Feto-Maternal Outcome of Vaginal Birth after Cesarean and Associated Factors Among Mothers with Previous Cesarean Scar at Attat Lord Merry Primary Hospital, Gurage Zone, South Ethiopia

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Abstract

**Background:** Vaginal delivery after previous one cesarean section for a non-recurring indication has been described by several authors as safe and having a success rate of 60-80%. Hence, many health professionals were encouraging Vaginal Birth After Cesarean (VBAC) for candidates leaving the century old dictum of once cesarean always cesarean. However, predicting success of VBAC following Trial of Scar (TOS) is still a difficult task due to the lack of a validated prediction tool. In addition to this, feto-maternal outcome was also uncertain and unknown in the study area including factors associated with. Hence, the objective of this study was to determine the perinatal and maternal outcome of pregnancy and factors associated with success of VBAC among mothers who had previous one cesarean section and gave birth at Attat Catholic Primary Hospital, South Ethiopia.

**Methods:** Facility based retrospective cross-sectional study design was used at Attat Catholic Hospital, Ethiopia from October 01/2015-September 30/2016. The data was collected from October 01-15, 2016. The data on socio-demographic, obstetric factors and outcome related variables were collected from medical record books using pretested data collection tool by trained data collectors. The collected data were coded, cleaned and entered to SPSS version 21 for analysis. Descriptive statistics was used to describe some of study variables. Logistic regression analysis (bivariate and multivariable logistic regression) was employed. Statistical tests such as Odds ratio (absolute measure of association) with 95% CI was used to see the associations. A P<0.05 was considered as statistically significant in all types of tests to declare significance.

**Results:** Out of all mothers who gave birth, 169 mothers gave birth with previous one cesarean section scar from which repeated caesarean section was 104 (61.5%). Majority 81 (78%) of them were done as an emergence and 146 offered TOS. Less than half of them 65 (44.5%) had successful VBAC and Cephalo-Pelvic Disproportion (CPD) was the major indication for failed VBAC. Passage of liquor at admission (AOR: 0.25, 95% CI: 0.084,0.733), history of vaginal birth after cesarean (AOR: 1.88, 95% CI: 0.084,0.733), cervical dilation at admission (AOR: 8.171, 95% CI: 3.303, 34.473) and type of indication for pervious cesarean section (AOR: 0.703, 95% CI: 0.014, 0.364) were significant factors associated with success of VBAC.

**Conclusion:** Successful vaginal delivery after one previous cesarean scar was 45.5% which was relatively low. Trial of vaginal birth after cesarean section should be encouraged for appropriate cases. Before indicating mothers for cesarean delivery due to only having history of previous one cesarean section, attention should be given to the indication to avoid unnecessary cesarean section.

Keywords: Previous cesarean section; Feto-maternal outcome; Success of VBAC; Factors associated

Abbreviations: ANC: Antenatal Care; APGAR: Appearance, Pulse Rate, Grinace, Activity and Respiratory Rate; CS: Cesarean Section; CSA: Central Statistics Association; CPD: Cephalo-Pelvic Disproportion; GA: Gestational Age; GC: Gregorian Calendar; GYN: Gynecology; HCT: Hematocrit; HIV: Human Immune Deficiency Virus; ICU: Intensive Care Unit; IEOS: Integrated Emergency Obstetrics and Surgery; LNMP: Last Normal Menstrual Period; LUSTCS: Lower Uterine Segment Cesarean Section; NGO: Non-Governmental Organization; NICU: Neonatal Intensive Care Unit; PMR: Per Nataal Mortality Rate; VBAC: Vaginal Birth After Cesarean Section; WHO: World Health Organization; TOS: Trial of Scar

Background

Caesarean delivery is an operation done to deliver a baby through an incision in the uterus. It is the most frequently performed surgical procedure worldwide. Cesarean section is one of life saving procedures and intervention attributed to decrement of the maternal mortality and morbidity rates [1].

