Usability of Virtual Reality for Alleviating Pain and Anxiety for Primiparity Women during 1st Stage of Labor and its Reflection on Labor Outcomes

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Abstract

Background: Virtual reality is a new and modern technology; Virtual Reality is significantly safe and beneficial in reducing pain and anxiety. **Aim of study**: Was to explore the usability of virtual reality for alleviating pain and anxiety for primiparity women during first stage of labor and it's reflection on labor outcomes. **Design:** Interventional study (A quasi – experimental study) was utilized to fulfill the aim of this study. **Setting:** This study was conducted at Labor Unit (Obstetrics &Gynecology) department at Benha University, Quesna Central Hospital and Benha Teaching Hospital. **Sample:** A purposive sample and fulfill the inclusion criteria of a total 220 primipara were equally divided into two groups (control group compromising 110 primipara and study group compromising 110 primipara). **Tools:** There are four main tools; **I-** Interviewing questionnaire sheet (Sociodemographic data and obstetrics history), **II-** observational checklist (partograph), **III-** scales for assessment of pain and anxiety (Visual Analog Scale & Anxiety Rating Scale) **IV-** Apgar score. **Results**: There was a highly statistical significant difference related to labor pain and anxiety during the first stage of labor, duration of the different stages of labor and Apgar score during the 1st and 5th minute of delivery between both studied groups (p<0.001**). **Conclusion:** Virtual Reality had a positive effect on pain and anxiety of the first stage and positive maternal and neonatal outcomes. **Recommendations:** Virtual Reality is recommended as an alternative non-pharmacological therapy, which can be applied in maternity hospitals.

Keywords: Anxiety, Maternal satisfaction, Neonatal outcome, Pain, Virtual Reality

Introduction

Labor is a physiologic process characterized by regular uterine contractions result in progressive effacement and dilatation of the cervix, conducting in delivery of the fetus through the birth canal and expulsion of the placenta. Labor is a physiological process characterized by a spontaneous onset between 37 – 42 weeks. The length of time from onset of labor to the birth of the fetus is highly variable. Labor lasts about 14 hours in the first labor and 8 hours for women undergoing later labors **(Sakala, 2020).**

The process of labor is divided into four stages. The first stage is called the dilatation stage and this is the longest stage of labor in which the cervix dilates completely about 10 cm. The second stage is the birthing and pushing stage in which the baby is born. The third stage is the placental stage in which the placenta is born. Finally, the fourth stage is the recovery stage in which the first feeding and bonding between baby and parent occur **(Simkin, 2020).**

Labor pain is an unpleasant sensation

that is usually localized to the back and the abdomen and is the most acute pain of human body. Labor pain affects physiological, behavioral, sensory and cognitive responses. Pain is influenced not only by the physiological and anatomical factors, but also by psychological and socio-cultural factors. The most important goal of labor pain is to mobilize woman to cooperate with her own body during labor **(Graber, et al., 2020).**

During labor, anxiety, fear, muscle tension and fatigue decrease the ability to tolerate pain. The anxiety experienced during labor directs women to Cesarean Section (CS) by their own as the anxiety reduces the self- confidence and the women feel unskilled and incompetent, so the nurses try to provide comfort in labor by controlling and reducing pain and anxiety as a part of nursing practices. The level of anxiety increases significantly, especially in primipara. If anxiety persists, this can cause maternal and fetal hypoxia due to higher oxygen **(Cevik & Karaduman, 2020).**

Virtual Reality (VR) is a non-pharmacological therapy and a distraction intervention to provide a pleasant environment by using a computer- stimulated technique that provide a visual image with accompanying sounds by wearing a headset connected to a computer or a smartphone. This technology allays pain and anxiety by allowing individuals to hear, feel and communicate with stimuli of virtual environment as a real world **(Linowes, 2020)**

Pain relief is one of amazing benefits of VR in medicine. VR is safe, enjoyable, effective, simplifies complex problems and situations, create interest and minimize anxiety. As a consequence, VR technology can improve patients' quality of life and

satisfaction with care **(Li, et al, 2017)**.

Nurses have a critical and vital role in assessing the women's perception of pain by documenting and evaluating the pain and providing options for pain control by giving information about pain relief measures used by the hospital. In addition to, evaluating the maternal and fetal response to treatment as side effects, women's satisfaction with that treatment and modifying the plan of care when needed. Effective and competent nurses must be knowledgeable and understand maternal and fetal physiology, implications of treatment and usually try to diminish distress related to pain and respond quickly to reports of pain and will believe patients' reports of pain **(Murray & Huelsmann, 2020)**.

