PERINATAL RISK FACTORS ASSOCIATED WITH INTRAPARTUM PERINEAL INJURIES AT THE KORLE BU TEACHING HOSPITAL

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Abstract

***Background*:** Obstetric perineal injury is a major contributor to women's reproductive health problems. More than 60% of women suffer varying degrees of obstetric perineal injuries during vaginal delivery requiring repair. This study determined the risk factors associated with perineal injury.

Method: Prospective observational study of 356 women who had singleton term vaginal delivery between 1stApril and 31stMay, 2018 at the KBTH. Socio-demographic and clinical data of participants were collected and analysed to determine association between variables. A p-value of <0.05 was considered statistically significant.

Results: Two hundred and thirty-six women (66.29%) had vaginal deliveries with no perineal injuries comprising 81 primiparous and 155 multiparous women. Perineal injury among the study participants were 120/356 (33.71%) while perineal injury for first degree, second degree, third degree and fourth degree were 75/356 (21.07%), 41/356 (11.52%), 2/356 (0.56%), 2/356 (0.56%) respectively. A total of 948 vaginal deliveries was conducted during the study period. The odds of developing a perineal injury was 8 times higher among participants with previous surgery on genital tract (OR, 8.29 [95% CI 2.69-25.6]; p<0.001) and 18 times higher among participants with previous postpartum complication (OR, 18.00 [95% CI 4.06-79.71], p<0.001). Babies with birth weights ≥2.5kg had 4.11 increased odds of developing perineal injury when compared to those with birth weights <2.5kg (OR, 4.11 [95% CI, 1.70-9.98] p=0.001). Vacuum delivery was strongly associated with a 4.81 odds perineal injury (OR, 4.81 [95% CI, 1.22-18.9] p<0.014).

Conclusion: The incidence of perineal injury among women who had vaginal delivery at the KBTH maternity during the study period of (12.66%) was high compared to other studies from the West African Sub-region. Risk factors such as previous postpartum complication, episiotomy, and gestational age at delivery, head circumference of the baby, asthma, hypertension and past genital tract surgery were significantly associated with perineal injury. Early identification of women at risk of perineal injury could help with interventions to reduce the incidence of this complication during childbirth.

Key Words: Perineal injury, Risk factors, Vacuum delivery, Haemorrhage

Introduction

Obstetric perineal injury (OPI), which refers to tears that involve the external and/or internal anal sphincter is a well-known complication of vaginal birth. Obstetric perineal injury (OPI) is an important aetiological contributor to women's reproductive health problems such as sexual dysfunction, pelvic organ prolapse, perineal pain, and bowel and bladder dysfunction.

Maternal morbidity associated with perineal injuries from labour is a major public health concern affecting many women globally. Nearly two million women globally are affected by OPI with an estimated 50,000 to 100,000 new women being affected each year (Barageine et al., 2014). Over 60% of women suffer from Obstetric perineal injury (OPI) with more than half requiring repair after spontaneous vaginal delivery (Fernando, 2007). Incidence of major degree perineal injury is varied and wide. While some studies have reported a reduction in the rates of injuries as low as 1%, other studies show a rising trend as high as 16% (Graham et al., 2005, Verghese et al., 2016).

Complications after vaginal delivery and associated morbidities are under-reported in most resource-limited settings (Edwards et al., 2006). There may be between 100,000 and 1million women living with fistula in Nigeria alone and over 70,000 in Bangladesh. In Ethiopia, it is estimated that 9,000 women annually develop a fistula of which only 1,200 are treated (WHO, 2006). Multi-country study conducted by the WHO on the incidence of severe perineal injuries in seven African countries (Algeria, Angola, Democratic Republic Congo, Kenya, Niger, Nigeria and Uganda) reported an average incidence of 2.1% with 0.6% as lowest and 7.8% as highest (Hirayama et al., 2012). In Ghana, the perineal injury is said to contribute to about 3.1% of recto-vaginal fistula (Danso KA, 1996).

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Obstetric characteristics such as primiparity, and instrument-assisted vaginal delivery and weight of the newborn child is associated with severe perineal injury in different populations (Kudish et al., 2008, Verghese et al., 2016). Other risk factors are advanced maternal age, post-term pregnancies, labour induction, prolonged second stage of labour, epidural anaesthesia, Asian ethnicity, and episiotomy have been identified in some populations (Goldberg et al., 2003, Graham et al., 2005, Edwards et al., 2006).

