ASSESSMENT OF NEONATAL OUTCOME OF OPERATIVE VAGINAL DELIVERY AND ITS DETERMINANTS AT DILLA UNIVERSITY REFERRAL HOSPITAL, SOUTH ETHIOPIA

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ABSTRACT

INTRODUCTION: Assisting laboring women to deliver vaginally using specialized instruments is a practice that dates back several centuries. Forceps and vacuum are the most popular of the operative vaginal procedures used in medical practice. Both are associated with increased risk of neonatal morbidity when compared to normal spontaneous vaginal delivery.

OBJECTIVE: This study was aimed to assess neonatal outcome of operative vaginal delivery and its determinants.

METHODS: Hospital based cross sectional retrospective study of women delivered between September 2013 and August 2015 in Dilla University Referral Hospital was conducted. All records of women delivered within the specified period of time was used as a total sample size. Data was entered into SPSS version 20 for analysis. Descriptive, bivariate & multivariate logistic regression was done to assess factors associated with the neonatal outcome.

RESULT: Data was collected from 216 women delivered by operative vaginal delivery of which 133 (61.6%) were delivered by vacuum, 76 (35.2%) were delivered by forceps and 7 (3.2%) by sequential use. Significant number of neonates 91(42.1%) delivered by operative vaginal delivery ended up with poor APGAR score. Birth weight of the neonate [AOR: 3.08, (CI: 1.16, 8.20)] and indication for operative vaginal delivery [AOR: 2.56 (CI: 1.22, 5.38)] were found to increase the risk of poor neonatal outcome.

CONCLUSIONS: Neonatal outcome with respect to APGAR score was significantly poor among operative vaginal deliveries in this study. Neonates with lower birth weight and operation done with the indication of fetal distress resulted in higher risk of poor outcome.

KEYWORDS: APGAR Score; Operative vaginal delivery; Dilla University Referral Hospital

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INTRODUCTION

Operative vaginal delivery is delivery accomplished vaginally with the aid of instruments including vacuum and forceps. It is carried out by applying direct traction on fetal skull or scalp for the maternal or fetal indications or both. It is a procedure with a long history spanning more than two centuries. In the lay and medical media, forceps and vacuum are the most popular of the operative vaginal procedures with comprehensive documentation of their development and use[1].

Vacuum and forceps was used for long time as important facet of modern obstetric practice. Vacuum and forceps assisted vaginal delivery account for a fairly constant rate at different countries of the world. Even though there are some scholars who still argue for a place of operative vaginal delivery in modern obstetric practices especially in low income countries, instrumental vaginal deliveries increases the risk of poor fetal outcome specifically in terms of APGAR scores[2].

The use of forceps has become increasingly uncommon and instead caesarian delivery is dramatically increasing. The use of forceps should always be preceded by an assessment of the risks and benefits measured against the cesarean section. This is because of the skill and experience required to effectively utilize forceps and the potential complications associated with inappropriate use may be severe. The use of forceps is associated with different fetal complications like transient facial paralysis, and intracranial damage, cephal and subgalial hematoma. The use of vacuum-assist is similar to that of forceps and the use of vacuum-assist rather than forceps does not alter the necessary steps prior to delivery[3,4].

WHO and other UN agencies previously consider assisted vaginal delivery as one of six critical functions of basic emergency obstetric care[5] and seen as one of the underutilized and least available emergency obstetric care signal functions in resource poor countries[6]. World-wide, instrumental vaginal deliveries (forceps and vacuum extraction) account for 7–11% of deliveries[7,8]. Fairly similar figure 5- 16% prevalence was reported from different health institutions in Ethiopia[9,10] though a study from Debre Birhan reported much higher (26%) use of instrumental delivery[11].

However recent assessments found that in most countries assisted vaginal delivery was the least likely function to be performed in basic facilities and currently some countries are substituting operative vaginal delivery by cesarean section. This is due to the fact that assisted vaginal delivery is associated with higher risk of both mothers and new born morbidities[12,13]. Operational vaginal deliveries are associated with increased risk of maternal and neonatal morbidity when compared to other mode of deliveries[14].

Ethiopia, a developing country with high perinatal and maternal morbidity and mortality is one of the countries in which instrumental delivery is widely practiced until recently[15]. Similar to other part of the country this procedure is the alternative option in Dilla University Referral Hospital as one method to intervene laboring mother. However there is a visible gap in the evidence for the actual risks associated with using operative vaginal delivery particularly with respect to it risk on fetal outcome. Hence this study is aimed to delineate the neonatal outcome of operative vaginal delivery and associated factors in Dilla University Referral Hospital particularly with respect to APGAR score which express the morbid effects of using instrumental delivery on neonate. The study will provide important evidence for the existing truth and gap about operational vaginal deliveries.