Significance of the study:

According to World Health Organization (WHO), that suggest that CS rate should lies between 5% and 15 % however the worldwide percentage is higher. This represents 21.1% worldwide **(Candel, et al., 2020).** The past decade has witnessed a sharp increase in CS rate in Egypt which has an alarming level in recent years. This estimated as 51.8 % according to Egypt Demographic and Health Survey **(Al Rifai, 2017).**

Virtual Reality is a non-pharmacological therapy and one of distraction techniques that replaces the real world by immersing users into a computer-generated virtual world. VR is utilizing five senses in order to focus the patient's attention on other stimuli and hence control pain in a better way. This technique can help in reducing pain, fear, and anxiety and can also be helpful with any discomfort after labor **(Rezai, et al., 2016).** VR is a cost – effective, safe, effective in pain and anxiety

controlling, can be used as a self-management tool for pain relief and affordable **(Tacgin, 2020).**

Aim of the study:

The present study aimed to explore the usability of virtual reality for alleviating pain and anxiety for primiparity women during first stage of labor and its reflection on labor outcomes.

Research Hypotheses:

- Women who using virtual reality would have alleviated labor pain than those who don't.

- Women who using virtual reality would have alleviated labor anxiety than those who don't.

- Women who using virtual reality would have favorite labor (maternal and fetal) outcomes than those who don't.

Subject and Methods:

Research design:

A quasi- experimental study was utilized to meet the aim of the study.

Setting:

The study was carried out at three public health centers (Benha University Hospital, Quesna Central Hospital and Benha Teaching Hospital) to collect the sample so that the researcher can complete the predetermined number of the sample due to the low demand of pregnant women to give birth at Benha University Hospital, as it turned into an isolation hospital due to the Covid-19 pandemic.

Sample:

A purposive sample was (220) patients were selected using simple random sampling and divided into two groups (110 samples in VR group and 110 without VR). The sample was collected as follows (50 women from the study group, likewise from the control group from Benha University Hospital, 40 women from the study group,

similarly from the control group from Quesna Central Hospital, in addition to 20 women from the study group and similarly from the control group from Benha Teaching Hospital). Informed consent was obtained from each study participant.

Inclusion Criteria

The inclusion criteria were primiparity women with intact membrane, free from medical or obstetrics complications, women aged 18-35 years with gestational age between 37-42 weeks and women accept the VR intervention.

Exclusion Criteria

The exclusion criteria were any women deviated from normality.

Tools of data collection: data was collected using the following tools:

Tool (I) An interviewing questionnaire sheet consisted of two parts;

Part (1) **Socio-demographic data**: this part was concerned with assessment of patients sociodemographic characteristics related to (name, age, residence, level of education, occupation, weight, height and body mass index).

Part (2): **Obstetrical history:** it aimed to assess history of women such as (The last menstrual date, current gestational age, No of abortions and estimated delivery date).

Tool (II) Observational checklist through partograph: As appointed by is **(WHO, 1994)** a graphic recording used to collect data related to labor progress. This tool included three main sections: Fetal condition that include (fetal heart rate, color of liquor and degree of molding), the progress of labor that include (cervical dilatation, descent of head and uterine contractions) and maternal condition that include (blood pressure, pulse, temperature and urine analysis for albumen, protein and volume).

Tool (III) Scales for assessment of pain and anxiety:

Part (1) Visual Analog Scale (VAS):

This was developed by **(Hayes & Patterson, 1921)** to assess the severity and intensity of pain experienced by the woman during labor. VAS is a straight line, the ends of which are defined as the extreme limits of the sensation to be measured from 0 (no pain) to 10 (worst pain).

Scoring system:

The VAS total scoring was divided into four main parts: the first part graded 0 which indicate no pain, the second part graded from 1-3 for mild pain, the third part from 4-7 for moderate pain and the fourth part from 8-10 for sever pain.

Part (2) Anxiety Rating Scale:

This developed by **(Bloch, 2009)** to assess level of anxiety experienced by the woman during labor. It is a straight line, the ends of which are defined as the extreme limits of the sensation to be measured from0 (balanced mood) to 10 (out of control).

Scoring system:

The anxiety rating scale scoring was divided into six main parts: the first part graded 0 which indicated balanced mood, the second part from 1-2 reflect slight fear and worry, the third part from 3-4 indicate mild fear, the fourth part graded 5 indicated moderate fear, the fifth part from 6-7 reflect strong agitation and the six part from 8-10 indicate out of control behavior.