Complications of perineal injury following vaginal delivery include haemorrhage, haematoma, perineal pain, dyspareunia, and fistula formation (Fernando, 2007).

Complications of obstetric perineal injuries include obstetric haemorrhage, the breakdown of repair, sepsis, incontinence of urine and of faeces/flatus following fistula formation, perineal pain, dyspareunia (painful sexual intercourse), and poor healing of a repaired perineal injury (Pergialiotis et al., 2014). Faecal/urinary incontinence has been found to be one of the contributing factors to marital disharmony and divorce in Sub-Saharan Africa (Lowder et al., 2007). Affected women in some cases are withdrawn from their families and are not able to mingle with society due to the bad odour from faecal /urine incontinence (Baumann et al., 2007).

Obstetrics and Gynaecology unit of the Korle bu Teaching Hospital (KBTH) maternity conducts on average between 25-30 deliveries a day and in the year 2017, the total delivery was 9,215 births of which over 4,884 births were spontaneous vaginal deliveries (KBTH, 2017). Some of these vaginal deliveries had perineal injuries with different degrees of severity.

There is a growing awareness of the complication and its long-term effect on maternal and fetal health in resource-limited countries including Ghana. However, there is very little literature on incidence, specific risk factors, and associated morbidity of OPI in Ghana. This study seeks to determine the current incidence and subtypes of perineal injury, and its associated risk factors at KBTH, a quaternary referral institution with a patient mix from all communities in and around Accra.

Methods

Study design and setting

This was a prospective observational study of women who had singleton term vaginal delivery at the obstetric unit Korle Bu Teaching Hospital (KBTH). KBTH is a 2000 bed quaternary referral hospital with several departments, Specialist Clinics, Wards, Pharmacies and Reference Laboratories. Study protocol was approved by Ethical and Protocol Review Committee of the School of Medicine and Dentistry (CHS-Et/M.10 – P 3.1/2016-2017). The study was conducted over a two-month period from 1st April to 31stMay, 2018. Perineal injury was classified into first, second, third- and fourth-degree perineal tears (including episiotomies) following spontaneous vaginal deliveries (SVD) or assisted vaginal deliveries.

Socio-demographic characteristics, Medical history and Past Obstetric history were retrieved from patients' records

Very ill women, multiple pregnancies, intrauterine fetal deaths, preterm vaginal deliveries, and women who were referred to the KBTH in the second stage of labour were excluded from the study. Eligible participants who met the inclusion criteria were recruited through simple random process after the study protocol was explained to them. All participants provided written informed consent. All singleton term vaginal deliveries were examined for perineal injuries and had rectal examination to assess sphincter tone. The women were reviewed at two (2) weeks and six (6) weeks post-delivery clinics to identify any other morbidity associated with perineal injury at the postnatal clinics. Pain was assessed with the help of the Numeric Rating Scale (NRS) where level of pain intensity was scored from zero as "no pain" and ten as "worse pain". Pain score ranging from 0 - 4 were categorized as "mild" while scores from 5 - 6 as "moderate" and categorized 7 - 10 as "severe (Pathak et al., 2018)

Statistical Analysis

Data was entered into Statistical Package for Social Sciences (SPSS, version 23; Chicago, IL) for analysis. Data were summarized as frequencies and proportions. Logistic regression analysis was used to determine variables associated with perineal injury and reported as Odds Ratio with 95% Confidence Interval. All reported p-values were two-sided and considered statistically significant at a level of $p < 0.05$.

Results

The incidence of perineal injury among women who had vaginal delivery during the study period was 120/948 (12.66%). The incidence of perineal injury for first degree, second degree, third degree and fourth degree were 75/948 (7.91%), 41/948 (4.32%), 2/948 (0.21%), 2/948 (0.21%) respectively.

A total of 948 women had vaginal deliveries during the study period and 356 were recruited for the study. Two hundred and thirty-six (66.29%) had vaginal deliveries with no perineal injuries while 120 (33.71%) women had obstetric perineal injuries of varying degrees of severity. The prevalence of perineal injury for first degree, second degree, third degree and fourth degree were 75/356 (21.07%), 41/356 (11.52%), 2/356 (0.56%), 2/356 (0.56%) respectively.

