

# Caesarean section rates and indications in the Democratic Republic of the Congo: The case of Mbandaka City

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## ABSTRACT

### Introduction

Caesarean section (CS) is a medically appropriate intervention for managing complications during childbirth. However, the increasing number of both scheduled and emergency CS procedures has led to concerns about the potential overuse of this technique. This trend has contributed to growing mistrust within the community, particularly in areas where CS is frequently performed. It is essential to examine the rates and indications for caesarean sections to understand the factors contributing to this increase and to address the concerns surrounding its use.

### Purpose

The purpose of this study was to evaluate the rate and primary indications for caesarean sections performed in Mbandaka, focusing on the period between 2022 and 2023. The study aimed to identify the main factors influencing the decision to perform a caesarean section and to provide evidence for improving maternal health practices in the region.

### Methods

A quantitative, descriptive, and cross-sectional design was used in this study. The research was conducted across the three health zones of Mbandaka: Bolenge, Mbandaka, and Wangata. A probabilistic, stratified, proportional, and multiphasic sampling technique was employed to select 552 respondents, distributed proportionally across 10 health facilities in the three zones. The data collected included the number of caesarean sections performed, their scheduling status, and the indications for each procedure.

### Results

The study found a caesarean section rate of 32% for the period from 2022 to 2023, with 37.3% being scheduled and 62.7% emergency procedures. The main indications were fetal distress (38.4%) and macrosomia (28.3%). Several factors significantly increased the likelihood of caesarean delivery, including macrosomia (16.4 times more likely), a scarred uterus (28.91 times), a shrunken pelvis (27.8 times), fetal distress (16.8 times), transverse presentation (32.1 times), and twin pregnancies (144.6 times). These findings highlight the substantial impact of medical conditions on caesarean delivery decisions, reflecting the high reliance on caesarean sections for managing childbirth complications in Mbandaka.

### Conclusion

The high CS rate in Mbandaka underscores the importance of improving maternal health practices and prenatal care to minimize risk factors that lead to the need for caesarean delivery. Educational programs aimed at increasing community awareness of the benefits and risks associated with CS are essential for reducing mistrust and ensuring informed decision-making. Furthermore, improving access to timely medical interventions and promoting strategies for preventing complications such as fetal distress and macrosomia could reduce the need for emergency caesarean sections and enhance overall maternal and child health.

## INTRODUCTION

A cesarean section, or C-section, is a surgical procedure used to deliver a baby through incisions made in the mother's abdomen and uterus. It is typically performed when vaginal delivery poses risks to the mother or baby or when complications arise during labor. Common indications include fetal distress, abnormal positioning of the baby, placental complications, or a history of prior cesarean deliveries. Although generally considered safe, cesarean sections are major surgeries and involve risks such as infection, bleeding, and prolonged recovery compared to vaginal births. Despite these risks, C-sections can be life-saving in certain medical scenarios (Carter & Walker, 2022; Boya et al., 2024; Sung et al., 2024).

The discussion on cesarean section (CS) rates reveals a global upward trend, with rates currently at 21% worldwide, projected to reach 29% by 2030, despite WHO recommendations that they remain between 10-15% (Brugeilles, 2014; Piroozi et al., 2024). While CS can be life-saving when medically indicated, misuse and overuse, often driven by non-essential reasons, pose significant risks to maternal and neonatal health (Traoré, 2021; Moldenhauer, 2024a, 2024b).

In Africa, the increasing CS rates, as noted by Baumard (2020), highlight a troubling pattern of unnecessary interventions, with a similar trend observed in the Democratic Republic of the Congo (DRC), where 21.8% of deliveries involved CS in certain provincial divisions and one in three in Kinshasa city (Mukuna et al., 2020; Lukunda et al., 2017). In a study conducted by Boya et al. (2024) on the factors associated with the negative experiences of women who underwent a cesarean section in Haut Uélé Province (DRC), the importance of communication before the procedure, midwife training, a healthy hospital environment, and positive family perceptions was highlighted as key to reducing negative experiences. This study also proposed practical recommendations to improve the quality of care and the well-being of patients who had undergone a cesarean section.

This study aims to analyze the frequency and indications of CS in Mbandaka between 2022 and 2023, focusing on socio-demographic and socio-economic contexts,

identifying medical justifications, and comparing findings with African and global data to draw implications for healthcare systems and maternal health outcomes.

## METHODS

### *Study Population and Sample*

The population of this study consists of women who gave birth by cesarean section in Mbandaka from 2022 to 2023, residing in the designated health zones mentioned earlier.

### *Study Area and Design*

The study was conducted in three health zones in the town of Mbandaka: the Bolenge, Mbandaka, and Wangata health zones. The study employed a cross-sectional and analytical design, with a quantitative and descriptive focus. This structured design aims to guide an in-depth examination of cesarean section rates and indications, with the objective of improving healthcare practices and outcomes for mothers and babies.

