Effect of respectful maternity care and effective communication during labor on maternal and neonatal outcomes: an interventional study

Khalat Karwan Fares\textsuperscript{1,2}, Hamdia Mirkhan Ahmed\textsuperscript{3}

\textsuperscript{1} Community Health Department, Koya Technical Institute, Erbil Polytechnic University, Erbil, 44001, Iraq

\textsuperscript{2} Ph.D. Student of Maternity Nursing College of Nursing, University of Raparin, Ranya, Iraq

\textsuperscript{3} College of Health Sciences, Hawler Medical University, Erbil, Kurdistan Region, Iraq

Abstract

**Background:** World health organizations (WHO) recommended respectful maternity care (RMC) and effective communication (EC) during labor and childbirth to reduce mistreatment and to improve women's experience of care. This study aimed to finds out the effect of RMC and EC's on maternal and neonatal outcomes.

**Methods:** This interventional study included 120 eligible women who were randomly assigned to the control (n= 60) and the intervention (n=60) groups, who were admitted to a hospital's delivery room in Koya city in Iraq's Kurdistan region from February 2, 2020, to January 8, 2021. The intervention group was provided care based on WHO recommendations on RMC and EC; the control group received routine care. The effects of the interventions were assessed using a Mann-Whitney U and Pearson Chi-Square or Likelihood Ratio test.

**Results:** In Comparing two groups, the length of labor among primiparous (M: 173.8, SD: 32.11 vs. M: 264.63, SD: 131.17 min; P= 0.049), length of hospitalization (prim parous; 356.7 ± 49.61 vs. 639.81 ± 454.53 min; P= 0.006. multiparous; 331.56 ± 83.10 vs. 366.17
± 80.89 min; P =0.031), and the number of emergency cesarean delivery (8 vs. 4), were significantly lower in the intervention group. Additionally, there was a highly significant difference in terms of labor pain (P< 0.001), initiation of breastfeeding (P< 0.001), and first-minute Apgar score (P< 0.001). Meanwhile, there were no significant differences in the perineal tear, length of labor in multi and grand multi mothers between the two groups. The rates of Apgar scores in 5 minutes and neonatal admission in ICU were similar between the two groups.

**Conclusions:** Our results suggest that implementing respectful maternity care and effective communication during labor and delivery can reduce the duration of labor and hospitalization, decrease emergency cesarean deliveries and labor pain, and promote neonatal outcomes such as first-minute Apgar score and initiation of breastfeeding.

**Keywords:** Respectful maternity care, Effective communication, Duration of labor and Hospitalization, Mode of birth, Perineal tear, labor pain, neonatal admission in ICU, and breastfeeding initiation.

**Background**

Every year, nearly 140 million babies are born worldwide [1]. The vast majority of these are vaginal deliveries of pregnant women with no recognized risk factors for complications, either for themselves or their babies, before labor starts [2]. However, the risk of severe morbidity and mortality for the mother and newborn raises when labor complications occur [3, 4].

According to qualitative study synthesis and many recent surveys [5–7], many women worldwide suffer inadequate treatment during childbirth, including abusive, neglectful, or disrespectful care. This critical public health and human rights issue calls for increased action, research, and
discussion, such as the White Ribbon Alliance's global strategy to encourage respectful maternity care [8]. Furthermore, WHO recommended Respectful Maternity Care (RMC), which refers to women in labor should be treated to maintain dignity, privacy, and confidentiality, ensure freedom from harm and mistreatment, and make informed decisions to receive continuous support during labor and childbirth. Moreover, recommended Effective Communication (EC) between maternity care providers and women in labor through simple and culturally appropriate methods [9]. Nevertheless, non-clinical intrapartum practices, such as providing emotional support through labor companionship, effective communication, and respectful care, which may be relatively inexpensive to implement, are not considered priorities in many areas [5]. In recent years, the relationship between lack of quality care and adverse maternal outcomes has been globally highlighted [10]. In this framework, the value of avoiding disrespect and abuse (D&A) during facility-based childbirth is becoming more widely recognized. Disrespect and abuse are fundamental violations of women's human rights and a significant barrier to accessing a good quality of care during intrapartum [7]. Delivery care is established on friendly behaviors and attitudes that must exhibit several characteristics. These indicators are introduced as the five critical "Cs" of communication, condolence, continuation, commitment, and courage [11]. Supporting the mother during childbirth through teaching, reassurance, and encouragement has been shown in studies to shorten labor and decrease cesarean deliveries [12, 13]. Furthermore, strengthening mother-infant bonding, increasing breastfeeding success, and significantly reducing the need for various medical interventions, such as analgesia, anesthesia, vacuum extraction, and forceps [13]. Continuous midwives' presence during labor is more likely to give birth spontaneously. Babies receive higher Apgar scores [14]. According to previous research, nurses cannot communicate effectively due to a deficiency in communication skills [15,
In the Iraqi Kurdistan region, a large percentage (41.6%) of women were not satisfied with the communication of midwives and physicians in the delivery room [17].

