Risk Factors for Severe Perineal Laceration among Vaginally Delivered Mothers in Public Hospitals in Ethiopia: Unmatched Case Control Study

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Abstract

The objective of this study was to identify risk factors for severe perineal lacerations among mothers who delivered vaginally in public hospitals in Ethiopia. Institutional based unmatched case control study design was conducted in Ethiopia from 1st January to 30th March, 2019. Cases were mothers who delivered vaginally with severe perineal laceration whereas controls were mothers who had delivered vaginally without a severe perineal laceration. Cases were selected consecutively and three controls per case were included using systematic sampling technique. Data were collected using piloted, structured questioner and checklist with face to face interview and record review. Data entry and analysis were done using epi-info version 7 and SPSS version 23 respectively. Bi-variable and multivariable logistic regression analysis was done. A p-value of <0.05 was considered as significant at 95% confidence interval and the strength of association was measured using odds ratio. Vacuum assisted delivery (aOR 5.356; 95% CI; 3.200-8.963), episiotomy (aOR 5.018; 95% CI; 2.895-8.699) and high birth weight (aOR 2.105; 95% CI 1.355-3.27) were the risk factors for severe perineal laceration. The incidence could be decreased with avoiding instrumental assisted delivery.

Keywords: Severe perineal laceration; Risk factors; Vaginal delivery; Ethiopia

Introduction

Vaginal delivery is a physiological process that holds multiple complications. Perineal trauma and vaginal laceration is considered a common complication associated with vaginal delivery [1]. Severe perineal laceration is expected to occur in approximately 5% of vaginal deliveries [2]. Perineal laceration is classified into four according to Royal college of Obstetrics and Gynecology: first degree perineal tear: injury to perineal skin and/or vaginal mucosa. Second degree perineal tear: injury to perineum involving perineal muscles but not involving the anal sphincter [3]. Third degree perineal tear is an injury to perineum involving the anal sphincter complex. Fourth degree perineal tear is an injury to perineum involving the anal sphincter complex external anal sphincter and internal anal sphincter and anorectal mucosa [4]. First and second degree perineal tears are classified as mild lacerations whereas third and fourth degree perineal tears are classified as severe perineal lacerations. A defect of the external anal sphincter can lead to urge fecal incontinence and a defect of the internal sphincter can lead to passive soiling stools and flats incontinence [3]. Potential sequelae of these severe obstetric perineal lacerations include increase the rate of elective caesarean section [5] chronic perineal pain [6], dyspareunia [7], fecal incontinence [8] and delayed sexual intercourse and fear of pain [9]. Severe perineal laceration negatively affect female's sexual function up to one year after delivery [10].

The previous studies identified maternal, fetal and delivery factors associated with severe perineal laceration such as instrumental delivery [3,11], birth weight [11-19], primparity [3,11,15], longer second stage of labor [12,20,21], shoulder dystocia [22-24], precipitated labor and gestational age >40 weeks [25], maternal age [26], large for gestational age [27,28], fetal head circumference [20], and previous severe perineal tear [29]. In Ethiopia there is limited data about risk factors for severe perineal laceration.

Therefore, the risk factors for severe perineal laceration should be investigated to set prevention strategy to reduce the incidence. The result of this study would be an input for clinical practitioners, policy makers and other stakeholders to put prevention strategies.

Methodology

Study setting and participants

Institutional based unmatched case control study design was conducted from 1st January, to 30th March, 2019 among vaginally delivered mothers in public hospitals in Ethiopia. As of 2018 population projection based on 2007 Ethiopian population and house census report the total population of the catchment area were about 40 million. There are about 25 public hospitals in the study area from which ten were selected using simple random sampling technique.

All mothers who had delivered vaginally ≥ 28 weeks of gestation in public hospitals in Ethiopia within the study period were the source population. All vaginally delivered mothers ≥ 28 weeks of gestation in the selected public hospitals in the study period were included as study population. All vaginally delivered mothers with cephalic presentation and ≥ 28 weeks of gestation for both singleton and twin delivery for both cases and controls were eligible for this study whereas all vaginally delivered mothers ≥ 28 weeks of gestation and cephalic presentation but with stillbirth for both cases and controls were excluded.