### *Study Population and Sample*

The study population comprised women who underwent cesarean deliveries in Mbandaka between 2022 and 2023 and resided within the city's designated health zones. The sampling process involved identifying the health zones, selecting ten health facilities within these zones for surveys, and allocating sample proportions to ensure representativeness. The sample size was calculated using the following formula:

$$n = \frac{t^2 p x p(1 - p) x N}{t^2 x p(1 - p) + (N - 1) x y^2}$$

Where:

- $t=1.96$  (for a 95% confidence level),
- $p=0.15$  (the WHO's recommended threshold estimated proportion for optimal maternal and neonatal outcomes),
- $N=31,903$  (population size),
- $y=0.05$  (margin of error).

Substituting these values yielded a sample size of 552. This sample was distributed across the 10 selected facilities based on a sampling fraction of  $f=n/N=10/38 = 0.26$ , where 10 represents the number of facilities authorized to perform cesarean sections and 38 is the total number of available facilities. Using this fraction, surveys were

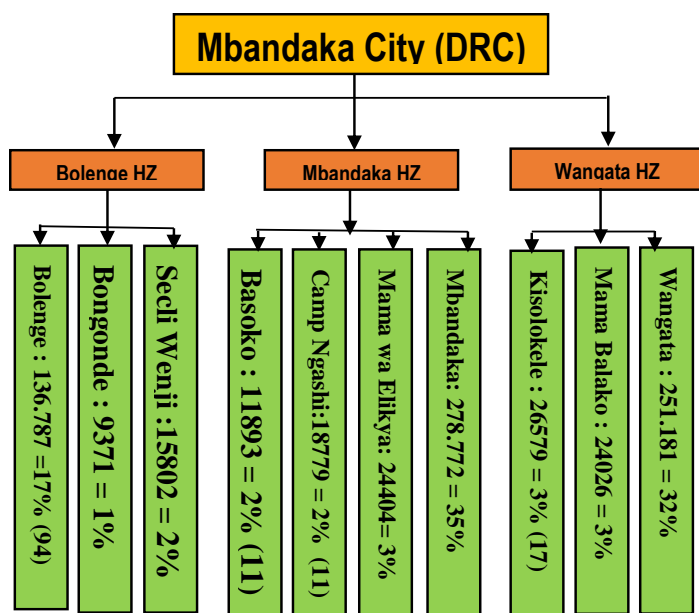
proportionally allocated to health zones: Bolenge (11 × 0.26 = 3), Mbandaka (16 × 0.26 = 4), and Wangata (11 × 0.26 = 3), ensuring accurate representation of the population.

**Table 1:**  
Presentation of the Population and Sample by Health Zone and Health Facility (Strata)

N°	Structures	Population	Target Population (4%)	Proportion	NR
<b>I BOLENGE HEALTH ZONE</b>					
1	Bolenge	136,787	5,471	17%	94
2	Bongonde	9,371	375	1%	5
3	Secli Wenji	15,802	632	2%	11
<b>II MBANDAKA HEALTH ZONE</b>					
4	Basoko	11,893	476	2%	11
5	Camp Ngashi	18,779	751	2%	11
6	Mama wa Elikya	24,404	976	3%	17
7	Mbandaka	278,772	11,151	35%	193
<b>III WANGATA HEALTH ZONE</b>					
8	Kisolokele	26,579	1,063	3%	17
9	Mama Balako	24,026	961	3%	17
10	Wangata	251,181	10,047	32%	176
<b>TOTAL</b>		<b>797,594</b>	<b>31,903</b>	<b>100%</b>	<b>552</b>

*Note:* Proportion refers to the number of target populations in each health area's structure divided by the total population of all health areas. The number of respondents (NR) per health area is calculated by multiplying the proportion by 552.

**Figure 1:**  
Proportional stratification of survey structures



*Ethical Considerations*

Ethical approval for the study was obtained from the Ethics Committee of the Higher Institute of Medical Technologies of Kinshasa (Decision No.: 0020/CBE/ISTM/KIN/RDC/PMBBL/2023) prior to data collection. Informed consent was obtained by clearly explaining the study's objectives, procedures, and potential risks to participants, both verbally and in writing, in a language they could understand. Participants were assured of their right to withdraw from the study at any time without consequences. To maintain data privacy, all collected information was anonymized, and unique codes were used in place of personal identifiers. Data was securely stored in password-protected systems, accessible only to authorized research team members. These measures were implemented in compliance with national and international ethical standards for research involving human subjects.