Even though, variation exists in rates of cesarean delivery across countries, currently the rate ranges from 10% to 40% [1,2]. Previous cesarean section has been found to be the commonest cause of increased cesarean section rate in many parts of the world [1]. Because of increased risk of maternal complications with repeat cesarean section and safety of VBAC, trial of labor for selected group of patients with previous scar has become a preferred strategy. A study recommended

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that, in the absence of a contraindication, a woman with one previous low transverse cesarean delivery be counseled attempt labor in a subsequent pregnancy [1]. These attempts were highly successful rates of Vaginal Birth After previous Cesarean (VBAC) increased from 3.4% to 28.3%, along with a concomitant decline in total cesarean delivery rates for the United States [2].

Vaginal Birth After Cesarean section (VBAC) is associated with shorter maternal hospitalizations, less blood loss and fewer transfusions, fewer infections and fewer thromboembolic events than cesarean delivery. Several reports have indicated that the absolute risk of uterine rupture attributable to a trial of labor is about 1 per 1000 [1-4]. A 60% to 80% success rate of vaginal birth after previous cesarean section has been reported by many authors if the primary caesarean was done for nonrecurring indications [1]. Some of the non-recurring indications for caesarean section are: poor labor progress, fetal distress, placenta previa, transverse lie, breech presentation, oblique lie, pregnancy induced hypertension and twins [1,3,4-6].

British figures indicate that among women with a prior caesarean section, 33% will successfully achieve vaginal birth in the subsequent pregnancy. Again there was considerable variation across institutions ranging from 6% to 64% [7]. One study in Lahore reported successful vaginal delivery in 70% of the patients and repeat emergency caesarean section in 30% of the patients. The leading indications for the repeat caesarean sections were: failure to progress, fetal distress and scar tenderness. There were no maternal and fetal complications occurred. They concluded that VBAC is a safe practice [8].

Both, attempting a vaginal birth and opting for an Elective Repeat Cesarean Section (ERCS) are associated with different risks for the mother and newborn and deciding a delivery plan involves a difficult weighing of those cases. For years, researchers have maintained an interest in the effective prediction or identification of factors, which can influence the outcome of a TOS. The ability to predict the outcome of an attempted trial of vaginal delivery plays an important role in initial counseling of pregnant women with previous one cesarean delivery [9].

Studies on predictors of success are few and most of them conducted in developed countries and difficult to generalize for resource limited setting. There is no study that assessed feto-maternal outcome and factors associated among mothers with previous one caesarean scar at Attat Catholic Primary Hospital. Hence, the objective of this study was to determine the feto-maternal outcome of pregnancy among women with previous cesarean section who gave birth at Attat Catholic Hospital and associated factors. More specifically, to assess the common mode of delivery among mothers with the previous one cesarean scar, to determine the outcome of VBAC and associated factors.

Materials and Methods

Study setting and design

The study was conducted at Aattat Primary Hospital Gurage Zone, SNNPR, Ethiopia, which is 175 km away from Addis Ababa and 410 km from regional city, Hawasa.

The hospital was established in 1961 E.C by Catholic Missionary and still now administered by them. The catchment population is 800,000, of which 51.2% females and 48.8% males. The Zone has 40 Health Centers and 2 newly established hospital which are government owned and all referred to this Hospital. It is one of affiliated hospital training IEOS students in conjunction with JUSU. It has 100 beds with delivery room, which give services for parturient mothers and other patients. The hospital has multidisciplinary staffs (Gynecologist, General Surgeon, emergency surgery students, Pharmacist, Lab. Technologist, midwives and clinical nurses). Through all the days of week the services are provided free of charge for all laboring mother.

