



## Original Article

# Comparison of Apgar scores in breech presentations between vaginal and cesarean delivery

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### ABSTRACT

**Objective:** The mode of delivery in breech presentation (BP) is controversial. Several studies have reported the advantages and disadvantages of delivery mode in BP. The aim of this study was to compare the Apgar scores in BPs between vaginal and cesarean delivery. **Materials and Methods:** A retrospective study was conducted at Dr. Zainoel Abidin General Hospital from January 2010 to December 2012. Data on the mode of delivery and Apgar scores at 1 and 5 min for infants with a BP were extracted from the medical records. Logistic regression was employed to assess the correlation between mode of delivery and Apgar scores. In addition, a meta-analysis was conducted to summarize findings from other regions. **Results:** A total of 205 (3.9%) BPs among 5252 deliveries between January 2010 and December 2012 were analyzed for this study. There were 26% (52 cases) vaginal and 74% (153 cases) cesarean deliveries. The mode of delivery for BP had a significant association with Apgar score at 1 min (odds ratio [OR] 95% confidence interval [CI] = 6.462 [2.476–16.870],  $P = 0.0001$ ) and 5 min (OR 95% CI = 7.727 [1.416–42.175],  $P = 0.018$ ). Our meta-analysis showed that the delivery mode had a significant association with Apgar score in BP (OR: 3.69; 95% CI: 2.18–6.26,  $P = 0.0001$ ). **Conclusions:** There was a significant association between Apgar scores in BPs and mode of delivery. Our results suggest better outcomes for cesarean than vaginal delivery in BPs.

**KEYWORDS:** *Apgar score, Breech presentation, Cesarean delivery, Vaginal delivery*

## INTRODUCTION

Breech presentation (BP) is a significant obstetric event associated with increases in perinatal morbidity and mortality [1]. BP complicates 3%–4% of all term deliveries and a higher proportion of preterm deliveries [2], ranging from 20% to 30% in preterm and 2%–9% in term pregnancies [3-5]. The relatively lower incidence at term is probably due to spontaneous correction [3]. Studies reported that BP is an independent risk factor for neonatal morbidity and mortality [6,7]. The incidence of neonatal morbidity associated with BP in one study was 3.6% [8]. However, the incidence varied from 0.37% [9] to 10.4% [10]. BP is also associated with asphyxia, birth trauma [9], acidemia at birth, and neurological disorders [8,11]. Birth morbidity in BP may be caused by underlying conditions such as congenital

anomalies [12] or intrauterine growth restriction or from perinatal complications during labor and delivery [13,14].

The morbidity and mortality of BP are influenced by the mode of delivery (vaginal or cesarean). There are advantages and disadvantages for each delivery mode in BP. The advantages of vaginal labor are minimized blood loss, minimized surgical stress, quicker recovery, and hemodynamic stability while the advantages of cesarean section are predictability, planned delivery, timed

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delivery, and immediate availability of all personnel. The disadvantages of vaginal labor are unpredictable timing and a potentially prolonged, painful, and stressful labor. The disadvantages of cesarean section are increased surgical stress, higher blood loss, longer recovery, and higher potential for postoperative complications [15]. In one study of patients opinions, vaginal labor was considered better because it caused less pain and suffering while lack of contractions and pain were considered advantages of cesarean section [16]. Asphyxia has an important role and has been associated with a variety of infant morbidities such as hypoxic-ischemic encephalopathy [17], cerebral palsy, mental retardation [18], cardiogenic shock [19], and vasoparalysis [20].

The Apgar score is widely used as a diagnostic test for asphyxia [21]. However, the mode of delivery is important in the evaluation of neonatal asphyxia. Therefore, this study aimed to investigate the association of Apgar scores in infants with BP with the mode of delivery (vaginal labor vs. cesarean section). The results of this study might be important in establishing guidelines for the management of BP.

## MATERIALS AND METHODS

### Study designs and participants

This study was a retrospective study conducted at Dr. Zainoel Abidin General Hospital from January 2013 to May 2013. The study was conducted in accordance with the Declaration of Helsinki and was approved by the local ethics committee of the institute. Informed written consent was waived because the study was a retrospective data analysis. The total population was all pregnant women (5252 patients – updated January 9, 2013) who delivered at this hospital from January 2010 to December 2012. A total sampling method was used in the study. The sample in this study included 205 BPs.