**RESULTS**

*Socio-demographic Data*

**Table 2:**  
Distribution of Caesarean Section Cases by Health Zone, Year, and Health Structure in Mbandaka, 2022-2023

Variables	Modalities	n = 552	%
<b>Health zone</b>	Mbandaka	232	42.0
	Wangata	210	38.0
	Bolenge	110	19.9
<b>Years</b>	2022	257	46.6
	2023	295	53.4
<b>Health Structures</b>	HGR Mbandaka	193	35.0
	HGR Wangata	176	31.9
	HGR Bolenge	94	17.0
	CSR Mama wa Elikya	17	3.1
	CSR Mama Balako	17	3.1
	C Kisolokele	17	3.1
	CS Basoko	11	2.0
	CS Wenji-Secli	11	2.0
	CSR Bongonde	5	0.9
	HMR Camp Ngashi	11	2.0

**Table 2** presents the distribution of caesarean section cases by health zone, year, and health structure in Mbandaka for the period 2022-2023. The results show that the study sample (n = 552) is distributed across various health zones, years, and health structures. A significant proportion of the sample comes from the Mbandaka health zone (42.0%),

followed by Wangata (38.0%) and Bolenge (19.9%), which reflects the population size and healthcare access in these areas. Regarding the years, 2023 accounts for a majority of the cases (53.4%) compared to 2022 (46.6%), suggesting an increase in the number of caesarean sections during the more recent year, potentially due to changes in healthcare practices or demand. In terms of health structures, most caesarean sections took place at HGR Mbandaka (35.0%) and HGR Wangata (31.9%), indicating that these are the main healthcare facilities for such procedures. Other health structures, including smaller community health centers such as CSR Mama wa Elikya, CSR Mama Balako, and others, contribute less, with percentages ranging from 0.9% to 3.1%.

**Table 3:**  
Distribution of Socio-Demographic Characteristics of Women Undergoing Caesarean Section in Mbandaka, 2022-2023

Variables	Modalities	n = 552	%
<b>Woman's age</b>	< 18 years	40	7.2
	18 - 22 years	103	18.7
	23 - 27 years	144	26.1
	28 - 32 years	126	22.8
	33 - 37 years	74	13.4
	38 - 42 years	57	10.3
	43 - 47 years	8	1.4
<b>Occupation</b>	Housewife	289	52.4
	Civil servant	72	13.0
	Shopkeeper	35	6.3
	Pupil/student	78	14.1
	Grower	28	5.1
	Informal	12	2.2
	Resourceful	38	6.9
<b>Education level</b>	Illiterate	34	6.2
	Literate	15	2.7
	Primary	110	19.9
	Secondary	320	58.0
	University	73	13.2
<b>Distance covered (km)</b>	Less than or equal to 5 km	357	64.7
	Between 6 and 9 km	154	27.9
	10 km or more	41	7.4
<b>Religion</b>	Catholic	176	31.9
	Protestant	138	25.0
	Muslim	37	6.7
	Revival	171	31.0
	Other	24	4.3
	Animist	6	1.1
<b>Marital status</b>	Single	119	21.6
	Married	400	72.5
	Widowed	8	1.4
	Divorced	25	4.5

**Table 3** presents the distribution of the socio-demographic characteristics of women undergoing caesarean sections in Mbandaka City. The **Table** presents the socio-demographic characteristics of women who underwent caesarean sections in Mbandaka between 2022 and 2023. The distribution by age shows that the majority of women were aged between 23 and 32 years, with 26.1% aged 23-27 years and 22.8% aged 28-32 years. Most women (52.4%) were housewives, followed by 18.7% aged 18-22 years. The majority had secondary education (58.0%), and most women lived within 5 km of the health facilities (64.7%). Catholic women represented 31.9%, with a significant proportion (72.5%) being married. This distribution provides a clear understanding of the social and demographic profile of women who underwent caesarean sections in the region.

*Socio-cultural Data*

**Table 4:**  
Use of Traditional Products During Pregnancy and Associated Factors Among Women Undergoing Caesarean Section in Mbandaka, 2022-2023

Variables	Modalities	n = 552	%
<b>Use of traditional products during pregnancy</b>	Yes	208	37.7
	No	344	62.3
<b>Gestational age of use of traditional products</b>	First quarter	33	15.9
	Second quarter	65	31.3
	Last quarter	110	52.8
<b>Types of natural products used (Medicinal plants)</b>	Alchornea cordifolia (Schumach. & Thonn.) Müll.Arg.	22	10.6
	Sida cordifolia L.	86	41.3
	Ocimum basilicum L.	47	22.6
	Aframomum giganteum (Oliv. & D.Hanb.) K.Schum.	33	15.9
	Ipomoea involucrata P.Beauv.	20	9.6
<b>Reasons for using traditional products during pregnancy</b>	Poverty	4	1.9
	Environmental influences	8	3.8
	Avoid evil spells	37	17.7
	Precipitate childbirth	108	51.5
	Fight fever	26	12.5
	Avoid pain	10	4.8
	Combat abortions	7	3.3
	Ignorance	2	0.9
The desire to have an abortion	6	2.8	

