Original Article

The Effect of Chewing Gum in Managing Labor Pain Intensity and Anxiety Level in Primiparous Women: A Randomized Controlled Trial

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Abstract

Background: Fear and anxiety of the pain caused by childbirth is the main resistance of women against natural childbirth; therefore, women prefer cesarean delivery. The utilization of non-pharmacological treatments can make the childbirth process pleasurable for the mother. This study aimed to determine the effect of chewing gum on anxiety and labor pain intensity in primiparous women.

Methods: This randomized controlled study was conducted in two public health centers (Babol, Iran) from May 2021 to October 2022. The participants comprised 116 primiparous women with a gestational age of 38–42 weeks and a diagnosis of labor pain. The pregnant women were subjected to block randomization and allocated to two groups of 58 patients. The intervention group received chewing gum for 20 minutes in the three stages, including dilatation of 3–4 cm, 5–7 cm, and 8–10 cm. The control group received only standard care. The tools used for data collection included demographic and obstetric characteristics, the State-Trait Anxiety Inventory (STAI) questionnaire, and the Visual Analog Scale (VAS). The data were analyzed hroughtSPSS, version 22, using the Chi-square test, Repeated Measures ANOVA, paired t test, independent t-test, and ANCOVA. A significance level of less than 0.05 was considered.

Results: There was a significant difference in the mean pain scores after the intervention between the two groups in dilatation of 3-4 cm ($P=0.003$), 5-7 cm ($P<0.001$), and 8-10 cm ($P<0.001$); also, the chewing gum group had lower pain intensity. There was a significant difference in the mean state anxiety ($P<0.001$) and trait anxiety ($P<0.001$) scores after the intervention between the two groups, and the gum chewing group had lower anxiety.

Conclusion: Chewing gum is a practical alternative method for decreasing anxiety and pain intensity during childbirth in primiparous women.

Trial Registration Number: IRCT20100510003902N5.

Keywords: Anxiety, Chewing gum, Labor pain, Parity, Women

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Introduction

When a woman faces an unknown childbirth process for the first time, she often feels anxious because coping with labor pain is widely viewed as an anxious moment. It is one of the most beautiful events in a woman's life.[1, 2] Although labor pain is a complex, subjective, and bittersweet paradoxical experience, it is undesirable and the most unpleasant aspect of the labor experience during parturition.[3-6] A Sweden study revealed that 41% of participants reported that labor pain was the worst experience they had ever had.[7] The severity of labor pain can cause severe emotions, anxiety, and disturbance in mothers' mental health. In addition, the physical consequences of this pain, such as increased oxygen consumption, decreased uterine blood supply and subsequent decreases in fetal blood flow, unstable fetal heart rate, lower newborn Apgar scores, and increased need for cesarean section, can cause unwanted effects on the physiological course of childbirth.[8] Pain leads to increased heart rate, blood pressure, sweating, and excessive activity of the endocrine system, which threaten the patient's well-being.[9, 10]

According to research findings, fear of labor pain is one of the critical factors influencing pregnant women, especially first-time mothers, to choose cesarean section as the mode of delivery. In addition, uncontrolled labor pain can lead to a negative or traumatic birth experience and decrease the motivation to give birth.[1, 11-13] Therefore, reducing labor pain through various pain relief methods can increase the mothers' inclination toward natural birth and motivation to give birth.[10] In many countries, especially developed countries, managing childbirth and making it a pleasant experience with minimal pain has become one of the most serious challenges for the public health system.[14, 15]

The main goal of childbirth care is to optimize the physical and mental health of the mothers to help them cope with the conditions and reduce the pain associated with childbirth. Both pharmacological and non-pharmacological methods can alleviate pain during childbirth. The first has some limitations due to its harmful effects on the mother and the fetus, high costs, the need for specialized personnel, medical contraindications for the mother and the fetus for the use of certain painkillers, the interruption of natural labor, and the risk of the mother's reflex reactions to painkillers. Therefore, many experts believe that non-pharmacological methods that are safer for the mother and fetus should be used to reduce labor pain.[16]

Non-pharmacological methods of pain relief are an essential part of midwifery care. The results of some studies have shown that all non-pharmacological pain relief methods are widely associated with maternal satisfaction. These methods have achieved a special place in midwifery due to their few side effects, ease of use, accessibility, and cost-effectiveness.[16-18]

