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Fetal Outcome after Vacuum Assisted Vaginal Delivery in Arba Minch General Hospital, Southern Ethiopia

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Abstract
Background: Vacuum assisted delivery (VAD) is one of the interventions used to reduce life-threatening complications for mothers and their babies. However, the effect of vacuum use on fetal outcomes was not well understood in low resource settings like Ethiopia. **Objective:** The objective of this study was to assess fetal outcome after vacuum assisted vaginal delivery in Arba Minch general hospital, southern Ethiopia.**Method:** A facility based cross sectional study was conducted among selected mothers who gave birth by vacuum assisted vaginal delivery from January 2013 to December 2014 at Arba Minch general hospital, southern Ethiopia. A total of 208 mothers record were traced from labor and delivery ward log book in January 2015. Data was collected by three intern medical doctors. Then it was entered into Epi data version 3.1 and exported to SPSS 20 statistical software for analysis. Descriptive statistics were done to display variables. Then bivariate and multivariate analysis was employed to determine independent predictors for favorable fetal outcome. Odds ratio with 95% CI were used to declare statistically significant association with outcome variables. **Results:** The proportion of favorable fetal outcome in the study area was 158(76%). While controlling for confounding variables during multivariate analysis, shortened duration of second stage of labor [AOR = 12.04(95% CI = 5.23, 27.74)] and non- application of episiotomy [AOR = 4.07(95% CI = 1.81, 9.13)] had shown positive association with favorable fetal outcome. **Conclusion:** The proportion of favorable fetal outcome in the study area was satisfactory. Early and appropriate management of second stage of labor were major predictors for favorable fetal outcome. Thus, government and organizations working on newborns health care should focus on factors enhancing shortened second stage of labor and avoid routine use of episiotomy during labor.
Keywords: Vacuum assisted delivery, fetal outcome, fetal complication, Arba Minch, southern Ethiopia**.**

Introduction

Globally, about 2.7 million neonatal deaths (death in the first 28 days of life) occurred in 2015. Of these, almost one million deaths occur on the day of birth [1]. Each year in Africa, around 1.16 million babies die in their first month of life mainly due to neonatal complications [2]. The situation was not different in Ethiopia. Its rate was 33/1,000 live births by 2015[3]. Vacuum assisted delivery (VAD) is one of the interventions designed to reduce life-threatening complications for a mother (hemorrhage, infection, perianal tear, incontinence, fistula etc) and her baby (birth trauma, perinatal asphyxia, meconium aspiration syndrome, etc) [4-6]. Vacuum assisted vaginal delivery is the use of vacuum extractor to accelerate vaginal delivery during prolonged second stage of labor (more than 1 hour for multiparous and more than 2 hours for nulliparous mothers) [7]. A vacuum assisted delivery should only be attempted when a specific obstetric indication was present [3]. The three major categories of indications were prolonged second stage of labor, non-reassuring fetal status, and maternal cardiac or neurological disease, but there is no absolute indication [3, 7]. Its rate varies from country to country and from facility to facility. A study conducted in the United States revealed that 3.2 percent of all deliveries in 2014 were accomplished via an operative vaginal approach, of which majority were vacuum assisted vaginal delivery [8], which was about 3.6 percent in 2010 [9]. Some studies in different countries revealed that maternal age, parity, abnormal presentation and position, strength of maternal expulsive effort, prior pelvic trauma and lack of skill attendant at birth were factors associated with poor fetal outcomes after vacuum assisted vaginal deliveries [10-13]. However, as per the investigators knowledge, there was no study conducted in the study area so far on fetal outcomes following vacuum assisted vaginal delivery. Therefore, this research was intended to assess fetal outcomes after vacuum assisted vaginal delivery in Arba Minch general hospital, southern Ethiopia.