**Table 4** shows the use of traditional products during pregnancy and associated factors among women undergoing Caesarean section in Mbandaka City. The results show that 37.7% of the women surveyed reported using traditional products during pregnancy. Among those who used traditional products, the majority (52.8%)

did so during the last trimester, with the second trimester accounting for 31.3% and the first trimester 15.9%. The most commonly used traditional products included *Sida cordifolia* (41.3%), *Ocimum basilicum* (22.6%), and *Aframomum giganteum* (15.9%). The reasons for using traditional products were mainly to precipitate childbirth (51.5%) and to avoid evil spells (17.7%). Other reasons included fighting fever (12.5%) and avoiding pain (4.8%). The use of traditional products was less frequently linked to poverty (1.9%) or environmental influences (3.8%). These data suggest that the majority of women used traditional products to address perceived health issues or cultural beliefs related to pregnancy, with a focus on expediting labor.

**Table 5:** Family Planning Practices and Traditional Product Use during Pregnancy in Mbandaka City

Variables	Modalities	n = 552	%
Combining traditional products with ANC	Yes	19	9.1
	No	189	90.9
Desired pregnancy	Yes	359	65.0
	No	193	35.0
Family planning practices	Yes	272	49.3
	No	280	50.7
Reasons for not using family planning methods	Ignorance	152	54.3
	Religion	39	13.9
	Poverty	2	0.7
	Sexual imposition by husband	38	13.6
	Not applicable (NA)	4	1.4
	Causes cancer	9	3.2
	Causes hemorrhage	32	11.4
	Causes hemorrhage and cancer	4	1.4

**Table 5** shows family planning practices and traditional product use during pregnancy in Mbandaka City. A small proportion of women (9.1%) reported combining traditional products with antenatal care (ANC) during their pregnancy, indicating that most preferred either one method or the other. In terms of pregnancy planning, 65% of women expressed that their pregnancy was desired, while 35% did not plan their pregnancy. Regarding family

planning practices, almost half of the women (49.3%) were using a family planning method, while 50.7% were not. Among those who did not use family planning, the most common reasons included ignorance (54.3%), religious beliefs (13.9%), and sexual imposition by their husbands (13.6%). Other reasons included concerns about health risks, such as causing cancer (3.2%) or hemorrhage (11.4%), highlighting significant barriers to family planning use in this population. This suggests that while some women use family planning methods, widespread use is hindered by a variety of social, cultural, and informational factors.

**Table 6:** Spousal Support During Antenatal Care (ANC) Visits in Mbandaka City

Variables	Modalities	n = 552	%
Having been accompanied by the spouse to the NPC	Yes	119	21.6
	No	433	78.4
Reasons for not providing support by the spouse to the NPC	Neglect	51	11.8
	Occupation	194	44.8
	Ignorance	27	6.2
	Travel	82	18.9
	Divorce	25	5.8
	Not applicable (NA)	13	3.0
	Deceased spouse	2	0.5
Single	39	9.0	

**Table 6** shows spousal support during antenatal care (ANC) visits in Mbandaka City. It shows that a majority of women (78.4%) reported that their spouse did not accompany them to antenatal care (ANC) visits, while only 21.6% received spousal support during these visits. The reasons for the lack of support from spouses varied. The most common reason was occupation, with 44.8% of women citing this factor, followed by travel (18.9%) and neglect (11.8%). Other reasons included ignorance (6.2%), divorce (5.8%), and a deceased spouse (0.5%). A small proportion (3.0%) reported that the reason for the lack of support was not applicable. These findings suggest that while some women are able to receive support from their spouses during ANC visits, various social and practical barriers, such as work commitments and physical distance, prevent many from having this support, which may affect their overall prenatal experience.

*Data on Obstetric History*

**Table 7:**  
Descriptive Statistics of Reproductive Health Variables in Mbandaka City

Variables	N	Min	Max	Average	Std. Error	Std. Dev.
Gesity	552	1	6	3.41	0.073	±1.723
Parity	552	1	6	2.81	0.070	±1.635
Number of living children	552	0	6	2.68	0.069	±1.624
Number of children who died	552	0	4	0.24	0.023	±0.549
Number of known abortions	552	0	6	0.56	0.036	±0.850
Number of eutocic deliveries	552	0	6	1.57	0.075	±1.772
Number of dystocic deliveries	552	1	6	1.31	0.027	±0.623
Number of caesarean deliveries	552	1	6	1.22	0.021	±0.485