### Eligibility criteria and data extraction

Eligibility criteria consisted of predefined inclusion and exclusion criteria. Inclusion criteria for this study were (1) pregnant women who had a BP and (2) were over 18-year-old. The exclusion criteria were (1) gestational age was <37 weeks or >40 weeks, (2) birth weight estimation was <2500 g or >3800 g, (3) nonanomalous newborn, (4) mother with placenta previa, (5) mother with a narrow pelvis, defined as a distance between the pubic bone and the promontory of <10 cm [3], (6) cephalopelvic disproportion, defined when the pelvis was not large enough to accommodate passage of the fetus [2], (7) uterine rupture, (8) cervical dystocia, (9) uterine dysfunction, and (10) soft tissue dystocia. Data extracted from the medical records included the mode of delivery in BP and Apgar scores at 1 and 5 min.

### Study procedures

The procedures in this study were as follows: (1) determine the population and sample size, (2) provide the explanations and record baseline data including personal, demographic, and clinical information, (3) collect data, (4) analyze the data using SPSS descriptively and analytically to determine the associations between variables.

### Study variables

#### *Apgar scores in breech presentation*

The Apgar score is conventionally assigned after birth and recorded in the newborn's chart. The Apgar score consists of the total points assigned for five objective signs in the newborn [22] and is used to evaluate newborns at 1 and 5 min after birth [23]. The Apgar score in the study was used to evaluate newborns with BPs. The measurement results for this variable were divided into Apgar scores <7 and  $\geq 7$ . An ordinal scale was used to assess this variable.

#### *Mode of delivery*

The modes of delivery, vaginal, and cesarean were compared in infants with BP. A nominal scale was used to assess this variable.

### Statistical analysis

Data on the association of Apgar scores of infants with BP with the mode of delivery were analyzed using bivariate analysis. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were analyzed using a double logistic regression test with SPSS software (SPSS, Version 15, Chicago, USA). A  $P < 0.05$  was considered statistically significant.

### Meta-analysis

A meta-analysis was conducted to assess the association between Apgar scores of infants with BPs and mode of delivery. Pubmed and Embase were searched for studies on the association between Apgar scores of infants with a BP and mode of delivery. The following information was extracted from each study: (1) name of the first author; (2) year of publication; (3) country of origin; (4) sample sizes of cases and controls, and (5) sample size of each delivery mode. The correlation between Apgar scores and the mode of delivery was estimated by calculating pooled ORs and 95% CIs. The significance of pooled ORs was determined by Z-tests ( $P < 0.05$  was considered statistically significant). A Q-test was performed to evaluate whether heterogeneity existed. A random effects model was used to calculate the OR 95% CI if heterogeneity existed ( $P < 0.10$ ). A fixed effects model was used to calculate the OR 95% CI if no heterogeneity existed. Publication bias was assessed using Egger's

test ( $P < 0.05$  was considered statistically significant). Comprehensive meta analysis (CMA), version 2.0, Biostat Inc, USA, was used to analyzed the data.

**RESULTS**

During this period, there were 224 (4.26%) BPs among a total of 5252 deliveries between January 2010 and December 2012. Of these, 19 patients were excluded because the gestational age was  $<37$  weeks or  $>40$  weeks (seven patients), the birth weight was estimated to be  $<2500$  g or  $>3800$  g (five patients), or the mother had a narrow pelvis and/or cephalopelvic disproportion (seven patients). Finally, 205 patients (3.9% of the total 5252 deliveries) with BP were included in the study. A flow chart of the study is shown in Figure 1.

Vaginal and cesarean delivery rates were 26% (52 cases) and 74% (153 cases), respectively. Apgar scores  $\geq 7$  at 1 min were recorded after 24 vaginal and 141 cesarean deliveries and at 5 min in 35 vaginal and 151 cesarean deliveries. Apgar scores  $<7$  at 1 min were recorded after 28 vaginal and 12 cesarean deliveries and at 5 min after 17 vaginal and 2 cesarean deliveries. The double logistic regression test showed that the mode of delivery in BP had a significant association with Apgar scores at

