

Effect of Open Glottis versus closed Glottis (Valsalva) in Second Stage of Labor on Maternal and Neonatal Outcomes

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Abstract

Background: Maternal pushing during the second stage of labor is crucial and important contributor to the involuntary expulsive force developed by uterine contraction results to influence on the mother and fetus. **Aim:** the study was conducted to compare between the effect of open glottis versus closed glottis (Valsalva) in second stage of labor on maternal and neonatal outcomes. **Methods:** Setting: Delivery Unit of Beni-suef University Hospitals. **Design:** A quasi-experimental comparative study. Subjects: A purposive sample of a total of 150 primiparous women; 75 in the Open Glottis group & 75 in the closed glottis (Valsalva) group. **Tools:** four tools were used; structured interviewing questionnaire, Apgar score, Visual analog scale, and women satisfaction questionnaire. **Results:** The duration of the 2nd stage of labor was shorter (5-10 min) in an open glottis (spontaneous) (54.0%) group compared to the closed glottis pushing group (2.0%). Oxygen wasn't used at all in open glottis pushing group compared to 74.0% of closed glottis pushing group. postpartum hemorrhage was too little in open glottis pushing group (96.0%) compared to 36.0% of the closed glottis pushing group. Also, all women in the open glottis pushing group experienced mild perineal pain compared to 32.0% in the directed pushing group ($p < 0.001$). The individual items of the VAS were significantly higher in the closed glottis pushing group than those in the open glottis pushing group. According to Apgar's score, there was a significant difference between the two groups during both the first and fifth minutes of birth. In the closed glottis pushing group, a higher proportion of babies are admitted to ICU than those in the open glottis pushing group (18.0 percent versus 10.0 percent). **Conclusion;** open glottis pushing during the 2nd stage of labor enhanced neonatal and maternal outcomes; whilst closed glottis pushing was associated with an increased duration of the 2nd stage of labor, risk of adverse neonatal outcomes and the postpartum hemorrhage was too little in open glottis pushing group. **Recommendations:** It may be recommended that open glottis pushing during the second stage of childbirth be included in the procedure for maternal hospitals.

Key words: : Maternal, neonatal, outcomes, open glottis, closed glottis (Valsalva), pushing, second stage of labor

Introduction

Childbirth, known as liberation or labor, is the termination of pregnancy when one or more offspring leave the uterus through

the vaginal canal or by Caesarean section

(Martin, E. 2015); Ibrahim, H., Elgzar, W., & Hassan, H. 2017). The most popular style of delivery is vaginal delivery (FIGO, 2012). Labor is alienated into 4 stages, the 1st stage begins from

the onset of painful and regular uterine contractions until the full dilatation of the cervix. The 2nd stage will begin from full dilatation of the cervix up to the expulsion of the fetus, the presenting part of the fetus may/may not be completely engaged at the beginning of the 2nd stage, and the woman may/may not have the advise to push. From the beginning of delivery of the baby till to the expulsion of the placenta and its membranes; it is the 3rd third stage of labor. The final stage is referred to as the 4th stage which represents a few hours following the expulsion of the placenta (**Memon, H., & Handa, V. 2013**). The transition from the 1st stage to the 2nd stage of labor is characterized by whole dilatation of cervix as evident by vaginal examination, beginning of bearing down effort, the crowning of the head, urge to defecate during a contraction when head presses the rectum, anal dilation during uterine contraction. The uterine contractions are more ordinary, more powerful, and last longer during the second stage. Throughout the descent of the presenting part, the resistance offered by the soft tissue & elastic recoil offered by the pelvic floor's soft tissue is overcome by physically powerful uterine contractions & retraction and the bearing down the effort of the mother (**Singh, 2019**). Spontaneous pushing happens when laboring women feel able to push. Pregnant women who were using open glottis pushing reported increasing levels of satisfaction with their birth experience. Spontaneous pushing enhanced fetal and maternal oxygenation (as measured with cord blood gas and patterns of fetal heart rate) (**Osborne & Hanson, 2012**). The technique of pushing used during the 2nd stage of labor is the chief factor that physician and/or nurse, and midwives as well should endorse during the delivery period. During closed glottis pushing the care-providers should detect a completely dilated cervix and laboring women should be instructed and encouraged to push at every uterine contraction within the 2nd stage of labor. This pushing will be done in the early or pelvic stages in which the women don't feel able to push at this stage. Fetal head has moved down to the pelvic cavity, it is not low sufficient to pressure the pelvic floor and distend the perineum. At this time the delivery women had no urge to push