METHOD AND MATERIALS

Study Design and Setting

Hospital based cross sectional retrospective record review study of women delivered by operative vaginal delivery between September 2013 and August 2015 in Dilla University Referral Hospital was conducted. The hospital is found in Gedeo zone, Dilla town, South Ethiopia located at 360 km from the center of the country. Dilla University Referral Hospital is governmental hospital which provides preventive, curative and rehabilitative services for more than 2 million population in the catchment area. Obstetrics service is one of the major services provided by the hospital for the community. This study was conducted in January 2016.

Population and sample size

Population for this study was all laboring mothers who gave birth by operative vaginal delivery at obstetrics ward of Dilla University Referral Hospital during the specified period. Mothers diagnosed with intra uterine fetal death (IUFD). For a sample size all mothers who gave birth by operative vaginal delivery during 2013-2015 were included in the study.

Data collection instruments and techniques

The data extraction check list was adapted from similar literatures conducted previously and the content of tools was designed to obtain information on socio-demographic characteristics, operative vaginal delivery immediate neonatal outcome, parity, GA, indication for intervention, skill of operator and availability and type of instrument. The data was collected by reviewing charts of the clients for secondary data from delivery registration log book, patients' card, and discharge registration books by English version instruments. The data was collected for 7 days by five diploma midwives nurses who were working out of assigned health facility, and trained & and have experience in data collection. Two BSc midwives nurses who have been trained & experience in supervision was recruited and participated as a supervisor in the study.

Data quality control and analysis

Properly designed and structured record review format was pre-tested before actual study. Completeness of the questionnaire was cross checked and substantially incomplete registries were discarded.

The collected data was entered into SPSS version 20 statistical software. The data was checked for inconsistencies and missing. Descriptive analysis like frequency, percentage, cross tabulation and regression. OR with their corresponding confidence interval was used to assess the relationship of independent variable with the dependent variable by using logistic regression the association is declared at $p<0.05$.

Operational definitions

- APGAR score: Aronym for appearance, pulse rate, girmis reflex, activity & respiratory rate which used to assess health status of new born with first five minutes.
  - Poor: ≤ 6 at 5 minutes of life
  - Normal Apgar: ≥7 at 5 minutes of life
- Operative vaginal delivery: Instrumental vaginal delivery.

ETHICAL CONSIDERATION

Ethical clearance was obtained from institutional review board of college of health sciences and medicine. Confidentiality of the collected information was secured.

RESULTS

Socio-demographic and obstetric information of study population

During study period a total number of 2,613 laboring mothers were admitted and managed of which 2,294 (91.14%) of deliveries were effected by SVD whereas 216 (8.66%) were by **operative vaginal delivery**. From the total of 216 of mothers who gave birth vaginally by operative vaginal deliveries during study period most of them 131(60.6%) were within the age range of 19-35 years and 126(56.3%) were from rural area. Majority pregnant mothers were married 210(97.3%) at their presentation for labor. Among mothers who gave birth by operative vaginal delivery 97(44.9%), were multiparas. At admission, the fetal presentation for almost all 214(99%) of the laboring
mothers was cephalic (vertex) (table 1).

Table: 1 Socio demographic and obstetric information of mothers delivered through operative vaginal delivery at DURH, January 2016.

Variables	Category	Frequency	Percentage
Age in years	< 19	37	17.2
	19-35	131	60.6
	> 35	48	22.2
	Total	216	100
Residency	Urban	90	41.3
	Rural	126	58.7
	Total	216	100
Marital status	Unmarried	4	1.9
	Married	210	97.
	Divorced	2	0.9
	Total	216	100
Parity	Nulli-para	97	44.9
	Primi-para	31	14.4
	Multi-para	88	40.7
ANC	Yes	167	77.3
	No	49	22.7

Labor related information of deliveries

Among women delivered with operative vaginal delivery, the commonest indication to intervene labor was NRFHRP (42.6%) followed by poor maternal effort (31%). The station during application of instruments was +2 and below for most 130(60.2%) of the deliveries and the cervix was fully dilated for 198(91.7%) (table: 2).