Additionally, WHO found no evidence on RMC and EC intervention's effect on maternal and neonatal outcomes [9]. Therefore, the researcher applying WHO recommendations for women in the delivery room in Koya city, Iraq. The study aimed to identify the effect of RMC and EC in the delivery room on maternal and neonatal outcomes.

**Methods**

**Study design and subject's recruitment**

An interventional study was carried out on (120) laboring women who attended Shahid Doctor Khalid Teaching Hospital to give birth to a child. Shahid Doctor Khalid Teaching Hospital in Koya city, is a public Hospital with (200) beds and eight beds in the delivery room. The participants were selected from a total (180) laboring women who met all of the study's eligibility criteria and were assigned randomly to the two intervention and control (Figure 1).

The study was conducted from February 2, 2020, to January 8, 2021. The subjects were randomly assigned to control (60) or intervention (60). Inclusion criteria were, Kurdish speaker, labour women in the active first stage with cervical dilatation of 5-6 cm, 38-42 week of gestation, Cephalic presentation, were primipara, multipara or Grand multipara, expected to have a singleton birth, absence of major obstetric or medical pregnancy complications, accept to participate in this study.

Mothers with high-risk mental health issues, cephalopelvic disproportion, or a prior cesarean section were excluded.

**Study tool of data collection**

The data were collected through a constructed questionnaire which consists of 3 parts as follows:
Part one: Includes the questions regarding sociodemographic and obstetric attributes of participants collected before implementation of RMC& EC. The particular data was based on age (year), level of education, primary means finishing six years of teaching, secondary means completing 12 years of education, institute and BSc includes those who spent two years or more at a university. Residency is graded as urban: Koya city, suburban, which includes places within a half-hour to one hour's drive from Koya city, and rural, including villages beyond the suburban areas. The occupation was known as housewife, student, or employed. Parity has been categorized as primipara (had first delivery), multipara (second to 4 deliveries) and grand multipara (five and more deliveries), gestational age, abortion or stillbirth, were included.

Part two: Was concerned about intrapartum information, which consists of a time of admission and discharge, cervical dilation on admission, administration of intravenous Oxytocin, duration of each stage of labor (documented by minutes), as the active first stage of labor began from (5-6cm) and continued until cervical dilation reached 10 cm, second stage 10 cm dilation until delivery, and the third stage started with the delivery of the fetus and continued until the placenta was delivered.

In the first stage of labor, the labor pain was measured every half-hour using a Visual Analog Scale (VAS). In labor studies, it is necessary to measure overall pain. Typically, studies assess pain at 30-minute intervals or at particular cervical dilation degrees [18, 19]. We used a 10 cm line on a questionnaire marked with no pain and the worst pain ever[20, 21]. The women were asked to indicate their current pain level [20]. The marks are measured in centimetres and interpreted as pain scores. This method for estimating labor pain also assumes that a mean value can be calculated because labour duration varies among women [22].

Part three: This part of the questionnaire was concerned about maternal outcomes, as follows:
1- spontaneous vaginal delivery: means vaginal delivery that occurs without the need for obstetrician or midwife to use Oxytocin or assisted by instrument.

2- vaginal delivery assisted with augmentation: it was performed with intravenous Oxytocin but without using instrument (forceps or vacuum)

3- Emergency cesarean section: for those with prolonged labor or failure to progression, mother exhaustion decreases or increases fetal heart rate.

Perineal status was classified as;

1- intact perineum: Those with intact perineum and a minor laceration that did not require suturing were included.

2- Tear: Those requiring suturing and an extensive perineal tear

3- Episiotomy: was routinely performed for all primiparous women.

4- Episiotomy and tear: those who had both episiotomy and tear

Part four: This section of the questionnaire covers neonatal outcomes, which included 1-minute and 5-minute Apgar score, neonatal admission in ICU, and breastfeeding initiation by providing information on the benefits of breastfeeding and assessing the mother's readiness to breastfeed.

Intervention process

Before starting the data collection, the researcher developed the intervention process after a comprehensive review of the literature regarding RMC &EC based on WHO recommendations. It selected ten items of EC, which include effective communication between maternity care staff and women during labor and childbirth, as the Guideline Development Group (GDG) approved [9]. As well as the 15-item RMC scale, this tool includes four components: friendly care (7 items),
abuse-free care (3 items), timely care (3 items), and discrimination-free care (2 items). It was developed in Ethiopia by Sheferaw et al., 2016 and demonstrated validity and reliability with a value of (0.845) [23].

