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Associated risk factors, maternal and fetal outcomes of caesarean delivery in four health facilities in Littoral Region, Cameroon: A cross-sectional study

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ABSTRACT

Background & aim: The caesarean rate is on the rise in Cameroon; nonetheless, there is a paucity of data regarding its associated risk factors and outcomes. This study aimed to determine the associated risk factors, as well as maternal and fetal outcomes of caesarean delivery in four hospitals in Cameroon.

Methods: This cross-sectional study was conducted on 1322 parturient women who gave birth in one tertiary, two secondary, and one primary healthcare facility in Cameroon within March 2015-February 2016. Maternal and fetal data were obtained by interviewer-administered pretested questionnaires. Univariate and multivariate analyses with Chi-square and Fischer's exact tests compared outcomes between caesarean and vaginal births.

Results: Referral from one hospital to another (AOR 2.83; 95% CI: 2.09-3.84) and antimicrobial use during labor and delivery (AOR 11.0; 95% CI: 7.6-17) were maternal factors independently associated with caesarean delivery. Postpartum hemorrhage of 1000-1500 mL (AOR 9.7; 95% CI: 1.7-55), maternal fever (AOR 3.5; 95% CI: 1.4-9.2), and prolonged hospital stay (AOR 3.8; 95% CI: 3.2-4.4) were maternal complications independently associated with caesarean delivery. Furthermore, birth asphyxia (AOR 2.1; 95% CI: 1.3-3.6), respiratory distress (AOR 4.7; 95% CI: 1.6-12.4), and neonatal sepsis (AOR 3.2; 95% CI: 1.5-6.9) were fetal complications independently associated with caesarean delivery.

Conclusion: There were more referrals from another facility, intrapartum antimicrobial use, hemorrhage, maternal fever, prolonged hospital stay including birth asphyxia, neonatal sepsis, and respiratory distress among caesarean delivery.

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Introduction

Caesarean delivery is the delivery of a fetus through a surgical incision through the abdominal wall (laparotomy) and uterine wall (hysterotomy) after 28 weeks of gestation [1]. It was initially introduced as a lifesaving procedure for mother and newborn. Nevertheless, over the years, its indication as an optional method of fetal delivery renders the discernment of risk-benefit very difficult [2]. The number of Caesarean sections (CS) has dramatically increased from 5.5% in the 1970s to 24.4% in the 1990s [3]. Caesarean delivery rates of 45% (within the range of 35-81%) have been reported in Brazil [4]. In Cameroon, this rate varies by city: 12.7% in Yaoundé [5] and up to 20.4% in Buea [6]. This procedure that involves laparotomy and hysterotomy has inherent risks of materno-fetal morbidity and mortality [7, 8], especially in low and middle-income countries (LMIC) where safe surgical procedures are not always guaranteed [9]. In Cameroon, CS is performed by obstetricians, surgeons, and general practitioners

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in urban settings, while it is carried out by nurses in rural settings [10-12].

Furthermore, health centers in rural areas are not well-equipped to ensure the safety of the procedure. These double standards potentially increase the risk of adverse events in Cameroon as they do in many LMIC. There is a paucity of data concerning the risk factors, as well as maternal and fetal outcomes of caesarean section in Cameroon.

The present study aimed to evaluate the risk factors, as well as maternal and fetal outcomes of caesarean section in four health facilities in the Littoral Region, Cameroon.

Materials and Methods

This cross-sectional study was conducted in four health facilities in two major cities in the Littoral Region, Cameroon: Douala, a major metropolitan city and economic capital of Cameroon and Edea an industrial suburban city located about 60 km from Douala. These facilities represent the health system pyramid of Cameroon in which the New Bell Hospital is a district hospital of primary level, the Edea Regional and Laquintinie hospitals are the secondary level, and the Douala General Hospital is the tertiary referral hospital.

The current study was performed on parturient women who referred to study hospitals for antenatal care and delivery within March 2015-February 2016. Respondents with a gestational age <28 completed weeks, reported multiple gestations, those who gave birth in other hospitals, or those who were reluctant to participate in the study were excluded from the research project. A total of 1322 births were registered. Those with a gestational age ≥28 completed weeks to term (37 to 42 completed weeks) were suitable for the study.