This results in a huge effort for a prolonged period of time due to the height of the fetal head, resulting in maternal tiredness during labor and raised level of fatigue during the postpartum period (**Yildirim & Beji, 2008**); (**Farag & Hassan, 2019**). The nursing role in labor unit is a vital role to observe maternal, fetal, and newborn conditions. Close observing in the inpatient settings is indicated for both maternal and fetal safety. Intake/output and uterine contractions should be monitored. In addition, cervical dilatation and effacement should be documented. Moreover, fetal observation is also required; continuous observing of fetal heart rate (FHR) is usually needed (**Hodnett, et al., 2011**). Nursing care for women during the 2nd stage of labor is multifaceted, involves intelligent and repeated assessments of both the mother and her fetus, encouraging fetal descent, and supporting a woman's ability to cope with labor and pushing (**Hanson, 2009; Hodnett, et al., 2011**). Maternity nurse should be record the progress of labor, reports nonstandard findings, and provides actions of support and encouragement of comfort, and prevents of infection as well (**Christine & Mcdonald, 2010**). Frequent change in position will be effectual in promoting relaxation and will facilitating fetal rotation and descent, as well. Comfort positions are also useful (**Abd-Allah, et al., 2017**). Periodic vaginal exams (PV) help in noticing the status of cervical dilation and effacement. Monitoring vital signs hourly, in the last phase, and every 30 minutes, in the active phase, of labor should be considered. Fetal heart rate (FHR) patterns and the duration of contractions, as well, should be observed and documented (**Orshan, 2008 ; Hassan & Nasr, 2017**). Throughout labor, the woman is given a complete physical examination, estimation of nutrition and fluid state, energy level, pain presence or absence, breast health, fundal height and consistency, lochia quantity and nature, perineal integrity, and circulatory sufficiency (**Orshan, 2008; Farag & Hassan, 2020**).

Significance of the study

Although 139 million offspring are now born annually worldwide, the health care team still do not know what type of pushing to recommend during labour, especially for women with epidural

analgesia, because of the type of pushing linked

with the least maternal-fetal morbidity has not yet been determined (Barasinski, Legrand & Vendittelli, 2019). Existing obstetric practices must thus be assessed so that academic training of perinatal professionals and counseling of pregnant women during pregnancy and labor can be suitably modified on the basis of evidence.

Aims of the Study

The research was carried out to compare between effect of open glottis versus closed glottis (Valsalva) in second stage of labor on maternal and neonatal outcomes.

Hypotheses

- Women with open glottis pushing during the 2nd stage of childbirth would have better maternal outcomes (shorter 2nd stage length, better perineal status, lesser postpartum fatigue)
- Fetal outcomes of open glottis pushing would have better (wellbeing, APGAR score) compared to closed glottis (Valsalva) pushing technique

Subjects and Methods

Research Design: A quasi-experimental comparative research design (study and control groups) was used to fulfill the aim of this study.

Study Setting

The present research was carried out at the Labor Units affiliated to Beni-Suef University Hospital. The labour Room 3 × 5 meters. Has a single delivery bed and bed side instrument tray. There is druger anesthesia machine, bed side monitors, also supplied with light source and Vacuum suction for humidity .during the period from February 2021 to July 2021.

Sampling

A purposive sample of 150 laboring women was eligible to participate in this study. Participate in the current study and to complete a written questionnaire and divided into (75parturient women closed glottis (Valsalva) pushing technique & 75parturientwomen open glottis pushing).

Women should be fulfilled the following inclusion criteria:

- Women who primiparous and singleton fetuses, in cephalic presentation.
- Gestation age between 37 and 40 weeks.
- Women who in active phase of the 1st of labor.
- Expected to have a vaginal delivery.
- Women who free from any obstetric or medical complications.
- Women who agree, able and available to share in this study.

Women will be excluded if they are:

- Women who less than 18 years old.
- Women who had a history of previous uterine surgery or cesarean delivery (CS).

Women who have an any contraindicating expulsive efforts condition or that may justify emergency delivery

Tools of Data Collection

Four tools were used for data collection in this study.

Tool I: A Structured-Interviewing-Questionnaire:- It is composed of 2 parts.

- a. **Part I: Women's socio-demographic data,** (age, education, occupation, residence, family income, and telephone number).