Before the actual data collection, the researcher conducted a pre-test on 10% (12 mothers, six control, and six intervention) who were not included in the study before the actual data collection period in order to identify a kind midwife and to select for the intervention group. To find the problems and barriers facing during data collection, and feasibility of the study.

Following the study's eligibility criteria and explaining the purpose of the study, informed consent was obtained. The woman was randomly assigned to either the intervention or the control group. The researcher was applied RMC and EC as follows:

**Ten items of EC were applied as follows:**

Following the woman's agreement to participate in the intervention group, the researcher welcomes her warmly and respectfully. The researcher and the midwife introduce themselves to a laboring woman, her companion, and her family, addressing the woman by name and accompanying her to the private room where she would deliver her baby (this took 5 to 10 minutes).

Taking a brief history concerning contraction characteristics such as frequency, length, and strength of contractions, membrane status (intact or ruptured), and complete sociodemographic and obstetric questions usually take ten to fifteen minutes.

The researcher assists the woman in taking a seat on the bed and lying on her back during the vaginal examination. After obtaining consent and describing the purpose of the examination, the midwife conducts a vaginal exam to assess cervical dilation and the percentage of cervical effacement.
After admitting the women, the researcher monitors vital signs, fetal heart rate, and labor pain every half-hour during the first stage of labor and estimating contractions every ten minutes (in the Kurdistan region, electronic fetal monitoring and partogram are not used regularly).

Between contractions, the investigator offers the women's information regarding the labor process, clearly explaining the stages of labor and all procedures carried out such as (fetal monitoring, intravenous therapy, medication was given). Additionally, all participants in the intervention group receive information about colostrum and the benefits of breastfeeding and are asked if they have any questions. (Women received no prenatal childbirth preparation classes, and the Kurdistan region lacked an antenatal care program for childbirth preparation).

Between contractions, the laboring woman requested a lower back massage. This was performed with the assistance of a researcher and a female companion. Intrapartum care was described as the researcher's continual reassuring and demonstration of empathy during the labor and delivery. Women were encouraged to express their needs, recommend a light meal or water, and request that she empties her bladder and wash her genitals (if she wants to).

The investigator regularly updates the woman and her family on labor progress and ensures adequate care is provided in a safe environment for the mother and the newborn's birth.

**15 items of RMC were applied as follows:**

The laboring woman has access to a skilled and kind midwife (with at least ten years of experience in childbirth), explaining the study's aim to the midwife to continuous emotional and physical care. The researcher was making sure that the woman understood our language. The investigator talked positively about pain and relief methods (administer pharmacological agent as ordered when she requested control) (Applied as a part of friendly care).
To avoid service delays for any reason, the researcher obtains medicine from the hospital pharmacy as orders, prepares the bedcovers, pads, and instruments. Additionally, allowing a woman to engage in religious practices (Timely care).

Responded to women’s needs whether or not she asked, such as (helping women change position on the bed for side-lying, squatting, standing, and walking) to increase comfort and promote labor progress. The second stage of labor advises spontaneous pushing when she feels an urge and empowers women to push in their way rather than forcing them to push or shouting at them, informing her to rest and relax between contractions to save energy for the next contraction. The researcher tries to eliminate women's disrespect (protect from verbal abuse, right to informed consent, maintaining privacy, treat with respect (Abuse free care).

After birth, wraps the newborn in warmed blankets. Following the delivery of the placenta and cleaning the perineum, the midwife checks to detect any vaginal or perineal tear and assists women in a comfortable position. If there was no tear, the woman was transferred to the postpartum unit with the initial attempt at breastfeeding.

Avoiding any insults directed towards the woman and their companions (Discrimination free care).

The researcher spent approximately 8-10 hours with each woman in the intervention group from admission to discharge from the hospital.

The control group (Routine care group)

1. The laboring women were not greeted warmly, and the midwives did not introduce themselves to them; instead, she directed them to proceed to the delivery room and wait to evaluate cervical dilation.

2. Service provision (prepare the bed, room, admitting women, examine the women to detect cervical dilation, obtain medicine from a pharmacy) was delayed about (ten to twenty minutes) to the laboring woman due to changing team shift or negligent the woman.
3. Women were admitted in the labor room with other laboring women (at least five laboring women).

4. The laboring women's food and fluid intake was restricted (delivery room staff frequently inform all women you must not take food and fluid due to the possibility of a cesarean section).