Chewing gum can improve an individual's mood and effectively interpret the link between pain and anxiety.[4] One study demonstrated a relationship between chewing gum and increased cerebral blood flow, indicating that chewing gum can enhance mental resilience to anxiety.[19]. Several studies have reported different results about the impact of chewing gum on pain and anxiety reduction.[4, 20, 21] In children during intravenous cannulation, according to the children's self-report and the nurse's report, the pain level of the experimental group was significantly lower than the control group. However, no significant difference was noted between the experimental and control groups' anxiety levels.[4] In the management of orthodontic cases, the relative pain scores for the 2 groups changed over time, with the chewing gum group experiencing slightly more pain on the day of bond-up and less on the subsequent 3 days; however, the differences had no clinical importance.[21] One study has shown that activation of the ventral part of prefrontal cortex during gum chewing evokes augmented activity of 5-HT (5-hydroxytryptamine receptors) neurons in the dorsal raphe nucleus, suppressing

nociceptive response.[20] The thought divergence interventions of chewing gum enhanced childbirth satisfaction, curtailed parturition duration stages, and reduced the perceived severity of labor pain.[22, 23]

Although some investigations have evaluated the impact of chewing gum on anxiety and pain reduction, the number of such studies is limited. To date, few studies in databases have examined the impact of chewing gum on the intensity of labor pain. According to the findings from previous research, there was a need in this study to focus on easily accessible effective methods that are user-friendly and allow individuals to manage their pain and anxiety.[4, 21, 24, 25]

Studies have shown that methods of distraction (chewing gum) are somewhat effective in reducing pain and anxiety in medical practice. Therefore, this trial aimed to determine the effect of chewing gum on anxiety and labor pain intensity in primiparous women.

Materials and Methods

This study is a randomized controlled trial on primiparous women who gave birth at two hospitals in Babol, Iran, between May 2021 and October 2022. The participants in this study were primiparous and gave birth at two hospitals (Ayatollah Rouhani and Shahid Yahyanejad) in Babol, Iran. The inclusion criteria were gestational age of 38-42 weeks based on the last menstrual period or ultrasound examination before 26 weeks according to a previous study,[26] spontaneous delivery, live fetus, cephalic singleton pregnancy, ability to chew gum, lack of medical and mental illness, no addiction, wanted pregnancy, no fetal malformations, no complications of natural childbirth in a relative, the mother not being a professional athlete, and consent to participate in the study. The exclusion criteria were mother's unwillingness to cooperate, abnormal fetal heart rate during delivery, use of other methods of painkiller including Entonox and spinal and epidural anesthesia during delivery, vaginal bleeding during the intervention, labor complications, chewing gum less than 20 min, and the need for a cesarean section.

The sample size was calculated according to Yildizeli Topcu et al.'s study.[4] In their study, the intervention group had (S_1=0.96), while the control group had (S_2=0.91), d=0.5 difference between the two means, with an alpha of 0.05 and 80% power, the required sample size was estimated at 105. Given a 10% dropout, the final sample size was adjusted to 116, resulting in 58 participants per group.

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 (S_1^2 + S_2^2)}{d^2}$$

The participants, after being evaluated in consultation by a doctor for normal delivery and after declaring that they were willing to participate in the study, were randomly assigned to the waiting list for the intervention groups (chewing gum) or to the control group (the standard care). Allocation was performed by a 1:1 block randomization using random assignment software with a block size of 4 blocks, which was performed by an individual not associated with the sampling and data analysis. The sort of allocation was written on a card and placed in nontransparent envelopes numbered consecutively for allocation concealment. The package was opened to the mothers by an individual who was not involved in the study. To obtain the mothers' consent to participate in the study, the mothers were informed about the purpose and advantages of the study.

The intervention took place in the hospital LDR (Labor, Delivery, and Recovery) room, using three pieces of sugar-free chewing gum (Orbit, approved by Iran's Ministry of Health) with nutritional value per piece of gum: 18 kJ energy, 0 g protein, 1.8 g carbohydrates., and 0 g lipid. Each piece weighed 1g and was administered at three stages of labor: at the beginning of active labor (3–4 cm dilation), the second phase (5–7 cm dilation), and the third phase (8–10 cm dilation). The mothers

were asked to run their natural chewing speed for at least 20 minutes.[25]

Participants in the control group received standard care (follow-up contractions, checking cervical dilatation and vital signs, and fetal heart monitoring), and it was emphasized that chewing gum or any chewable should not be used during hospitalization before delivery.