Methods and materials

Study design and setting

A facility based cross sectional study was conducted in Arba Minch general hospital, southern Ethiopia in January 2015. Arba Minch hospital is located 505 km southwest of Addis Ababa (capital city of the country) and serving for more than 2 million people in southern Ethiopia. During the study period 9,012 mothers got delivery service from the hospital. Among them 5,030(55.8%) were by spontaneous vaginal delivery, 3,607 (40%) were by cesarean section and 375(4.2%) were by vacuum assisted vaginal delivery.

Population

Source population for our study was chart records of all women who were admitted to Arba Minch general hospital labor ward from January 2013 to December 2014 and vacuum was applied to assist vaginal delivery whatever was the indication. Study population was selected mothers among those who gave birth by vacuum assistance and whose record was complete.

Sample size and sampling technique

A single population proportion formula was used to calculate the sample size. Proportion of favorable fetal outcome of 50%, 95% level of significance, 5% margin of error and 10% for incomplete data were used as parameters. When we used population correction formula, since our source population was 375, the final sample size was 208. All records of vacuum delivery at Arba Minch general hospital during the study period were traced from labor and delivery ward log book and patient charts from card room. The list of all mothers who had vacuum assisted vaginal delivery during study period was prepared for sampling frame and the study subjects were selected by simple random sampling technique using random

number table.

Data collection procedures and tools

Data was collected using structured data extraction tools prepared in English which was adapted from different literatures related to the topic. The questionnaire mainly addressed socio demographic variables of mothers (age, residence, and marital status); obstetrics history (parity, gestational age, previous pelvic trauma, duration of second stage of labor, indication for vacuum extraction etc); condition of newborn baby (sex, birth weight, head circumference, Apgar score etc). A fetal condition was categorized as favorable and unfavorable outcome. A newborn who developed complication such low Apgar score (0-3), birth trauma, perinatal asphyxia, meconium aspiration syndrome, or death following vacuum assisted vaginal delivery was categorized as unfavorable fetal outcome and a newborn with normal status after vacuum assisted vaginal delivery was categorized as favorable fetal outcome. Apgar score was a scoring system based on five criteria (heart rate, respiration, color, muscle tone and response to stimulation) and used as a marker of a newborn baby's need for resuscitation at birth. A score of 0, 1 or 2 is awarded for each criterion, with a total score out of ten. The score is assessed at first and fifth minutes after birth. It was stratified as low Apgar score (0-3), intermediate Apgar score (4-7) and normal range (>7) [7]. Three intern medical doctors were participated for data extraction from obstetric log books. Patient information requiring clarification was retrieved from patient chart in card office.

Data quality control

Data collectors and supervisors were trained for two days on data extraction and pretest was done 10% records of mothers who had given birth with vacuum assistance from Arba Minch health center. Close supervision on data collection process was done by supervisors and principal investigators and data was checked for completeness on daily basis.

Data analysis

Data was edited, coded and entered into Epi data version 3.1 and exported to SPSS 20 statistical software for analysis. Double entry was done by principal investigator before analysis. Descriptive statistics such as frequency, percentage and mean were done to display variables. Then bivariate analysis was done and all explanatory variables which have association with the outcome variable with p value less than 0.2 were included in multivariate analysis. Then multivariate analysis was employed to determine independent predictors for favorable fetal outcome after vacuum assisted vaginal delivery. OR with 95% CI were used to decide whether those independent variables included in multivariate analysis were statistically significant or not with the outcome variable.

Ethical consideration

Ethical approval and clearance was obtained from ethical review committee of Arba Minch University, College of Medicine and Health Sciences. Official letter was written and permission was taken from Arba Minch hospital chief clinical service officer to extract the data. To keep the privacy of mothers, name of the mothers was not included in the study; rather a registration number was used.

Results

Socio demographic characteristics of mothers

A total of 208 mothers who had given birth with vacuum assisted vaginal delivery in Arba Minch general hospital were participated in our study. Majority of the study participants, 121 (58.2%) were in the age group of 25 to 34 years, 126 (60.6%) were from urban area and 198 (95.2%) were married (Table 1).

