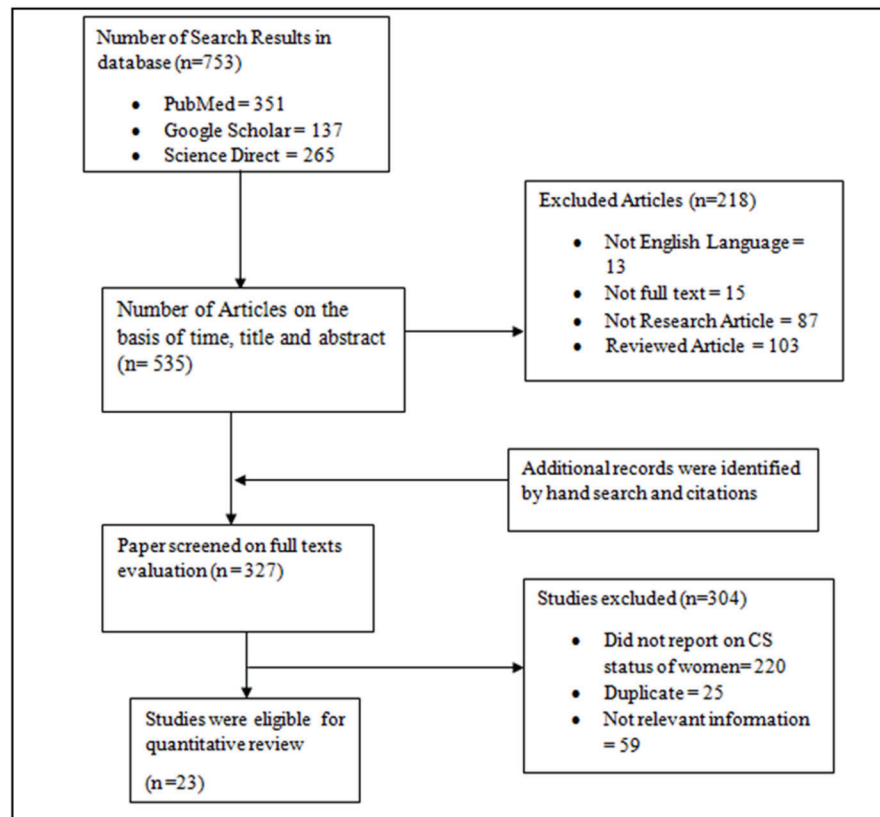


Fig. 1. Flowchart of meta-analysis search results and process of selecting articles.

Maternal age group (20-29) years is 0.19 times less likely to choose CS as compared to the age group (30-39) years [OR 0.81; 95% CI (0.70, 0.94), $p < 0.01$]. Age group (20-29) years is 0.16 times less likely to select CS than the age

group ≥ 40 years [OR 0.84; 95% CI (0.52, 1.35), $p = 0.47$]. Mother's education level is found to be the most alarming determinants to choose CS as delivery mode. Educated mothers are 8.86 times more likely to choose CS as compared

to their uneducated counterparts [OR 8.86; 95% CI (3.12, 25.13), $p < 0.01$]. This may be because of the fact that they are busy with their educational affairs (education or jobs). They have limited time to wait for the normal delivery which happens quite un-specifically whereas for C-section they can fix the date in advance and plan accordingly. For marital status OR is 1.40 with 95% CI (0.86, 2.30) and $p = 0.18$ indicates married mothers are 1.40 times more likely to select CS than unmarried mothers and this factor is not significantly associated with CS. It is found that mothers residential status is not associated with their choice of CS [OR 1.02; 95% CI (0.68, 1.53), p -value= 0.91]. Mother's employment status is also comparable and insignificantly associated with their choice of CS [OR 0.97; $Z = -0.12$; $p = 0.90$].

For ANC, women who receive ANC 1-3 times is 2.11 times more likely to choose CS than the women who did not receive ANC at all [OR 2.11; 95% CI (0.95, 4.67), $Z = 1.84$, $p = 0.07$] which indicates that this factor is not significantly associated with CS at 5% level of significance but significantly associated at 10% level of significance.