The sample size was calculated using the Lorenz formula[13] :

$$n = z^2 * \frac{p(1-p)}{d^2}$$

Where n=Sample size

Z= Standard normal deviate for 95% confidence interval=1.96

P= The prevalence of cesarean section; p=20.4%=0.204 in a study conducted in Buea, Cameroon[6]

d= Accepted margin of error 5%=0.05

Therefore, $n=1.96^2 * 0.204 * (1-0.204)/0.05^2$

$n= 0.62381/0.0025$

n=249.5 participants. Therefore, the minimum sample size required for the study was calculated at 250 participants. We added 10% (25 participants) of this population to account for sample attrition and obtained a minimum sample size of 275 participants. In addition, we used the convenient and consecutive sampling method to enroll participants as they came to the hospital.

Ethical approval was obtained from the Institutional Ethical Committee of the Faculty of Medicine and Pharmaceutical Sciences, University of Douala (2015/2135/UB/VD/RC/FHS). In addition, administrative authorizations were obtained from the Dean of the Faculty of Health Sciences, University of Buea and the directors of the hospitals concerned.

We developed a questionnaire from the literature review and adapted our questionnaire from a pre-existing one that had already been validated. We tested the questionnaire (face validity) on 15 pregnant women in another health facility (Buea Regional Hospital) for readability, clarity, and comprehension and adjusted it as required. Furthermore, we obtained consent from parturients in the labor room and monitored them during labor making sure that they were provided with standard care. In the present study, standard care included: partograph opened at 4 cm dilatation, a four-hour action line drawn, and hourly maternal-fetal assessment. Both primigravida and multigravida women who underwent cesarean section were included in the study.

Respondent's hospital records and verbal interviews were used to collect the following data:

- Socio-demographic variables (e.g., age, marital status, occupation, religion, and level of education)
- Medical (e.g., history of chronic illnesses, such as HIV, hypertension, diabetes, preeclampsia/eclampsia, gestational hypertension, urinary tract infection (UTI), pre-pregnancy weight, and height)
- Surgical history (previous caesarean delivery and myomectomy)

- Obstetrical history (e.g., Gravidity, parity, antenatal care visits, gestational age, pregnancy complications, mode of delivery, birth weight, history of current pregnancy, and anemia) and maternal complications (blood loss, postoperative fever, anemia, wound infection, UTI, breast disorders, endometritis, postpartum eclampsia, and hospital stay).
- Toxicology (e.g., alcohol intake, cigarette smoking, and marijuana use)

Throughout labor, the parturient was monitored for labor progression and the fetus was assessed for acute fetal distress (normal fetal heart rate=110 to 160 beats per min) and /or greenish meconium-stained amniotic fluid. At the douala general hospital (DGH), cardiotocograph (Sonicaid) was used to monitor labor electronically. After birth, the newborn was assessed for viability (breathing, neonatal heartbeat, umbilical cord pulsation, discoloration of the mucous membranes, movement of voluntary muscles, and 1 and 5 minute Apgar scores). The weight of the neonate was measured to the nearest gram with a mechanical baby scale balance with sliding weights (seca 745™). The newborn was monitored for the presence of respiratory distress: respiratory grunting, flaring of the alae nasae, intercostal recession, sub-xyphoid recession, thoracoabdominal asynchrony, and respiratory rate less than 40 or greater than 60 breaths per min. All stillbirths, neonatal sepsis, prematurity or neonatal deaths, and neonatal intensive care unit (ICU) admissions were recorded. In addition, wound dressing was performed in the health facilities, and it affected the caesarean section. This enabled us to follow-up any wound complications. The questionnaires were completed when the women referred to hospitals for post-operative evaluation one month after caesarean or six weeks after vaginal birth.

We respected the principles of the Helsinki declaration in the present study [15].

Data were double-checked for errors before entry into a password-protected personal computer and coded. Only identification numbers referred to participants. Identifiable information (consent forms) was kept separate from the data collection forms and both documents could be linked only by codes kept by the principal investigator. Data were entered into EpiData (version 3.1) and analyzed using STATA (version 13.1). The categorical variables (marital status, gravid status) were presented as frequencies and percentages, whereas continuous variables (age, birth weight, gestational age, weight, height) were presented as Mean±SD and interquartile range. Univariate and multiple logistic regression analyses were used to test the associations between predictor and outcome variables. A p-value less than 0.05 was considered statistically significant.

Results

General characteristics

A total of 1322 participants were enrolled in the study within March 2015-February 2016. Out of this population, 808 (61.1%) cases had vaginal births, while 514 (38.9%) parturient underwent caesarean delivery. The participants were within the age range of 11-46 years with a mean maternal age of 28.7±5.8 years. Regarding occupation, 55.0% (727/1322) of respondents were unemployed.