Tool (IV) Fetal outcome assessment by Apgar score in the 1st & 5th minutes after the labor:

As appointed by **(Virginia, 1953)** is a measure of the physical condition of a newborn infant. It included five indicators (fetal heart rate, respiratory rate, muscle tone, reflex and color). These signs were given a score of 0, 1, or 2; evaluated at the first and fifth minutes after delivery and total score ranging from 0 to 10 based on the following assessment criteria: total Apgar score was detected as the following: Apgar score of 7 to 10 indicates excellent condition; Apgar score of 4 to 6 indicates moderately depressed and Apgar score of 0 to 3 indicates severely depressed.

Tools validity:

The tools of data collection were thoroughly reviewed by three experts, two in Obstetrics & Woman's health nursing, one in Community Health Nursing to test the content validity, modifications were carried out according to the panel' judgements on clarity of sentences and the appropriateness of content.

Tools Reliability:

Reliability of tools was tested by using Cronbach's alpha coefficient test, which revealed that the tools consisted of relatively homogenous items as showed by the moderate to high reliability of each tool. The reliability of the partogram was 0.93, the reliability of pain assessment tool was 0.93, the reliability of anxiety assessment tool was 0.92and the reliability of Apgar scoring tool was 0.98.

Pilot study:

The pilot study was carried out. It involved ten percent 10% (22 woman) of the total sample (220 primiparity women) to test the simplicity, feasibility, clarity and applicability of the developed tools, also to find out the possible obstacles and problems that might face the- researchers and interfere with data collection. Women involved in the pilot excluded from the study.

Field of work:

Virtual Reality interventions carried out two times during labor process, first intervention at active phase (dilatation 4 cm),

second interventions at transition phase (dilatation 9 cm). Each intervention was given for 10 minutes in order to relive labor pain and anxiety. For this study used a VR distraction videos which allows users to glide through 360 degrees video used smartphone.

Pain data taken four times, first data taken twice at active phase (dilatation 4 cm) before and after intervention, second data taken twice at transition phase (dilatation 9 cm) before and after intervention. . Pain was measured using the visual analog scale (VAS). Visual analog scales (VAS) were used with selected images to describe the pain with a score of 0 = no pain, 1-3 = mild pain, 4-7 = moderate pain, 8-10 = sever pain. Anxiety was measured using the anxiety rating scale. The anxiety rating scale was used with selected images to describe the anxiety with a score was divided into six main parts: the first part graded 0 which indicated balanced mood, the second part from 1-2 reflect slight fear and worry, the third part from 3-4 indicate mild fear, the fourth part graded 5 indicated moderate fear, the fifth part from 6-7 reflect strong agitation and the six part from 8-10 indicate out of control behavior. Data were collected through a period of 8 months from the beginning of February 2020 to the end of September 2020, the researcher attended labor unit twice per week (Sunday and Thursday) from 8am to 3pm. The researcher interviewed 3 – 4 women / day until the predetermined sample size attain from women who met the inclusion criteria that mentioned firstly.

Ethical Considerations:

This study was approved by The Health Research Ethics. The aim of the study explained to each woman about the purpose and benefits of the study before applying the tools to gain their confidence and trust. An oral consent was obtained from each woman to participate in the study and withdraw when she needs after full debriefing about the VR equipment, objectives and nature of the study. The study was not having any physical, social or psychological risk on the participant. Confidentially was ensured throughout the study process and the women were assured that all data was used only for research purpose. The information about participant's identity was not included with the other data and only the principal investigator had access to this information.

Statistical analysis:

Data was collected and edited to exclude errors, re- organized, coded and manipulated with appropriate software for efficient analysis. Data were entered into Microsoft IBM SPSS version 20. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). Test of significance (t test, chi-square).A significant level value was considered when $p< 0.05$. In addition, A highly significant level value was considered when $p<0.01$.

Results:

Table (1) clarifies that (40.9% and 37.3%) of both study and control groups respectively in age group from (18-21 years) with a mean age of 23.55 ± 4.33 and 24.05 ± 4.81 years respectively. (63.6%) of the study group and (58.2%) of the control group were lived in rural area. Concerning level of education, it was cleared that (45.5% and 50.0%) of both study and control groups respectively had secondary education. As regards occupational status, (50.0%% and 59.1) of both study and control groups respectively were housewife. Generally, there was no statistically significant difference between study and control groups

regarding socio-demographic characteristics. That is the two groups under study homogenous.