Sample size and sampling technique

Sample size was calculated using epi-info version 7 Statcalc for unmatched case control study taking duration of second stage of labor as a risk factor for severe perineal laceration in previous study [21] with the assumption of 80% (1-β) power, 3.2 odds ratio, 86.4% of exposure among controls, 3:1 control to case ratio, 95% confidence level and 10% non-response rate. Finally, a total of 578 participants were included (145 cases and 433 controls). Ten public hospitals were selected using simple random sampling methods. Sample size was drawn proportionally from each hospital based on the average delivery rate of previous three months. All mothers who had delivered vaginally in hospitals ≥28 weeks of gestation, cephalic fetal presentation, and vaginal delivery with severe perineal laceration within the study period were taken consecutively as cases until the required sample size was reached. And three controls per case were selected using systematic random sampling technique (on every 6th interval).

Variables and measurements

The dependent variable was severe perineal laceration as (yes =1, no =0) whereas maternal age, residence, religion, occupation, educational status, marital status, body mass index, long second stage of labor, history of cesarean section, precipitated labor, parity, history of episiotomy, gestational age, birth weight, head circumference, number of infant, instrumental (forceps or vacuum) delivery, induction of labor, shoulder dystocia, persistence occiput posterior position, episiotomy and qualification of birth attendant were taken as independent variables.

Case: Is defined as mother who had delivered vaginally ≥ 28 weeks of gestation, cephalic presentation with an injury of anal sphincter muscle (internal and external) with anorectal mucosa (third and fourth degree perineal tear) whereas control is defined as mother who had delivered vaginally ≥ 28 weeks of gestation, cephalic presentation without any degree of perineal laceration.

Ten Bachelor of Science degree midwifes were recruited as data collector and two master of sciences degree holder midwifes who had experiences in the same activity as supervisors were assigned to control the overall activities of the data collection processes. Both data collectors and supervisors had taken two days training about the data collection process. Variables such as: resident, marital status, religion, educational level, occupation, parity,

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history of episiotomy, history of caesarean section(C/S), and pre-gestational/gestational diabetic mellitus(GDM) were collected using interviews techniques whereas gestational age, duration of second stage labor, precipitated labor, forceps assisted delivery, vacuum assisted delivery, induction of labor, shoulder dystocia, foetal head position, current episiotomy, foetal head circumference, birth weight, number of pregnancy, weight of mother, height of mother and qualification of birth attendant were extracted using checklist from maternal card, partograph, delivery logbooks and some of them were measured by delivery attendants.

Data quality was controlled by giving training and piloting the study. A data collection tool was translated to Amharic, the working language in the study area, and then translated back into English to keep consistency by two professionals (one English language and one medical expert). All completed questioner and checklist were also examined for completeness and consistency during data storage before analysis.

A structured questioner and checklist were developed from different related articles. Weight and height of the mother was measured using Digital weight and height scale whereas weight and head circumference of the new born was measured using digital weight scale and tape meter.

Statistical analysis

Data entry and analysis were done using epi-info version 7 and Statistical Package for Social Solution (SPSS) version 23 software respectively. Frequency distribution was performed to describe the characteristics of the study participant. Bi-variable logistic regression analysis was done to select candidate variables. Those variables significant at bi-variable analysis with p-value ≤ 0.25 were entered in to multi-variable binary logistic regression analysis using backward elimination techniques. The fitness of model was checked using Hosmer-Lemeshow goodness of fit-test (p-value was >0.05). Odds ratio with 95% confidence interval was used as a measure of strength of association. Those variables with p-value less than 0.05 were taken as significant in the final model.