The pooled estimate of CS among women who receive ANC 1-3 times is 1.58 times more likely as compared to women who receive ANC ≥ 4 times [OR 1.58; 95% CI (0.13, 19.39), $Z = 0.36$, $p = 0.72$]. Birth order 2-3 is comparable with birth order 1 [OR 1.01; 95% CI (0.95, 1.73), $Z = 0.04$, $p = 0.97$]. Women with birth order 2-3 is 1.51 times more likely to choose CS as compared to birth order ≥ 4 [OR 1.51; 95% CI (1.23, 1.85), $Z = 3.96$, $p < 0.01$] indicates that this factor is significantly associated with CS. For mother's pregnancy

intension, the pooled estimate of CS among women who had pregnancy intension is 1.35 times more likely than the women who had not [OR 1.35; 95% CI (0.81, 2.24), $Z = 1.16$, $p = 0.24$]. Middle class mothers are 1.41 times more likely to prefer CS than poor women [OR 1.41; 95% CI (1.16, 1.17), $Z =$, $p < 0.01$] and this economic condition of mothers is significantly associated with CS. For middle and rich mother OR is 0.43 with 95% CI (0.28, 0.66), $Z = -3.92$, $p < 0.01$ indicates that the pooled estimate of CS among middle class mothers is 0.57 times less likely than the mothers with rich economic condition. For mother's preference towards CS, mothers who prefer CS is 0.79 times less likely than the mother who do not [OR 0.21; 95% CI (0.05, 0.97), $Z = -2$, $p = 0.05$]. For previous CS, OR is 9.39 with 95% CI (1.32, 66.59), $Z = 2.24$, $p < 0.05$] indicates that the pooled estimate of CS among women who have previous CS is 9.39 times more likely to go through CS than the women who have not and evidently this factor is a significant determinant to CS. For types of delivery facility, the pooled estimate of CS among women who have given birth under government hospitals/facilities is 0.33 times less likely than the women who have given birth under private hospitals/facilities [OR 0.67; 95% CI (0.46, 0.99), $Z = -2.23$, $p = 0.04$]. Another important factor which pushes women towards CS is doctor's preference towards CS without any medical emergency. However we need not find enough information on that from the mentioned sources. It is a matter to be worried that educated mothers are preferring CS (OR=8.86) without any medical need than normal delivery even knowing the life-long risk of CS.

Table 1. Summary table of the factors which influenced CS.

Factors	OR(95% CI)	Overall Effect Z, p-value	Q, df, p-value	I ²
Maternal age at birth	1.45[1.24; 1.70]	$Z = 4.57$; $p < 0.01$	426.53, 17, < 0.01	96.0%
Mother's education level	8.86[3.12; 25.13]	$Z = 4.10$; $p < 0.01$	31690.98, 17, 0.00	100%
Marital status	1.40[0.86; 2.30]	$Z = 1.34$; $p = 0.18$	630.24, 6, < 0.01	99.0%
Residence	1.02[0.68; 1.53]	$Z = 0.11$; $p = 0.91$	622.20, 9, < 0.01	98.6%
Mother's employment status	0.97[0.60; 1.58]	$Z = -0.12$; $p = 0.90$	611.54, 9, < 0.01	99%
Antenatal Care	2.11[0.95; 4.67]	$Z = 1.84$; $p = 0.07$	2331.19, 6, 0.00	100%
Birth order	1.01[0.59; 1.73]	$Z = 0.04$; $p = 0.97$	5531.08, 6, 0.00	100%
Mother's pregnancy intension	1.35[0.81; 2.24]	$Z = 1.16$; $p = 0.24$	2.57, 2, 0.28	22%
Mother's economic status	1.41[1.16; 1.71]	$Z = 3.43$; $p < 0.01$	225.88, 11, < 0.01	95%
Mother's preference towards CS	0.21[0.05; 0.97]	$Z = -2$; $p = .05$	38.36, 2, < 0.01	95%
Previous CS	9.39[1.32; 66.59]	$Z = 2.24$; $p = 0.03$	574.88, 3, < 0.01	99%
Government/private facility	0.67[0.46; 0.99]	$Z = -2.23$; $p = 0.04$	689.97, 8, < 0.01	99%

Lack of quality government hospitals or delivery facilities are also playing crucial role-pushing the pregnant women to go to private delivery facilities where CS is done more frequently. It is also alarming that mothers who are receiving antenatal care 1-3 times are preferring CS as compared to the mothers who never receiving antenatal care. It suggests that antenatal

care providers are also preferring CS without any medical need. Hence caesarean delivery rate is increasing day by day.

It is observed that significant heterogeneity is found among most of these meta-analyses except for mother's pregnancy intension (Table 1).

This is obvious as because diverse studies are considered in these meta-analyses from all over the world with diverse characteristics.

Another issue of meta-analysis, publication bias is also reported in this research (Fig.3 and Fig. 4).