**Table 7** provides the descriptive statistics of reproductive health variables in Mbandaka City. The descriptive statistics of reproductive health variables in the studied population in Mbandaka show that the average number of pregnancies (gestity) is 3.41, with a standard deviation of 1.723, indicating moderate variation in the number of pregnancies among women. The average number of live births (parity) is 2.81, with a range from 1 to 6 and a standard deviation of 1.635. The average number of living children is 2.68, while the average number of deceased children is low at 0.24, with a standard deviation of 0.549. The average number of known abortions is 0.56, with noticeable variation, reflected in a standard deviation of 0.850. Regarding deliveries, the average number of eutocic (normal) births is 1.57, with a standard deviation of 1.772, while the average number of dystocic (complicated) births is 1.31, with a standard deviation of 0.623. Finally, the average number of caesarean deliveries is 1.22, with a standard deviation of 0.485, suggesting that caesarean deliveries were common among the women in the study. These statistics provide an overview of reproductive health trends among women in Mbandaka City, with a wide range of experiences in pregnancies, live births, child deaths, abortions, and types of deliveries.

*ANC Data*

**Table 8:**  
Distribution of Factors Influencing the Timing of Antenatal Care (ANC) Initiation and Reasons for Delayed Start in Mbandaka City

Variables	Modalities	n = 552	%
<b>Age of pregnancy and onset of ANC</b>	In the first quarter	111	20.1
	Second quarter	280	50.7
	Last quarter	149	27.0
	Not applicable	12	2.2
<b>Reasons to start at this age</b>	Ignorance	34	6.2
	Poverty	57	10.3
	Distance from centre	4	0.7
	Multiparity	32	5.8
	Avoid many appointments	111	20.1
	Use of traditional products	32	5.8
	Malaria	83	15.0
	Threat of abortion	19	3.4
	Not applicable (NA)	12	2.2
	Travel	36	6.5
	Respect CPN standards	53	9.6
Shame	5	0.9	
Monitor progress of mother and fetus	40	7.2	
Avoid dystocia	9	1.6	

The data reveals that most women (50.7%) began their antenatal care (ANC) in the second trimester, while 27.0% initiated care in the third trimester. A smaller proportion (20.1%) sought ANC in the first trimester. Some women did not have a clear time of ANC initiation (2.2%). The reasons for delayed ANC initiation include ignorance (6.2%), poverty (10.3%), and distance from healthcare centres (0.7%). Many women also reported preferring fewer appointments (20.1%) or using traditional products (5.8%) as reasons for their delay. Other reasons included the presence of medical conditions such as malaria (15.0%) or a threat of abortion (3.4%). Some women delayed ANC due to travel concerns (6.5%) or to monitor the progress of both the mother and the fetus (7.2%). Fewer women cited reasons like shame (0.9%) or the desire to avoid dystocia (1.6%). These factors highlight the challenges that women face in initiating timely and regular ANC in Mbandaka, which could inform health interventions aimed at improving maternal and fetal health outcomes in the region.

**Table 9:**  
Distribution of Indications for Caesarean Section in Mbandaka

Indications for Caesarean Section	Modalities	n = 552	%
Macrosomia	No	396	71.7
	Yes	156	28.3
Scarred uterus	No	485	87.9
	Yes	67	12.1
Fetal distress	No	340	61.6
	Yes	212	38.4
Procidious cord	No	549	99.5
	Yes	3	0.5
Transverse presentation	No	477	86.4
	Yes	75	13.6
Breech presentation	No	536	97.1
	Yes	16	2.9
Prolonged labour	No	521	94.4
	Yes	31	5.6
Placenta previa	No	523	94.7
	Yes	29	5.3
Dynamic dystocia	No	543	98.4
	Yes	9	1.6
Pre-uterine rupture	No	549	99.5
	Yes	3	0.5
Fetal-pelvic disproportion	No	527	95.5
	Yes	25	4.5
Twin pregnancy	No	518	93.8
	Yes	34	6.2
Gestational diabetes (Dynamic dystocia)	No	549	99.5
	Yes	3	0.5

The data highlights various indications for caesarean sections, with macrosomia being a significant factor for 28.3% of cases, while 71.7% of women did not experience this issue. Scarred uterus was a reason for caesarean section in 12.1% of cases, while 87.9% did not have this condition. Fetal distress was another key factor, with 38.4% of women experiencing it, while 61.6% did not. Other indications included transverse presentation (13.6%), breech presentation (2.9%), prolonged labour (5.6%), and placenta previa (5.3%). Fetal-pelvic disproportion was reported in 4.5% of cases, while 93.8% of pregnancies were not complicated by twin pregnancies. Conditions such as procidious cord, pre-uterine rupture, and gestational diabetes were rare, affecting only a small proportion (less than 1%) of the cases. These findings reflect the primary medical conditions leading to caesarean sections in the region, which could guide future healthcare interventions

and better management of pregnancy complications in Mbandaka.