Table 1. General risk factors associated with cesarean birth (multivariate analysis)

Variable	Adjusted odds ratio	95% CI	P-value
Referral from other hospitals			
Yes	2.83	2.09-3.84	<0.001
No	1		
Parity greater than 5	0.97	0.90-1.05	0.445
Antimicrobial use during delivery			
Yes	11.0	7.6-17.0	<0.001
No	1		

CI: Confidence interval

The monthly income of the study population ranged from 95.32-704.04 USD, 19% of participants earned 176.51-353.02 USD, and 54.94% did not earn a salary. Only 11.9% of

cases had health insurance coverage. 93.63% of respondents were Christians, and 47.2% were married. A small minority (2.5%) were illiterate. Most participants neither drink alcohol nor smoke: 72.20% and 98.98%, respectively.

The number of pregnancies and term births in the study group ranged from 1-13 and 0-9 with a mean of 3.0±2.0 and 2.0±2.0, respectively. About 86.14% of respondents had a preterm delivery, while 68.84% of cases did not have a miscarriage.

Maternal weight and height of respondents ranged from 52-124 Kg and 1.44-1.82 m and mean 82.88±15.94 Kg and 1.63±0.08 m, respectively. We recorded 96.6% of respondents who had no known chronic diseases, and 86.01% of cases had no previous caesarean delivery. More than half of respondents (54.6%) with a scarred uterus had a trial of vaginal birth after a previous cesarean birth, and only 3.9% of this group had normal vaginal delivery after caesarean delivery.

The number of antenatal care visits ranged from 0-15 with a mean of 6±2. About 98.7% of cases received prophylaxis for malaria, iron supplements, folic acid, and tetanus toxoid during pregnancy. It is worthy to note that 9 (5.54%) cases were HIV positive.

Table 2. Maternal complications of cesarean versus vaginal birth (multivariate analysis)

Parameters	Adjusted Odds Ratio	95% CI	P-value
Haemorrhage (mL)			
>1500	5.59	0.67-45.73	0.113
1000-1500	9.65	1.69-55.14	0.011
500-1000	0.71	0.29-1.75	0.462
<500	1		
Maternal Fever			
Yes	3.52	1.35-9.17	0.010
No	1		
Anaemia			
Yes	0.28	0.05-1.50	0.138
No	1		
Wound infection			
Yes	0.86	0.16-4.58	0.862
No	1		
Urinary tract infection			
Yes	0.65	0.06-6.54	0.710
No	1		
Breast disorders			
Yes	3.26	0.52-20.32	0.205
No	1		
Endometritis			
Yes	0.42	0.06-2.98	0.386
No	1		
Postpartum preeclampsia			
Yes	0.75	0.28-1.97	0.554
No	1		
Length of hospital stay (days)	3.77	3.20-4.44	<0.001

CI: Confidence interval

The gestational age at delivery was within the range of 28-45 weeks with a mean gestational age of 38.7±2.9 weeks. Most respondents (95.96%) had a singleton pregnancy, 80.2% of cases had spontaneous labor, and 25.5% had electronic monitoring of labor and delivery. Most participants (67.84%) were in labor for less than 12 h.

Factors associated with Caesarean delivery

General factors associated with caesarean delivery

The antimicrobial use (AOR 11.0; 95% CI: 7.6-17.0) and referral from one hospital to another (AOR 2.83; 95% CI: 2.09-3.84) were maternal factors independently associated with caesarean delivery (Table 1).

Maternal complications of caesarean delivery

Postpartum hemorrhage of 1000-1500 mL (AOR 9.7; 95% CI: 1.7-55.4), maternal fever (AOR 3.5; 95% CI: 1.4-9.2) and length of hospital stay (AOR 3.8; 95% CI: 3.2-4.4) were maternal complications independently associated with caesarean delivery (Table 2).

Foetal complications of caesarean delivery

Birth asphyxia (AOR 2.1; 95% CI: 1.3-3.6), respiratory distress (AOR 4.7; 95% CI: 1.6-12.4), and neonatal sepsis (AOR 3.2; 95% CI: 1.5-6.9) were foetal complications independently associated with cesarean birth (Table 3).