5. The delivery room staff did not inform the family about labor progress or reassure them of adequate care.

6. The researcher only observed and recorded the necessary data without explaining or clarifying any procedures. Midwives and delivery room staff did not explain them.

7. Following admission, women were instructed to remain in the delivery room without regular checkups by the midwives until the women's companion requested it or cervical dilation was complete, and the baby was ready to be born.

8. The researcher observed the woman and her companion in the control group frequently exposed to verbal abuse. Unfortunately, we do not have official data on the prevalence of disrespect in the delivery room in the Kurdistan region.

**Statistical analysis**

The statistical package SPSS version 25.00 (SPSS 25.00, IBM Corp; USA) was used. The categorical and numerical characteristics of the mothers were presented with frequency (percentage) and means (SD). The Pearson Chi-square, Fisher Exact test, and Mann-Whitney U were used to assess baseline information homogeneity across two groups. A Mann-Whitney U test analyzed the difference between two groups in length and stages of labor, length of hospitalization, 1-minute and 5-minute Apgar score. The Effect of RMC and EC on maternal outcomes (mode of birth, perineal tear) and neonatal outcome (Initiation of breastfeeding, neonatal admission of ICU) in both groups were compared by Chi-square test, whereas Wilcoxon W was used to compare the mean value of labor pain score of two groups. Level of significance set to p= 0.05.

**Ethical considerations**
The study protocol received approval from the scientific and Ethical committee of the College of Nursing/ Raparin University registration number: 7-29 (22/1/2020). Erbil and Koya Health Directorate granted the official permission for collecting data. The level of intervention that was provided to the participant in the intervention group was considered to be safe. In addition, informed consent was taken from each woman after explaining the required information for all participants. It is emphasized that they have the right to withdraw at any time. Also, the study sample's personal information was kept confidential, the participants' permission was obtained to publish the data in this research.

Results

As shown in Table 1, there were no statistically significant differences between the control and intervention groups in terms of age (27.50 vs. 28.52, p=0.373), gestational age (39.07 vs. 39.17, p=0.666), and oxytocin use (3.35 vs. 2.62, p=0.151), residency, education, mother's occupation, para, and abortion (P>0.05). The only significant difference (p=0.034) was in family income. The length of labor among primiparous was significantly shorter in the intervention group than the control group (M: 173.8, SD: 32.11 vs. M: 264.63, SD: 131.17 min; P= 0.049), and the mean duration of labor in multiparous and grand multiparous women were shorter although, it was non statistically significant (p> 0.05). Similarly, the length of hospitalization (prim parous; 356.7 ± 49.61 vs. 639.81 ± 454.53 min; P= 0.006. multiparous; 331.56 ± 83.10 vs. 366.17 ± 80.89 min; P =0.031) were significantly shorter in the intervention group compared with the control group.

In each stage of labor, the total mean score duration was compared between groups. However, no substantial difference was found except the active phase period of labor among the primiparous
mother was shorter in the intervention group (M: 134.40 SD: 440) than in the control group (M: 216.27 SD: 105.61) (Table 2).

Comparing mode of birth between groups showed a significantly lower rate of emergency cesarean section and a higher rate of spontaneous vaginal delivery in the intervention group (p=0.042) (Table 3). Despite that intervention group had high rate of an intact perineum, Chi-square analysis revealed no significant difference in the impact of RMC and EC on the perineal status between groups (p=0.344) (Table 2).

The VAS was used to measure labor pain in both groups, and the Wilcoxon W test showed that the total labor pain mean score in the intervention group (M: 7.378 SD: 0.67) was significantly lower than in the control group (M: 8.472 SD: 0.62), (P< 0.001) (Table 2).

After the intervention, the highly significant scores for neonatal outcomes were observed in terms of the first minute Apgar score (p< 0.001) and initiation of breastfeeding (p< 0.001) in the intervention group compared with the control subject. Meanwhile, there was no statistical difference in five minutes Apgar score and neonatal admission in ICU (p > 0.05) (Table 4).

**Discussion**

This paper was designed to examine implementing WHO recommendations regarding RMC and EC with other criteria like having a private room for laboring mothers. And its effect on maternal and neonatal outcomes.