Table 1 illustrates the distribution of socio-demographic participants who were mostly Ghanaian women of varied ethnicity and ages. Five study participants (1.4%) who were non-Ghanaians were from Togo (3), Ivory Coast (1) and Nigeria (1). The mean age was 29.01 ±5.95 years with a range of 14 to 46 years. Majority of the study participants were between the ages

Table 1: Socio-demographic characteristics

	Frequency (%)
Characteristics	**N =**
	n (%)
Age group (years)	
<20	21 (5.9)
20-29	169 (47.5)
30-39	152 (42.7)
40+	14 (3.9)
Marital status	
Married	286 (80.3)
Single/cohabiting	70 (19.7)
Educational level	
Secondary education	179 (50.3)
Basic education	86 (24.2)
Tertiary education	68 (19.1)
No formal education	23 (6.5)
Religion	
Christian	313 (87.9)
Muslim	43 (12.1)
Nationality	
Ghanaian	351 (98.6)
Non-Ghanaian	5 (1.4)
Occupation	
Private employment	227 (63.8)
Not economically active	50 (14.0)
Public employment	48 (13.5)
Employed but not working at the moment	17 (4.8)
Unemployed but seeking	11 (3.1)
NGO employment	3 (0.8)

of 20 and 39 years. Majority of study participants 286 (80.3%) were married.

Educational level and occupation of participants were significantly associated with perineal injury. The odds of developing a perineal injury was 2.6 times higher (OR, 2.60 [95% CI, 0.91-7.83], p=0.046) among participants with basic level education than those who had no formal education. The odds of developing a perineal injury was 4 times higher among women who were unemployed but seeking (OR, 4.14 [95% CI, 1.08-17.45], p=0.017) and those employed but currently not working (OR, 4.00 [95% CI, 1.29-12.87] p=0.007) compared to women who are not economically active (Table 2).

History of asthma, hypertension and anaemia were significantly associated with perineal injury.

While asthma (OR, 4.81 [95% CI, 1.22-18.9] p=0.035) and hypertension (OR, 6.30 [95% CI, 1.67-23.7] p=0.004) were associated with an increased odd of developing perineal injury, the odds of patients with anaemia developing perineal injury was decreased, (OR, 0.38 [95% CI, 0.20-0.69] p=0.001). Other medical conditions such as diabetes mellitus, depression, sickle cell disease, heart disease, chronic kidney disease, anxiety and high cholesterol was not associated with obstetric perineal injuries (Table 3).

Past obstetric history of participants such as past gynaecologic surgery, increasing gravidity, number of prior spontaneous vaginal deliveries, perineal injuries needing repair in previous deliveries, episiotomy in past delivery, and parity of two to five and above were all significantly associated with obstetric perineal injury. The odds of developing a perineal injury was 8 times higher among participants with previous surgery on genital tract (OR, 8.29 [95% CI 2.69-25.6]; p<0.001) and 18 times higher among participants with previous postpartum complication (OR, 18.00 [95% CI 4.06-79.71], p<0.001). Past history of caesarean delivery, the type of pregnancy (singleton / multiple), prior history of stillbirths, type of accoucheur (midwife / resident / consultant), type of presentation (cephalic / breech), and maternal weight was not associated with perineal injuries (Table 4a). Gestational age at delivery, duration of second stage of labour and induction of labour also influenced the odds of developing a perineal injury (Table 4b).

Using Mann-Whitney test to estimate blood loss after delivery, women who had a perineal injury on the average bled more than those who did not (OR, 1.003 [95% CI, 1.001-1.004] p<0.001). Participants who had babies with birth weights ≥2.5kg had 4.11 increased odds of developing perineal injury when compared to those with birth weights<2.5kg and this effect was statistically significant (OR, 4.11 [95% CI, 1.70-9.98] p=0.001). Analysis of head circumference of babies showed babies with slightly bigger mean head circumferences (33.3±2.0) cm developed perineal injuries compared to those with smaller mean head circumferences (32.1 ±1.7) cm and this effect was statistically significant (OR, 1.31 [95% CI, 1.20-1.43] p<0.001) (Table 5). Participants with severe postpartum perineal pain had increased odds of perineal injury compared to those without perineal pain by a factor of 11.8 (OR, 13.75 [95% CI, 2.82-129.89] p<0.001) while episiotomy (OR, 4.26 [95% CI, 2.52-7.21] p<0.001) was strongly associated with the development of perineal injury. Vacuum delivery was strongly associated with a 4.81 odds perineal injury (OR, 4.81 [95% CI, 1.22-18.9] p<0.014). Cervical tears, rectal sphincter tone and outcome of babies in the neonatal intensive care unit (NICU) did not yield any strong statistical association with perineal injury (Table 6).