Obstetric characteristics of mothers

Concerning obstetric history of mothers, more than half of them, 107 (51.4%) were nulliparous, 199 (95.7%) were at gestational age between 37-42 weeks and 121 (58.2%) with unknown status of pelvic trauma while attending Arba Minch general hospital for vacuum assisted vaginal delivery. In our study about 109 (52.4%) of vacuum assisted vaginal delivery were attended by Integrated Emergency Surgical Officer (IESO). However, general practitioners and midwives were equally attended it in the hospital. In this study, duration of second stage of labor was extended greater than or equals to two hours for 117(56.3%) of mothers. And prolonged labor was the primary indication to use vacuum assisted vaginal delivery in about 98 (47.1%) of mothers followed by fetal distress, 61 (29.3%) in the study setting. Episiotomy was done for 121 (58.2%) mothers to manage second stage of labor and 2(1%) of them developed episiotomy extension as a complication. Finally the delivery end up without any maternal complication for about 203 (97.6%) of mothers and only 5(2.4%) mothers developed complications like wound site infection and preeclampsia at discharge (Table 2).

Fetal outcome and newborn characteristics

Concerning the newborns characteristics, 110(52.9%) were male, 202(97.1%) had within normal birth weight range (ie 2,500 – 4,000 grams) and 132(63.5%) had head circumference of 36-40 centimeters. The mean Apgar score of newborns was 6.09(SD±1.38) at first minute, 7.12(SD± 1.36) at fifth minute and 44 (21.2%) of their Apgar score status was from 0 to 3 at first and/or fifth minute. Among the newborns 50(24%) have developed unfavorable fetal outcome and the most common cause for it was low Apgar score 44(88%), followed by perinatal asphyxia 17(34%). All of the newborns with unfavorable fetal outcome after vacuum assisted vaginal delivery were resuscitated and 37(74%) of the resuscitation was done by using ambu bag. Besides resuscitation 31(62%) newborns from those developed complication were transferred to Neonatal Intensive Care Unit (NICU) for better management. The major diagnosis of newborns at NICU were perinatal asphyxia for 17(34%), meconium aspiration syndrome for 8(16%) and birth trauma for 6(12%). Finally 2(1%) of all newborn baby after vacuum assisted vaginal delivery were died of asphyxia in Arba Minch general hospital during study period (Table 3).

Factors affecting fetal outcomes after vacuum assisted vaginal delivery

Five variables (newborns head circumference, pelvic trauma, delivery attendant, duration of second stage of labor, and episiotomy application) had shown significant association during bivariate analysis. However, while controlling for confounding variables during multivariate analysis less than two hours duration of second stage of labor [AOR = 12.04(95% CI = 5.23,27.74)] and non-application of episiotomy [AOR = 4.07(95% CI = 1.81,9.13)] had shown positive association with favorable fetal outcome (Table 4).

Discussion

This study was conducted to identify fetal outcomes after vacuum assisted vaginal delivery at Arba Minch general hospital, southern Ethiopia. Our study showed that 158(76%) of the newborns after vacuum assisted vaginal delivery had favorable fetal outcome. The proportion of vacuum assisted vaginal delivery at the hospital was also found to be 4.2% of all deliveries. This was comparable with the study conducted in Nigeria (4.4%) but it was lower than the study conducted in America (5%) and Pakistan (5.83%) [14, 15, 16].

Our study showed that those newborns delivered from mothers whose second stage of labor was less than two hours were more likely favorable fetal outcome than those delivered from mothers whose second stage of labor extended greater than or equals to two hours [AOR = 12.04(95% CI = 5.23,27.74)]. Though the study conducted in Munich revealed shortened duration of the second stage of labor was not associated with favorable fetal outcome [17], our study finding was consistent with the study conducted in Nigeria and other counties such that the shortened second stage of labor, the better fetal outcome (mainly higher Apgar score and lower incidence of perinatal asphyxia) [14, 18]. Therefore, shortening duration of second stage of labor was assumed to be best practice to avert adverse fetal outcome in the study area.

