

Research Article

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Determinants Of Caesarean Section: A Retrospective Study at St Joseph Hospital, Zimbabwe

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Abstract

Background: Caesarean section (C-section) is a medically necessary procedure aimed at ensuring the safety of both the mother and child. However, the significant rise in the number of C-sections performed globally raises concerns about their potential health implications. This study explores the prevalence and factors associated with C-sections at St. Joseph's Hospital in Zimbabwe.

Methods: Secondary data was collected from patient files extracted from the theatre and delivery registers. Records of 985 women aged 15-49 years were purposively selected. Frequency, Chi-square tests and multivariate regression models were run to examine the relationship between maternal and child factors associated with caesarean section delivery. After removing women's records with missing information, the data were analyzed using SPSS version 20. Binary logistic regression and adjusted odds ratios (AOR) with 95% confidence intervals (CI) were employed to identify the determinants of cesarean section.

Results: The overall prevalence of caesarean sections at St. Joseph's Hospital was 45.5%. Maternal factors significantly associated with cesarean sections included maternal height (AOR=0.218, $p<0.05$), maternal weight (AOR=0.417, $p<0.05$), having four or more children (AOR=4.484, $p<0.05$), and having one to three children (AOR=1.606, $p<0.05$). Child factors were found not to be significant.

Conclusion: This study highlights that maternal factor rather than child factors significantly influenced C-section. The maternal factors including maternal height, weight, and parity, were determinants of cesarean section rates. C-section prevalence was far higher than the WHO recommendation. Understanding these determinants is essential for crafting effective interventions and policies aimed at reducing the overuse of this procedure in both private and public healthcare facilities. Achieving this requires a comprehensive strategy, such as ongoing monitoring of cesarean section rates in various settings, enhancing access to healthcare, and educating women about safer delivery options available at healthcare facilities.

Keywords: caesarean section; determinants; maternal factors; child factors; Zimbabwe

Introduction

The emergence of cesarean section (C-section) deliveries as a prevalent mode of childbirth represents a significant public health concern. The increasing global rates of C-sections have surpassed the World Health Organization's recommended threshold of 10-15%. With particular emphasis on the alarming prevalence in SubSaharan Africa, where C-sections account for over 80% of obstetric procedures [1,2]. While the procedure is indispensable in specific clinical scenarios, its excessive application can exacerbate morbidity and mortality risks for both mothers and infants [3]. In resource-limited settings, the pronounced utilization of C-sections is frequently linked to non-medical determinants [4]. Variations in C-section rates are observable across the African

continent; for example, Ghana reports a rate of 42% [5], Ethiopia 52% [6], Nigeria 34.8% [7], and South Africa at 27.4%, revealing considerable country disparities [8]. Furthermore, Zimbabwe has witnessed a remarkable increase in C-section rates, which escalated from 8.9% in 2001 to 29.8% in 2020 [9]. Additionally, the rising prevalence of non-communicable diseases, including asthma, diabetes, and obesity, has been correlated with higher C-section incidences [10,11]. Notably, studies indicate a complex relationship between educational attainment and C-section rates. Some findings suggest a tendency for women with higher education levels to opt for C-sections, attributed to increased awareness and a desire to avoid the discomfort associated with vaginal delivery [12-14]. Conversely, other investigations

reveal that women with only primary education may exhibit elevated C-section rates. Potentially due to limited autonomy in decision-making regarding their childbirth [15-17]. Moreover, a strong correlation exists between maternal weight and C-section rates, with overweight and obese individuals demonstrating a heightened likelihood of resorting to surgical delivery [12-14]. Nevertheless, there is limited evidence suggesting that women of normal weight may also have elevated C-section rates [18]. Disparities are also noted among primiparous and multiparous women regarding C-section rates, with some studies indicating that first-time mothers are more inclined towards surgical delivery due to apprehensions about labor pain and the perceived convenience [3,12,16,19]. Equally, other research points towards a higher likelihood of C-sections among multiparous women, potentially stemming from pelvic alterations following multiple pregnancies or increased complications in subsequent deliveries [6,13,20,21]. Finally, neonatal characteristics also play a critical role in C-section outcomes, with higher birth weights correlating positively with surgical interventions [4,6,7,12,20]. On the other hand, some studies indicate that lower birth weights may also be associated with elevated rates of C-sections [14,17,22,23]. The study is aimed at establishing the prevalence rate of C-section and determine the correlates Of C-section using retrospective hospital data.