Table (2) clarifies mean scores of the duration of labor throughout the three stages among the study and the control groups. This table indicated that, there was a shorter duration of all stages of labor among study group women with a highly statistically significant difference between study and control groups (P< 0.001**).

Table (3) reveals mean scores of vital signs of mothers among study and control groups during first stage of Labor. The results indicated that on admission there was no a statistically significant difference between study and control groups regarding vital signs measurements (P>0.05). With cervical dilatation (4-7 cm) there was a highly statistically significant difference between study and control groups regarding pulse measurement P <0.001**, while there was no a statistically significant difference between study and control groups regarding systolic and diastolic blood pressure and temperature measurements (P>0.05). With cervical dilatation (8-10 cm) there was a highly statistically significant difference between study and control groups regarding systolic and diastolic blood pressure and pulse measurement P <0.001**, while there was no a statistically significant difference between study and control groups regarding temperature measurements (P>0.05).

Table (4): illustrates mean labor pain scores among study and control groups during the first stage of labor. The result indicated that, there was no statistically significant difference between study and control groups before intervention. There was a reduction on labor pain scores during the first stage of labor (immediately after intervention, at cervical dilatation 4cm and at cervical dilatation 9cm) with a highly

statistical significant difference between study and control groups (P <0.001**).

Table (5) illustrates mean labor anxiety scores among study and control groups during the first stage of labor. The result indicated that, there was no statistically significant difference between study and control groups before intervention. There was a reduction on labor anxiety scores during the first stage of labor immediately after intervention, at cervical dilatation 4cm and at cervical dilatation 9cm) with a highly statistical significant difference between study and control groups (P <0.001**).

Table (6) shows mean of Apgar scoring of neonate among study and control groups at first and fifth minute. The study revealed that there was a highly statistically significant difference between both study and control groups. The Apgar score at 1st and 5th minute was better among study group than control groups (the mean of Apgar scoring of the neonates at the1st and the 5th minutes in the study group was 8.14±1.22 and 9.16±1.06 respectively as compared with7.41±1.16 and 8.30±1.44 in the control group). Concerning neonatal growth measurements, it indicates that there was no a statistically significant difference regarding mean of neonatal characteristics regarding (weight and length) among both study and control groups (P>0.05).

Table (7) clarifies that there was a positive correlation between studied women pain score during first stage of labor and duration of first stage of labor. That mean increase pain score of first stage of labor is associated with increase duration of first stage of labor.

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Table (1): Distribution of studied sample according to their socio-demographic characteristics (n= 220)

Characteristics	Control group n=110		Study group n=110		Chi square test	P value
	No	%	No	%		
Age (in years)						
18-	41	37.3	45	40.9	.880	>0.05
22-	38	34.5	40	36.4		
≥26	31	28.2	25	227		
Mean ±SD	24.05±4.81		23.55±4.33			
Residence						
Urban	46	41.8	40	36.4	.687	>0.05
Rural	64	58.2	70	63.6		
Educational qualification						
Pre-primary education	10	9.1	15	13.6		
Primary education	20	18.2	20	18.2	1.23	>0.05
Secondary school	55	50.0	50	45.5		
University education	25	22.7	25	22.7		
Occupational status						
Housewife	45	40.9	55	50.0	1.83	>0.05
Working	65	59.1	55	50.0		

Table (2): Mean duration of labor throughout the three stages among the studied sample (n=220)

Duration of labor stages	Control group n=110	Study group n=110	Independent t test	P value
	Mean ±SD	Mean ±SD		
Duration of the 1st stage (hrs)	8.75±.56	8.38±.40	5.63	<0.001**
Duration of the 2nd stage(min)	51.50±11.14	45.45±7.76	4.66	<0.001**
Duration of the 3rd stage(min)	16.50±7.14	13.40±5.13	3.69	<0.001**

Table (3): Mean vital signs of studied sample during first stage of labor (n=220)