Results

Socio-demographic characteristic of cases and controls mother

Of a total 578 participants (145 cases and 433 controls), the response rate was 99.6% (99.3% for cases and 99.7% for controls). The mean age of the cases and controls was 27.42 ± 3.4 standard deviation (SD) and 28.52 ± 3.6 (SD) years respectively. The majority, 130 (90.3%) of cases and 373(86.3%) of controls were urban resident (Table 1).

Maternal, fetal and delivery related characteristics of cases and controls

About, 29 (20.1%) and 86 (59.7%) of cases and 83 (19.2%) and 190 (44.0%) of controls had delivered their first and second child respectively. About, 65 (45.1%) of cases and 296 (68.5%) of controls had delivered spontaneously whereas 50 (34.7%) of cases and 54 (12.5%) of controls had delivered with instrumental assistance delivery.

Regarding to body mass index, about, 82 (56.9%) cases and 256 (59.3%) of controls had normal body mass index in the range of 18.5-24.9.

About, 135 (93.8%) of cases and 406 (94.0%) of controls had delivered term (37-42 weeks) newborns. About, 130 (90.3%) of cases and 411 (95.1%) controls had occiput anterior fetal position during labor. One hundred fourteen cases and three hundred thirty three controls had attended by midwife professionals during labor.

With regard to fetal related characteristics, about, 143 (99.3%) cases and 432 (100.0%) controls had delivered a single baby. The mean weight of infants was 3409.72 gm ± 379.42 (SD) and 3341.67 gm ± 294 (SD) born from case and control mothers respectively. The mean infant head circumference was 36.2 cm ± 0.9 (SD) and 35.8 cm ± 0.89 (SD) from case and control mothers respectively (Table 2).

The risk factors associated with severe perineal laceration

Both bi-variable and multivariable logistic regression analysis revealed that episiotomy on current delivery; vacuum assisted delivery and high birth weight were the risk factors for severe perineal laceration in the current study (Table 3).

Discussion

Mothers who had delivered infant with birth weight of > 3500gm had 2.11 times more likely to develop severe perineal laceration compared to mothers who had delivered infant with birth weight of (2300-3500 gm). This study was agreed with the studies conducted in Stockholm Sweden [12], England [26], Austria [13], in multi-country studies conducted in three regions(Africa, Latin America and Asia) [11], Riyadh Saudi Arabiya [1], UK [14], Tel Aviv, Israel [16] and Ohio state university [18]. This might be due to unproportioned fetal size to maternal birth canal outlet that could damage internal and external sphincter muscles results in severe perineal laceration. On other side in a study conducted at Tygerberg hospital in Cape Town, South Africa infant birth weight had no effect on severe perineal laceration [24]. This might be due to a difference in fetal weight categorization or might be due to law infant birth weight.

The odds of developing severe perineal laceration were 5.02 times more likely among mothers who had delivered using episiotomy on current delivery compared to those mothers who have no episiotomy (aOR 5.02; 95% CI; 2.91-8.96). This study was consistent with a study done in Northern California USA [21], Ohio state university [18] and USA [22]. The possible reason might be due to episiotomy more exposes the intertwined perineal muscle to further injury. But in study conducted in Korea [30] and South Africa [24] episiotomy had no effect in severe perineal laceration. The possible justification might be perineal care would be given for all delivered mothers or the type of episiotomy procedure might be different. The study conducted in Australia episiotomy is a risk factor for severe perineal laceration for multiparous but protective for primiparas [23] and in a study conducted at English health services episiotomy was a protective factor for severe perineal laceration [26]. This might be due to more serious perineal support would have given for episiotomy incised mothers.

Table 1: Socio-demographic characteristic of cases and controls among vaginally delivered mothers in Ethiopia, 2019.