Methods

Data Source

Data was gathered from 985 patient files encompassing all deliveries that took place from January to December 2023. A purposive sampling method was employed, focusing on files with complete information due to constraints in resources and time. This dataset included all women aged 15 to 49 years, while women below 15 years and those above 49 years excluded from the analysis.

Outcome

The outcome variable in this study was the mode of delivery, defined as the method employed for childbirth. Participants were categorized based on their delivery method, with those born via cesarean section designated as 1, representing 'Cesarean,' and those delivered vaginally classified as 0, signifying 'Normal.' This binary coding facilitates a clear assessment of delivery outcomes in the analysis.

Independent variables

Maternal factors

Maternal age was categorized as follows: 1 = '15-19'; 2 = '20-24'; 3 = '25-29'; 4 = '30-34'; and 5 = '35 and above'. Educational attainment for mothers was coded as 1 = 'primary'; 2 = 'secondary'; and 3 = 'tertiary'. Employment status categorized women who were self-employed or professionally employed as 1 = 'employed', while housewives, unemployed individuals, and students were categorized as 2 = 'unemployed'. Marital status classified women who were legally married or cohabitating as 1 = 'married', and those who were single or divorced as 0 = 'single'. Height was coded such that women measuring 150 cm and above were labeled as 1 = 'tall', while those measuring 149 cm and below were labeled as 0 = 'short'. Weight was categorized with those weighing over 90 kg coded as 1 = 'overweight', and those weighing below 90 kg coded as 0 = 'normal weight'. Parity was classified with 0 = '<1'; 1 = '1-3'; and 2 = '4 or more visits'. Lastly, antenatal care visits were categorized as 0 = '0-4 visits' and 1 = '5 or more visits'.

Child factors

In the context of this study, infants with a birth weight under 2,500 grams were classified as 'below average' and assigned a code of 0, while those exceeding this weight threshold were categorized as 'average' and coded as 1. Additionally, the Sex Of the infants was recorded with a binary coding system, where male infants were designated a code of 1 and female infants coded 0.

Statistical analysis

Univariate, Bivariate and Multivariate methods were employed to analyze the determinants of cesarean sections. Frequencies and percentage distributions of the variables were used to describe the respondents' characteristics. The Chi-square test was utilized to evaluate bivariate associations between independent variables and outcomes. In the multivariate analyses, binary logistic regression analysis was conducted to assess the influence of various determinants on cesarean section. The results of the logistic regression model are presented as adjusted odds ratios (AORs) along with their corresponding 95% confidence intervals in Table 3. Before fitting the model, all independent variables were assessed for multicollinearity using the variance inflation factor (VIF). Results not presented. The fitted model was assessed for goodness fit using the Hosmer-Leeshawn test to examine whether the explanatory variables

were specified correctly and also test for goodness of fit. Only significant factors at bivariate were added in the final binary regression.

Ethical Consideration

The study adhered to ethical principles, and obtained approval from the University of Zimbabwe and St. Joseph's Mission Hospital,

Results

Characteristics of the study population

Univariate Analysis

Table 1 indicates the distribution of respondents by selected background variables. The overall proportion of women who had Caesarean section at the facility was 45.5%. Concerning age, approximately 8.4%

were aged 15-19 years, 29.9 % were 20-24 years, 29.2% aged 25-29 years, 20.7% in 30-34 years and 11.7% were in 35+ years category. Regarding the level of education, 80.5% had a secondary education and 18.4% had tertiary education. The majority of respondents (60.5%) were unemployed and 39.5% were employed. Marriage was universal with 99.7% of the respondents being married or cohabitating with their partners whilst only a proportion of 0.3% reported being single. More than three thirds (67%) of the women were tall and 69.8% of women had normal weight. Two-fifths (41.6 %) Of the women had given birth to one child and 55.4% had more than one child. Regarding the sex of the baby, 51.4 % were girls and 48.6 % were boys. Concerning the baby weight, 68.4%were of average weight and 49.8% of the women had had 0-4 ANC visits.