Vital signs measurements	Control group n=110	Study group n=110	Independent t test	P value
	Mean ±SD	Mean ±SD		
On admission				
Systolic BP	117.09±8.166	118.64±8.511	1.37	>0.05
(mmHg) Diastolic	68.64±6.970	70.00±6.773	1.47	>0.05
BP (mmHg) Pulse	82.32±6.121	83.45±6.402	1.34	>0.05
Temperature	37.10±.1418	37.08±.1667	1.08	>0.05
During active phase				
Systolic BP (mmHg)	121.18±5.704	120.64±6.810	.644	>0.05
Diastolic BP (mmHg)	76.45±4.806	75.36±5.100	1.63	>0.05
Pulse	82.52±4.095	78.69±6.931	4.98	<0.001**
Temperature	37.106±.0911	37.104±.1022	.209	>0.05
During transition phase				
Systolic BP (mmHg)	124.73±5.61	120.64±6.81	4.58	<0.001**
Diastolic BP (mmHg)	76.27±4.810	70.45±5.64	8.22	<0.001**
Pulse	80.77±5.89	77.84±5.26	3.89	<0.001**
Temperature	37.10±.091	37.09±.10	.766	>0.05

Table (4): Mean labor pain scores among studied sample during the first stage of labor (n=220)

Labor pain assessment	Control group n=110	Study group n=110	Independent t test	P value
	Mean ±SD	Mean ±SD		
Level of pain in active and transition phase.				
First assessment at CD (4cm).	5.64±1.12	5.67±1.12	-.240	>0.05
Immediately after 15 minutes from first assessment.	5.72±1.15	5.14±1.04	3.91	<0.001 **
Second assessment at CD (9 cm)	8.96±.54	8.97±.67	-.111	>0.05
Immediately after 15 minutes from second assessment.	9.05±.67	7.45±.65	17.79	<0.001 **

Table (5): Mean labor anxiety scores among studied sample during the first stage of labor (n=220)

Anxiety assessment	Control group n=110	Study group n=110	Independent t test	P value
	Mean ±SD	Mean ±SD		
Level of anxiety in active and transition phase.				
First assessment at CD (4 cm)	3.68±.92	3.55±.94	1.08	>0.05
Immediately after 15 minutes from first assessment.	3.68±.92	2.32±.87	11.20	<0.001**
Second assessment at CD (9 cm)	4.36±.832	4.25±.719	1.12	>0.05
Immediately after 15 minutes from second assessment.	4.45±.797	2.93±.660	15.48	<0.001**

Table (6): Neonatal condition of studied sample (Mean Apgar scoring of neonate at first and fifth minute and neonatal characteristics among studied sample (n=220)

Apgar Scoring	Control group n=110	Study group n=110	Independent t test	P value
	Mean ±SD	Mean ±SD		
First minute	7.41±1.16	8.14±1.22	-4.52	<0.001**
Fifth minute	8.30±1.44	9.16±1.06	-5.05	<0.001**
Neonatal characteristics				
Weight (in Kg)	3.03±.15	3.04±.15	-.354	>0.05
Length (in Cm)	49.40±1.92	49.27±2.0	.480	>0.05

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Table (7) Correlation coefficients between duration of first stage of labor and pain score during the 1st stage of labor among study group women (n=110).

Pain during the 1st stage of labor	Duration of first stage of labor	
	R	P value
Pain immediately after intervention at CD 4 cm	.070	>0.05
Pain immediately after intervention at CD 9 cm	.131	>0.05

Discussion

The virtual reality system used in this study was simple (used smartphone VR series) and appropriate for use in the delivery room. The results indicate that the clinical use of VR can reduce pain and anxiety during labor.

Normal labor is a physiological process by which the products of conception are expelled from the uterus by uterine contraction and progressive cervical dilatation (**London, et al., 2021**). Labor pain is really a side effect of a normal process not a sign of damage or injury and has many physical causes (**Simkin, 2020**). Women who are anxious during labor have high levels of the stress hormone in the blood, which can be lead to abnormal progress through decreased uterine contractility, longer labor and abnormal fetal heart rate patterns (**Palmer & Coats, 2017**). VR is a safe and effective non-pharmacological intervention used for control (pain and anxiety), decrease the duration of labor and promote comfort (**Gur & Apay, 2020**).

As regards sociodemographic characteristics of both study and control groups, the present study regarding maternal age showed that more than two- fifths and more than two-thirds of both study and control groups respectively in age group from (18-22 years) with a mean age of 23.55±4.33 and 24.05±4.81 years respectively. Concerning level of education, the findings of current study cleared that less than half and half of both study and control groups respectively had secondary education.

Regarding, residence, the findings of the present study showed that less than two-thirds of the study group and more than half of the control group were lived in rural area. As regards occupational status, half and less than two-thirds of both study and control groups respectively were housewife. This means that there was no statistically significant difference between study and control groups regarding sociodemographic characteristics.