Table 2: Labor related information of deliveries conducted in DURH, South Ethiopia January 2016

Labour related information		Forceps N =76		Vacuum No=133		Both N =7		Total N=216	
		No	%	No	%	No	%	No	%
Indication	Prolonged SSOL	19	25	33	24.8	5	71.4	57	25.3
	NRFHRP	41	53.9	50	37.6	1	14.3	92	42.6
	Poor maternal effort	16	21.0	50	37.6	1	14.3	67	31.0
Station	+1 & above	28	36.8	54	40.6	4	57.1	86	39.8
	+2&below	48	63.2	79	59.4	3	42.9	130	60.2
Cervix fully dilatation	Fully dilated	72	94.7	120	90.2	6	85.7	198	91.7
	Not fully dilated	4	5.3	13	9.8	1	14.3	18	8.3

Intra-partum, post-partum information and delivery outcome

Among women delivered with operative vaginal delivery, 133 (61.6%) were delivered by Vacuum Extraction, 76(35.2%) were delivered by forceps and 7(3.2%) were by sequential use. Out of 216 neonates 91(42.1%) were delivered with poor APGAR. Segregating in to different types of used instruments, 43.4% of those who delivered with forceps had poor APGAR score. Similarly among those who delivered with vacuum application, the proportion of neonates with poor APGAR score was 39.1% and 85.7% among sequential use. After birth,

80(37.0%) of new born required aggressive resuscitation and 51(23.6%) referred to NICU for further care and management plan. From the total mothers delivered with operative vaginal delivery, 26(12%) mothers developed intra-partum operative delivery related complications (table 2).

Table: 3 Intra-partum and post-partum information and delivery outcome of deliveries conducted in DURH, January 2016.

Intra-partum and postpartum information		Forceps N =76		Vacuum No=133		Both N =7		Total N=216	
		No	%	No	%	No	%	No	%
Birth injury	Yes	19	25	22	16.5	7	100	48	22.2
	No	57	75	111	84.5	0	0	168	77.8
Referred to NICU	Yes	22	28.9	23	17.3	6	85.7	51	23.6
	No	54	71.1	110	82.7	1	14.3	168	76.4
Early Neonatal death	Yes	2	2.6	1	0.8	4	57.1	7	3.2
	No	74	97.4	132	99.2	3	42.9	209	96.8
APGAR @1&5th min.	Poor (0-6)	33	43.4	52	39.1	6	85.7	91	42.1
	Normal (≥7)	43	56.6	81	60.9	1	14.3	125	57.9
Birth Weight (kg)	1.5 – 2.499	20	26.3	18	46.2	1	2.6	39	18.4
	2.5 – 3.999	41	53.9	79	64.2	3	2.4	123	58.0
	>4	14	18.4	34	68.0	2	4.0	50	23.6
Resuscitated	Yes	33	43.4	43	32.3	7	100	83	38.4
	No	43	56.5	90	67.7	0	0	133	61.57
Fetal sex	1. Male	37	48.7	72	54.1	2	50	111	51.4
	2. Female	39	51.3	61	45.9	2	50	102	47.9
Maternal complication	Yes	10	13.2	14	10.5	2	28.6	26	12.0
	No	66	86.8	119	89.5	5	71.4	190	88.0
Type of complication	PPH	2	20.0	6	42.9	1	50.0	9	34.6
	Laceration	7	70.0	6	42.9	1	50.0	14	53.6
	Incontinence	1	10.0	2	14.3	0	0	3	11.5

Factors associated with Poor Neonatal outcome (poor APGAR score)

Merely use of instrumental application might not resulted in poor APGAR among neonates delivered with operative vaginal delivery. In this study attempts were made to assess factors that further contribute for poor neonatal outcome among women who delivered at Dilla University Referral Hospital. Accordingly, indication for using instrumental delivery and birth weight were found to increase the risk of poor neonatal outcome. From the multivariable analysis result neonates delivered by assisted delivery with indication for NRFHRP were 2.5 times more likely to have poor APGAR score compared to those with indication for poor maternal effort [AOR: 2.56 (CI:1.22,5.38)]. Compared to neonates of birth weight greater than or equal to 4 kg delivered with instrumental delivery, those delivered with birth weight of less than 2.5 were 3 times more likely to be with poor APGAR score [AOR: 3.08, (CI: 1.16,8.20)]. Parity of the mother and station of the labor progress were not found to increase the risk of poor APGAR score among the neonates (table 4).

Table: 4 Determinants of fetal outcome among deliveries conducted with operative vaginal delivery among women delivered at DURH, January 2016.