Hospital based cross-sectional retrospective study design was used from October 01/2015-Septmeber 30/2016. All mothers with pervious one cesarean scar who gave birth in Attat Catholic hospital were source population and all mothers with one pervious cesarean scar who gave birth in Attat Catholic Hospital within the study period were study population. Women with one previous lower segment cesarean section, singleton pregnancy, cephalic presentation and term gestation were included in the study. However, Those women with two or more cesarean sections, previous uterine surgery like myomectomy and classical section were excluded.

Sample size

All mothers with one pervious cesarean scar who gave birth within the specified period in St. Luke Catholic Primary Hospital were included which is 169.

Study variables

Dependent variable is success of VBAC and independent variables were age, residence, gravidity, parity, LNMP, ANC follow up, GA, duration of labor, FHB, cervical dilatation, station, pre operation HCT, previous indication for cesarean section, time of passage of liquor and history of vaginal birth after cesarean.

Method of data collection

Data were collected using structured, standard data extraction format/checklist to collect patient information from delivery registration books, operation registration books and individual charts. The check list was prepared in English and information abstracted from medical record books. Eight data collectors were participate in the data collection process after training them for one day. Before the actual data collection, the checklist was pre-tested on 5% of the total sample size. Day to day supervision was carried out during the whole period of data collection by the supervisor. At the end of each day, the questionnaire was review and cross checked for completeness, accuracy and consistency by the investigator and corrective discussion were under taken with collectors.

Data processing and analysis

The collected data was being checked for its completeness, entered using Epidata version 3.1 and exported to SPSS-20 for analysis. Frequency distributions of both dependent and independent variables were worked out and the association between independent and dependent variables was measured and tested using chi square and AOR. To identify candidate predictors of VBAC, bivariate analysis was done. AOR was used at 95 % confidence interval and 5% level of precision to check level of significance.

Operational definitions

Gestational age is calculated from the LNMP or fundal height that was documented on the card, if not from the duration of amenorrhea documented from mothers recall and is rounded to the nearest weeks. Amenorrhea of 9 months was taken as 37-42 weeks gestation for all mothers.

Cesarean section- means delivery of the fetus, membrane and placenta after 28 weeks of gestation by opening of abdomen and uterus.
Elective cesarean section- operation that done at a pre-selected time before onset of labour, usually at completed 39 week.

Elective Repeat cesarean section- cesarean section done at a pre-selected time before onset of labour in presence of previous cesarean section.

Successful VBAC- A vaginal delivery (spontaneous or assisted) in a woman had previous one cesarean section.

Parity- number of births (both life birth & stillbirth) of at least 28 weeks of gestational age.

TOL- trial of labor after cesarean section to achieve VBAC.

Station- degree of engagement of the presenting part, measured as distance in centimeters or between the fetus and the ischial spines.

 Arrest Disorders- (1) secondary arrest of dilatation, with no progressive cervical dilatation in the active phase of labor for 2 h or more and (2) arrest of descent, with descent failing to progress for 1 h or more.

Cephalo-Pelvic Disproportion (CPD)- is failure of the fetus to pass safely through the birth canal because the fetal head being relatively larger than the maternal pelvic size.

Prolonged 2nd stage: The 2nd stage of labor lasting more than 1 h in multipara and 2 h in nulliparous.

Cervical dilatation status- active stage- In general, requires ≥ 80% effacement and ≥ 4 cm dilatation of the cervix.

Full dilatation/second stage- is from full dilatation (10 cm) until delivery of the baby.

APGAR- a score for the new born based on appearance, heart rate, grimace, activity (movement) and response.

Fetal distress (NRFHRP)- abnormal fetal heart rate pattern with tachycardia of >160 beats/min. and bradycardia of <110 beats/min.

Operative vaginal delivery- applying direct traction on the fetal skull with forceps or vacuum.

Uterine dehiscence- when the uterine muscle is separated but the visceral peritoneum is intact.