Table 2: Socio-demographic factors associated with perineal injury

Characteristic	Perineal injury		OR [95% C.I]	p-value
	Yes N = 120 n, %	No N = 236 n, %		
Age group				
<20	7 (5.8)	14 (5.9)	0.90 [0.18-4.82]	0.884
20-29	64 (53.3)	105 (44.5)	1.10 [0.31-4.36]	0.873
30-39	44 (36.7)	108 (45.8)	0.73 [0.21-2.95]	0.595
40+	5 (4.2)	9 (3.8)	1.00	
Marital status				
Married	99 (82.5)	187 (79.2)	1.24 [0.70-2.18]	0.485
Single/cohabiting	21 (17.5)	49 (20.8)	1.00	
Educational level				
Tertiary education	27 (22.5)	41 (17.4)	1.23 [0.42-3.84]	0.675
Secondary education	35 (29.2)	144 (61.0)	0.46 [0.16-1.35]	0.093
Basic education	50 (41.7)	36 (15.3)	2.60 [0.91-7.83]	**0.046**
No formal education	8 (6.7)	15 (6.4)	1.00	
Religion				
Christian	106 (88.3)	207 (87.7)	1.06 [0.54-2.09]	0.865
Muslim	14 (11.7)	29 (12.3)	1.00	
Nationality				
Ghanaian	118 (98.3)	233 (98.7)	0.76 [0.13-4.61]	0.764
Non-Ghanaian	2 (1.7)	3 (1.3)	1.00	
Occupation				
Unemployed but seeking	11 (9.2)	5 (2.1)	4.14 [1.08-17.45]	**0.017**
Public employment	23 (19.2)	24 (10.2)	1.80 [0.74-4.45]	0.157
Private employment	51 (42.5)	165 (69.9)	0.58 [0.29-1.22]	0.109
Employed but not working at the moment	17 (14.2)	8 (3.4)	4.00 [1.29-12.87]	**0.007**
NGO employment	1 (0.8)	2 (0.8)	0.94 [0.02-19.34]	0.962
Not economically active	17 (14.2)	32 (13.6)	1.00	

OR = Odds Ratio ***C.I = Confidence Interval***

Table 3: Medical history associated with perineal injury

Characteristic	Perineal injury		OR [95% C.I]	p-value
	Present N = 120 n (%)	Absent N = 236 n (%)		
High cholesterol				
Yes	2 (1.7)		5 (2.1) 0.78 [0.15-4.10]	1.000
No	118 (98.3)	231 (97.9)	1.00	
Anxiety				
Yes 2 (1.7)		6 (2.5)	0.65 [0.13-3.27]	0.722
No	118 (98.3)	230 (97.5)	1.00	
Asthma				
Yes	7 (5.8)	3 (1.3)	4.81 [1.22-18.9]	**0.035**
No	113 (94.2)	233 (98.7)	1.00	

Continuation of Table 3: Medical history associated with perineal injury

Sickle cell disease				
Yes	4 (3.3)	2 (0.8)	4.03 [0.73-22.3]	0.185
No	116 (96.7)	234 (99.2)	1.00	
Heart disease				
Yes	2 (1.7)	2 (0.8)	1.98 [0.28-14.3]	0.606
No	118 (98.3)	234 (99.2)	1.00	
Hypertension				
Yes	9 (7.5)	3 (1.3)	6.30 [1.67-23.7]	**0.004**
No	111 (92.5)	233 (98.7)	1.00	
Anaemia				
Yes	15 (12.5)	65 (27.5)	0.38 [0.20-0.69]	**0.001**
No	105 (87.5)	171 (72.5)	1.00	
Chronic kidney disease				
Yes	2 (1.7)	1 (0.4)	3.98 [0.36-44.4]	0.264
No	118 (98.3)	236 (100.0)	1.00	
Depression				
Yes	2 (1.7)	7 (3.0)	0.55 [0.11-2.71]	0.723
No	118 (98.3)	229 (97.0)	1.00	
Diabetes				
Yes		4 (3.3) 3 (1.3)	2.68 [0.59-12.2] 0.232	
No	116 (96.7)	233 (98.7)	1.00	