Table 1: Percentage distribution of selected characteristics of respondents by background variables (n=985)

Variable	Frequency	Percentage
Mode Of delivery (Outcome variable)		
Cesarean		45.5
Normal	537	54.5
Age		
15-19	83	8.4
20-24	295	29.9
25-29	288	29.2
30-34	204	20.7
35+	115	11.7
Level Of Education		
Primary	11	1.1
Secondary	793	80.5
Tertiary	181	18.4
Occupation		
Employed	389	39.5
Unemployed	596	60.5
Marital Status		
Married	982	99.7
Single		0.3
Maternal Height		
Tall	667	67.7
Short	318	32.3
Maternal Weight		
Normal weight	688	69.8
Overweight	297	30.2
parity		
<1	410	41.6
1-3	546	55.4
4+	26	2.6
Sex of the baby		
Boy	479	48.6
Girl	506	51.4
Birth weight		

Below average	311	31.6
Average	674	68.4
ANC Visits		
0-4	491	49.8
5+	490	49.7
TOTAL	985	100

Correlates and Differentials in respondents' utilization of Caesarean

Bivariate Analysis

Table 2 presents differentials in CS deliveries during the most recent birth by socioeconomic characteristics. Out of the 985 mothers who delivered at the health facility, 45.5% underwent CS. Over a third of the mothers had secondary education (30.5%), while CS delivery was significantly higher among those with tertiary education (54.7%). In terms of physical stature, 67.7% of mothers were

reported to be tall; however, CS was more prevalent among those of short stature (73.3%; $p < 0.000$). More than half of the mothers fell within the normal weight category (69.8%), but CS was notably more common among overweight mothers (61.1%; $p < 0.001$). Furthermore, 55.4% of mothers had a cesarean delivery after their first or second child, with a higher prevalence observed in mothers having their first pregnancy (52.9%; $p < 0.000$). While most babies were born with average weight (68.4%), a significant proportion of those delivered via CS were below the average weight (50.2% $p < 0.045$).

Table 2: Correlates and Differences in Respondents utilization of Caesarean Section (n=9851).

Variables	Number of respondents	Percentage Section delivered by C-Section	Chi-square Test (P-values)
Age			0.155
15-19	83	37.3	
20-24	295	41.7	
25-29	288	50	
30-34	204	47.5	
35+	115	46.1	
Level of Education			0.022**
Primary	11	45.5	
Secondary	793		
Tertiary	181	54.7	
Occupation			0.087
Employed	389	48.8	
Unemployed	596	43.2	
Marital Status			0.672
Married	982	45.5	
Single			
Maternal Height			0.000**
Tall	667	39.9	
Short	60	73.3	
Maternal Weight			
Normal weight	698		
Overweight	131	61.1	
Parity			0.000**
	410	52.9	
02-Mar	546	40.7	
4+	26	26.9	
Sex of the baby			0.621
	47g	44.7	
Girl	506	46.2	
Birth weight			0.341

Below average	311	50.2	
Average	674	43.3	
ANC Visits			0.972
	491	45.5	
	490	45.5	
Total	985	100	

Determinants of Caesarean Section Deliveries: Binary Logistic Regression Analysis

Multivariate Analysis

In the identifying the net effect of independent variables on the dependent variable, a final model was constructed based on the significant variables identified through bivariate analysis. These variables were educational attainment, maternal weight, maternal height, and parity. Table 3 presents the results of the multivariate logistic regression analysis conducted among women who delivered at the institution, categorized by background variables. When considering primary education as the baseline category, the analysis indicates that women with secondary education exhibited an adjusted odds ratio (AOR) of 1.107 (95% CI = 0.256-4.617, p = 0.889) for delivering via Caesarean section compared to their counterparts with tertiary education, who

demonstrated a reduced likelihood of such delivery (AOR = 0.759; 95% CI = 0.1763.277, p = 0.712). Additionally, maternal stature emerged as a significant factor: women of taller stature had a lower Odds Of undergoing Caesarean delivery in comparison to those of shorter stature, with an AOR Of 0.218 (95% CI = 0.118-0.404, p = 0.000). Furthermore, the analysis revealed that overweight women exhibited an AOR of 0.417 for delivering by Caesarean section relative to women with normal weight, implying that being overweight does not significantly elevate the risk of Caesarean delivery. Women who had given birth 2-3 times were found to be 1.6 times more likely to deliver via Caesarean section (AOR = 1.606; CI = 1.162-2.214, p = 0.000) in comparison to women who had given birth once. Notably, mothers with four or more children had a higher odds ratio of 4.484 for Caesarean section delivery relative to the baseline category of nulliparity (AOR = 4.484; CI = 1.296-14.40, p = 0.000).

