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POLISH JOURNAL OF PHYSIOTHERAPY

OFICJALNE PISMO POLSKIEGO TOWARZYSTWA FIZJOTERAPII

THE OFFICIAL JOURNAL OF THE POLISH SOCIETY OF PHYSIOTHERAPY

NR 3/2023 (23) KWARTALNIK ISSN 1642-0136



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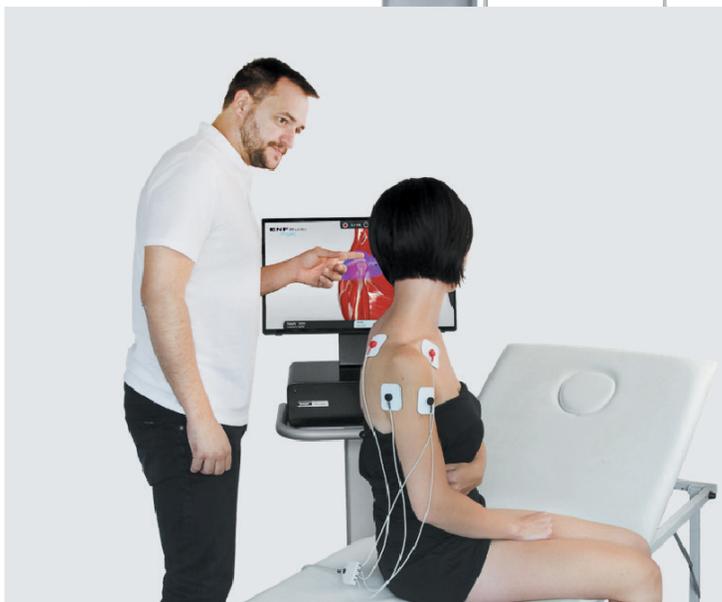
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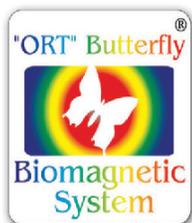
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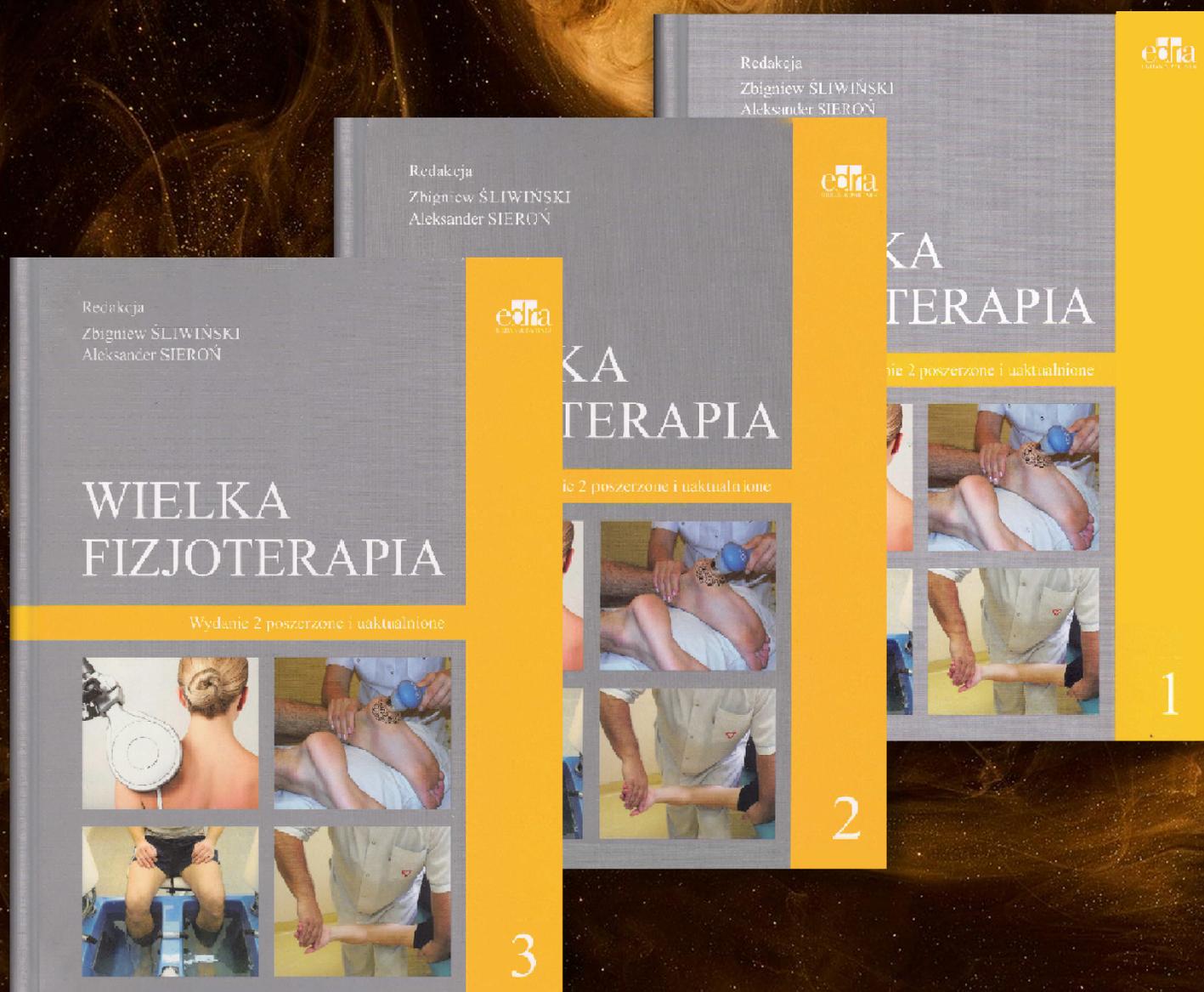