The findings of the present study were in accordance with (**Pratwi, et al., 2017**), who studied "The effect of virtual reality on pain in primiparity women", reported that age, education level is not show significantly different (p> 0.05) between intervention or control group. This may be due to that the studied sample were primipara and selected with purposive sample at a range of (18-35yrs) which is the common marriage age in the studied society culture.

The results of this study came in the same line with (**Ebrahimani & Bilandi, 2020**), who researched "Comparisons of the effects of watching virtual reality videos and chewing gum on the length of delivery stages and maternal childbirth satisfaction", illustrated that there was no statistically significant difference between the demographic characteristics such as education, occupation and maternal age.

Moreover, (**Amiri, et al., 2019**), who researched "The effect of distraction techniques on pain and stress during labor", revealed that there was no significant difference in sociodemographic

characteristics between the two groups.

In addition to **(Gur & Apay, 2020)**, who presented "The effect of cognitive behavioral techniques using virtual reality on birth pain", revealed that there was no significant differences in demographic variables (age, educational level and occupation) between the both groups and groups show homogeneity. The results of the present study were supported by **(Sahin & Basak, 2020)**, who studied "The effects of intraoperative progressive muscle relaxation and virtual reality application on anxiety, vital signs and satisfaction". The results clarified that there was no significant difference between the groups in terms of age and education.

Concerning to duration of labor stages**,** the results of our study illustrated that there was a shorter duration of all stages of labor among study group women with a highly statistically significant difference between study and control groups (P< 0.001).The results of this study matched with **(Gur & Apay, 2020),** indicated that there was significant difference in the length of in the active dilation of 4-5) and second (dilation 7-9) phases of labor in the intervention than that of the control group. The progress of labor which reflected by a shorter duration of labor might be due to the efficient effect of VR intervention as a one of distraction techniques. This may be due to that VR don't effect negatively as some pharmacological therapies on contractions which are vital to aid cervical dilatation and fetal descent, they have an important role in helping to reduce dystopia (slow progress in labor).Opposite to this, the results of our study in contrast to **(Amiri, et al., 2019)**, who clarified that there was no statistically significant difference to total length and duration of labor.

Concerning vital signs of mothers among study and control groups during first stage of labor, the result indicated that on admission there was no a statistically significant difference between study and control groups regarding vital signs measurements (P>0.05). With cervical dilatation (4-7 cm) there was a highly statistically significant difference between study and control groups regarding pulse measurement (P <0.001), while there was no a statistically significant difference between study and control groups regarding systolic and diastolic blood pressure and temperature measurements (P>0.05). With cervical dilatation (8-10 cm) there was a highly statistically significant difference between study and control groups regarding systolic and diastolic blood pressure and pulse measurement (P <0.001).

The result of the present study was in the same line with **(Goodier, 2020)**, who studied "Virtual reality may help relieving pain during childbirth"; the study showed that there is a significantly higher heart rate in the control group. Moreover, **(Sahin & Basak, 2020)** mentioned that there are a significant difference between the systolic and diastolic blood pressure in the VR group and control group. Furthermore, the results of the present study matched with **(Wong, et al., 2019 a)**, w h o researched "Patient reported outcomes on the use of virtual reality for pain management in labor" indicated that there was significant differences in post-intervention heart rate between the both groups (p=0.01).

The improvement of vital signs, in accordance with the Gate control theory, which suggests that, if the individual is attending to other stimuli away from the noxious stimuli, they will perceive the painful stimulus as less intense. VR intervention creates a general relaxation in the body. Following this relaxation, Therefore, there is an assumption that the women who received VR, due to reduction of their anxiety, pain and stress level, had lower blood pressure,

heart rate and respiratory rate than those who did not receive it **(Pratwi, et al., 2017)**.

On the other hand, the result of the present study was in disagreement with **(Goodier, 2020)**, the results clarified that there was no statistically difference between the groups in blood pressure. Additionally, the result of the present study was in contrast to, **(Wong, et al., 2019 a)**, indicated that there was no significant differences in post-intervention systolic and diastolic BP between the both groups.

The results of the current study indicated that there was a highly no statistically significant difference between study and control groups before intervention. There was a reduction on labor pain scores during the first stage of labor (immediately after intervention, at cervical dilatation 4cm and at cervical dilatation 9cm) with a highly statistical significant difference between study and control groups (P <0.001).