**Maternal outcomes**

The current study found that the implementation of WHO recommendations cause the shortening of hospitalization and early postpartum discharge comparatively. The short duration of hospitalization can prevent undesirable adverse events that directly affect the women and neonatal
health, such as Hospital-acquired conditions. Similarly, in western countries, there is a tendency to shorten the length of hospital stay after childbirth, driven by cost control [24] hospital bed availability and a movement toward demedicalisation of childbirth [25]. Additionally, reducing hospitalization after childbirth results in decreased staff workload can represent a substantial savings of high services [24]. Many studies have supported early obstetric discharge for healthy mothers and term infants, finding no significant differences in neonatal and maternal morbidity or psychological well-being between early and standard discharge and an even higher rate of breastfeeding [26, 27]. Enhancing the delivery of respectful and high-quality maternal health care assist in increasing maternal health outcomes [28, 29]

In the present study, implementing RMC and EC to the laboring women showed a shorter duration of the active phase and the overall duration of labor in primiparous women. The results of the present study are in agreement with the statement of several other research. In a randomized trial of 100 nulliparous women, the results show that laboring women assisted by an experienced midwife, in an isolated room, able to eat and walk, explained labor process, the midwife remained with the woman throughout labor and delivery, was significantly reduce the duration of labor [12, 30]. In a study conducted in Mexico City among 724 primiparous women, the intervention group received Psychosocial support compared with routine care; the result indicated that the duration of labor was significantly shorter [31].

The women in the intervention group were prepared for childbirth by describing a procedure, maintaining a close relationship with laboring women, reassurance, and being familiar with the maternity ward; all of these factors can help reduce women's fear of childbirth and, as a consequence, shorten the duration of labor. Fear and anxiety have been shown to increase
catecholamine levels in the blood [32] and elevated catecholamine levels have been linked to enervated uterine contractility and prolonged labor [32, 33]. Respectful maternity care is a rightful expectation of every woman. On the contrary, issues like disrespect, abuse, ill-treatment, and overcrowding are prevalent worldwide [34].

A cross-sectional study of (N=2639) women delivered at 68 public health institutions in Uttar Pradesh, India, was conducted. This study examines the associations between provider mistreatment during childbirth and maternal complications. It discovered that one in five (20.9%) women reported provider mistreatment during childbirth, including discrimination and abuse; complications during delivery (e.g., obstructed labor) was reported by 45.8 of women [35].

In meta-analyses of qualitative studies about their perspectives and experiences of the evidence supporting the quality of care provided to mothers and infants, women reported that information and education were critical to their ability to learn for themselves they needed to understand the organization of services in order to access them in a timely way, that services needed to be provided respectfully by staff who engendered trust and were not abusive or cruel [36].

The decrease in labor length may be due to a reduction in labor pain. The present study founded that the intervention group had significantly lower labor pain. Although, the impact of each RMC and EC on labor pain was not measured separately. Furthermore, In the current study, women who have requested it receive back massage; some previous studies have found that back massage reduces pain intensity during labor [37, 38]. Conversely, severe labor pain and anxiety increase the impact of adrenalin and cortisol on uterine contractility, resulting in prolonged labor [39]. In a descriptive study in Iran, communication skills with the patient can have many potential benefits such as reduced symptoms, pain, anxiety, enhanced peace of mind, and cooperation with the medical team [15].
In this study, Chi-square analysis showed RMC and EC decreased the emergency cesarean rate and increased spontaneous vaginal delivery by more than twofold in the intervention group compared with the control group. Several studies reported that good communication and emotional support in the delivery room reduce the cesarean section rate [12, 30, 40, 41]. A phenomenological study conducted in 2010 found that when a midwife accompanies laboring women, their privacy is protected, the labor environment is secure, and labor is explained, resulting in fewer caesareans and complications [42]. In agreement with our findings, 'Creating a close relationship, building trust, and implementing adequate continuous support during labor help stop the fear-stress-pain cycle, thus reducing catecholamine secretion, improving uterine contraction, and physiologic childbirth acceleration,' writes Ahmadi Afshar, quoting Rosen [43].

The study group's remaining intact perineum was higher than the control group. Although this difference was non statistically significant regarding the perineal tear, quasi-experimental research by Sehhatie, et al., 2014, providing one-to-one delivery care and continuous attendance of the midwife in the experimental group significantly lower grade of the perineal lacerations [41]. In addition, a Swedish study interviewing with twenty midwives revealed that preserving women's privacy and positive communication during labor, maintaining a sense of security, no rushing, focus on the natural process of labor, taking its time was regarded as critical factors in avoiding birth injuries [44].

**Neonatal outcomes**

Beneficial effects of RMC and EC not only appear in maternal outcomes but also significantly affects neonatal outcomes. Findings showed the intervention group compared with the control group demonstrated a highly significant difference in first-minute Apgar score. The results of this
study confirm previous research on neonatal Apgar scores, the importance of effective communication and emotional support of parturient women improve the outcome of childbirth, and neonatal Apgar score [40]. In San Francisco and Berkeley, California, a retrospective cohort analysis compared 3551 physician-managed women to 1056 certified nurse-midwife-managed women; this study shows that the newborns of women cared for and supported by nurse-midwives have a higher rate of Apgar score [45]. In a large mixed-method study during 2013-2014, a positive relationship with the mother in the delivery room can increase the quality of life and contribute to health-promoting behaviors. For instance, growing mothers' knowledge of maternal and neonatal health care [40].