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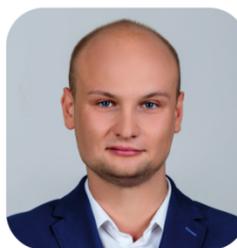
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# Effect of spontaneous cephalic version techniques with acoustic stimulation on maternal and neonatal outcomes in breech presentation: A randomized clinical trial

*Wpływ technik spontanicznego ułożenia główkowego w połączeniu ze stymulacją akustyczną na wyniki matczyno-noworodkowe w położeniu miednicowym płodu: randomizowane badanie kliniczne*

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Hamada Ahmed Hamada<sup>3(A,B,C,D,E,F)</sup>, Amal Yousef<sup>4(A,B,C,D,E,F)</sup>, Doaa Saeed<sup>5(A,B,C,D,E,F)</sup>**

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## Abstract

**Aim.** Breech presentation complicates 3-4% of all term deliveries. This trial aimed to study the effect of combining spontaneous cephalic version (SCV) techniques with acoustic stimulation on the position of breech fetuses and their subsequent impact on maternal and neonatal outcomes.

**Materials and Methods.** A randomized controlled trial was conducted involving 60 pregnant women at 32-34 weeks of gestation, all expecting a singleton fetus in complete breech presentation. They were assigned to two equal groups:

Group (A) consisted of intervention participants who performed SCV techniques in conjunction with acoustic stimulation from 34 weeks of gestation, along with routine antenatal care.

Group (B) comprised control participants who continued with their routine prenatal care up to delivery.

**Results.** The chi-square test indicated a statistically significant increase in the number of vaginal deliveries among participants in Group (A) due to the fetuses turning to a vertex position. Meanwhile, neonates from Group (B) demonstrated a statistically significant higher Apgar score value at the 1st minute of life compared to those in Group (A).

**Conclusion.** Spontaneous cephalic version techniques combined with acoustic stimulation are effective in repositioning a breech baby into a vertex position, thereby reducing the incidence of cesarean sections and associated morbidities for both mother and neonate.

## Key words:

breech presentation, spontaneous cephalic version techniques, acoustic stimulation, vertex position

## Streszczenie

**Cel.** Położenie miednicowe płodu komplikuje 3-4% wszystkich porodów w terminie. Celem tego badania było zbadanie wpływu połączenia technik spontanicznego ułożenia główkowego (SCV) ze stymulacją akustyczną na pozycję płodów w położeniu miednicowym oraz ich wpływ na wyniki matczyno-noworodkowe.