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Table 1: Socio demographic characteristics of mothers who had previous one cesarean section and tried for VBAC in JUSH, 2016.

| Variables                        | Category | No. | %   |
|----------------------------------|----------|-----|-----|
| Age in years                     | <25      | 45  | 26.6|
|                                  | 25-30    | 91  | 53.8|
|                                  | <30      | 33  | 19.5|
| Residence                        | Urban    | 52  | 30.8|
|                                  | Rural    | 117 | 69.2|

Table 2: Obstetric history of mothers who had previous one cesarean section and tried for VBAC in JUSH, 2016.

| Indications For Previous Caesarean Section | Frequency | %   |
|-------------------------------------------|-----------|-----|
| Mal presentation                          | 16        | 9.5 |
| Failed induction                          | 5         | 3   |
| Non reassuring fetal heart rate           | 24        | 14.2|
| CPD                                       | 44        | 26  |
| APH                                       | 4         | 2.4 |
| Other                                     | 6         | 3.6 |
| Unknown                                   | 70        | 41.4|
| Total                                     | 169       | 100 |

Table 3: Indications for previous cesarean section for mothers who had previous one cesarean section and tried for VBAC in JUSH, 2016.
Factors associated with success of VBAC

The association between independent variables and success of VBAC was checked by binary logistic regression model to identify candidate variables (P<0.25). During bivariate analysis, parity, (COR-13.12, 95% CI: 4.99, 34.975), passage of liquor at admission (COR-0.230, 95% CI: 0.116, 0.457), the indication for pervious cesarean section (OR-0.53, 95% CI: 0.14, 0.199), cervical dilation at admission (COR-3.6, 95% CI: 1.877, 6.903) and history of vaginal birth after cesarean section (COR-0.46, 95% CI: 0.020, 0.103) were candidate variables identified for the final model.

In multivariate logistic regression after it was adjusted for the variables in the model, women who had passage of liquor at admission (AOR: 0.25, 95% CI: 0.084, 0.733), history of vaginal birth after cesarean (AOR: 1.88, 95% CI: 0.084, 0.733), cervical dilation at admission (AOR: 8.171, 95% CI: 3.303, 34.473) and type of indication for pervious cesarean section (AOR: 0.703, 95% CI: 0.014, 0.364) were significant factors associated with success of VBAC.

Table 4: Maternal and neonatal outcome among mothers who had previous one caesarean section scar and tried for VBAC in JUSH, 2016.

| Variable                      | No.  | %    |
|-------------------------------|------|------|
| intra and post operation complication | 4    | 3.8  |
| PPH                       | 5    | 4.8  |
| Infecction                  | 95   | 91   |
| Infection                  | 2    | 3    |
| No complication            | 60   | 92   |
| Scar dehiscence             | 3    | 4.6  |
| PPH                       | 2    | 3    |
| No complication            | 112  | 30.2 |
| Not stated                  | 61   | 66   |
| Alive                      | 166  | 98.2 |
| Dead                       | 3    | 1.8  |
| <7                          | 13   | 7.7  |
| >=7                        | 153  | 90.5 |
| 0                           | 3    | 1.8  |

Table 4: Maternal and neonatal outcome among mothers who had previous one caesarean section scar and tried for VBAC in JUSH, 2016.

Maternal and neonatal outcome

There was no maternal death during the study period, laparotomy were done for three scar dehiscence (2%) and 6 (3.6%) of mother had hemoglobin <7 and transfused blood. Majority of neonate with birth weights between 2500-4000 gm 161 (95%), 127 (75.1%) of neonate with hemoglobin <7 and transfused blood. Majority of neonate with birth weights between 2500-4000 gm 161 (95%), 127 (75.1%) of neonate with hemoglobin <7 and transfused blood. There were 16 (4.3%) neonate with birth weights below the standard accounts 60-80%.

Three fourth (75%) of mothers who had passage of liquor at admission were less likely to have successful VBAC when compared to no history of passage of liquor at admission. Those mothers who had history of vaginal birth after cesarean section were almost 2 times more likely to have successful VBAC than counterparts. Those mothers who had dilated cervix at admission (>=4 cm) were 8 times more likely to have successful VBAC than counter parts. One third (30%) of mothers with NRFHR as an indication for pervious cesarean section were less likely to have successful VBAC than those mothers with unknown indication (Table 5).