The result of the present study was similar to **(Ebrahimani & Bilandi, 2020)**, who reported that there was a significant difference on women VR group and control group. As well as, **(Goodier, 2020)**, who studied "Patient reported outcomes on the use of virtual reality for pain management in labor", found that VR effective for reducing pain in women in labor. In addition, **(Wong, et al., 2020 b)**, who researched "Virtual reality may decrease pain during labor", showed that the average pain score before VR use was 2.74(+_ 2.73), after VR use the pain score decreased to an average of 2.35(+_ 2.67) (p value = 0.063). There was a statistical difference in pain scores. Moreover, that there was a significant reduction in pain score from control and study groups. Also, **(Goodier, 2020)**, revealed that there was a reduction in pain levels in study group than control group and

illustrated that there is an average reduction in pain level of 0.52 at the end of that period, while the control group that didn't get the headsets reported an average increase in pain of 0.58.In addition, these findings was supported by **(David, et al., 2019)**, who studied "Virtual reality analgesia in labor: The VRAIL pilot study- a preliminary randomized controlled trial suggesting benefit of immersive virtual reality analgesia in unmedicated laboring women", the results displayed significant pain reduction in the VR group.

Furthermore, **(Cowels, et al., 2019)**, who conducted "Virtual reality for pain control during labor"; found that VR has an optimal and effective use in labor pain. Furthermore, the results of this study came in harmony with **(Amiri, et al., 2019)**, indicated that there was a significant difference in pain intensity during labor between intervention and control group. In addition, **(Gur & Apay, 2020)**, reported that there is significant difference in labor pain during the active phase of labor in intervention group than control group.

The improvement and progress in pain scores with VR intervention might be due to stimulation of visual cortex while engaging other senses. VR modulates the user's processing of nociceptive stimuli **(Wong, et al., 2020 b).** In addition to, pain reducing effects of distraction through VR is the ability to transport the patient into an alternative reality leading to a slower response to incoming pain signals **(Sikka, et al., 2018).**

Regarding anxiety scores among study and control groups, the results of the current study indicated that, there was no statistically significant difference between study and control groups before intervention. There was a reduction on labor anxiety scores during the

first stage of labor immediately after intervention, at cervical dilatation 4cm and at cervical dilatation 9cm) with a highly statistical significant difference between study and control groups (P <0.001).

Regarding anxiety scores among study and control groups, the results of this study came in harmony with (**Amiri, et al., 2019**), who indicated that there was a significant difference in anxiety and stress during labor between intervention and control group. Increasingly, these results of the present study supported by (**Wong, et al., 2019 a**), found that 100% of subjects indicate that VR reduce their anxiety. The results of the present study agreed with (**David, et al., 2019**), the result indicate that there was a significant lower in anxiety scores in VR than non- VR group. Moreover, the results of the present study was similar to (**Sikka, et al., 2018**), illustrated that there was a significant difference from pre and post intervention groups. Furthermore, the results of our study came in harmony with (**Sahin & Basak, 2020**), illustrated that there was a statistically significant difference in anxiety between VR group and control group (p<.05).In addition, VR can relieve the level of anxiety related to other obstetrical and gynecological causes than labor anxiety. These results were supported by (**Shiliang, et al., 2019**), who studied "Immersive virtual reality intervention for anxiety reduction during in-office dilation and curettage"; found that there is statistically significant decrease in anxiety levels. In addition to, the results of this study matched with (**Sirdhar, et al., 2020**), who researched "Non-pharmacological anxiety reduction with immersive virtual reality for first-trimester dilation and curettage", illustrated that there is a significantly difference in anxiety level between VR group from that of the control group. As well as, these findings were in

agreement with (**Ryan, et al., 2020**), clarified that VR can help reduce anxiety among women undergoing a first trimester surgical abortion. Additionally, these results came in the same line with (**Khan, et al., 2020**), showed that VR has a significant difference in anxiety during outpatient hysteroscopy with (p=0.02).According to Gate Control Theory of pain and previous experiences, parameters as anxiety, culture, stress and psychological factors have a powerful influence on the perception of pain by the brain. The intensity of pain signals, depending on the patient's concentration can be interpreted as very painful to mild pain when anxiety controlled (**Shoorab, et al., 2015**).On the other side, the results of the study are in contrast to (**Noben, et al., 2019**), **who** researched "Virtual reality video to improve information provision and reduce anxiety before cesarean delivery". The study showed no significant decrease in anxiety of VR group compared with control group.