**Materiały i metody.** Przeprowadzono randomizowane badanie kontrolne z udziałem 60 ciężarnych kobiet w 32-34 tygodniu ciąży, które spodziewały się pojedynczego płodu w pełnym położeniu miednicowym. Zostały one podzielone na dwie równe grupy:

Grupa (A) składała się z uczestniczek interwencji, które stosowały techniki SCV w połączeniu z akustyczną stymulacją od 34 tygodnia ciąży, wraz z rutynową opieką przedporodową.

Grupa (B) skupiała uczestniczki kontrolne, które kontynuowały rutynową opiekę przedporodową do porodu.

**Wyniki.** Test chi-kwadrat wykazał statystycznie istotny wzrost liczby porodów drogą pochwową wśród uczestniczek z grupy (A) dzięki obróceniu się płodów w pozycję główkową. Tymczasem noworodki z grupy (B) wykazały statystycznie istotnie wyższy wynik w skali Apgar w pierwszej minucie życia w porównaniu z noworodkami z grupy (A).

**Wnioski.** Techniki spontanicznego ułożenia główkowego w połączeniu ze stymulacją akustyczną skutecznie przestawiają płód w położeniu miednicowym w pozycję główkową, co prowadzi do zmniejszenia liczby cięć cesarskich oraz powiązanych z nimi powikłań dla matki i noworodka.

## Słowa kluczowe:

położenie miednicowe płodu, położenie miednicowe płodu, stymulacja akustyczna, pozycja główkowa

## Introduction

A baby in breech presentation is defined as a fetus who is lying longitudinally with the feet or buttocks close to the cervix. This condition complicates 3-4% of all term deliveries [1]. Breech presentation incidence is influenced by both fetal and maternal diseases along with other medical conditions. Occurrence of these factors, higher the probability of breech presentation between 4% to 50% [2,3]. Failure of the fetus to turn to a cephalic presentation will lead to breech presentation at delivery. This failure can result from endogenous and exogenous factors. Endogenous factors include inability of fetus to adequately move due to fetal abnormalities such as CNS malformations, neck masses and aneuploidy [4]. While exogenous factors leading to breech presentation involve insufficient intrauterine space available for fetal movements due to possible uterine malformations or fibroids, polyhydramnios, placenta previa, and multiple gestations. Fetal anomalies are observed in 17% of preterm breech deliveries and in 9% of term breech deliveries. Breech presentation is considered a main cause to higher the incidence of perinatal mortality between 2- to 4-fold, regardless of the mode of delivery [5]. Cesarean section is considered safer than vaginal birth to deliver fetuses in breech position [6]. However, conducting cesarean sections to deliver all breech babies is difficult to implement due to limited resources available to provide this service especially in developing countries [7]. The risk of harm or death for the breech baby is reduced dramatically by cesarean section but it does increase to the mother compared with a vaginal delivery [6]. Additionally, under certain circumstances cesarean sections are not always available or possible because of mother's decision. Vaginal delivery of a breech baby was previously the norm until 1959. A breech presentation with the fetus buttocks are the first to come out is preferred when vaginal delivery is attempted [8]. External cephalic version (ECV) is the transabdominal manual rotation of the fetus from a bottom first position to a head first position [9]. External cephalic version (ECV) is a safe alternative to vaginal breech delivery or cesarean delivery, reducing the cesarean delivery rate for breech by 50%. ACOG (2016) recommends offering ECV to all women with a breech fetus near term [10]. Other turning techniques mothers can do on their own are referred to as "spontaneous cephalic version" (SCV); these techniques can turn the fetus without any medical assistance. These techniques include assuming certain positions as well as performing certain exercises with acoustic stimulation to the mother's abdomen. All these techniques can be done at 34 weeks' of gestation [11,12]. Vibroacoustic stimulation (VAS), is the application of a vibratory sound stimulus to the abdomen of a pregnant woman to induce fetal heart rate FHR accelerations.13 up till now, there are no trials conducted to determine the effect of adding spontaneous cephalic version techniques with acoustic stimulation to routine antenatal care at the end of 3rd trimester to help in turning breech baby and prevent complication to fetuses and mothers. Therefore, this clinical trial was directed to study the effect of adding spontaneous cephalic version techniques with acoustic stimulation at the

end of pregnancy on turning breech fetus and its effect on maternal and neonatal outcomes.