OR =Odds Ratio ***C.I = Confidence Interval***

Table 4 (a): Past obstetric history

Characteristic	**Perineal injury**		**OR [95% C.I]**	**p-value**
	Yes N = 120 n (%)	No N = 236 n (%)		
Past gynaecologic surgery				
Yes	11 (9.2)	9 (3.8)	2.55 [1.03-6.32] **0.038**	
No	109 (90.8)	227 (96.2)	1.00	
Gravida group				
0-4	110 (91.7)		176 (74.6) 3.75 [1.84-7.63]	**<0.001**
5 and above	10 (8.3)	60 (25.4)	1.00	
Parity group				
P2-P5 and above	99 (82.5)	155 (65.7)	2.46 [1.40-4.46]	**0.001**
P1	21 (17.5)	81 (34.3)	1.00	
Number of Prev. SVD grouped (N=251)	N = 96	N = 155		
1	55 (57.3)	49 (31.6)	2.90 [1.71-4.92]	**<0.001**
≥2	41 (42.7)	106 (68.4)	1.00	
Number of Prev. CS (N=17)	N=13	N=4		
1	10 (76.9)	4 (100.0)	Not estimable	0.541
≥2	3 (23.1)	0 (0.0)	1.00	
Previous surgery on genital tract				
Yes	15 (12.5)	4 (1.7)	8.29 [2.69-25.6]	**<0.001**
No	105 (87.5)	232 (98.3)	1.00	
Previous postpartum complication				
Yes	16 (13.3)	2 (0.8)	18.00 [4.06-79.71]	**<0.001**
No	104 (86.7)	234 (99.2)	1.00	
Previous stillbirth				
Yes	4 (3.3)	13 (5.5)	0.59 [0.19-1.86]	0.440

Continuation of Table 4 (a): Past obstetric history

No	116 (96.7)	223 (94.5)	1.00	
Perineal injury needing repair in previous injuries				
Yes	32 (26.7)	17 (7.2)	4.68 [2.48-8.87]	<**0.001**
No	88 (73.3)	219 (92.8)	1.00	
Episiotomy in past delivery				
Yes	41 (34.2)	25 (10.6)	4.38 [2.50-7.67]	<**0.001**
No	79 (65.8)	211 (89.4)	1.00	

OR =Odds Ratio C.I = Confidence Interval

Table 4 (b): Current Obstetric history

Characteristic	**Perineal injury**		**OR [95% C.I]**	**p-value**
	Yes N=120 n, %	No N=236 n, %		
Type of accoucheur				
Midwife	107 (89.2)	204 (86.4)	1.29 [0.65-2.56]	0.505
Resident	13 (10.8)	32 (13.6)	1.00	
Last recorded maternal weight (kg)	75.5 ±11.8	76.7 ±13.4	0.98 [0.97-0.99]	0.426
Gestational age at delivery (weeks)	39.3 ±1.7	38.2 ±2.5	1.22 [1.11-1.35]	<**0.001**
Induction of labour				
Yes	30 (25.0)	21 (8.9)	3.41 [1.86-6.28]	<**0.001**
No	90 (75.0)	215 (91.1)	1.00	
Duration of the second stage of labour (min)	13.9 ±13.2	9.6 ±4.7	1.13 [1.07-1.19]	**0.001**
Presentation of baby				
Cephalic	120 (100.0)	228 (96.6)	Not estimable	0.055
Breech	0 (0.0)	8 (3.8)	1.00	