Table 3.Foetal complications of cesarean birth (multivariate analysis)

Variable	Adjusted odds ratio	95% CI	P-value
Apgar score 1 min	0.98	0.80-1.19	0.818
Apgar score 5 min	0.92	0.751.13	0.420
Perinatal death	0.62	0.21-1.80	0.380
Birth asphyxia	2,12	1.26-3.58	0.005
Respiratory distress	4.71	1.60-12.36	0.002
Jaundice	1.30	0.45-3.70	0.625
Neonatal sepsis	3.21	1.51-6.85	0.003
Prematurity	0.91	0.50-1.67	0.766
Stillbirth	0.62	0.19-1.99	0.419
None	1	-	-

CI: Confidence interval

Discussion

The current study aimed to determine the associated risk factors, maternal and fetal outcomes of caesarean delivery.

Risk factors associated with caesarean delivery

Obstetric practice in Cameroon and most low-income countries has always been heralded by late referral of patients for appropriate decision-making and intervention. The key instrument for the follow-up of labor in most hospitals in Cameroon is the partograph. The use of partogram is not consistent in all hospitals in Cameroon. In the Bamenda Health District, Cameroon, it was previously reported that partograph was only present in 1% of the files which were filled to standard, while no partograms were used at all in 41.8% of files [14]. The inappropriate use of partograms leads to late referrals. Other reasons for late referral include poor road network, lack of transportation (ambulances), and non-compliance with the referral system as recommended by the ministry of health, or lack of good monitoring devices. Among the hospitals which were under study, only the Douala General Hospital is equipped with the facilities for antepartum and intrapartum electronic monitoring of maternal/foetal wellbeing. The results of the present study have confirmed that referral from one hospital to another (OR 2.80, 95% CI: 2.07 – 3.80) is associated with cesarean birth. This finding is consistent with the result of a study which was carried out in a DGH which reported a maternal mortality ratio of 275 per 100.000 live births with the late referral of parturient identified as a contributing factor [15].

Antimicrobial use during labor and delivery (AOR 11.0, 95% CI: 7.6 – 17) was another factor associated with caesarean delivery. Some respondents had other reasons that indicated the use of antimicrobials, such as premature rupture of membranes and vaginal infection with group B streptococcus. These co-morbidities are sometimes associated with preterm birth [16] and histological chorioamnionitis [17]. However, it has been reported that vaginal preparation with chlorhexidine or povidone-iodine reduces the risk of postcaesarean endometritis [18, 19].

Maternal complications of caesarean delivery

Prolonged hospital stay (AOR 3.8; 95% CI: 3.2-4.4) was associated with cesarean birth. This increased the financial burden of delivery in the present study. Admission to Obstetrics and Gynaecologic department of DGHs may cost from 25.16 USD/day for a room with three patients to 67.10 USD/day for a single room. This cost is prohibitive in a country where the

minimum wage of workers is about 67.09 USD [20]. Nevertheless, the Cameroon government has fixed cesarean birth costs in primary and secondary care hospitals at 69.57USD. This will go a long way to assist the population where only 11.9% of the study population has health insurance, especially in the urban areas. Respondents from this subgroup with insurance coverage are mainly those whose husbands or themselves work in companies in Edea (Aluminium and hydroelectricity companies) and multi-national companies in Douala.

Hemorrhage as a complication of cesarean births has been previously reported which leads to an increased need for blood transfusions, as compared to vaginal deliveries [8]. The most cases of hemorrhage in the current study were from uterine atony. However, uterotonic (misoprostol and oxytocic) medications and blood banks were available at health facilities for the management of postpartum hemorrhage [21].

Maternal fever was associated with cesarean birth despite (48 h) antibiotic prophylaxis. This can be attributed to a pre-existing vaginal infection that went unnoticed. At the DGH, we screened the participants for vaginal infection (Group B streptococcus, bacterial vaginosis, and mycoplasma) in the third trimester of pregnancy. Positive cases received appropriate treatment based on culture and antimicrobic susceptibility tests. However, it was not the case with the other hospitals under study. In addition, some patients had malaria after cesarean birth. It is noteworthy that Cameroon is a hyper-endemic zone for malaria which exposes parturients to low-grade plasmodium falciparum parasitaemia. Therefore, some patients develop clinical malaria in the transient state of postoperative immunosuppres sion [22, 23].

Breast disorders mainly included breast engorgement and mastitis. In a study carried out in three hospitals in Cameroon, the prevalence of mastitis was reported as 15%. In addition, poor breastfeeding hygiene was detected in 42% of these women[24]. Preeclampsia/eclampsia is a leading cause of maternal mortality in Cameroon [25, 26]. Women at risk should be well monitored even after delivery for probable postpartum eclampsia [27, 28].