Variables		APGAR Score		COR(95%CI)	AOR (95%I)
		Poor	Normal		
Age of mother	<19yr	9	28	1.84(0.74,4.5)	0.70(0.21,0.35)
	19-35	60	71	0.95(0.488,1.85)	1.29(0.51,3.24)
	>35	22	26	1	1
Address	Urban	35	55	1	1
	Rural	56	70	1.26 (0.73,2.18)	1.24(0.67,2.29)
ANC	Yes	66	101	1	1
	No	25	24	0.63(0.33, 1.19)	1.94(0.94,4.00)
Indication	Prolonged SSOL	21	36	0.69(0.32,1.51)	1.15(0.50,2.66)
	NRFHRP	50	42	0.36(0.18, 0.69)	2.56(1.22,5.38)*
	Poor maternal effort	20	47	1	1
Cervical dilatation	Fully dilated	81	117	1	1
	Not fully dilated	10	8	0.55(0.21, 1.46)	2.34(0.78,7.07)
Station	+1 and above	13	1	1	1
	+2 and below	48	82	0.59(0.34,1.02)	0.76(0.41,1.41)
Episiotomy	Yes	49	82	0.61(0.35, 1.06)	1
	No	42	43	1	1.21(0.64,2.29)
Sex	Male	54	57	1	1
	Female	34	68	1.89(1.10, 3.30)	0.64(0.35,1.18)
Birth weight	≤2.499	20	19	0.37(0.15, 0.89)	3.08(1.16,8.20)*
	2.5-3.999	53	70	0.51(0.25, 1.05)	2.21(0.98,4.98)
	More than 4 kg	14	36	1	1
Parity	Nulli-para	13	18	0.65(0.36,1.16)	0.79(0.34,1.83)
	Prim-para	42	46	0.79(0.35,1.81)	0.84(0.28,2.47)
	Multipara	36	61	1	1

DISCUSSION

This study was tried to assess the neonatal outcome of operative vaginal delivery in Dilla University Referral Hospital. Operative vaginal delivery is thought as effective instrument that may avoid unnecessary Caesarean sections and its complications[16]. In this study proportion of operative vaginal delivery was found to be 8.66%. This level of operative vaginal delivery in Dilla University Referral Hospital (DURH) is comparable to finding from Jimma University Medical Center (JUMC)[15] and the level of operative vaginal delivery rates in UK which have remained stable at between 10% and 13%. However this proportion is much higher than 1.4% magnitude of operative vaginal delivery in Istanbul[17].

The commonest indication for operative vaginal delivery in DURH is non reassuring fetal heart rate pattern which is in agreement with studies elsewhere[15-17]. Other studies found the frequent indication for operative vaginal delivery to be to cut short the second stage of delivery[18].

This study revealed that large number of neonates 91(42.1%) delivered by operative vaginal delivery were delivered with poor APGAR score. This finding is much higher than 8.2% poor APGAR score found from study at Istanbul Kanuni Sultan Süleyman Education and Research Hospital[17] and 13.6% proportion from study conducted in Uttarakhand, India[18]. It is also much higher than 13.2% level of poor APGAR score among neonates delivered by operative vaginal delivery in JUMC[15]. This difference in the level of poor APGAR score may be due to the difference in the status of

quality of service in the institutions and difference in the study population. Considerable number of mothers were also developed operative vaginal delivery related complications.

In this study instrumental delivery increased the risk of poor neonatal outcome and particularly sequential use of instruments was substantially increased the risk of poor APGAR score. In this regard 85% (6 out of 7) of the neonates delivered with sequential use were with poor APGAR score. Similarly in study conducted at JUMC type of instrument applied for operative vaginal delivery was the strongest predictor of neonatal outcome[15]. The risk of poor APGAR score was also higher among neonates delivered with operative vaginal delivery with the indication of non-reassuring fetal heart rate pattern in this study. This may be due to the fact that the intrauterine fetal distress that prompted the use of instrumental delivery may contribute for the poor APGAR score after delivery. Birth weight was also found to have statistically significant effect on the neonatal outcome of operative vaginal delivery in our study. Neonates with lower birth weight were at higher risk of poor APGAR score. This might be due to the fact that neonates with lower birth weight are more susceptible to birth injury.

CONCLUSSION

In general neonatal outcome among operative vaginal deliveries with respect to APGAR score in this study is significantly poor. While applying operative vaginal delivery, birth weight should be critically taken into consideration. Stronger studies using primary data should be studied conducted to further investigate and risk analysis of the cons and pros of using operative vaginal delivery.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

Abbreviations

APGAR=	Appearance, pulse rate, girmis reflex, activity & respiratory rate
AOR=	Adjusted odd ratio
DURH=	Dilla university referral hospital
IUFD =	Intrauterine Fetal Death
NICU=	Neonatal Intensive Care Unite
NRFHRP=	Non Reassuring Fetal Heart Rate Pattern
SVD=	Spontaneous Vaginal Delivery

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