Part II: Mothers' current labor and delivery data. Maternal data includes the duration of labor stages, use of oxytocin, duration of pushing, episiotomy, postpartum hemorrhage level, tear and its degree, degree of perineal pain (mild, moderate, or severe) and amniotic fluid characteristics .

Tool II: Newborn's Data Sheet: Which Include

- a. **Apgar score**

This is a simple method to assess of the newborns' condition. It is carried out at the 1st minute and 5th minutes after fetal expulsion. It is based on an assessment of 5 physical signs, such as; heart rate, respiratory effort, reflex irritability, muscle tone, and color of skin. Its total score ranges from zero to 10. A score of

"0" means the absence of these signs, while 10 mean a totally healthy infant; however, infants' rarely score 10 at the 1st minute. If the newborn score ranges from 7 to 10, this indicates good newborn condition. A score from 4 to 6 indicates moderate newborn condition (moderate asphyxia), and from 0 to 3 indicates very bad newborn condition (sever asphyxia).

b. Admission of neonatal in an intensive care unit (NICU)

Tool III: Visual Analog Scale for Fatigue (VAS-Fatigue)

The original VAS-Fatigue scale consists of 18-items (13 items for fatigue and 5 items for energy). It is a valid tool that was previously tested for its validity and reliability (Lee, Hicks, & Ninomurcia, 1991). VAS-Fatigue was assessed three times; immediately; 2-hours and 24-hours after labor; by asking each woman to mark her level of fatigue/energy on 10 cm scale, The scale is horizontally line numbered from 1 to 10 were graded as the subsequent, mild fatigue score (1-3), moderate fatigue score (4-6), and severe fatigue score (7-10). Every woman was requested to mark the horizontal line with (√). Finally, by calculating the point at which the (√) mark was located the researcher calculates the fatigue score.

Tool IV: Women's Satisfaction Questionnaire

This tool developed by Yurachai (2006) and used by the researcher to evaluate the level of women's satisfaction regarding the pushing technique used during labor. It was demonstrated by selecting one of two options; either satisfied score 1 or not satisfied score 0.

Validity and Reliability

Before starting the fieldwork, the developed tools were reviewed by 5 specialists in the maternity specialty and their comments were considered. The tool's accuracy was based on Cronbach ALPHA. The Cronbach's alpha for the reliability was 0.76.

Ethical Considerations

Participants were provided with explanations about the goal of the research, and were also told that they could withdraw from the study at any time before the study was finish. A consent form had been requested to sign by the participants who agreed to connect in this study. Details about the confidentiality of the participants' data were ensured. Participants know ledged that only the investigators involved in the study accessed and manipulate their data.

Pilot Study

It was carried out on 10.0% of the total sample before starting the data collection, who were excluded from the final study sample. This was done to identify any ambiguity of the questions and to evaluate the applicability and clarity of the tools and to estimate the time needed to fill in the tool. According to the results of the pilot study, the statements were clear and tools are feasible.

Field Work

After obtaining official permission from the director of Beni- Suef University hospitals and the agreement of the chairman of obstetrics departments, data were collected through a period of nearly 6 months from the beginning of February 2021 to July 2021, the researchers visited the study setting 3 days/week from 9 am to 3 pm. The researcher introduced herself and briefly explained the goal and technique of this study to the eligible women. The researcher then divided the sample into two groups the first attendance 75 eligible parturient women were assigned to the closed glottis (Valsalva) pushing technique group, while the second attendance 75 eligible parturient women were assigned to the open glottis pushing group.

A. Group (1): Closed glottis (Valsalva) pushing technique group (n=75)

Women in this group were subjected to the directed pushing or closed glottis (Valsalva) pushing technique. By instructing her to take deep breathes and holds it (Valsalva maneuver), high abdominal pressure induced by descent of the diaphragm and repeat the same technique

with each uterine contraction until birth. Labor progression will be decided by the obstetricians by vaginal examination (PV). Just the once fully dilatation of the cervix dilated, the researcher instructs and gives confidence laboring women to push at the start of each uterine contraction, whether they had able to push or not. The researcher can distinguish the uterine contractions by positioning her palm at the funds of the uterus above the woman's abdomen. When a contraction starts, the laboring women were requested to acquire a deep breath and hold it while both hands hold on the bedside rails and push strongly for as long as possible (closed glottis); they were educated to repeat the same procedure with every contraction until birth.