*Bi-variate Analysis*

**Table 10:**  
Association Between Socio-Demographic Factors and Caesarean Section in Mbandaka City

Variables	Caesarean section		$\chi^2$	P		
	NO	YES				
Age	< 18 years	N	35	5	46.929	0.000
		%	7.9%	4.7%		
	18-22 years	N	87	16		
		%	19.6%	15.0%		
	23 – 27 years	N	123	21		
		%	27.6%	19.6%		
	28 – 32 years	%	108	18		
		N	24.3%	16.8%		
	33 – 37 years	%	59	15		
		N	13.3%	14.0%		
	38 – 42 years	%	27	30		
		N	6.1%	28.0%		
43 – 47 years	%	6	2			
	N	1.3%	1.9%			
Total	%	445	107			
	N	100.0%	100.0%			
Marital status	Married	N	311	89	7.635	0.006
		%	69.9%	83.2%		
	No married	N	134	18		
		%	30.1%	16.8%		
	Total	N	445	107		
		%	100.0%	100.0%		

The analysis shows significant associations between both age and marital status with the likelihood of undergoing a caesarean section. A chi-square test revealed a highly significant association between age and caesarean section ( $\chi^2 = 46.929$ ,  $p = 0.000$ ). The highest proportion of caesarean sections occurred among women aged 38-42 years, with 28.0% of this group undergoing the procedure. In contrast, younger age groups, such as those under 18 years, had a lower incidence of caesarean sections (4.7%). Marital status also demonstrated a significant relationship with caesarean delivery ( $\chi^2 = 7.635$ ,  $p = 0.006$ ), with married women more likely to have a caesarean section (83.2%) compared to unmarried women (16.8%). These findings suggest that both age and marital status play a

role in determining the likelihood of caesarean section in the region, highlighting important socio-demographic factors that should be considered in maternal healthcare planning and interventions.

**Table 11:**  
Association Between Traditional Product Use and Caesarean Section in Mbandaka City

Variables	Modalities	Caesarean Section		$\chi^2$	p
		YES (%)	NO (%)		
Product use T1	No	2 (1.9%)	105 (98.1%)	3.987	
	Yes	31 (7.0%)	414 (93.0%)		
Product use T2	No	16 (15.0%)	91 (85.0%)	1.290	
	Yes	49 (11.0%)	396 (89.0%)		
Product use T3	No	26 (24.3%)	81 (75.7%)	1.590	
	Yes	84 (18.9%)	361 (81.1%)		

The analysis explored the relationship between the use of traditional products during pregnancy and the likelihood of undergoing a caesarean section. A chi-square test revealed a significant association between the use of traditional product T1 and caesarean section ( $\chi^2 = 3.987$ ,  $p = 0.047$ ). Women who used traditional product T1 had a lower incidence of caesarean sections (1.9%) compared to those who did not use the product (7.0%). However, no significant associations were found between the use of traditional products T2 ( $\chi^2 = 1.290$ ,  $p = 0.256$ ) and T3 ( $\chi^2 = 1.590$ ,  $p = 0.207$ ) and the likelihood of caesarean section. These findings suggest that while the use of certain traditional products may influence delivery outcomes, further investigation is needed to understand the full extent of their impact.

The analysis in **Table 12** examined the factors associated with caesarean section deliveries, with a focus on various pregnancy-related conditions. Significant associations were found between several variables and the likelihood of caesarean section. For example, macrosomia was strongly associated with caesarean section ( $\chi^2 = 159.17$ ,  $p = 0.000$ ), as 77.6% of women with macrosomia underwent caesarean delivery. Similarly, a scarred uterus was significantly linked to caesarean section ( $\chi^2 = 13.18$ ,  $p = 0.000$ ), with 22.4% of women with a scarred uterus requiring a caesarean. Fetal distress ( $\chi^2 = 70.41$ ,  $p = 0.000$ ), transverse presentation ( $\chi^2 = 104.05$ ,  $p = 0.000$ ), prolonged labor ( $\chi^2 = 70.79$ ,  $p = 0.000$ ), and shrunken pelvis ( $\chi^2 = 132.91$ ,  $p = 0.000$ ) were also significant factors. However,

no significant associations were observed between caesarean section and conditions such as proclivence of the cord ( $\chi^2 = 0.37$ ,  $p = 0.540$ ), breech presentation ( $\chi^2 = 1.48$ ,  $p = 0.223$ ), placenta previa ( $\chi^2 = 0.44$ ,  $p = 0.506$ ), pre-uterine rupture ( $\chi^2 = 0.72$ ,  $p = 0.394$ ), dynamic dystocia ( $\chi^2 = 0.40$ ,  $p = 0.507$ ), fetal-pelvic disproportion ( $\chi^2 = 2.17$ ,  $p = 0.141$ ), twin pregnancy ( $\chi^2 = 0.03$ ,  $p = 0.855$ ), and gestational diabetes ( $\chi^2 = 0.72$ ,  $p = 0.34$ ). These findings suggest that specific conditions, such as macrosomia, scarred uterus, fetal distress, and others, are key factors influencing the decision to perform a caesarean section.