Table 3: Logistic regression analysis results for determinants of CS delivery

Variable	AOR (95%	p-values
Level of Education		
Primary	1 (ref)	
Secondary	1.107 (0.256, 4.617)	0.889
Tertiary	0.759 (0.176, 3.277)	0.712
Maternal Height		
Tall	1 (ref)	
Short	0.21B (0.1 18, 0.404)	0.000
Maternal Weight		
Normal weight	1 (ref)	
Overweight	0.417 (0.270,0.643)	
parity		
	1 (ref)	
2-3	1.606 (1.162, 2.214)	0.004
	(1.396, 14.40)	0.012

Discussion

The study had two objectives: to determine the prevalence of CS and examine the correlates associated with CS and maternal as well as child factors at St Joseph's Mission Hospital in Zimbabwe. The data was captured from 985 deliveries that occurred between January and December 2023

revealed that maternal height, maternal weight, and parity were statistically associated with CS. However, education, occupation, antenatal care (ANC) visits, baby sex and weight exhibited a weak positive association with CS in this study. The study found a CS prevalence rate of 45.5% at St. Joseph's Mission Hospital. The high prevalence Of CS at St. Joseph's

Mission Hospital could be attributed to women preferring Cesarean section as compared to vaginal delivery, a practice that had become common in most Sub-Saharan countries. Additionally, increased accessibility to CS services and patient preference for CS may contribute to this rise [3]. However, this figure was slightly lower than the reported rate of 48% found in a study conducted in Iran [18], potentially due to differences in study area and methodology. However, the prevalence of CS was significantly higher in comparison to most African countries [5-8]. This is considerably higher and acceptable considering all these studies also used hospital-based records. The explanation could be explained in two folds: Firstly, CS maybe now a social desirability norm among women delivering in that Zimbabwean hospital. Secondly, previous studies had shown women who deliver in private and faith-based hospital prefer CS [3]. This implies that they can these are richer women and can afford the professional costs associated with CS in private hospitals.

The odds Of Cesarean section were higher among pregnant women with a height less than 150cm. Women of short stature had greater odds of delivering via Cesarean section compared to tall women. Similar findings were reported by [25], Who found that short stature was significantly correlated with a higher chance Of CS. This association can be attributed to the common link between short stature and a contracted pel vis, a major factor in CS delivery, especially in mothers at risk of cephalopelvic disproportion (CPD). However, short stature also reflects a woman's nutritional status from childhood, where genetic factors may play a significant role. Therefore, the obstetric significance of a particular height should be considered in relation to the patient's genetic background. Contrary to these findings, the study by indicated that women of tall stature (155cm and above) were more likely to deliver by C-section compared to those of short stature (below 150cm). Similarly [12], found no significant difference in CS between mothers with a height less than 60 inches and those over 60 inches. Therefore, there is no general consensus on the how woman's height influences the likelihood of undergoing a CS. This implies that other confounding factors contribute to CS like breech births, post term pregnancy, pregnancy-induced hypertension and fetal distress. The second implication maybe be socio-cultural and psychological factors associated with preference of CS over natural delivery.

Maternal weight was also identified as a risk factor for Cesarean deliveries. The study found an association between maternal weight and Cesarean section, with overweight women likely to deliver by CS. These findings concur with the results found in Bangladesh by [19], which revealed that overweight or obese mothers were more likely to have a CS performed compared to those who had a normal delivery. Similarly, in another study in Bangladesh, [12] found greater Odds of CS delivery among women who were obese. This aligns with the findings of [26,29], who found an association between obesity and CS. These findings can be explained by the increased risk of complications in obese women due to their dietary intake during pregnancy. Overweight mothers suffer from hypertension and high blood pressure, reducing the possibility of a normal delivery. Consequently, they are often scheduled for a Cesarean section, increasing CS rates in the region. Contrary to these findings, the study by revealed that CS was associated with women Who had a lower BMI compared to those Who were obese. This discrepancy was attributed to the fact that the BMI used in the study was within the normal range. Additionally, the odds of CS delivery were found higher women who had multiparous. The odds of CS increase with an increase in parity. These are dissimilar findings with another study conducted in Zimbabwe which revealed that primigravidas had a greater chance of delivering by CS compared to multigravidas. This could be explained by the fact multigravidas is associated with higher maternal age. Maternal age and parity may increase the risk of complications at delivery. Older women may request a CS delivery without any medical complications, contributing to the increase in CS at hospitals.