Variable	Category	Case (N, %)	Controls (N, %)
Maternal age, year	19-24	23(16.0)	57(13.2)
	25-30	98(68.1)	262(60.6)
	31-36	22(15.3)	106(24.5)
	37-42	1(0.7)	7(1.6)
Marital status	Married	137(95.1)	416(96.3)
	Unmarried	2(1.4)	7(1.6)
	Divorced	4(2.8)	6(1.4)
	Widowed	1(0.7)	3(0.7)
Religion	Orthodox	94(65.3)	309(71.5)
	Muslim	38(26.4)	95(22.0)
	Others	12(8.3)	28(6.5)
Occupation	Employed	30(20.8)	101(23.4)
	Merchant	74(51.4)	187(43.3)
	Housewife	35(24.3)	139(32.2)
	Others	5(3.5)	5(1.2)
Educational status	No education	10(6.9)	26(6.0)
	Primary	41(28.5)	85(19.7)
	Secondary	57(39.6)	181(41.9)
	Tertiary	36(25)	140(32.4)

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Table 2: Maternal, fetal and delivery related characteristics of cases and controls among vaginally delivered mothers in Ethiopia, 2019.

Variable	Category	Cases (N, %)	Controls (N, %)
Parity	I	29(20.0)	83(19.2)
	II	86(59.7)	190(44)
	≥ III	29(20.1)	159(36.8)
History episiotomy	Yes	57(49.56)	69(19.7)
	No	58(50.4)	281(80.3)
History of C/S	Yes	1(0.9)	2(0.6)
	No	114(99.1)	344(99.4)
Pre-pregnancy/ GDM	Yes	1(0.7%)	3(0.7)
	No	143(99.3)	429(99.3)
Body mass index (BMI)	< 25 kg/m^2	83(57.6)	258(59.8)
	≥ 25 kg/m^2	61(42.4)	174(40.2)
Episiotomy on current delivery	Yes	54(37.5)	94(21.8)
	No	90(62.5)	338(78.2)
Instrument-assistance without episiotomy	Yes	78(54.2)	132(30.6)
	No	66(45.8)	300(69.4)
Precipitated labour	Yes	24(16.7%)	64(14.8)
	No	120(83.3)	368(85.2)
Labour initiation	Spontaneous	142(98.6)	419(97.0)
	Induced	2(1.4)	13(3.0)
Duration of SS labour	< 1 hr	56(38.9)	177(41.0)
	1to < 2 hr	72(50.0)	217(50.2)
	2 to < 3 hr	14(9.7)	34(7.9)
	3 to < 4 hr	2(1.4)	4(0.9)
Position of fetal head	Occiput anterior	130(90.3)	411(95.1)
	Occiput posterior	12(8.3)	10(2.3)
	Brow	2(1.4)	5(1.2)
	Others	-	6(1.4)
Gestational week	< 37 weeks	8(5.6)	19(4.4)
	37-42 weeks	135(93.8)	406(94.0)
	> 42 weeks	1(0.7)	7(1.6)
Profession of birth attendant	Midwife	114(79.2)	333(77.1)
	Others [a]	9(6.3)	47(10.1)
	Physician	21(14.6)	52(12.0)
Birth weight	2300-3500 gm	85(59.0)	313(72.5)
	>3500 gm	59(41.0)	119(27.5)
Infant HC	33-34.9 cm	8(5.6)	47(10.9)
	35-37 cm	120(83.3)	364(84.3)
	37.1-39 cm	16(11.1)	21(4.9)

SS labour = second stage labour N, % = number and percentage HC=head circumference a=nurses, health officers, medical students.

Table 3: The risk factors associated with severe perineal laceration among vaginally delivered mothers in Ethiopia, 2019.