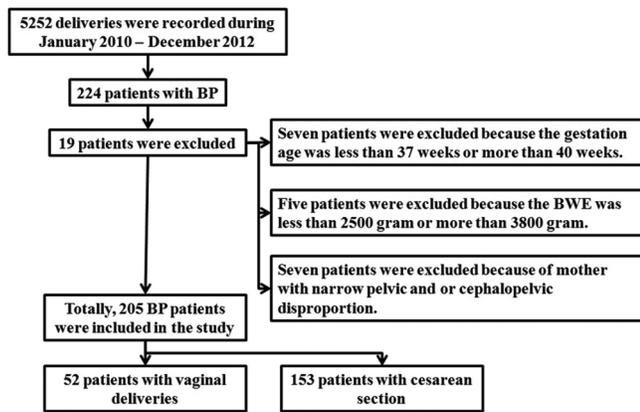
1 min (OR 95% CI = 6.462 [2.476–16.870],  $P = 0.0001$ ) and 5 min (OR 95% CI = 7.727 [1.416–42.175],  $P = 0.0180$ ). Our analysis showed that infants with a BP had better Apgar scores after cesarean than vaginal delivery. Table 1 shows the association of Apgar scores in BP with the mode of delivery.

In the meta-analysis, a total of 22040 vaginal and 22146 cesarean deliveries with BPs were identified. Overall, the results showed a significant association between Apgar scores in BP and the mode of delivery. The mode of delivery was significantly associated with the Apgar score in BPs (OR 95% CI = 3.69 [2.18–6.26],  $P = 0.0001$ ). A forest plot of the correlation between Apgar scores in BPs and the mode of delivery is shown in Figure 2. A summary of the ORs and 95% CIs regarding the correlation between Apgar scores in BP and mode of delivery in the studies in the meta-analysis is shown in Table 2. Evidence for heterogeneity ( $P = 0.0001$ ) between studies was found in all multiplicative. Therefore, the data in this study were assessed using a random effects model. Using Egger’s test, no publication bias could be detected ( $P = 0.648$ ).

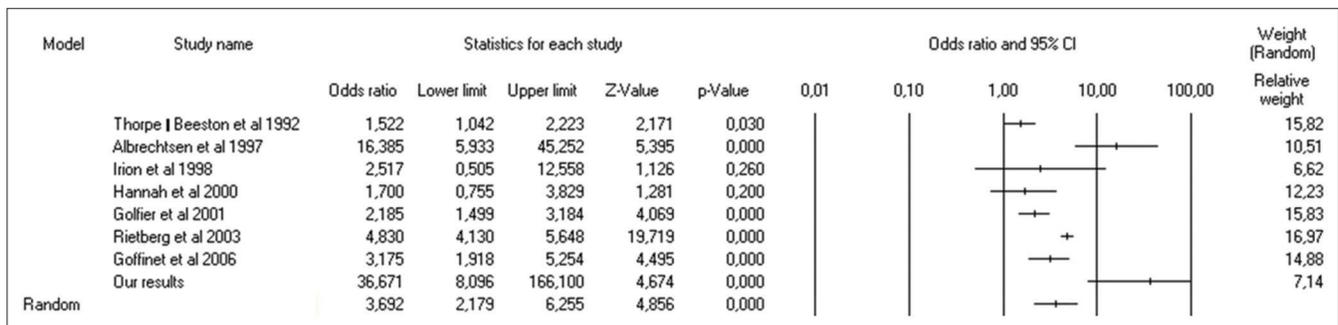
**DISCUSSION**

BP is an important cause of deformities [24]. BP is associated with asphyxia, which has an important role in the development of several infant morbidities including hypoxic-ischemic encephalopathy [17], cerebral palsy, mental retardation [18], cardiogenic shock [19], and vasoparalysis [20]. The Apgar score is widely used to detect asphyxia in newborns [21]. The Apgar score in infants with BP is strongly influenced by the mode of delivery as shown in this study.

This is the first study in Indonesia, on the correlation between Apgar scores in infants with a BP and the mode of delivery. The first study on this subject was conducted by Main *et al* [25]. in the United States (US). The concept of this study was similar to that of several previous studies on Apgar scores in BPs and delivery



**Figure 1:** Flow chart of the study. BP: Breech presentation; BWE: Birth weight estimation



**Figure 2:** Forest plot of the association between Apgar scores in breech presentations and mode of delivery in various studies

**Table 1: Summary of odds ratio and 95% confidence interval regarding the association of Apgar scores of breech presentation with the mode of delivery**