OR = Crude Odds Ratio C.I = Confidence Interval

Table 5: Maternal and Neonatal Outcomes

Characteristic	**Perineal injury**		**OR [95% C.I]**	**p-value**
	Yes N=120	**No N=236**		
Estimated blood loss (EBL) (mls)	200 [200-300]	200 [150-200]	1.003 [1.001-1.004]	<**0.001**
Birth weight	3.17 ±0.46	2.94 ±0.61	1.001 [1.00-1.001]	<**0.001**
Birth weight group 1				
≥2.5kg	114 (95.0)	194 (82.2)	4.11 [1.70-9.98]	**0.001**
<2.5kg	6 (5.0)	42 (17.8)	1.00	
Birth weight group 2				
≥4.0 kg	4 (3.3)	7 (3.0)	4.00 [0.64-22.04]	0.057
2.5-3.9 kg	110 (91.7)	187 (79.2)	4.12 [1.66-12.20]	**0.001**
<2.5 kg	6 (5.0)	42 (17.8)	1.00	
APGAR 1 min				
1-3	2 (1.7)	10 (4.2)	0.40 [0.04-1.89]	0.214
4-6	22 (18.3)	39 (16.5)	0.60 [0.14-2.01]	0.377
7-10	96 (80.0)	187 (79.2)	1.00	
APGAR 5 min				
1-3	1 (0.8)	4 (1.7)	0.48 [0.01-4.89]	0.500
4-6	4 (3.3)	13 (5.5)	0.59 [0.14-1.96]	0.354

Continuation of Table 5: Maternal and Neonatal Outcomes

7-10	115 (95.8)	219 (92.8)	1.00	
Head circumference of the baby (cm)	33.3 ±2.0	32.1 ±1.7	1.31 [1.20-1.43]	**<0.001**
NICU admission				
Yes	15 (12.5)	36 (15.3)	0.79 [0.42-1.52]	0.526
No	105 (87.5)	200 (84.7)	1.00	
Duration of admission(days)	3 (2-3)	2 (2-3)	0.82 [0.68-0.98]	0.852

OR =Odds Ratio C.I = Confidence Interval

Table 6: Morbidities associated with perineal injuries

Characteristic	**Perineal injury**		**OR [95% C.I]**	**p-value**
	Yes N=120 n, %	No N=236 n, %		
Perineal pain postpartum				
Severe (7-10 NRS)	11 (9.2)	2 (0.8)	13.75 [2.82-129.89]	**<0.001**
Moderate (5-6 NRS)	55 (45.8)	99 (41.9)	1.39 [0.86-2.25]	0.158
Mild (0-4 NRS)	54 (45.0)	135 (57.2)	1.00	
Episiotomy				
Yes	47 (39.2)	31 (13.1)	4.26 [2.52-7.21]	**<0.001**
No	73 (60.8)	205 (86.9)	1.00	
Vacuum delivery				
Yes	7 (5.8)	3 (1.3)	4.81 [1.22-18.9]	**0.014**
No	113 (94.2)	233 (98.7)	1.00	
Sphincter tone assessment at rectal examination				
Good	60 (50.0)	100 (42.4)	1.53 [0.94-2.49]	0.069
Poor/Bad	1 (0.8)	0 (0.0)	Not estimable	0.113
Satisfactory	10 (8.4)	11 (4.7)	2.32 [0.82-6.42]	0.067
Very good	49 (40.8)	125 (53.0)	1.00	

OR = Odds Ratio, C.I = Confidence Interval

Discussion

Overall perineal injury incidence among women who had a vaginal delivery at the KBTH during the study period was 12.66%. This incidence of 12.66% was higher than what was reported in Nigeria (9.1%)(Njoku C, 2015;), Pakistan (5.1%)(Baghestan et al., 2010), Brazil (0.9%) (Artieta-Pinedo et al., 2017), UK (0.1% - 10.2%)(Zimmo et al., 2017). It was; however, lower than South Africa (16.2%) (Naidoo and Moodley, 2015). The incidence was however comparable to India (12.4%) (Jensen et al., 2017) and UK (12.9%) (Smith et al., 2013). The incidence in this study did not differ much from that found in India. India is a developing country and may have similar environmental factors compared to Ghana where this study was conducted. This varied incidence in obstetric perineal injury may be attributed to differences in management patterns during delivery in these settings as well as different patient characteristics.

The relatively low incidence of 9.1% in the Nigerian study compared to the 12.66% in the index study could be as a result of the long period of data collection (Njoku C, 2015;), the methodology used (retrospective in the Nigerian compared to the prospective in the Ghana) mode of delivery and patient characteristics for the Nigerian study. The index study was a prospective observational study done over a two-month period compared to the retrospective study done between 2009 and 2014 in Nigeria.

The KBTH is a national quaternary referral teaching hospital with adequate experienced trained personnel coupled with modern facilities which provide first class delivery services. This may account for the observed incidence in comparison to rates in other parts of the West African sub-region.