D4:I24 Variables	Category	Case (N, %)	Controls (N, %)	cOR (95% CI)	aOR (95% CI)	P-value
Birth Weight	2300-3500 gm	85(59)	313(72.5)	1	1	----
	> 3500gm	59(41)	119(27.5	1.83(1.2.32-2.71)	2.11(1.36-3.27)	0.001
	Fetal HC					0.089
Fetal head circumferences	35-37 cm	8(5.60)	47(10.9)	1	1	-----
	33-34.9 cm	120(83.3)	364(84.3)	0.516(0.24-1.11)	0.45(0.14-1.45)	0.181
	37.1-39 cm	16(11.1)	21(4.9)	2.311(1.17-4.57)	1.98(0.87-4.46)	0.102
Fetal head Position	Fetal head position					0.059
	Occiput anterior	130(90.3)	411(95.1)	1	1	-----
	POP	12(8.3)	10(2.3)	3.794(1.60-8.98)	3.114(1.17-8.28)	0.23
	Other	2(1.4%)	11(2.6)	0.575(0.13-2.63)	0.607(0.12-3.00)	0.54
Episiotomy on current delivery	Yes	54(37.5)	94(21.8)	2.157(1.44-3.25)	5.02(2.91-8.71)	<0.001
	No	90(62.5)	338(78.2)	1	1	----
Vacuum Assisted delivery	Yes	78(54.2)	132(30.6)	2.689(1.83-3.95)	5.36(3.20-8.96)	<0.001
	No	66(45.8)	300(69.4)	1	1	----
Educational status	Education					0.078
	No education	10(6.9)	26(6)	1	1	-----
	Primary	41(28.5)	85(19.7)	1.254(0.55-2.85)	1.18(0.46-3.02)	0.733
	Secondary	57(39.6)	181(41.9)	0.819(0.37-1.80)	0.70(0.27-1.78)	0.454

	Tertiary	36(25)	140(32.4)	0.669(0.31-1.51)	0.56(0.26-1.08)	0.227
Resident	Urban	130(90.3)	373(86.3)	1	1	---
	Rural	14(9.7)	59(13.7)	0.681(0.37-1.26)	0.532(0.26-1.08)	0.081

N=number, cOR=crude odd ratio, aOR=adjusted odd ratio; CI=confidence interval; POP= persistent occiput posterior position of the fetus: HC=head circumference. 1=reference category

The odds of developing severe perineal laceration was 5.36 fold higher among mothers who had delivered assisted with instrument (vacuum) compared to those mothers who had spontaneous delivered. This study was in line with a study done in Cape town South Africa [24] in Tel Aviv, Israel [25], Northern California US [21], United states [22], England [26], in a multi country study conducted in 24 countries of three continents (Africa, Latin America and Asia) and vacuum assisted delivery was a risk factor for severe perineal laceration for Africa and Asia [11], Riyadh Saudi Arabiya [1], in Tel Aviv Sourasky Medical Centre, Israel [16,17] and study done at Ohio state university [18]. The possible explanation might be due to the use of excessive forces by delivery attendants during vacuum extraction without perineal care on injured perineum or lack of experience in vacuum extraction manipulation might further impose injury.

Conclusion

Vacuum assisted delivery, episiotomy on current delivery and high birth weight were the risk factors for severe perineal laceration. Instrumental assisted delivery is not recommended unless other options are impossible. Ultrasound guided fetal weight estimation might be able to help with the decision of delivery modality. The skill of delivery attendant in vacuum manipulation and the effect of vacuum assisted delivery on severe perineal laceration had to be investigated separately.

Limitations

Measuring precipitated labor by asking for those mothers who come to health institution after labor initiated at home, might not be accurate. The skill of delivery attendant on instrument manipulation was not assessed separately.

Declarations

Ethical approval and consent to participate

Ethical approval was obtained from Debre Markos University, collage of health sciences, Institutional review board (letter id DMU IRB/23). Permission was obtained from each hospital concerned officials. All eligible parents who were at the time of the event were given detailed information about the study in local language and then written informed consent was taken from every mother who voluntarily agreed to participate in the study. The right of the respondent was informed and respected to withdraw or not to participate in the interview. Confidentiality of the information collected was maintained.

Acknowledgements

I would like to express my deepest gratitude to Debre Markos University, data collectors and participants of the study.

Authors' Contributions

The authors conceived the study, done data analysis, drafted the manuscript and critically reviewed the manuscript. Finally, the authors approved the manuscript after immense review.

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