The obstetric and demographic characteristics questionnaire, Visual Analog Scale (VAS) for labor pain, and State-Trait Anxiety Inventory (STAI) were used for data collection in both groups. The questionnaire on demographic and obstetrical data was completed before the intervention in both groups. It included the variables of age, education, occupation, family income, gravida, abortion, gestational age, and status of pregnancy planning.

Childbirth pain intensity was evaluated using a VAS at the beginning of the intervention, dilatation of 3-4 cm, dilatation of 5-7cm, and dilatation of 8-10 cm. On this scale, the participants marked the severity of their pain on a 10-cm ruler with selected images to describe the pain, with a score of 0-1 indicating no pain, 2-3 little pain, 4-5 somewhat disturbance, 6-7 disrupting activity, 8-9 very disturbing, and 10 very painful/unbearable. The last result from this assessment was a score of 0-10. The VAS is a standard tool, and its validity and reliability have been globally proven; an alpha Cronbach test of 0.86 was used to test its reliability.[27, 28]

Women completed the STAI at the beginning of the intervention and after the intervention in dilatation 8-10 cm to estimate their anxiety. The STAI is a 40-point self-response scale that evaluates different elements of "state" and "trait" anxiety and measures how the subject feels with 40 questions with response options of 1=not at all/rarely, 2=a little/sometimes, 3=moderately/often, and 4=very/almost always. This measure has 2 subscales, each containing 20 questions. Initially, the S-Anxiety Scale assesses the current state of anxiety, mental fear, stress, tension, distress, and activation/nervousness of the autonomous nervous system. The T-Anxiety Scale assesses partly constant aspects of "anxiety proneness," including general placidity, self-assurance, and reliability.[29, 30] In each subscale, 20 to 80 points are measured.[31] A score of 20 indicates the lowest level of anxiety, and a score of 80 the highest level of anxiety (none or minimal 20-31, mild 32-42, moderate 43-52, severe 53 or more). Scoring was inverted for expressions that indicate anxiety.[32] The validity of this questionnaire in Iran was confirmed.[33] The reliability of the questionnaire was assessed by a Cronbach's alpha of 0.9 for anxiety.[31]

Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS Inc., Chicago, version 22). Quantitative data were summarized using means and standard deviations, while categorical data were presented with frequencies and percentages. Independent t-test was used for between-group comparison of pain intensity and trait anxiety, and ANCOVA test for state anxiety variables. Paired t-test was used for within-group comparison of state and trait anxiety; also, Repeated Measures ANOVA was used for within-group comparison of pain intensity. Statistical significance was considered at P value<0.05.

This study was approved by the Babol University Biomedical Research Ethics Committee (IR.MUBABOL.REC.1400.059). This study was conducted according to the principles of the Declaration of Helsinki. The authors explained the aim of the study to all the women. Before each participant participated in the study, verbal and written informed consent was obtained. Additionally, mothers included in the study were informed by the researchers that participation in the study was entirely voluntary and that they had the right to discontinue/withdraw at any time without any changes in their care. The researchers would maintain the confidentiality and anonymity of their answers and/or the data collected. This study was registered with IRCT20100510003902N5 in the Iranian Registry of Clinical Trials