Those newborns delivered from mothers in which episiotomy was not applied during second stage of labor were about four times more likely favorable fetal outcome than those newborns delivered with application of episiotomy during labor [AOR = 4.07(95% CI = 1.81,9.13)]. This finding was consistent with the study conducted in in Bulgaria and other reviewed literature [19, 20], such that application of episiotomy during second stage of labor had not been verified as a protective effect on adverse fetal outcome. Thus routine episiotomy should not be practiced as an essential part of assisted vaginal delivery to shorten second stage of labor so as to have favorable fetal outcome.

As limitation, since the study was record based some data might not be accurately documented or only adverse outcomes might be documented and therefore the finding would be inflated. Moreover, our study did not compare fetal outcome among newborns in which vacuum was not applied during second stage of labor.

Conclusion and recommendation

The proportion of unfavorable fetal outcome in the study area was high when compared to other developing countries. Early and appropriate management of second stage of labor were major predictors for favorable fetal outcome. Further study should be considered to compare the fetal outcome with and without application of vacuum during second stage of labor.

Competing interests

The author declares that there is no competing interest.

Author's contributions

AY: Participated during study conception, proposal development, data management and analysis

WF**:** Study conception and design, data analysis and writing of manuscript. All authors read and approved the final manuscript.

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References

1. WHO, Global Health Observatory (GHO) data: Available at: http://www.who.int/gho/ maternal_health/mortality/maternal/en/
2. WHO, Joy L, Kate K. Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa. Available at: http://www.who. int/pmnch/media/publications/africanewborns/en/.2006.
3. UNICEF, WHO, World Bank. Estimates developed by the UN Inter-agency group for child mortality estimation. 9 September 2015. Available at: www.childmortality.org
4. Maimoona H, Naza B, Asma Y. Indication and risks of vacuum assisted deliveries. JIMSA October-December 2013; 26(4) 213-214.
5. Johanson RB, Menon B. Vacuum extraction versus forceps for assisted vaginal delivery (review). page 2-3.
6. Thomas F, Cora A, et al. A prospective observational study of 1000 vacuum assisted deliveries with the omnicup device. page 574-575

7. Ministry of Health, Federal Democratic Republic of Ethiopia. Labor and delivery care blended learning module for the Health Extension program. Addis Ababa, Ethiopia. Available at: http://www.open.edu/openlearnworks/mod/resource/view.php?id=50799
8. Hamilton BE, Martin JA, Osterman MJ, et al. Births: Final Data for 2014. National Vital Statistics Report. 2015 Dec; 64(12):1-64.
9. Cuuingham, Leveno, Bloom et al. operative vaginal delivery, William obstetrics, 24th edition. Chapter 29, page 1188.
10. Steven G, Jennifer R, et al. Risks and benefits of operative vaginal delivery. Obstetrics in normal and problem pregnancies, 5th edition, 2007, page 934-935.
11. Royal college of obstetricians and Gynecologists (UK). Setting standards to improve women's health. Operative vaginal delivery: green-top guideline N° 26; January 2011.
12. Elisabeth K Wegner, Ira M Bernstein. Operative vaginal delivery. UpToDate 19.3. Feb 25, 2011.
13. Operative vaginal delivery in Scotland, a 20 year overview. Births in Scotland Publication Series Volume 4; 2003.
14. Lucky O, Okechukwu B, et al. Comparison of outcomes between operative vaginal deliveries and spontaneous vaginal deliveries in southeast Nigeria, International Journal of Gynecology and Obstetrics, June 2014; 125(3), Pages 206–209.
15. Unzila A, Errol R. Vacuum Assisted Vaginal Delivery. Technical review: Dec2009; 2(1).
16. Maimoona H, Nazia B, Asma Y. Indications and Risks of Vacuum Assisted Deliveries. Department of Obstetrics & Gynaecology, Sharif Medical & Dental College, Pakistan. December 2013; 26(4).
17. Janni W, Schiessl B, Peschers U, et al. The prognostic impact of a prolonged second stage of labor on maternal and fetal outcome. Acta Obstetricia Gynecol Scand. 2002 Mar; 81(3):214-21.
18. Zhang H, Ling Y, Jin S. Effect of prolonged second stage of labor on maternal and neonatal outcomes. Asian Pacific Journal of Tropical Medicine. May 2011; 4(5):409-11.
19. Nalbanski A, Nikolov A. Routine episiotomy: a five year practice at University Hospital "Majchin Dom". PubMed, 2009; 48(5):11-4.
20. Woolley RJ. Benefits and risks of episiotomy: a review of the English-language literature since 1980.PubMed, Obstet Gynecol Surv. 1995 Nov; 50(11):806-20.