## Materials and Methods

### Study Design

The study design was selected as a randomized clinical trial that compared 2 groups. Group (A) included the intervention participants who performed SCV techniques together with acoustic stimulation from 34 weeks of gestation onwards till the date of delivery with routine antenatal care [11]. While Group (B) included the control participants who continued their routine pre-natal care till the date of delivery. Coding of all participants' data was used to ensure anonymity of participants. Assigning participants to groups was conducted by a blinded and independent research assistant who randomly opened sealed envelopes contained a computer -generated randomization card.

### Sampling

Recruiting eligible participants took place for 6 months from May 2022 till November 2022. Eventually, 60 pregnant women at their 32-34 weeks of gestation expected a single healthy fetus presented by complete breech diagnosed by an obstetrician and confirmed by ultrasonography (Medison Apparatus X6). Participants were either primiparous or multiparas with the history of vaginal delivery. All of them recruited from the maternity unit of Beni-Suef University Hospital, Beni-Suef, Egypt. Participants' age ranged from 25 and 35 years and their body mass index (BMI) was not higher than 40 kg/m<sup>2</sup>. Women were excluded from the trial if they had placenta previa, a history of antepartum hemorrhage, hypertensive disease, intra uterine growth retardation, iso-immunization, uterine anomaly, previous uterine operations, multiple pregnancy, premature rupture of membranes, fetal congenital anomaly, any contraindication to vaginal breech delivery as contracted pelvis and increased fetal weight or fetal death in uterus. Informed consent has been obtained from all participants included in this study.

### Ethical approval

The research related to human use has been complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the ethical committee at the institutional review board of the Faculty of Physical Therapy, Kafr El Sheikh University.

### Procedure

The study sample included 2 equal groups of eligible participants each group included 30 participants. Additional confirmation screening for the inclusion and the exclusion criterion and demographic data was conducted, including age and BMI. A full assessment of history was performed for each patient in both groups prior to the start of the study in accordance with the items of the data recording sheet. Spontaneous cephalic version techniques (SCV) were

performed by group (A) participants with the help of a woman health physiotherapist through conducting positioning and exercise sessions 5 times per week starting from 32-34 weeks of gestation on wards till the date of delivery at the physical therapy department of Beni-Suef University hospital. While vibroacoustic stimulation was done by the obstetrician by means of a simple artificial larynx on the head of the fetus through the mother's abdomen while conducting routine ultrasonography (Medison Apparatus X6). Vibroacoustic stimulation was conducted for 10 seconds and repeated 7 times per session. Additionally, these stimulations were executed 3 times per week only for fetuses showing signs of turning from buttock-first position to a head-first position with instructing the mother to wear abdominal binder after ultrasonography [13]. All exercise sessions were held by the same physiotherapist. Guidelines of the American College of Obstetricians and Gynecologists (ACOG) for exercise during pregnancy with its FITT principle (frequency, intensity, time, and type) were applied to exercises and positions used in conducting SCV technique sessions with a frequency of minimum 5 times per week, intensity set at moderately hard perceived exertion, time of 60 minutes per day, and type of low impact. Number of participants per session was limited to six to ensure their close supervision. SCV sessions were divided into 3 phases a warming-up phase followed by an active phase then a cooling-down phase. Warming -up phase included walking on treadmill to train large muscle groups for 10 minutes. This phase intensity was monitored using target heart rate zones, the Borg scale (rating of perceived exertion), or the 'talk test' [14]. Heart rate zones provided in the ACOG guideline corresponded to moderate-intensity exercise (60–80% of maximal aerobic capacity,  $VO_{2max}$ ). Also, this phase included posture correction exercises from crock lying, supine, and sitting and standing positions (each exercise was maintained for 5 s and then the woman relaxed for 10 s and repeated this 5 times), diaphragmatic and lateral costal breathing exercises (the woman took a deep breath for 5 s and relaxed for 10 s and repeated this 3 times). Active phase was practiced solely by participants included mainly general relaxation and feeling muscle sense for 10 minutes. Next, assuming a modified side lying position combined with natural and quiet breathing for 15 minutes. Women were instructed to lie on their right side if the fetal back was on the left side or lie on their left side if the fetal back was on the right side, Participants were instructed to preferably repeat this position multiple times a day [15]. Then, assuming a knee to chest position for 15 minutes [16]. Finally cooling down phase included maintaining cross-sitting and squatting positions each for 5 minutes. Additionally, Diversion drill training for 3 minutes and panting breathing for 2 minutes. This regimen practiced by participants of Group (A) till the date of delivery. Participants performed SCV techniques five times per week under supervision of physiotherapist, whereas for the remaining 2 days, they were instructed to perform the