**Table 12:**  
Factors Influencing Caesarean Section Deliveries: A Statistical Analysis of Pregnancy-Related Conditions

Variables	Caesarean Section		$\chi^2$	p
	NO (%)	YES (%)		
Macrosomia	372 (83.6%)	24 (22.4%)	159.17	0.000
	73 (16.4%)	83 (77.6%)		
Scarred uterus	402 (90.3%)	83 (77.6%)	13.18	0.000
	43 (9.7%)	24 (22.4%)		
Fetal distress	312 (70.1%)	28 (26.2%)	70.41	0.000
	133 (29.9%)	79 (73.8%)		
Proclivence of the cord	443 (99.6%)	106 (99.1%)	0.37	0.540
	2 (0.4%)	1 (0.9%)		
Transverse presentation	417 (93.7%)	60 (56.1%)	104.05	0.000
	28 (6.3%)	47 (43.9%)		
Breech presentation	434 (97.5%)	102 (95.3%)	1.48	0.223
	11 (2.5%)	5 (4.7%)		
Prolonged labour	438 (98.4%)	83 (77.6%)	70.79	0.000
	7 (1.6%)	24 (22.4%)		
Placenta previa	423 (95.1%)	100 (93.5%)	0.44	0.506
	22 (4.9%)	7 (6.5%)		
Pre-uterine rupture	442 (99.3%)	107 (100.0%)	0.72	0.394
	3 (0.7%)	0 (0.0%)		
Dynamic dystocia	437 (98.2%)	106 (99.1%)	0.40	0.507
	8 (1.8%)	1 (0.9%)		
Fetal-pelvic disproportion	422 (94.8%)	105 (98.1%)	2.17	0.141
	23 (5.2%)	2 (1.9%)		
Shrunken pelvis	412 (92.6%)	50 (46.7%)	132.91	0.000
	33 (7.4%)	57 (53.3%)		
Twin pregnancy	418 (93.9%)	100 (93.5%)	0.03	0.855
	27 (6.1%)	7 (6.5%)		
Gestational diabetes	442 (99.3%)	107 (100.0%)	0.72	0.34
	3 (0.7%)	0 (0.0%)		

*Multivariate Analysis***Table 13:**  
Factors Influencing the Likelihood of Caesarean Section: Odds Ratios and Confidence Intervals (Logistic Regression)

Variables	Modality	N	S.E.	Wald	p	OR	95% CI
<b>Macrosomia</b>	No	396	1.678	33.464	0.000	16.399	[6.775 - 13.667]
	Yes	156					
<b>Scarred uterus</b>	No	485	1.738	20.883	0.000	28.910	[93.190 - 84605.268]
	Yes	67					
<b>Shrunken pelvis</b>	No	462	1.824	18.858	0.000	27.836	[2.411 - 238.333]
	Yes	90					
<b>Fetal distress</b>	No	340	1.375	29.233	0.000	16.837	[114.219 - 25000.650]
	Yes	212					
<b>Transverse presentation</b>	No	75	1.847	19.189	0.000	32.121	[87.372 - 121719.263]
	Yes	3					
<b>Twin pregnancies</b>	No	518	1.327	14.055	0.000	144.610	[10.736 - 1947.860]
	Yes	34					

The results in **Table 13** indicate that several factors are strongly associated with the likelihood of having a caesarean section. Women with macrosomia (a large baby) are 16.4 times more likely to undergo a caesarean section (OR = 16.399, CI: [6.775 - 13.667]). The likelihood increases significantly for women with a scarred uterus, with an odds ratio (OR) of 28.91 (CI: [93.190 - 84605.268]). Similarly, women with a shrunken pelvis are 27.8 times more likely to have a caesarean section (OR = 27.836, CI: [2.411 - 238.333]). Fetal distress significantly increases the odds of a caesarean section, with an OR of 16.837 (CI: [114.219 - 25000.650]). Women with a transverse presentation are 32.1 times more likely to undergo a caesarean section (OR = 32.121, CI: [87.372 - 121719.263]). Lastly, twin pregnancies are associated with a higher likelihood of caesarean section, with an OR of 144.610 (CI: [10.736 - 1947.860]). These factors demonstrate strong associations with caesarean delivery, highlighting the role of medical conditions in the decision for this type of birth.