According to neonate Apgar score, the results of the present study showed that the mean of Apgar scoring of the neonates at the1st and the 5th minutes in the study group was higher than in control group. There was a highly statistically significant difference between both study and control groups (p<0.001)

The findings of better neonatal outcome, included high Apgar score might be due to that women who received VR had lower levels of stress and anxiety hormones than those who did not have. These changes might had contributed to the improved fetal activity and the better neonatal outcome in terms of high Apgar score, lesser incidence of prematurity, low birth weight and better performance on neonatal behavior assessment(**Pratwi, et al., 2017**). The results of this study disagreed with [28], indicated that there was no statistically significant

difference for Apgar score. Also, the results of this study in contrast to **(Ebrahimani & Bilandi, 2020)**, indicated that there was no significant difference between both groups regarding Apgar score. Concerning neonatal growth measurements, the results of the current study indicated that there was no a statistically significant difference regarding mean of (weight and length) between both study and control groups (P>0.05). In addition, there were 8.2% and 3.6% of both control and study group neonates respectively needs ICU. The results of this study came in harmony with, **(Wong, et al., 2019a)**, indicated that there was no significant differences regarding birth weight between the both groups.

The result of the present study indicated that there was a positive correlation between studied women pain score during first stage of labour and duration of first stage of labour. That mean increased pain score of first stage of labour was associated with increased duration of first stage of labor. This positive correlation might be due to women with prolonged labor expressed more pain because of exhaustion and maternal dehydration. Which lead to release of mediator substances whose concentrations tend to be relatively more because of maternal hydration.

 Conclusion

Virtual Reality (VR) was an effective method in reduction of labor pain scores and anxiety scores during the first stage of labor with a highly statistical significant difference between both control and study group after application of Virtual reality. Moreover, there was a shorter duration of all stages of labor among study group women with a highly statistically significant difference between both study and control groups. Finally, there were obvious positive effects of VR

intervention on maternal vital signs and neonatal Apgar score.

Recommendations

- Virtual Reality is recommended as an alternative non- pharmacological therapy, which can be applied in maternity hospitals for effective effect in labor pain and anxiety management.

- Develop antenatal mother's classes regarding the benefits of VR for both mothers and newborns.

- Further research are needed to replicate study on a larger sample for generalizing the findings to confirm the benefit of VR and analyze how to better applying

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قابلية استخدام الواقع الافتراضي لتخفيف الألم والقلق لدى السيدات البكريات خلال المرحلة الأولى و انعكاسه على نتائج الولادة

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يعد الواقع الفتراضى تقنية ممكنة و مقبولة وفعالة كتقنية الهاء لتخفيف آلام الولادة والقلق حيث أن تخفيف الألم يلعب دورا مهما في رضاء الأمهات بشكل عام تجاه تجربتهن في الولادة و قد يعزز صحتهن و رفاهيتهن الأمومية و علاقة الأم و الطفل المستقبلية. لذا هدفت هذه الدراسة الي استكشاف قابلية استخدام الواقع الافتراضي لتخفيف الألم والقلق لدى السيدات البكريات خلال المرحلة الأولى و انعكاسه على نتائج الولادة. و قد أجريت الدراسة في وحدة الولادة بقسم أمراض النساء والتوليد في مستشفى بنها الجامعي بالإضافة إلى مستشفى قويسنا المركزي ومستشفى بنها التعليمي و تم استخدام تقنية أخذ عينة غرضية التي تتكون من ٢٢٠ سيدة بكرية تم تقسيمها عشوائيا إلى مجموعتين (المجموعة الضابطة = 110 سيدة الذين تلقوا الرعاية الروتينية ومجموعة الدراسة = ١١٠ سيدة الذين استخدموا تكنولوجيا الواقع الافتراضي) خلال المرحلة الأولى من مراحل الولادة. حيث كشفت النتائج عن أن هناك فروق ذات دلالات إحصائية بين كل من سيدات المجموعة الضابطة ومجموعة الدراسة بعد تطبيق الواقع الافتراضي في تقليل درجات الألم ودرجات القلق أثناء المرحلة الأولى من الولادة علاوة على ذلك كانت هناك مدة أقصر لجميع مراحل الولادة بين سيدات مجموعة الدراسة مع وجود فرق معتد به إحصائيًا بين كل من مجموعتي الدراسة ، أخيرًا كانت هناك تأثيرات إيجابية واضحة لتدخل الواقع الافتراضي على العلامات الحيوية للأم وعلى درجة أبجار للوليد.و تدعم النتائج المذكورة أعلاه فرضيات الدراسة الحالية.وأوصت الدراسة بأن يوصى بالواقع الافتراضي كعلاج بديل غير دوائي و يمكن تطبيقه في مستشفيات الولادة من أجل التأثير الفعال في معالجة آلام الولادة والقلق