Goldberg and his colleagues reported the following as incidence for major degree perineal injury: 4.3% in whites; 2.0% in blacks; 9.1% among Asians; and 3.4% Hispanics (Goldberg et al., 2003). The low incidence of major degree injury in blacks compared to other populations may suggest differences in pelvic floor anatomy and function between different population

groups (Goldberg et al., 2003). The incidence of major degree perineal injuries (3rd and 4th degree OPI) 0.56% in the current study did not differ much from the 0.1% in Uganda, 1.4% in Japan, and 0.1% in China as reported by Hirayama and colleagues (Chikazawa et al., 2016). It is low compared to studies from South Africa (4.1%)(Naidoo and Moodley, 2015), Michigan USA had earlier reported 64.4% second degree, 28.8% third degree, and 6.8% fourth-degree lacerations (Artieta-Pinedo et al., 2017), whilst a study in Britain recorded an incidence of 1.58% for both third and fourth-degree injury(Eskandar and Shet, 2009).Low incidence of major degree perineal injury in this study could be as a result of the small numbers and the duration of the study as well as the methodology used. The most common perineal injury type observed among participants in our study was first-degree injury similar to what was earlier reported in Zaire and Nigeria (Naidoo and Moodley, 2015, Garba I, 2016). These first- degree injuries are generally minor and self-limiting that requires no suturing.

A study by Njoku in Nigeria found anaemia was a major complication of lower genital tract injury (Njoku C, 2015;).The severity of genital tract injury is directly related to the degree of haemorrhage/anaemia. However, in the index study, the incidence of anaemia was low in women with perineal injury. It is possible that anaemia patients in labour had more perineal protection/more attention in the second stage of labour compared with those without anaemia. Other reasons may be due to differences in methods and patient characteristics. The finding of primiparity being associated with a decreased odd of perineal injury is inconsistent with literature where primiparity was found to increase the odds of perineal injury (Kudish et al., 2008). Parity of two to four was associated with an increased odds of developing perineal injuries in our study which is inconsistent with literature where primiparity was found to increase the odds of perineal injury (Kudish et al., 2008).

Previous medical history of surgery on the genital tract, postpartum complication, perineal injuries needing repair, episiotomy, gestational age at delivery, duration of second stage of labour and induction of labour were observed in our study to be significantly associated with perineal injuries and these factors have also been reported in other studies (Carroll et al., 2003, Pergialiotis et al., 2014, Naidoo and Moodley, 2015). These may be due to repeated injury along previous injuries, an extension of such injuries and poor healing of past perineal injuries. Average gestational ages for women who had perineal injuries were slightly higher than those who had no injuries which may be due to an increase in fetal weight as the pregnancy advances, presentation/position of the fetus in labour or other patient characteristics (Smith et al., 2013, Jango et al., 2016). Similarly, in our study, women who spent longer average duration in the second stage of labour were at an increased odd of developing a perineal injury compared to those who spent less time in the second stage (Garretto et al., 2016, Garmi et al., 2016) which may be due to pressure necrosis of the presenting part, use of episiotomy, use of manipulative procedures and the use of vacuum for some second stage delivery.

Mothers with babies with larger average head circumferences developed perineal injuries compared to those with babies with smaller mean head circumferences and this was statistically significant. Larger head circumference was a risk factor to perineal injury which was consistent with other studies (Baghestan et al., 2010, Jiang et al., 2017).

Episiotomy as a risk factor to perineal injury in our study was consistent with findings from other studies (Carroll et al., 2003, Stephansson et al., 2016). The high rate of episiotomy observed in this study is worrying, since it is linked to increased risk and development of perineal injury (Pergialiotis et al., 2014).

Conclusion

The incidence of perineal injury among women who had vaginal delivery at the KBTH maternity during the study period (12.66%) is high compared to other studies from the West African Sub-region. Risk factors such as previous postpartum complication, episiotomy, and gestational age at delivery, head circumference of the baby, asthma, hypertension and past genital tract surgery significantly associated with perineal injury. Early identification of women at risk of perineal injury could help with interventions to reduce the incidence of this complication during childbirth.

Authors' contributions

CT originated the study and contributed to drafting of manuscript. AS, KM and JDS coordinated all aspects of study implementation and contributed to data interpretation and drafting of manuscript. CT performed literature search, developed data collection instrument, assisted with recruiting participants and reviewing manuscript. WK analysed data, contributed to interpretation of results and drafting of the manuscript. All authors reviewed and approved the final draft of this manuscript.

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Conflict of interest

The authors declare that they have no competing interests

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