B. Group (2): Open glottis pushing technique group (n=75)

Women in this group were subjected to the open glottis pushing or spontaneous pushing technique. They only started to push when they felt the need to do. Throughout the first stage, they were taught by the researcher to relax during uterine contractions by inhaling deeply-slowly and exhaling deeply-slowly until the contraction had stopped (breathing exercise), while in the second stage they were educated to push spontaneously, by pushing only during a contraction when you feel the urge to bear down or have a bowel movement and by not holding your breath so rest in between, without exact guidance about timing and length of push. At what time the crown was visible at 2-3 cm, the laboring woman was sent to the labor room to complete the birthing procedure.

For open glottis pushing and closed glottis pushing groups

Maternal Assessment

- Levels of fatigue and energy were evaluated using VAS-Fatigue immediately, at 2 and 24 hours postpartum. As well as, women's satisfaction regarding the technique that was evaluated on the discharge time was

the primary outcome.

- Duration of the 2nd stage, perineum status; either episiotomy incision or tear, and the level of perineal pain were the secondary outcomes.

Neonatal Assessment

- Apgar score was evaluated at the 1st and 5th minute postpartum.
- Admission to the neonatal intensive care unit (NICU).

Statistical Analysis

The collected data were coded, processed, and analyzed using the SPSS (Statistical Package for Social Sciences) version 15 for Windows (SPSS Inc, Chicago, IL, USA). Qualitative data were presented as number and percent. Chi-Square test was performed to get a comparison between the two groups. It provided quantitative data as mean \pm SD. Two groups were compared using the Student t-test. $P < 0.05$ was considered statistically relevant. The graphical presentation included a 3-D Cylinder diagram.

Results

Table (1) Poetries general characteristics of both open glottis pushing and closed glottis pushing groups according to their demographic characteristics. There was no significant difference between the both groups as regards the age of the participants, educational level, occupation status residence, and family income ($P > 0.05$).

Table (2) shows that there was no significant difference between the two as regard onset of delivery and increase in oxytocin dose, the labor started spontaneously in the majority of both groups, the dose of oxytocin not increased in 44 women (59.7%) in closed glottis pushing group and 50 of women (66.7%) in open glottis pushing group. The table revealed that there was a significant concerning the duration of the second stage of labor, oxygen use, and use of analgesia. The duration of the second stage of labor was 5-10 min in 38 women (50.7% of open glottis pushing group), while the duration of the second stage of labor was ≥ 20 min, 30 women, 40% of closed glottis pushing group. Oxygen not used in 50 women of closed glottis pushing

group (66.7%) and 75 women (100% in open glottis pushing group). Analgesia not used in 40 women of closed glottis pushing group (52.3%) and 53 women (70.7% in open glottis pushing group).

Table (3) clears that the duration of the 2nd stage of labor was shorter (5-10 min) in a open glottis (spontaneous) (54.0%) group compared to the closed glottis pushing group (2.0%) and there was a significant difference between the two groups concerning the duration of the current labor stages ($P < 0.05$).

Table (4) represents the comparison of maternal outcomes between closed glottis pushing and open glottis pushing groups. The table shows that the postpartum hemorrhage was too little in 72 of participants (96%) of open glottis pushing group while the postpartum hemorrhage was too little in 35 of participants (46.7) of closed glottis pushing group. Among the women in the closed glottis pushing group, 22 (29.3%) had intact perineum while among the women in the open glottis pushing group 56 (74.7%) had intact perineum. Also, perineal pain was mild in 25 (33.3%), and moderate in 35 (46.7%) of the women in the closed glottis pushing group compared to 75 (100%) had mild pain in the open glottis pushing group. All women in the open glottis pushing group had clear amniotic fluid.

Table (5) illustrates that the Apgar score at the first minute was good in 45 babies (60%) of the closed glottis pushing group and 75 babies (100%) of the open glottis pushing group, there was a significant difference between the two groups ($P = 0.001$).

Apgar score at the fifth minute was differing significantly between the two groups. A higher rate of babies in the closed glottis pushing group was admitted to the ICU than those in the open glottis pushing group (15% versus 6.7%, $P = 0.249$).

Table (6) shows the comparison of the women's satisfaction between the closed glottis and open glottis pushing groups. This table reveals that the women in the open glottis pushing group more frequently found that they can have appropriate and adequate control over her care (100% versus 56% respectively, $P < 0.001$), more frequently found that the persons responsible for her care were caring and compassionate (100% versus 66.7% respectively, $P < 0.001$), more frequently found that their needs have been addressed with appropriate consideration for her time (100% versus 64% respectively, $P < 0.001$), and 75 (100%) of the open glottis pushing groups found that they would choose the same type of care for her next labor and 43 (57.3%) of the closed glottis pushing groups found that they would choose the same type of care for her next labor.