In comparison to parity of order zero. the study revealed that woman of higher order parity is more likely to deliver by CS, However, these findings concurred with in Ethiopia, who found that women with higher birth orders were more likely to deliver by CS. Similarly, [4] found that women with more children were significantly more likely to deliver through CS compared to primigravidas. The study found that child factors (sex, and weight of the baby) were found not to be significantly associated with CS. However, elsewhere findings point to the effects of baby weight being a predictor of CS [23], where Ukrainian women with fetal weight smaller than average recorded the highest C-section rates compared to women with babies of average weight.

Similarly, 's findings in rural Vietnam significantly linked CS to low birth weight. These results are also in line with the findings of [1], who found lower Odds of CS delivery in larger babies at a population-based level? Another possible reason could be that women who have babies below average may request CS without any medical complications. The study found no association between the level of education and Cesarean section. This concurs with the findings of [22], which found no association between educational attainment and Cesarean section. also found no correlation between educational attainment and Cesarean section in their multivariate analysis.

Strength Of the study

The study sought to address a global major public health problem, especially in Sub-Saharan Africa. Therefore, the major strength of this study lies in its use of retrospective representative data from a local hospital. The findings of this study can be generalized and applied to other hospital-based studies in other countries. Additionally, our findings revealed that maternal factors were significantly associated with CS in the study. Understanding these determinants is imperative to develop long-term interventions that would see a reduction in the risk of falling into cesarean section untimely. These important key points contribute to the improvement of both child and maternal health risks.

Limitations of the study

This study presents several limitations. Firstly, a retrospective study could not establish a definitive cause-and-effect relationship due to insufficient control over variables and the potential for bias. The chosen participants may not represent the broader population accurately, which can result in skewed outcomes. Moreover, data collected retrospectively may be incomplete or inaccurate, thereby affecting the overall reliability and validity of the findings. Nonetheless, the results of this study serve as a valuable foundation for developing programs and interventions aimed at enhancing child and maternal health risks in Zimbabwe, in line with several Sustainable Development Goals (SDGs) targets, especially Good Health and Well-being (SDG 3).

Recommendations

Our findings underscore the critical importance of improving access to maternal health care for young girls and mothers of reproductive age in Zimbabwe. The government should collaborate with various stakeholders, including the commercial sector and

international organizations, to finance CS as more women seem to opt for it and enhance the health and well-being of reproductive mothers. Evidence suggests women who had two children and over are at higher risk of undergoing CS compared to first time mothers. The government should also invest in healthcare to facilitate accurate diagnosis and treatment of maternal illnesses that could elevate the risk of cesarean sections. Moreover, enhancing investment policies in the country is essential for improving the socioeconomic status of the population, ultimately leading to better access to high-quality maternal healthcare services.

Conclusion

The study reveals that Caesarean section delivery continues to pose a significant challenge in Zimbabwe. It also shows that the factors influencing the need for Cesarean sections vary among different communities. When comparing this study with others conducted in the region, it becomes evident that a broader approach is necessary to tackle the child and maternal mortality and morbidity associated with Caesarean sections in Zimbabwe. The findings underscore women's vulnerability to these compositional factors and suggest that interventions should aim to reduce these variations in order to improve child and maternal survival rates.

Declarations

Ethical Statement

The authors received ethical clearance and were granted access to the dataset from St Joseph Hospital Theatre and Delivery registers. The dataset can be accessed on the following email (yvonnechipfumbuD@gmail.com) upon request.

Credit Authorship Contribution Statement

Yvonne Chipfumbu conceptualized, Collected the data at St Joseph Hospital, designed the Methodology, Writing-original draft Emmanuel Bvurume. Analyzed the data and report writing.

Kudakwashe Mhlanga: Analyzed data, reviewed results and editing.

Kudzaishe Mangombe Conceptualized, supervised the whole paper writing, reviewed the paper

Charles Lwanga: Reviewed & edited the final paper.

Declaration Of Competing Interest

The authors declare that they have no known competing financial interests or personal

relationships that could have appeared to influence the work reported in this paper.

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