Discussions

Previous caesarean section was said to constitute the highest single indication for repeated caesarean section because obstetricians still regard vaginal birth after previous caesarean section as a high-risk option. This study revealed that common mode of delivery was repeated caesarean section 104 (61.5%) and CPD was the major indication for repeated caesarean section that may be due to inappropriate diagnoses of CPD. This study was conducted with the main objective of identifying factors associated with successful vaginal delivery on mothers offered trial of labor after previous one lower segment caesarean section. Significant factors were passage of liquor at admission, history of vaginal birth after cesarean, cervical dilation at admission and type of indication for pervious cesarean section were significant factors associated with success of VBAC.

The VBAC success rate vary from place to place 45.5% (in our study) was approximately similar with reported from three teaching hospitals such as Addis Ababa, Begum, Nigeria 49%, 43.2% and 50% respectively [5,9,10]. But our finding is lower than the rate of VBAC in Tanzania which was 55%, 69% in Havana Nigeria teaching hospital, 62.3% in India and 72.1% in Kuwait and higher than the reported from USA 29% [3,4,11-13]. This discrepancy may be due to the variety type of indication diagnosed and applied for the previous cesarean section. Most probably if true CPD is an indication for the previous cesarean section, VBAC will fail. Other indications may not appear during trial of labor after previous one lower segment caesarean section.
In this study, the strongest predictor determining success of VBAC was cervical dilatation at admission. Those who were admitted with cervical diameter greater >=4 cm (Active first stage of labour) had a strong likelihood of vaginal delivery than those admitted at cervical diameter of <4 cm (latent first stage of labour). This is due to high frequency of false labour and slow progress in the latter which is the same finding with another study done in Addis Ababa, Malaysia [4,8,10]. Many authors reported previous vaginal birth was the single best predictor for successful VBAC [1,3,8-10].

Those mothers with fetal distress were indicated for pervious cesarean section has been found associated with high success of VBAC than unknown indication. CPD and failer of progress of labor were the main cause of failure which was the same result with Havana Specialist Hospital, Lagos, teaching hospitals in India [14,15]. Passage of liquor at admission was good prognostic factor which was having same finding with research done in Addis Ababa, Malaysia [4,9]. In our case parity is not a significant factor at the final model.

In this study, maternal age, gestational age, duration of labor after admission, station at the time of admission and birth weight were not found significant determinants. However, Birth weight was one of the major predictor in another study [4,8]. Gestational age was not found as significant predictor of success of VBAC in our study. There are reports which found that gestational age above >=40 weeks is associated with poor success [4,8]. In our case, the finding could also be confounded by high number of unknown dates and ascertainment of correct date was not possible.

Perinatal and maternal outcome of labor were recorded among women who had trial of VBAC in this study were 3 scar dehiscence similar with research done in Tanzania 2%, India 2% and 3 perinatal death and no maternal death occurred which is similar finding with Malaysia 2 deaths [9,12,16]. Infection 5 (4.8%), PPH 4 (3.8%) were the major intra and post operation short term complication observed. However, when we compare these complications, it was higher than occurred during vaginal birth (VBAC). There is no difference in the first and fifth min APGAR score.

The possible limitations of this study were the clinical part of data abstracted from the secondary data or patient's chart. This finding may be biased by the physician's knowledge and skill who followed and did the procedures as well as documenting reliable information on the chart. In addition, we might miss other important variables due to incompleteness and unavailability of formats in the chart. The design is not strong enough to show cause and effect relationship rather it reveals with temporary factors which affect the outcome observed at a time. This finding may not be generalized to the target population because of non-probablity sampling technique used at a single facility.