same techniques as in the program at home onwards till the date of delivery while maintaining previous positions with empty stomach. Compliance with home-based exercise was monitored by a self-recorded diary. Attendance of at least 15 out of 20 sessions was required to complete the intervention.

In Group (B), the control participants continued their lifestyle with the routine antenatal care till the date of delivery. At delivery, the obstetrician tried ECV for all participants in both groups who did not show any change in fetal position before taking decision to conduct cesarean delivery.

## Outcome measures

### *Mode of delivery*

Delivery mode included normal vaginal delivery that involved either spontaneous vaginal delivery or instrumental vaginal delivery which required the use of special devices such as forceps or a vacuum extractor as well as caesarean section.

### *Apgar score*

Apgar score was mnemonic word to aid learning referred to appearance, pulse, grimace, activity, and respiration. It was used to assess the neonates' condition during critical first and fifth minutes of newborn life in neonates of both groups' participants. By adding scores for the above items, the resulting Apgar score ranged from 0 to 10. Scores below 3 were generally considered critically low, 4–6 as low, and higher than 7 as generally normal [17].

### *Data analysis*

All statistical procedures either descriptive or inferential were performed by using the Statistical Package for the Social Sciences (SPSS) software, version 23 for Windows. The analysis involved two primary variables. The first one was mode of delivery which was determined by using  $\chi^2$ -test to reveal if there was a statistically significant difference between the two groups regarding mode of delivery. The second variable was the neonates' Apgar score (measuring periods) t- test was used to determine whether there was a statistically significant difference in the APGAR score values in the neonates of Group (A) and neonates of Group (B) at first and fifth minutes of life. Preliminary assumption checking revealed that data were normally distributed, as assessed by a normal Q-Q plot. The examination of studentized residuals for values greater than  $\pm 3$  proved that there were no outliers.

## Results

Base line measurements revealed no statistically significant differences ( $p > 0.05$ ) between the participants in both groups concerning age, BMI, or gestational age. However, the chi-square test revealed significant difference between the groups in the mode of delivery with sixteen fetuses (53.33%) turned into vertex position at delivery in Group (A) participants ( $p < 0.05$ ) (Table 1) and (Table 2).

**Table 1. Demographic characteristics of both groups**

Variable	Group (A)	Group (B)	t-value	Comparison	
	Mean ± SD	Mean ± SD		P-value	Significance
Age (years)	28.23 ± 2.87	29 ± 3.07	0.112	0.326	NS
BMI (kg/m <sup>2</sup> )	33.01 ± 1.73	33.83 ± 1.88	0.54	0.085	NS
Gestational age (weeks)	33.33 ± 1.49	33.33 ± 1.49	0.00	1.00	NS

SD: standard deviation, BMI – body mass index, S – significant, NS – non-significant.

**Table 2. Mode of delivery of both groups**

Mode of delivery distribution, n (%)	Group (A)	Group (B)	X <sup>2</sup>	p-value	Significance
Spontaneous vaginal delivery	19 (63.4%)	7 (23.4%)	14.105	0.001	S
Operative vaginal delivery	6 (20%)	4 (13.4%)			
Caesarean delivery	5 (16.6%)	19 (63.4%)			

X<sup>2</sup>: Chi-square test, p-value-probability value, S – significant.