From the funnel plots it is found that evidence of publication bias exists in most of the meta-analyses considered here. This findings is also justified as we have considered only the studies in English literature only, though remedy of publication bias is beyond the scope of this research work.

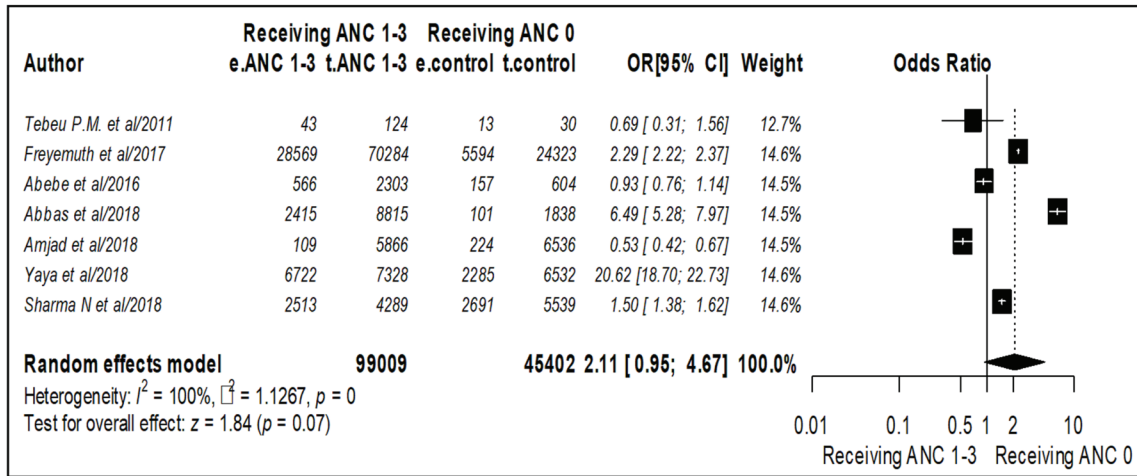


Fig. 2. Forest plot shows that the pooled prevalence of CS of women receives ANC 1-3 times is 2.11 times more likely than the women receives ANC 0 time.

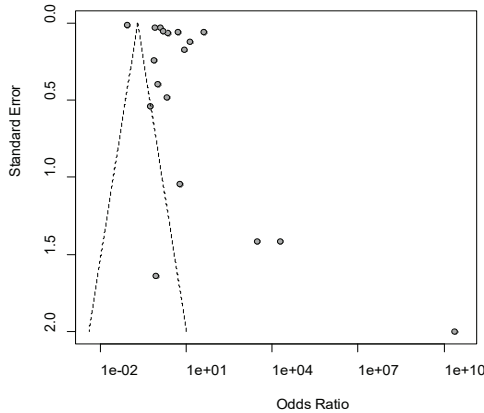


Fig. 3. Funnel plot of educational status of women who undergone CS suggests an evidence of publication bias in the meta-analysis.

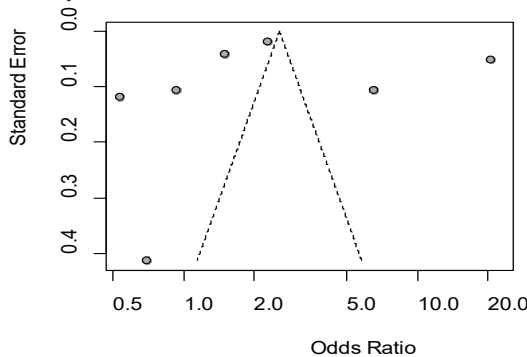


Fig. 4. Funnel plot of women who received ANC also suggests evidence of publication bias.

V. Conclusion

Twenty three cross-sectional studies are used in this meta-analysis and random effects model is employed using OR

as an effect measure. We have investigated the associated factors which influence women to choose caesarean delivery or C-Section and quantified the contribution of these factors in terms of OR. Six factors namely maternal age at birth, mother’s education level, economic status, mother’s preference towards CS, previous CS and delivery facility are found to be statistically significant factors at 5% level of significance based on Z test. Antenatal care is found to be significant at 10% level of significance while other factors such as marital status, residence, mother’s employment status, birth order, mother’s pregnancy intension are found to be insignificant.

Strict policy and monitoring on CS are needed from the policy makers to stop CS without any clinical need. Awareness from the mothers as well as from the doctors are must to control this increased rate of CS, otherwise this pattern will go on putting the mothers and babies at needless risk, increasing the likelihood of infection, excessive bleeding, organ damage and blood clots, as well as a significantly longer hospital stay for the mothers.

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