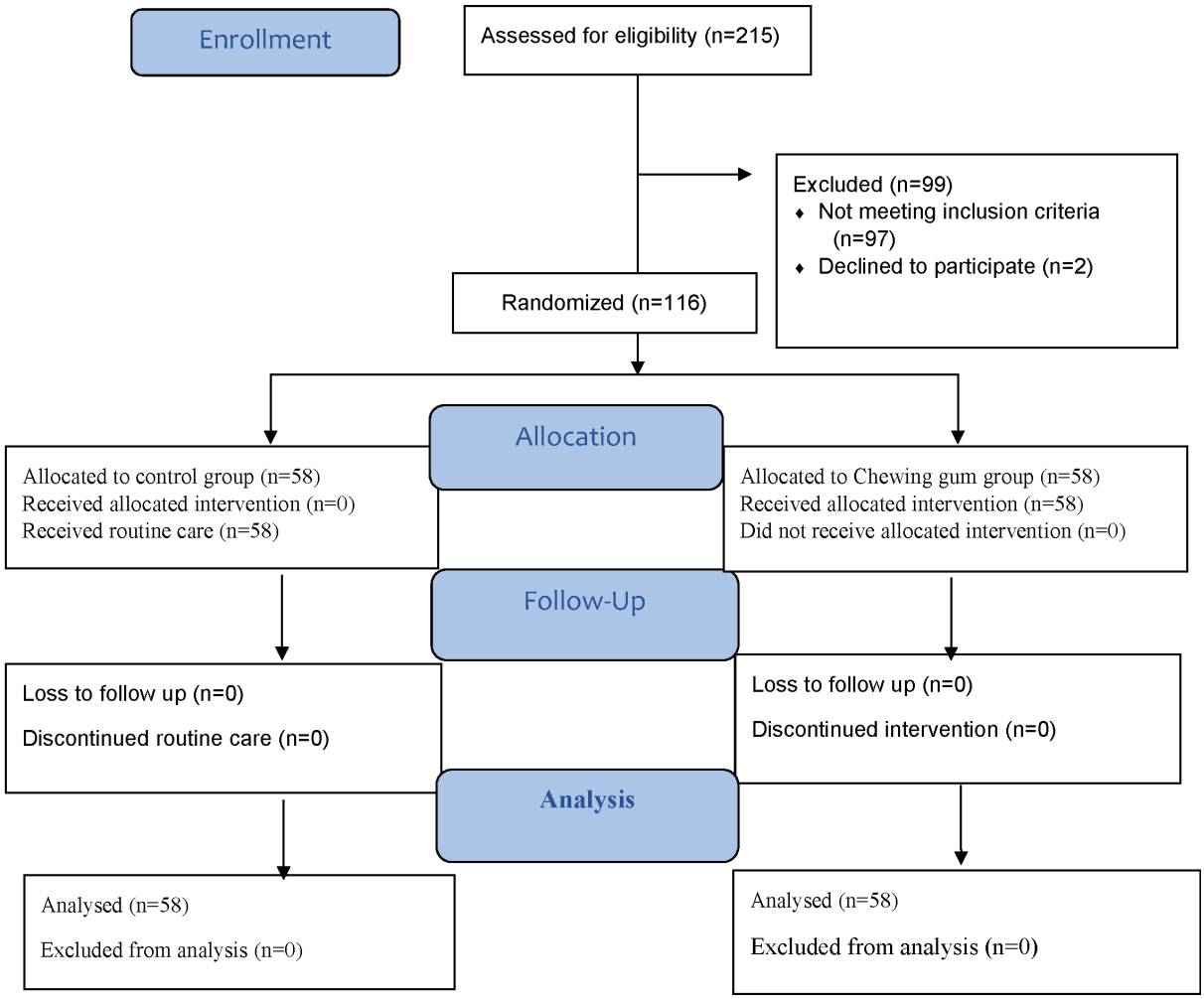

Figure 1: CONSORT flowchart of the study

Results

In this study, 215 pregnant women whose gestational age was 38-42 weeks were assessed, 116 of whom met the inclusion criteria and were enrolled in the final analysis (Figure 1). The participants' mean age was 28.12±3.97 years. Nearly sixty-eight percent of patients had a university degree. Table 1 shows the demographic characteristics of the groups.

There was a significant difference in the mean pain scores after the intervention between the two groups in dilatations 3-4 cm (P=0.003), 5-7 cm (P<0.001), and 8-10 cm (P<0.001); the chewing gum group had lower pain (Table 2).

Before the intervention, there was no significant difference in the mean of trait anxiety between the two groups (P<0.272). There was a significant difference in the mean trait anxiety score after the intervention between the two groups, and the gum chewing group had lower trait anxiety (P<0.001). Before the intervention, there was a significant difference in the mean of state anxiety variables between the two groups (P<0.001). According to ANCOVA test, there was a significant difference in the mean state anxiety after the intervention between the two groups, and the gum chewing group had lower state anxiety (P<0.001) (Table 3).