Apgar score	Mode of delivery		OR (95% CI)	P
	Pervaginal, n (%)	Perabdominal, n (%)		
1 <sup>st</sup> min				0.0001
<7	28 (53.8)	12 (7.8)	6.462 (2.476-16.870)	
≥7	24 (46.2)	141 (92.2)		
5 <sup>th</sup> min				0.0180
<7	17 (32.7)	2 (1.3)	7.727 (1.416-42.175)	
≥7	35 (67.3)	151 (98.7)		

OR: Odds ratio, CI: Confidence interval, P: Significance, n: Amount of the patients

**Table 2: Summary of the comparison of this study with other several studies regarding the association of the mode of delivery for breech presentation and their outcomes**

First author name and year	BP	Total labor	Vaginal labor	Cesarean section	Population	OR	95% CI	P	VAS (>7/<7)	CAS (>7/<7)	
Main <i>et al.</i> , 1983	240	NA	NA	NA	US	NA	NA	NA	0.0010	NA	NA
Thorpe-Beeston <i>et al.</i> , 1992	3447	117,000	961	2486	UK	1.52	1.04	2.22	0.0300	917/44	2410/76
Albrechtsen <i>et al.</i> , 1997	1212	41,026	639	573	Norway	16.39	5.93	45.25	0.0001	573/66	168/4
Irion <i>et al.</i> , 1998	705	32,230	385	320	Switzerland	2.52	0.51	12.56	0.2600	379/6	318/2
Hannah <i>et al.</i> , 2000	646	2088	88	558	Canada	1.70	0.75	3.93	0.2000	80/8	527/31
Herbst and Thorngren-Jerneck, 2001	1050	30,641	603	447	Sweden	NA	NA	NA	0.0020	NA	NA
Golfier <i>et al.</i> , 2001	1116	NA	414	702	France	2.18	1.50	3.18	0.0001	347/67	645/57
Gilbert <i>et al.</i> , 2003	100,667	3,271,092	4952	95,715	California	1.50	1.30	1.60	0.0001	NA	NA
Rietberg <i>et al.</i> , 2003	28,750	350,609	16,975	11,775	Netherlands	4.83	4.13	5.65	0.0001	15,760/1215	11,590/185
Goffinet <i>et al.</i> , 2006	8105	264,105	2526	5579	France and Belgium	3.17	1.92	5.25	0.0001	2465/37	5547/26
Our results	205	5252	52	153	Indonesia	36.67	8.10	166.10	0.0001	35/17	151/2

BP: Breech presentation, US: United States, UK: United Kingdom, NA: Not available, OR: Odds ratio, CI: Confidence interval, P: Significance, VAS: Vaginal labor Apgar score, CAS: Cesarean section Apgar score

mode [8,9,14,25-31]. The percentage of BP in our study was low at around 4%, similar to the rates of 2.9% in the United Kingdom (UK) [26], 2.9% in Norway [27], 2.2% in Switzerland [28], 30% in Canada [14], 3.4 % in Sweden [8], 3.1% in California [30], 8.2% in the Netherlands [9], and 3.1 % in France and Belgium [31].

However, the delivery mode varied widely in these studies, with respective vaginal and cesarean rates of 27.9% and 72.1% in the UK [26], 52.7% and 47.3% in Norway [27], 54.6% and 45.4% in Switzerland [28], 13.6% and 86.4% in Canada [14], 57.4% and 42.6% in Sweden [8], 37.1% and 62.9% in France [29], 4.9% and 95.1% in California.[30], 59.0% and 41.0% in the Netherlands [9], and 31.2% and 68.8% in France and Belgium [31]. In four studies [8,9,27,28], vaginal deliveries were more common while in the other five studies [14,16,29-31], cesarean section was used more often for BPs. In our study, the cesarean section was more dominant with a rate of 74% (153 cases). Birth asphyxia is defined as a reduction of oxygen delivery and an accumulation of carbon dioxide owing to