Table (7) showed that the individual items of the VAS-fatigue were also significantly higher in the closed glottis Pushing group than those in the open glottis pushing group.

Table1. Distribution of the general characteristics of both spontaneous pushing and directed pushing groups according to their demographic data (each group n=75)

Socio-demographic data	Closed glottis pushing (75)		Open glottis pushing (75)		F / χ^2 (P)
	No	%	No	%	
Age:					
<25-	21	28.0	18	24.0	1.363 (0.506)
25-30	45	60.0	39	52.0	
30-35	6	8.0	15	11.25	
≤35	3	4.0	3	8.0	
Level of education:					
- Illiterate/Read & Write	3	4.0	2	2.7	1.852 (0.327)
- Primary	25	33.3	3	4.0	
- Secondary/equivalent	35	46.7	62	82.7	
- University	12	16.0	8	10.6	
Occupation:					
- Housewife	60	80.0	45	60.0	1.101 (0.506)
- Working	15	20.0	30	40.0	
Residence:					
- Rural	40	53.3	32	42.7	1.248 (0.536)
- Urban	35	46.7	43	57.3	
Family income					
-Enough	63	84.0	66	88.0	1.222 (0.426)
-Not enough	12	16.0	10	12.0	

Table 2. Comparison of the current labor data between open glottis pushing and closed glottis pushing groups (each group n=75)

Variables	Closed glottis pushing (75)		Open glottis pushing (75)		χ^2	P
	No	%	No	%		
Onset of delivery						
• Spontaneous	50	66.7	55	73.3	2.767	0.096
• Induction	25	33.3	20	26.7		
Increase in oxytocin dose						
• Increased	31	41.3	25	33.3	1.563	0.211
• Not increased	44	59.7	50	66.7		
Oxygen use						
• Used	25	33.3	0	0.0	14.943	<0.001*
• Not used	50	66.7	75	100.0		
Duration of the 2nd stage of labor						
• 5-10 min	5	6.7	38	50.7	54.364	<0.001*
• 10-15 min	15	20.0	27	36.0		
• 15-20 min	25	33.3	10	13.3		
• ≥20 min	30	40.0	0	0.0		
Use of Analgesia						
• Yes	35	46.7	22	29.3	6.250	0.012*
• No	40	52.3	53	70.7		

Table 3. Comparison of duration of the current labor stages between the two groups

Variables	Closed glottis pushing (75)	Open glottis pushing (75)	T	P
Duration of first stage (in minutes)	381.2 ± 336.92	31.8 ± 6.29	7.151	0.000*
Duration of second stage (in minutes)	34.8 ± 34.81	14.9 ± 5.04	4.269	0.000*
Duration of third stage (in minutes)	26.1 ± 31.88	11.4 ± 1.47	2.933	0.005*

Table 4. Comparison of maternal outcome between directed pushing and spontaneous pushing groups

Variables	Closed glottis pushing (75)		Open glottis pushing (75)		χ ²	P
	No	%	No	%		
Postpartum hemorrhage					40.970	<0.001*
• Too little	35	46.7	72	96%		
• Mild	20	26.7	3	4%		
• Moderate	20	26.7	0	0%		
Condition of perineum					17.359	<0.001*
• Intact Perineum	22	29.3	56	74.7		
• 1 st Degree Laceration	28	38.4	13	17.3		
• 2 nd Degree Laceration	25	33.3	6	8.0		
Severity of perineal pain					17.359	<0.001*
• Mild	25	33.3	75	100.0		
• Moderate	35	46.7	0	0.0		
• Severe	15	20.0	0	0.0		
Amnionic fluid characteristics					12.360	0.002*
• Clear	49	65.3	75	100%		
• Bloody	15	20.0	0	0%		
• Meconium stained	11	14.7	0	0%		

Table 5. Comparison of the newborn outcome between the two groups (each group = 75)