With regards to the APGAR score values, at the first minute of life there was a statistically significant difference between the mean value of the APGAR score of Group (A) neonates and Group (B) neonates with the higher values in

neonates of Group (B). However, at the fifth minute of life, there was not any statistically significant difference in the mean value of the APGAR score in neonates of both groups (Table 3).

**Table 3. Apgar score at different measuring periods in both groups**

APGAR score	Group (A) (Mean ± SD)	Group (B) (Mean ± SD)	Mean difference	95% CI	P-value	Significance
At 1st minute	6.43 ± 0.5	7.23 ± 0.43	0.8	(0.558–1.042)	0.0001*	
At 5th minute	8.7 ± 0.46	8.7 ± 0.46	0	(0.369–0.965)	0.667	

SD: standard deviation, 95% CI – 95% confidence interval.

## Discussion

The result of this study revealed two statistically significant differences in two different variables. First, the mode of delivery was mainly spontaneous vaginal delivery in Group (A) participants with sixteen fetuses delivered spontaneously by cephalic vaginal delivery. While it was mainly cesarean section in Group (B) participants. Second, the Apgar score value at the 1st minute of neonates' life was significantly higher in neonates of Group (B). However, there was no statistically significant difference in the Apgar score value at fifth minute of life between neonates of both groups.

The present study results are in agreement with those of Kuswandi and Mongan, who discovered that for mothers with breech presentation practicing relaxation exercises reinforced by imagining and communicating with the baby could help the breech baby to turn into the vertex position and reduce the need to conduct cesarean sections as well as decrease risks to the fetus during and after delivery [18,19]. Also, this trial findings are in line with those of Aprilia et al, who found that maintaining knee

to chest position properly and regularly at the end of 3rd trimester most likely could turn a breech baby to its normal position [20]. Combining fetal acoustic stimulation with certain positions and relaxation training to change the layout of a baby would most likely help breech baby to return to its normal position. Rotation of the fetal head would be stopped if the mother experienced fear or strained which would result the uterus to remain tense, and the baby would get less space for turning [21]. Additionally, these findings are supported by those of the Japanese obstetrician, Taoka who introduced the lateral position for breech presentation in 1943 to allow the fetus to fall headfirst into the amniotic fluid cavity supported by gravity and promote rolling forward; assuming this position is still used nowadays in breech presentation to prevent cesarean delivery [22]. Lying in a lateral position is a safe and easy method that can be performed from 28 to 29 weeks of gestation.

However, this trial results are not supported by those of Marumo et al., who revealed that the knee-chest position was still controversial because it sometimes induced dysphoria or uterine

contractions [23]. In another randomized clinical trial of 105 women, higher mean Apgar scores were observed at the 1st minute, but not at the 5th minute, among newborns of women assigned to training and positioning during pregnancy [24]. This was observed in a per-protocol analysis and not in an intention-to-treat analysis, and the Apgar score at the 5th minute is considered a better sign of newborn wellbeing than that at the 1st minute [25,26].

The findings of this study provide grounds for advocating pregnant women with breech presentation to assume specific positions combined with relaxation training and acoustic stimulation to the fetal head to help in turning the fetus thus, prevent the risk of cesarean delivery together with saving the neonate from complications associated with cesarean delivery in resource-limited countries.

### Limitations

Although this study was designed as a randomized clinical trial, its small sample size is its main limitation. Based on

sample size estimation with the power of the study  $1-B = 80\%$  to detect the effect size of  $d = 0.5$  with a significance level of  $< 0.05$ , 50 participants were needed for each group.

### Conclusion

In conclusion, spontaneous cephalic version techniques in the form of assuming certain positions like lateral position and knee to chest position together with communicating with the fetus by acoustic stimulation are effective in turning breech baby into vertex position as well as decreasing incidence of cesarean section and its morbidities on mother and her neonate. So, these techniques must be added to routine antenatal care during third trimester of pregnancy to all women with breech presentation.

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