Conclusion

Out of 169 mothers with previous one cesarean scar, 104 (61.5%) of them were undergone Trial of Labor (TOL). Of this, successful VBAC was observed in 65 (45.5%) which was relatively lower than the standard 60-80%. Passage of liquor at admission, history of vaginal birth after cesarean section, cervical dilatation at admission >=4 cm and indication (NRFHR) for previous cesarean section were significant factors associated with success of VBAC.

Acknowledgment

We would like to express our deepest gratitude and appreciation to the hospital registry, health professionals working at Attat Catholic Primary hospital and Obstetrics and gynecology department of JU. We also aknowledge Jimma University-Institute of Health-IRB for securing ethical letter and for the fund provided.

Ethics Approval and Consent to Participate

Ethical clearance and an approval letter obtained from Jimma University institute of health-institutional reviewing board, then support letter obtained from JUSH administrative office to the study hospital. Confidentiality was maintained by using anonymous codes and the patients' chart number.

Table 5: Bivariate and multivariable logistic regression model showing factors associated with success of VBAC among mothers who had previous one caesarean scar in JUSH, 2016.

| Variable                     | VBAC Success | COR 95%CI       | AOR 95%CI       | P value |
|------------------------------|--------------|-----------------|-----------------|---------|
| Parity                       |              |                 |                 |         |
| Para I                       | 8            | 0.230 (0.116, .457) | 0.248 (0.084, 0.733) | 0.012   |
| Para II                      | 31           | 0.46 (0.20, .510) | 1.88 (0.220, 2.349) | 0.001   |
| Para III or +                | 26           | 3.6 (1.877, 6.903) | 8.171 (3.303, 44.73)* | 0.001   |
| Passage of liquor            |              |                 |                 |         |
| Yes                          | 16           | 1.156           | 0.148           |         |
| No                           | 49           | 1.66 (0.121, 23.00) | 0.703           |         |
| History of VBAC              |              |                 |                 |         |
| YES                          | 54           | 0.46 (0.20, .510) | 1.88 (0.220, 2.349) | 0.001   |
| No                           | 19           | 3.6 (1.877, 6.903) | 8.171 (3.303, 44.73)* | 0.001   |
| Cervical dilatation at admission |         |                 |                 |         |
| <4 cm                        | 23           | 1.156           | 0.148           |         |
| >=4 cm                       | 69           | 1.66 (0.121, 23.00) | 0.703           |         |
| Indication of previous C/S   |              |                 |                 |         |
| Failed induction and augmentation | 2        | 0.944 (0.143, 6.247) | 1.66 (0.121, 23.00) | 0.703   |
| NRFHR                        | 21           | 0.053 (0.014, .199) | 0.703 (0.014, 0.864) | 0.002   |
| CPD                          | 11           | 1.118 (0.472, 2.647) | 0.513 (0.243, 2.72) | 0.737   |
| APH                          | 1            | 1.118 (0.109, 11.445) | 6.564 (0.335, 128.6) | 0.215   |
| Other                        | 3            | 0.373 (0.069, 2.009) | 0.109 (0.005, 2.258) | 0.152   |
| Unknown                      | 19           | 1               | 1               |         |

*Significant variable (P<0.05)
Consent to Publish

All parties involved agreed to publish on international peer reviewed journal. During data abstraction, all concerned body informed and agreed on the major objective of the study which is for academic purpose including publication.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available. The SPSS (software) which is completed with raw dataset can be also shared. All data generated or analyzed during this study are included in this manuscript.

Conflict of Interest

All authors declare that they have no financial and non-financial competing interests. None of the authors of this paper has a financial or personal relationship with other people or organizations that could inappropriately influence or bias the content of the paper.

Authors Contributions

Yibeltal Siraneh had made substantial contributions to conception and design, analysis and interpretation of data including manuscript preparation. Fanta Assefa and Mahlet Tesfaye worked a lot in acquisition of data and reviewed the manuscript for the intellectual content. All authors read and approved the final manuscript.

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