All participants in the intervention group received information on lactation and the benefits of colostrum and breast milk. In consequence, initiation of breastfeeding significantly higher among the study group. Similar to our findings, a cross-sectional study was proved that mothers who received breastfeeding counseling were 2.7 times more likely to initiate breastfeeding on time than mothers who did not receive breastfeeding counseling [46]. A study from South African reported that when a woman had good support from nurses or medical practitioners, her breastfeeding experience was good even the woman initially struggled with breastfeeding [47]. Knowledgeable nurses and midwives support the women, which has been shown to be effective in extending breastfeeding duration [48].

On the other hand, a lack of knowledge, inconsistent advice, and perceived insufficient support from health professionals can contribute to a lack of breastfeeding initiation [48, 49]. The Control group in the present study did not receive information on breastfeeding. Therefore, it is probable that the control group's lower rate of breastfeeding initiation. It could be due to a lack of communication between women and providers and the absence of continuous training and
educational programs for nurses and midwives focused on maternal and neonatal health. The RMC and EC interventions were found to be effective in increasing breastfeeding initiation and neonatal Apgar Score, which can lead to improved maternal and newborn health.

**Strength and limitation of the study**

The study's key strength is the experimental study, including primiparous, multiparous, and grand multiparous women. A small sample size of the current study is considered as a limitation of the study. The researchers utilized a private delivery room in the intervention group due to the researcher's incapacity to examine and apply WHO recommendations for all laboring women in the delivery room without assistance.

**Conclusions**

The study showed that implementing RMC and EC during labor and delivery improves maternal and neonatal outcomes (reduces the duration of labor, labor pain, the number of cesarean sections, and the length of hospitalization, as well as increases spontaneous birth, initiation of breastfeeding, and the rate of Apgar score). In addition, promoting mutual respect between women and providers has the potential methods for reducing disrespect and abuse during childbirth that can significantly improve the quality of maternity care—further studies are needed by supporting RMC and EC in the level of health facilities and health system.

**Abbreviations**

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Author's contribution

HMA formulated the idea, prepare the proposal and design of the study. KKF developed a questionnaire and research intervention, collect the data, interpreted data, and drafted the manuscript. The final version of the manuscript has been read and accepted by all Authors.

Authors' information

KKF is a Lecturer at Erbil Polytechnic University/ Koya Technical Institute Kurdistan region- Iraq and a Ph.D. student of Maternity Nursing in Collage of Nursing in Raparin University Kurdistan region- Iraq. HMA is Professor; Ph.D. in Maternity Nursing; Dean of College of Health Sciences; Director of the Center for Research and Education in Women's Health in Hawler Medical University, Erbil - Kurdistan Region - Iraq. Hamdia76@gmail.com, hamdia.ahmed @hmu.edu.krd 009647504478625.

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Availability of data and materials

Sets of data used and analyzed in the current study and the current report are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study's Ethical approval was obtained from The Ethics Committee of college Nursing/Raparin University registration number: 7-29 (22/1/2020). The verbal consent was taken from each woman after explaining the purpose and procedure of the study, and it was mentioned in the special form
requested by Ethics Committee. Additionally, they were also assured confidentiality of the information.

Consent for publication

Not applicable.

Competing interests

The authors declare no conflict of interest.

Author Details

1Community Health Department, Koya Technical Institute, Erbil Polytechnic University, Erbil, 44001, Iraq. 2Ph.D. Student of Maternity Nursing College of Nursing, University of Raparin, Ranya, Iraq. 3College of Health Sciences, Hawler Medical University, Erbil, Kurdistan Region, Iraq.
Table 1: Comparison of mother’s characteristics between groups (N=120).