Table 1. Socio-demographic characteristics of mothers with vacuum assisted vaginal delivery in Arba Minch general hospital, southern Ethiopia, January 2015.

Variables (n=208)	Frequency	Percent
Age of mother		
15-24	66	31.7
25-34	121	58.2
35-49	21	10.1
Residence		
Urban	126	60.6
Rural	82	39.4
Marital status		
Married	198	95.2
Unmarried/divorced	10	4.8

Table 2. Obstetric characteristics of mothers with vacuum assisted vaginal delivery in Arba Minch general hospital, southern Ethiopia, January 2015.

Variable (n=208)	Frequency	Percent
Parity of mother		
Nulliparous	107	51.4
Multiparous	101	48.6
Gestational age		
<37 weeks	2	1.0
37 – 42 weeks	199	95.7
>42 weeks	7	3.4
Pelvic trauma		
no	87	41.8
unknown	121	58.2
Delivery attendant		
Specialist	17	8.2
General practitioner (GP)	41	19.7
Integrated Emergency Surgical Officer (IESO)	109	52.4
Midwife	41	19.7
Duration of second stage of labor		
< 2 hours	91	43.8
≥ 2 hours	117	56.3
Indication		
fetal distress	61	29.3
prolonged second stage	98	47.1
poor maternal effort	49	23.6
Episiotomy done		
No	87	41.8
Yes	121	58.2
Maternal complication after delivery		
No	203	97.6
Yes	5	2.4

Table 3. Characteristics and management of newborn who were delivered by vacuum assisted vaginal delivery in Arba Minch general hospital, southern Ethiopia, January 2015.

Variable (n=208)	Frequency	Percent
Sex of newborn		
Male	110	2.9
Female	98	47.1
Birth weight in grams		
2500 - 4000	202	97.1
<2500 or >4000	6	2.9
Head circumference in cm		
32-35	76	36.5
36-40	132	63.5
Apgar status at 1st and/or 5th minute		
4-10	164	78.8
0-3	44	21.2
Fetal outcome		
Favorable	50	24
Unfavorable	158	76
Transferred to Neonatal Intensive Care Unit (NICU)		
Yes	31	14.9
No	177	85.1

Table 4. Factors affecting fetal outcomes after vacuum assisted vaginal delivery in Arba Minch general hospital, southern Ethiopia, January 2015.

Variables (n=208)	Fetal outcome		COR (95% CI)	AOR (95% CI)
	Favorable	Unfavorable		
Head circumference				
36-40	106	26	**1.56(1.24,1.96)***	1.25(0.57,2.74)
32-35	52	24	1	1
Pelvic trauma				
no	73	14	**2.21(1.11,4.41)***	0.74(0.24,2.29)
unknown	85	36	1	1
Delivery attendant				
Midwife	35	6	**8.33(2.28,30.49)***	2.75(0.55,13.78)
GP	32	9	**5.08(1.51,17.14)***	2.12(0.48,9.29)
IESO	84	25	**4.80(1.66, 13.91)***	2.55(0.69,9.47)
Specialist	7	10	1	1
Duration of second stage of labor				
< 2 hours	108	9	**9.84(4.44,21.80)***	**12.04(5.23,27.74)****
≥ 2 hours	50	41	1	1
Episiotomy done				
No	75	12	**2.86(1.39,5.88)***	**4.07(1.81,9.13)****
Yes	83	38	1	1

**** Significant in bivariate analysis ** Significant in multivariate analysis***