cessation of blood supply to the fetus [32]. The Apgar score [33] and it is widely used as an index of the severity of intrapartum asphyxia [34]. In the vaginal delivery group, 28 patients had Apgar scores <7 and 24 had scores ≥7 at 1 min, and 17 patients with Apgar had scores <7 and 35 had Apgar scores ≥7 at 5 min. For the cesarean group, 12 patients had Apgar scores <7 and 141 had Apgar scores ≥7 at 1 min while two patients had Apgar scores <7 and 151 had scores ≥7 at 5 min. In our study, mode of delivery in BP had a statistically significant association with Apgar score at 1 min (OR 95% CI = 6.462 [2.476–16.870], *P* = 0.0001) and 5 min (OR 95% CI = 7.727 [1.416–42.175], *P* = 0.0180). The risk of asphyxia (evaluated from the Apgar score) was about six- to eight-fold higher in the vaginal delivery than the caesarean delivery group. As of July 15, 2016, 10 studies had evaluated the correlation between delivery mode in BP and asphyxia with the Apgar score. They showed different results but had the same basic conclusion. Eight studies showed that the mode of delivery had a significant association with infant asphyxia in the US (*P* = 0.0010) [25], the UK (OR

95% CI = 1.52 [1.04–2.22]  $P = 0.0300$ ) [26], Norway (OR 95% CI = 16.39 [5.93 – 45.25],  $P = 0.0001$ ) [27], Sweden ( $P = 0.0020$ ) [8], France (OR 95% CI = 2.18 [1.50–3.18]  $P = 0.0001$ ) [29], California (OR 95% CI = 1.50 [1.30–1.60]  $P = 0.0001$ ) [30], the Netherlands (OR 95% CI = 4.83 [4.13–5.65]  $P = 0.0001$ ) [9], and France and Belgium (OR 95% CI = 3.17 [1.92–5.25]  $P = 0.0001$ ) [31]. The Swiss (OR 95% CI = 2.52 [0.51–12.56]  $P = 0.3000$ ) [28] and Canadian studies (OR 95% CI = 1.70 [0.75–3.93]  $P = 0.2000$ ) [14] found no significant correlation between mode of delivery and infant asphyxia. These different results could not be explained properly. A comparison of the results of this study with several other studies is described in Table 2.

The management of BP at term can include external cephalic version, planned caesarean section, and a trial of vaginal delivery. Although several studies have recommended a trial of vaginal labor, this method is not supported by neonatal outcomes [35-37]. There are not enough data from this retrospective study alone to determine the best management for BP. Therefore, a meta-analysis can help determine the actual association. Our previous meta analysis had shown the actual association regarding the role of several genes in some diseases [38-40]. In this study, we combined data from several other studies on the association between Apgar scores in BP and the mode of delivery. We calculated the combined ORs and 95% CIs of eight studies with the results of our study. We found that the delivery mode had a significant association with Apgar scores in BP (OR 95% CI = 3.69 [2.18–6.26],  $P = 0.0001$ ). Cesarean section was better than vaginal delivery for the management of BP. A forest plot of the correlation between Apgar scores in BP and mode of delivery is shown in Figure 2. These results are supported by a meta-analysis conducted by Gifford *et al* [41]. on infant outcomes after breech delivery. They showed that a trial of vaginal delivery was associated with an increased risk of neonatal injury and/or death. The meta-analysis of Berhan and Haileamlak [42] on perinatal mortality and morbidity in planned vaginal breech delivery found that the relative risk of perinatal mortality and morbidity was about two- to five-fold higher in the planned vaginal than in the planned caesarean delivery group. A meta-analysis by Mozurkewich and Hutton [43] showed that fetal or neonatal death and 5-min Apgar scores <7 were more frequent in the trial of labor group.

Although the resuwed that the cesarean section group had the better outcomes in BP, it is not presently possible to give recommendations for the management of BP. Therefore, obstetrics and gynecology organizations are expected to review neonalts of this study shotal outcomes

in BP to determine gold standard recommendations for the management of BP.

There were several limitations in the study. First, some data on factors associated with BP were not included, such as parity, maternal age, maternal body mass index, type of BP, birth trauma, and uterine scarring. Second, false negative results could have occurred in this study because of the small sample size. Therefore, further studies with larger sample sizes are needed to determine the actual association. Third, the results of this study did not fully reflect the Aceh population because samples were recruited only from Dr. Zainoel Abidin Teaching Hospital.

## CONCLUSIONS

Our study found that mode of delivery in BP had a significant association with the risk of infant asphyxia evaluated at 1 and 5 min. Our meta-analysis showed that the delivery mode had a significant association with Apgar scores in BP. Further studies using larger and prevalent sample sizes and including factors that play a role in BP and asphyxia are needed to correlate the mode of delivery in BP with the risk of asphyxia in the Aceh population.

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## Conflicts of interest

There are no conflicts of interest.

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