<table>
<thead>
<tr>
<th>Subject’s Characteristics</th>
<th>Control (n=60)</th>
<th>Intervention (n=60)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Year)</td>
<td>27.50 (7.4)</td>
<td>28.52 (6.9)</td>
<td>0.373*</td>
</tr>
<tr>
<td>Residency</td>
<td></td>
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<tr>
<td>Urban</td>
<td>32 (53.3)</td>
<td>32 (53.3)</td>
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<tr>
<td>Suburban</td>
<td>25 (41.7)</td>
<td>22 (36.7)</td>
<td>0.546**</td>
</tr>
<tr>
<td>Rural</td>
<td>3 (5)</td>
<td>6 (10)</td>
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<tr>
<td>Education Levels</td>
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<td></td>
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<tr>
<td>Cannot read and write</td>
<td>5 (8.3)</td>
<td>8 (13.3)</td>
<td></td>
</tr>
<tr>
<td>Can read and write</td>
<td>15 (25)</td>
<td>7 (11.7)</td>
<td></td>
</tr>
<tr>
<td>Primary School graduate</td>
<td>17 (28.3)</td>
<td>12 (20)</td>
<td></td>
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<tr>
<td>Secondary School graduate</td>
<td>14 (23.3)</td>
<td>25 (41.7)</td>
<td>0.106***</td>
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<tr>
<td>Institute and college graduate</td>
<td>9 (15)</td>
<td>8 (13.3)</td>
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<tr>
<td>Occupation of mother</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>5 (8.3)</td>
<td>6 (10)</td>
<td></td>
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<tr>
<td>House wife</td>
<td>54 (90)</td>
<td>52 (86.7)</td>
<td>0.361**</td>
</tr>
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<td>Student</td>
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<td>2 (3.3)</td>
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<tr>
<td>Gestational age (weeks)</td>
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<td>39.17</td>
<td>0.666*</td>
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<td>Parity</td>
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<td>Primipara</td>
<td>17 (28.3)</td>
<td>13 (21.7)</td>
<td>0.681***</td>
</tr>
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<td>Multipara</td>
<td>32 (53.3)</td>
<td>36 (60)</td>
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<tr>
<td>Grand multipara</td>
<td>11 (18.3)</td>
<td>11 (18.3)</td>
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<tr>
<td>Abortion</td>
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<tr>
<td>Aborted</td>
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<td>0.835***</td>
</tr>
<tr>
<td>Not aborted</td>
<td>44 (73.3)</td>
<td>45 (75)</td>
<td></td>
</tr>
<tr>
<td>Oxytocin use IU</td>
<td>3.35 (2.803)</td>
<td>2.62 (2.491)</td>
<td>0.151*</td>
</tr>
<tr>
<td>Neonatal weight (g)</td>
<td>3744.17 (428.843)</td>
<td>3725 (504.177)</td>
<td>0.776*</td>
</tr>
<tr>
<td>Monthly family income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient</td>
<td>14 (23.3)</td>
<td>15 (25)</td>
<td></td>
</tr>
<tr>
<td>Barely sufficient</td>
<td>29 (48.3)</td>
<td>39 (65)</td>
<td>0.034***</td>
</tr>
<tr>
<td>Insufficient</td>
<td>17 (28.3)</td>
<td>6 (10)</td>
<td></td>
</tr>
</tbody>
</table>

*Mann-Whitney U **Likelihood Ratio, *** Pearson Chi-Square
### Table 2: Maternal outcomes

<table>
<thead>
<tr>
<th></th>
<th>Control (n=50)</th>
<th>Intervention (n=50)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of labor / Minute</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primipara</td>
<td>264.63 ± 131.17</td>
<td>173.8 ± 32.11</td>
<td>0.049</td>
</tr>
<tr>
<td>Multipara</td>
<td>159.85 ± 91.57</td>
<td>148.03 ± 75.90</td>
<td>0.686</td>
</tr>
<tr>
<td>Grand Multipara</td>
<td>148.09 ± 82.43</td>
<td>123.1 ± 79.45</td>
<td>0.622</td>
</tr>
<tr>
<td><strong>Length of Hospitalization/ Minute</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primipara</td>
<td>639.81 ± 454.53</td>
<td>356.7 ± 49.61</td>
<td>0.006</td>
</tr>
<tr>
<td>Multipara</td>
<td>366.17 ± 80.89</td>
<td>331.56 ± 83.10</td>
<td>0.031</td>
</tr>
<tr>
<td>Grand Multipara</td>
<td>508.72 ± 339.72</td>
<td>358.4 ± 102.35</td>
<td>0.260</td>
</tr>
<tr>
<td><strong>Duration of Stages of Labor/ Minutes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primipara</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active stage of labor</td>
<td>216.27 ± 105.618</td>
<td>134.40 ± 44.008</td>
<td>0.048</td>
</tr>
<tr>
<td>Second stage of labor</td>
<td>35.27 ± 29.584</td>
<td>26.50 ± 11.511</td>
<td>0.548</td>
</tr>
<tr>
<td>Third Stage of labor</td>
<td>13.09 ± 7.556</td>
<td>12.90 ± 6.707</td>
<td>0.972</td>
</tr>
<tr>
<td>Multipara</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active stage of labor</td>
<td>115.32 ± 86.502</td>
<td>113.53 ± 70.701</td>
<td>0.988</td>
</tr>
<tr>
<td>Second stage of labor</td>
<td>34.39 ± 34.227</td>
<td>25.70 ± 13.290</td>
<td>0.431</td>
</tr>
<tr>
<td>Third Stage of labor</td>
<td>10.14 ± 6.682</td>
<td>8.80 ± 3.498</td>
<td>0.994</td>
</tr>
<tr>
<td>Grand Multipara</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active stage of labor</td>
<td>110.82 ± 86.154</td>
<td>90.60 ± 78.692</td>
<td>0.548</td>
</tr>
<tr>
<td>Second stage of labor</td>
<td>27.55 ± 18.002</td>
<td>24.20 ± 16.137</td>
<td>0.548</td>
</tr>
<tr>
<td>Third Stage of labor</td>
<td>9.73 ± 5.274</td>
<td>8.30 ± 2.452</td>
<td>0.750</td>
</tr>
<tr>
<td>Labor pain</td>
<td>8.472 ± 0.62</td>
<td>7.378 ± 0.67</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Perineal status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intact</td>
<td>13 (26)</td>
<td>20 (40)</td>
<td></td>
</tr>
<tr>
<td>Episiotomy</td>
<td>8 (16)</td>
<td>9 (18)</td>
<td>0.344</td>
</tr>
<tr>
<td>Tear</td>
<td>26 (52)</td>
<td>20 (40)</td>
<td></td>
</tr>
<tr>
<td>Episiotomy and Tear</td>
<td>3 (6)</td>
<td>1 (2)</td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Delivery outcomes