Variables	Closed glottis pushing (75)		Open glottis pushing (75)		χ^2	P
	No	%	No	%		
Apgar score at the 1st minute						
• Good (8-10)	45	60.0	75	100%	13.636	0.001*
• Moderate asphyxia (7-5)	28	37.3	0	0%		
• Sever asphyxia (≤ 4)	2	2.7	0	0%		
Apgar score at the 5th minute						
• Good (8-10)	61	81.3	75	100%	9.890	0.007*
• Moderate asphyxia (7-5)	13	17.3	0	0%		
• Sever asphyxia (≤ 4)	1	1.4	0	0%		
Admission of neonatal in intensive care unit (NICU)						
• Yes	15	20.0	5	6.7	1.529	0.249
• No	60	80.0	70	93.3		

Table 6. Comparison of the newborn outcome between the two groups (each group = 75)

Variables	Closed glottis pushing (75)		Open glottis pushing (75)		χ^2	P
	No	%	No	%		
Appropriate and adequate control over my care						
• Yes	33	44.0	0	0%	29.870	<0.001
• No	42	56.0	75	100%		
Caring and compassionate from the person responsible						
• Yes	25	33.3	0	0%	17.647	<0.001*
• No	50	66.7	75	100%		
Dealing effectively with problem have arisen up						
• Yes	47	62.7	45	60.0	0.0	1.0
• No	28	37.3	30	40.0		
Appropriate consideration addressed my needs for my time						
• Yes	27	36.0	0	0%	20.482	<0.001*
• No	48	64.0	75	100%		
The organization of my care has not been suitable						
• Yes	60	80%	65	86.7	1.961	0.161
• No	15	20%	10	13.3		
Would want the same type of my care for my next pregnancy						
• Yes	32	42.7	0	0%	28.205	<0.001*
• No	43	57.3	75	100%		

Table 7 Distributions of fatigue scale between the two groups (each group = 75)

Variables	Closed glottis pushing (75)		Open glottis pushing (75)		χ^2	P
	No	%	No	%		
Not at all tired						
• Mild	20	26.7	49	65.3	29.459	<0.001*
• Moderate	35	46.7	20	26.7		
• Severe	20	26.7	6	8.0		
Not at all sleep						
• Mild	25	38%	49	65.3	21.030	<0.001*
• Moderate	35	38%	20	26.7		
• Severe	15	24%	6	8.0		
Not at all drowsy						
• Mild	19	28%	49	65.3	27.874	<0.001*
• Moderate	41	52%	20	26.7		
• Severe	15	20%	6	8.0		
Not at all fatigue						
• Mild	18	26%	49	65.3	30.444	<0.001*
• Moderate	42	50%	20	26.7		
• Severe	15	24%	6	8.0		
Not at all worn out						
• Mild	15	20%	49	65.3	35.968	<0.001*
• Moderate	45	60%	20	26.7		
• Severe	15	20%	6	8.0		
Not at all energetic						
• Mild	17	22.7	49	65.3	24.767	<0.001*
• Moderate	50	66.7	20	26.7		
• Severe	8	10.6	6	8.0		
Not at all active						
• Mild	17	22.7	49	65.3	24.767	<0.001*
• Moderate	50	66.7	20	26.7		
• Severe	8	10.6	6	8.0		
Keeping the eyes open is no effect at all						
• Mild					17.668	<0.001*
• Moderate	17	22.7	53	70.7		
• Severe	48	64.0	18	24.0		
Moving my body is no effect at all						
• Mild					24.706	<0.001*
• Moderate	17	22.7	53	70.7		
• Severe	50	66.7	18	24.0		
Concentrating is no effect at all						
• Mild					23.86	<0.001*
• Moderate	17	22.7	53	74%		
• Severe	50	66.7	22	26%		
I have absolutely no desire to close my eyes						
• Mild					26.420	<0.001*
• Moderate	18	24.0	53	70.7		
• Severe	49	65.3	15	24		
I have absolutely no desire to lie down						
• Mild					25.615	<0.001*
• Moderate	18	24.0	53	70.7		
• Severe	49	65.3	18	24.0		
	8	10.6	4	5.3		

Discussion

Labor is defined as a normal physiological process that ejects the fetus from the maternal uterus to the outside world. Labor is divided into 3-phases or stages. The second stage is also a confront for women as well as midwives and obstetricians **El-Sayed et al., (2020)** also distinguished by intense, frequent, and regular uterine contractions during which labor women experience vaginal & rectal pressure, and an overwhelming urge of bearing down. Maternal bearing assists in fetal drop during the second stage, as the fetus completes the sequence of cardinal movement of labor, it turns and goes down via the maternal pelvis. Pregnant women bearing-down efforts have been discussed

and researched for decades and their impact on moms and fetuses **Hassan et al., (2021)**