Fetal complications of cesarean birth

Fetal adverse outcomes associated with cesarean section included birth asphyxia, respiratory distress, and neonatal sepsis or infection. These complications occurred as a result of acute fetal distress during caesarean delivery. A study performed in Peru reported that those in Robson groups 1 and 3 were significantly associated with stillbirths and maternal mortality [29]. Another study in Asia reported higher rates of severe asphyxia and palsy from vaginal births, as compared to elective cesarean birth [30].

The present study has investigated the associated risk factors and outcomes of cesarean birth. Therefore, it can provide a platform for interventions to improve birthing experience, reduce morbidity and the financial burden associated with caesarean delivery.

One of the limitations of the present study was recall bias; in other words, some respondents could not remember some vital information during the interview, and some variables collected were not analyzable. In addition, we did not consider some risk factors of caesarean section, such as the length of labor stages and comparison between emergency and elective caesarean sections.

Conclusion

As evidenced by the obtained results, the factors independently associated with caesarean delivery included referral from another health facility, and intrapartum antimicrobial use. Moreover, it was found that parturient with cesarean birth had a prolonged hospital stay, more hemorrhage, and maternal fever. In addition, the neonates born by cesarean section had more birth asphyxia, neonatal sepsis, and respiratory distress.

Acknowledgements

The present study was approved by the Institutional Ethical Committee of the Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Cameroon (2015/2135/UB/VD/RC/FHS). Informed consent was obtained from all participants included in the study.

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Conflicts of interest

Authors declared no conflicts of interest.

References

1. Fakhar S, Saeed G. Old procedures are still valuable: avoiding unnecessary caesarean section to decrease risk in the next pregnancy. Taiwanese Journal of Obstetrics and Gynecology. 2009; 48(1):76-78.
2. Gregory KD, Jackson S, Korst L, Fridman M. Caesarean versus vaginal delivery: whose risks? Whose benefits? American Journal of Perinatology. 2012; 29(1):7-18.
3. Stafford RS. Rising caesarean section rates. JAMA. 1990; 263(5):683-687.
4. Barros AJ, Santos IS, Matijasevich A, Domingues MR, Silveira M, Barros FC, et al. Patterns of deliveries in a Brazilian birth cohort: almost universal caesarean sections for the better-off. Revista de Saude Publica. 2011; 45(4):635-643.
5. Nkwabong E, Kouam L, Wamba T, Ngassa P, Doh AS, Mve KV, et al. Indication des cesariennes a la maternite du CHU de Yaounde de 2000 A 2004. Clinics in Mother and Child Health. 2006; 3(1):453-456.
6. Njim T, Choukem SP, Mbu R. Caesarean sections in a secondary level care hospital of Cameroon: an analysis of their six-year trends and adverse neonatal outcomes. BMC Research Notes. 2017; 10(1):430.
7. Hung HW, Yang PY, Yan YH, Jou HJ, Lu MC, Wu SC. Increased postpartum maternal complications after caesarean section compared with vaginal delivery in 225 304 Taiwanese women. The Journal of Maternal-Fetal & Neonatal Medicine. 2016; 29(10):1665-1672.
8. Hammad IA, Chauhan SP, Magann EF, Abuhamad AZ. Peripartum complications with caesarean delivery: a review of Maternal-Fetal Medicine Units Network publications. The Journal of Maternal-Fetal & Neonatal Medicine. 2014; 27(5):463-474.
9. Epiu I, Byamugisha J, Kwikiriza A, Autry MA. Health and sustainable development; strengthening peri-operative care in low income countries to improve maternal and neonatal outcomes. Reproductive Health. 2018; 15(1):168.
10. Ashengo T, Skeels A, Hurwitz EJ, Thuo E, Sanghvi H. Bridging the human resource gap in surgical and anesthesia care in low-resource countries: a review of the task sharing literature. Human Resources for Health. 2017; 15(1):77.
11. Kinney MV, Kerber KJ, Black RE, Cohen B, Nkrumah F, Coovadia H, et al. Sub-Saharan Africa's mothers, newborns, and children: where and why do they die? PLoS Medicine. 2010; 7(6):e1000294.
12. Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR. The increasing trend in caesarean section rates: global, regional and national estimates: 1990-2014. PloS One. 2016; 11(2):e0148343.
13. General Assembly of the World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. The Journal of the American College of Dentists. 2014; 81(3):14.
14. Egbe TO, Ncham EN, Takang W, Egbe EN, Halle-Ekane GE. Use of the partogram in the Bamenda health district, north-west region, Cameroon: a cross-sectional study. Gynecology and Obstetrics Research Open Journal. 2016; 2(5):102-111.
15. Ekane GE, Mangala FG, Obinchemti TE, Nguefack CT, Njamen TN, Kamgaing JT, et al. A review of maternal deaths at douala general hospital, Cameroon: the referral system and other contributing factors. International Journal of Tropical Disease and Health. 2015; 8(3):123-133.
16. Donders GG, Van Calsteren K, Bellen G, Reybrouck R, Van den Bosch T, Riphagen I, et al. Predictive value for preterm birth of abnormal vaginal flora, bacterial vaginosis and aerobic vaginitis during the first trimester of pregnancy. BJOG: An International Journal of Obstetrics & Gynaecology. 2009; 116(10):1315-1324.
17. Martius J, Eschenbach DA. The role of bacterial vaginosis as a cause of amniotic fluid infection, chorioamnionitis and prematurity--a review. Archives of Gynecology and Obstetrics. 1990; 247(1):1-13.
18. Morton VH, Wilson A, Hewitt C, Weckesser A, Farmer N, Lissauer D, et al. Chlorhexidine vaginal preparation versus standard treatment at caesarean section to reduce endometritis and prevent sepsis-a feasibility study protocol (the PREPS trial). Pilot and Feasibility Studies. 2018; 4(1):84.
19. Mohamed H, Hassan S, Hemida R. Vaginal preparation with antiseptic solution before caesarean section for reducing post partum morbidity. OSR-JNHS. 2015; 4:75-80.
20. Minimum Wage Rates in Cameroon. WageIndicator. Available at: URL: https://wageindicator.org/salary/minimum-wage/cameroon; 2018.