<table>
<thead>
<tr>
<th>Mode of Birth</th>
<th>Control (n=60)</th>
<th>Intervention (n=60)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous vaginal delivery</td>
<td>6 (10)</td>
<td>16 (26.7)</td>
<td></td>
</tr>
<tr>
<td>Vaginal delivery assisted with</td>
<td>46 (76.7)</td>
<td>40 (66.7)</td>
<td>0.042*</td>
</tr>
<tr>
<td>Augmentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency cesarean section</td>
<td>8 (13.3)</td>
<td>4 (6.7)</td>
<td></td>
</tr>
</tbody>
</table>

* Pearson Chi-Square

Table 4: Neonatal outcomes

<table>
<thead>
<tr>
<th></th>
<th>Control (n=50)</th>
<th>Intervention (n=50)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apgar score in 1 minute</td>
<td>7.02 (0.869)</td>
<td>7.74 (0.922)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Apgar score in 5 minutes</td>
<td>9.16 (0.889)</td>
<td>9.40 (0.857)</td>
<td>0.07*</td>
</tr>
<tr>
<td>Initiation of Breast feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (20)</td>
<td>41 (82)</td>
<td>0.001**</td>
</tr>
<tr>
<td>No</td>
<td>40 (80)</td>
<td>9 (18)</td>
<td></td>
</tr>
<tr>
<td>Neonatal Admission in ICU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2 (4)</td>
<td>2 (4)</td>
<td>0.691***</td>
</tr>
<tr>
<td>No</td>
<td>48 (96)</td>
<td>48 (96)</td>
<td></td>
</tr>
</tbody>
</table>

*Mann-Whitney U, ** Pearson Chi-Square, ***Fisher's Exact Test
Enrollment

- Not meeting inclusion criteria (n=48)
- Refused to participate (n=9)
- Unfavorable pelvis (n=3)

Assessed for eligibility

Excluded (n=60)

Randomized (n=120)

Allocated to intervention (n=60)
- Received routine care in delivery room (n=60).
- Applied RMC and EC during labor and childbirth (n=60).
- Responds questions regarding to sociodemographic and obstetric characteristics (n=60).
- Intrapartum information recorded (n=60).
- Discontinued from the study due to emergency caesarian section (n=4).
- Withdrew from the study (n=2)
- Missing data (n=2).
- Previous uterine scar (n=2).

Allocated to control group (n=60)
- Received routine care in delivery room (n=60).
- Responds questions regarding to sociodemographic and obstetric characteristics (n=60).
- Intrapartum information recorded (n=60).
- Discontinued from the study due to emergency caesarian section (n=8).
- Withdrew from the study (n=1)
- Missing data (n=1)

Data on neonatal outcomes has been recorded.

Analysis

- Analyzed (n=50)
- Excluded from analysis (n=10)

- Analyzed (n=50)
- Excluded from analysis (n=10)

Figure 1
References


38. Chang M, Wang S, Chen C. Effects of massage on pain and anxiety during labour: a