As regards the **socio-demographic data** of the participating women that including age, residence, occupation, and family income, the results of the present study showed no significant difference between the two groups as regards the previously mentioned items. The previous result agreed with the study of **Hassan et al., (2021); Nasr, Omar & Hegazy, (2021)** who found that, there was no statistical significant difference between both groups regarding socio- demographic characteristics $p>0.05$. While there was a significant difference between the two groups as regards the educational level. This finding was in the same line with **Ibrahim & Hassan, (2015); Yee et al., (2019)** who study spontaneous versus valsalva pushing techniques at the 2nd stage of labor among primiparas' women on labor outcomes” and “Maternal and Neonatal Outcomes With Early Compared With Delayed Pushing Among Nulliparous Women”.

In relation to the length of 2nd stage of labor, as it considers a one of the outcomes measurements, the current study revealed that there were significant differences for the duration of the second stage of labor, oxygen use, and use of analgesia. The findings of the current study supported by **Prins et al (2011); Farag& Hassan, (2020)** who reported that the length of labour was significantly shorter in women who used the valsalva pushing technique (three studies; 425 women; mean difference 18.59 minutes; 95% CI 0.46–36.73 minutes). Plus, the second stage of labor was significantly longer with spontaneous pushing. Decrease in Hb levels in valsalva pushing group was determined to be higher than spontaneous pushing group **Koyucu &Demirci,(2017)**. Such results may be due to the association of open glottis pushing with harmony synchronization between different muscles including abdomen, diaphragm and pelvic floor muscles, which consequently increase the fetal descent and the short period of the 2nd stage of labor. Such finding agreed with a convenience study of 77 nulliparous women, **Hassan et al., (2021)**, while, the mean duration of the expulsion phase was longer among the open-glottis group (24.4 min \pm 17.4 vs. 18.0 min \pm 15.0, $p=0.002$). The two groups did not appear to differ in the effectiveness of their pushing (48.0% in the open glottis group versus 55.2% in the closed-glottis group, **Barasinski, Legrand & Vendittelli, (2020) .**

Also, in the study of **Hassan et al., (2021)**, explained the association between provider communication and actual maternal pushing behavior in 2nd stage labor and test differences in 2nd stage length and total maternal pushing time through maternal pushing behavior; they added that the proportion of open-glottis pushing by the birth mother had shortened the duration of the 2nd stage of labor positively and significantly.

Besides, in the study, **Hassan et al., (2021)** clarified the relationship between provider contact and actual maternal pushing behavior in 2nd stage labor and test differences in 2nd stage length and total maternal pushing period

by maternal pushing behavior; added that the proportion of open-glottis pushing by the birth mother had positively and substantially shortened the duration of 2nd stage labor. This result may be explained by that the parturient of the closed-glottis pushing was directed and educated to push at full cervical dilatation; early phase in the second stage, which causes a decrease in woman ability to push during the active phase in the 2nd stage and results in a longer second stage of labor than in open-glottis pushing.

As regarding the comparison of maternal outcome between two groups, the present study revealed that there were four statistically significant findings found concerning maternal outcome include postpartum hemorrhage, condition of the perineum, the severity of perineal pain, and amniotic fluid characteristics. This finding supported by **Hassan et al., (2021)**, who reported that, postpartum hemorrhage was too little in spontaneous pushing group (96.0%) compared to 36.0% of the directed pushing group. Also, all women in the spontaneous pushing group experienced mild perineal pain compared to 32.0% in the directed pushing group ($p < 0.001$) in his study about "Spontaneous Versus Directed Pushing Technique: Maternal and Neonatal Outcomes: A Comparative Study in Northern Upper Egypt". Whereas **Prins et al., (2011)**; **Farg, & Hassan, (2019)**. who found that, there was no statistical difference was identified in the number of instrumental/operative deliveries (three studies; 425 women; relative risk 0.70; 95% CI 0.34–1.43), perineal repair, postpartum hemorrhage. Perineal pain during often observed at first postpartum hours [28]. But, The groups did not differ for perineal injuries **Barasinski, Legrand & Vendittelli, (2019)**. Additionally, **Hussien et al.,(2014)** The duration of pushing was lower in the spontaneous pushing group than directed pushing. Most of the women in the spontaneous pushing group had significantly a lower pain index after 1 hour from full cervical dilatation and perceived less fatigue within 1-4 hours of childbirth ($p=0.000$).