**DISCUSSION**

The study revealed a caesarean section (CS) rate of 32% in Mbandaka, which is higher than the WHO's recommended threshold of 10-15% for optimal maternal and neonatal outcomes (Piroozi et al., 2024). This rate aligns with findings in the United States (32% in 2021) (Moldenhauer, 2024a) but significantly exceeds those reported in Mali (16.79% in Kati) (Aichata, 2020) and Algeria (16%) (Baumard, 2020). Traoré (2021) specifies that the age group most represented among Caesarean section patients was 18–34 years, accounting for 75% of cases. In Mbandaka, however, the most exposed age group was 23–27 years. At Kibua General Hospital in France, nearly 21% of pregnancies are delivered surgically. In a global analysis of Caesarean section rates, Dumont and Guilmoto (2020) highlight significant disparities between countries, with some exceeding the WHO's recommended criteria of 10%-15%. According to Dembélé (2022), a study based on Robson's classification at the San Referral Health Centre reported 582 Caesarean sections out of 2,224 deliveries, indicating a frequency of 26.17%, compared with the 32% observed in our research in Mbandaka. However, it is lower than the rates observed in countries like Brazil, where CS rates surpass 50% (Rudey et al., 2020).

The divergence from the WHO recommendations suggests systemic and socio-cultural factors driving the higher CS rates in Mbandaka, warranting closer examination. Socio-cultural factors, such as preferences for CS due to perceived safety or convenience, may play a role, alongside systemic factors like limited access to advanced obstetric care, lack of adherence to clinical guidelines, and disparities in healthcare infrastructure. For example, in contrast to well-developed healthcare systems in France and the UK that reduce fetal distress through rigorous monitoring, Mbandaka experiences higher rates of CS for fetal distress (38.4%). This indicates potential gaps in antenatal care, intrapartum monitoring, and early medical interventions.

The indications for CS in Mbandaka, particularly fetal distress (38.4%) and macrosomia (28.3%), underscore these systemic limitations. In developed settings like France and the UK, comprehensive protocols for managing high-risk pregnancies and macrosomia minimize unnecessary surgical interventions (Diallo et al., 2023; Moldenhauer,

2024a). In Mbandaka, however, macrosomia (28.3%) is a leading indication, suggesting challenges in managing gestational diabetes and providing timely interventions for at-risk pregnancies.

The age distribution of CS patients also provides insights into regional disparities. While the 23–27 age group is most affected in Mbandaka, studies in other regions, such as Kibua (Ntabo & Badiambila, 2023) and Mali (Aichata, 2020), report slightly different age groups. This variation may reflect demographic differences, fertility patterns, and access to healthcare. The reliance on emergency CS in Mbandaka (62.7% of cases) indicates a reactive rather than preventive approach to maternal health, which may contribute to the high rate of surgical deliveries. Comparatively, the robust healthcare systems in developed countries prioritize preventative care, reducing emergency interventions (Murray et al., 2018).

Similarly, the high prevalence of twin pregnancies and transverse presentations as indications for CS in Mbandaka reflects challenges in antenatal screening and management, contributing to the elevated CS rate. While the CS rate in Mbandaka aligns with some global trends, it exceeds WHO recommendations and reflects disparities in healthcare access, quality, and socio-cultural factors. These findings highlight the need for targeted interventions, including improved antenatal care, adherence to evidence-based guidelines, and community education, to address preventable CS and optimize maternal and neonatal outcomes. Future studies should explore the role of socio-economic and healthcare inequities in shaping these trends and develop strategies to align CS practices with global standards.

## CONCLUSION AND RECOMMENDATIONS

The study on caesarean section rates and indications in Mbandaka, with an overall rate of 32% for the period 2022–2023 (37.3% scheduled and 62.7% emergency), highlighted issues related to irregular antenatal care (ANC) and socio-cultural factors. The main indications, such as fetal distress (38.4%) and macrosomia (28.3%), each increase the likelihood of caesarean delivery by 16 times. The results showed a lower proportion of caesarean sections among women aged 23 to 27 years (19.6%;  $\chi^2 = 46.929$ ;  $p < 0.001$ ). Irregular ANC attendance was

associated with factors such as multiparity, financial constraints, the use of traditional remedies, and frequent travel during pregnancy. These findings underscore the need to strengthen health policies and practices to improve ANC accessibility and regularity through financial subsidies, community-based services, and regulation of traditional remedies. Initiatives such as continuous training programs for healthcare workers focused on managing high-risk pregnancies and fetal monitoring, as well as community awareness campaigns on the benefits of ANC, are also recommended to reduce reliance on emergency caesarean sections and improve obstetric outcomes.

**Ethical Approval:** Ethical approval for the study was obtained from the Ethics Committee of the Higher Institute of Medical Technologies of Kinshasa (Decision No.: 0020/CBE/ISTM/KIN/RDC/PMBBL/2023).

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