21. Egbe TO, Halle-Ekane GE, Tchente CN, Nyemb JE, Belley-Priso E. Management of uterine rupture: a case report and review of the literature. BMC Research Notes. 2016; 9(1):492.
22. Fievet N, Ringwald P, Bickii J, Dubois BE, Maubert B, Hesran JY, et al. Malaria cellular immune responses in neonates from cameroon. Parasite Immunology. 1996; 18(10):483-490.
23. Prabhu PS, Sridharan S, Ramesh S. Effects of surgical stress on early nonspecific immune response in children. Indian Journal of Surgery. 2014; 76(1):44-48.
24. Egbe TO, Ngonsai DT, Tchounzou R, Ngowe MN. Prevalence and risk factors of lactation mastitis in three hospitals in Cameroon: a cross-sectional study. Journal of Advances in Medicine and Medical Research. 2016; 13(1):1-10.
25. Ekane GE, Obinchemti TE, Tchente CN, Fokunang LK, Njamen TN, Bechem NN, et al. Attainment of the fifth millennium development goal: utopia or reality based on trends in maternal mortality in 12 years in two regional hospitals in fako division, Cameroon? A retrospective study. Open Journal of Obstetrics and Gynecology. 2014; 4(13):771.
26. Egbe T, Dingana T, Halle-Ekane G, Atashili J, Nasah B. Determinants of maternal mortality in mezam division in the north west region of Cameroon: a community-based case control study. International Journal of Tropical Diseases and Health. 2016; 15:1-15.
27. Shah A, Fawole B, M'Imunya JM, Amokrane F, Nafiou I, Wolomby JJ, et al. Caesarean delivery outcomes from the WHO global survey on maternal and perinatal health in Africa. International Journal of Gynecology & Obstetrics. 2009; 107(3):191-197.
28. Ye J, Zhang J, Mikolajczyk R, Torloni MR, Gülmezoglu AM, Betran AP. Association between rates of caesarean section and maternal and neonatal mortality in the 21st century: a worldwide population-based ecological study with longitudinal data. BJOG: An International Journal of Obstetrics & Gynaecology. 2016; 123(5):745-453.
29. Tapia V, Betran AP, Gonzales GF. Caesarean section in Peru: analysis of trends using the Robson classification system. PLoS One. 2016; 11(2):e0148138.
30. Chongsuvivatwong V, Bachtiar H, Chowdhury ME, Fernando S, Suwanrath C, Kor-Anantakul O, et al. Maternal and fetal mortality and complications associated with caesarean section deliveries in teaching hospitals in Asia. Journal of Obstetrics and Gynaecology Research. 2010; 36(1):45-51.