They also had significantly lower rates of episiotomy, perineal lacerations, postpartum hemorrhage and cesarean section. Postpartum hemorrhage (PPH) is more prevalent by pushing technique in labor **Farg, & Hassan, (2019)**.

Concerning the neonatal outcomes, the Apgar scores of neonates were the indicator used to decide the neonates' outcomes, the results of the current study revealed that the neonates' Apgar score among the open glottis pushing group illustrated higher and stronger scores compared to the closed glottis pushing. Such results because the fact that closed glottis pushing is associated with closed pushing of glottis, which affects maternal hemodynamic and increases intrathoracic pressure. This consequently reduces venous return to the heart, cardiac production, maternal arterial pressure, and placenta blood perfusion, which affects the supply of oxygen to the fetus and is seen in the lower PH and Po₂ of the umbilical arterial blood. Though exhalation and open glottis are associated with bearing down during open glottis pressing, air escapes, and the thoracic pressure is not preserved. This study finding supported by **Hussien et al.,(2014)**, who reported that, their newborn had the highest Apgar score at the first and fifth minutes and none of them had fetal complications. In addition, only one study found a better 5-minute Apgar score and a better umbilical artery pH in the "open glottis" group **Barasinski, Legrand & Vendittelli, (2019)**.

Hassan et al., (2021) demonstrated that subjecting to open glottis pushing leading to improvement of fetal oxygenation; when assessed by cord blood gas and fetal heart rate patterns. Such a study result may be due to that the closed glottis pushing technique harmed circulation and placenta perfusion reasoning weakening in the neonatal status **Ibrahim et al., (2017)**. Moreover, **Hussien et al.,(2014)**,who can be concluded that improved fetal status, neonatal and maternal outcomes have been identified when women were allowed to bear-down in response to their own natural urges rather than in response to

commands for repeated, sustained pushes using Valsalva maneuver. Furthermore, **Başar & Hürata (2018)**, spontaneous pushing is effective in shorter second stages of labor and higher Apgar scores. There were, also, neonatal outcomes did not differ significantly **Prins et al., (2011)**.

Regarding the exhaustion scores in the post-partum's first 2 hours, the current study explained that the difference between the two groups was highly statistically significant. These findings were in the same line with **Hassan et al., (2021)** who added that the mean fatigue and energy scores varied between Valsalva and spontaneous pushing group, even pushing spontaneously recovered from fatigue faster than those in Valsalva groups. Consistent with the present study finding that of **Başar & Hürata (2018)** who reported that Fetal distress, oxygen use, increase in oxytocin, operative intervention, perineal laceration and postpartum hemorrhage were seen less in the spontaneous pushing group. However, no statistical difference was found between the groups ($p>0.05$)

In addition, **Haseeb et al., (2014)** in the study to examine out the impact of two dissimilar pushing strategies in the 2nd stage of labor on postpartum maternal exhaustion and Apgar score of Saudi females' neonates, they added that the physiological pushing technique had a better outcome with respect to postpartum maternal tiredness and neonatal Apgar's score when compared to closed glottis pushing during the 2nd stage of labor **Haseeb, et al.,(2014)**. This result may be related to the time required for pushing was minimized for group uses open glottis push because the pushing didn't rely on the birth attendants' instructions, but on the bodies of women asking them to push. Accordingly, the study hypothesis is accepted. Women with open glottis pushing during the 2nd stage of childbirth would have a shorter period of the 2nd stage of labor, better perineal status, less postpartum

exhaustion, and better fetal well-being than those with closed glottis (Valsalva) pushing technique.

Conclusion

Open glottis pushing technique during the 2nd stage of labor is safer and less exhausting. It hasn't been linked with confirmed adverse effects. It greatly shortens the duration of 2nd stage of labor, decreases perineal laceration incidence and postpartum hemorrhage was too little in open glottis pushing group. It also has a higher result in neonatal Apgar's score and postpartum maternal fatigue compared to closed glottis push during the 2nd stage of labor. Also, there is a highly significant association with open glottis pushing technique and women childbirth satisfaction.

Recommendation

The following recommendations have been proposed:

- It may be suggested that open glottis pushing during 2nd stage of labor be included in the maternal hospitals' protocol.
- Training women in the 1st stage of labor on the open glottis pushing method and offering support in the 2nd stage for open glottis pushing.
- Increasing awareness for nurses and caregivers working in the delivery room about the open glottis pushing during the 2nd stage of labor.
- Dissemination of the present study result to all hospital and MCH health services

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