Discussion

Pain and anxiety are common concerns during labor, particularly among primiparous women. These factors can prolong labor, elevate stress hormone levels, and negatively affect both maternal and newborn outcomes.[34] Pain management and the anxiety of labor and delivery are two of the most pressing problems in the healthcare system.

Table 1: Demographic and obstetric characteristics of women in the intervention and control groups

Maternal characteristics	Chewing gum group (N=58) Mean±SD	Control group (N=58) Mean±SD	P value
Maternal age (year)	27.76±4. 02	29.24±6.92	0.16*
Body mass index (kg/m^2)	31.98±4.99	32.47±4.50	0.21*
Gestational age (weeks)	38.37±1.33	38.96±0.96	0.07*
	N (%)	N (%)	
Job			0.99**
Housewife	53 (91.40)	52 (89.7)	
Employed	5 (8.6)	6 (10.3)	
Gravida			0.99**
1	37 (63.79)	34 (58.62)	
≥2	21 (36.21)	24 (41.38)	
Abortion			0.33**
1	19 (32.8)	17 (29.30)	
≥2	2 (3.4)	7 (12.08)	
Education			0.22**
Under diploma	22 (37.9)	14 (24.1)	
Diploma	17 (32.8)	24 (41.4)	
Undergraduate	19 (32.8)	20 (34.5)	
Planned pregnancy			0.99**
Yes	39 (67.24)	38 (65.51)	
No	19 (32.76)	20 (34.49)	

*Independent t test; **Chi-square test

Table 2: Comparison of the mean pain severity scores of mothers between the intervention and control groups

Variable	Control group (N=58) Mean ± SD	Chewing gum group (N=58) Mean ± SD	P value*
Pain before intervention	6.15±1.35	6.18±1.02	0.890
Pain immediately after the intervention in dilatation 3-4 cm	7.43±1.25	6.75±1.13	**0.003**
Pain immediately after the intervention in dilatation 5-7 cm	9.32±0.71	8.57±0.88	<0.001
Pain immediately after the intervention in dilatation 8-10 cm	9.97±0.18	9.46±0.77	<0.001
P value**	<0.001	<0.001	

*Independent t test; **Repeated Measures ANOVA

Table 3: Comparison of the means of the anxiety variables between the intervention and control groups before and after the intervention

Variable	Groups	Before Mean±SD	After Mean±SD	P value*
Trait anxiety	Chewing gum (N=58)	40.89±7.13	46.98±7.05	<0.001
	Control (N=58)	42.31±6.64	61.62±7.75	<0.001
	P value**	0.272	<0.001	-
State anxiety	Chewing gum (N=58)	38.24±6.67	40.98±6.90	<0.001
	Control (N=58)	54.00±7.07	60.15±7.17	<0.001
	P value	<0.001**	<0.001***	-

*Paired t test; **Independent t test; ***Analysis of covariance (ANCOVA) with partial Eta squared=0.533

The use of distraction techniques during childbirth minimizes labor pain and anxiety.[35] Various pharmacological and non-pharmacological techniques for managing and decreasing pain and anxiety have been proposed.[36]

In the current study, there was no significant difference between the groups in terms of pain intensity before the intervention. After the intervention, during the progress of labor in the active phase, when the pain

intensity of women increased, chewing gum use significantly reduced the pain severity of women in the dilatations of 3-4 cm, 5-7 cm, and 8-10 cm compared with the control group. Additionally, intragroup comparison showed a significant difference in both groups. The issue was due to the progress of labor, which increases the pain intensity of women.

Although there are many studies about the effect of different nonpharmacological methods on childbirth pain and management of childbirth pain and anxiety,[16-18] the number of studies investigating the effect of gum chewing on childbirth pain and anxiety is very limited in the literature. A limited number of studies suggest that gum chewing may help to manage pain in childbirth as a simple and easily applicable method.[23, 35, 37, 38]

The expectation and desire for pain relief vary widely between women during labor and delivery.[39] By using distraction techniques during childbirth, the pain and anxiety of childbirth can be minimized because the brain can only focus on one thing at a time.[35] Chewing gum can transfer patients' attention to mastication, reduce the neuronal response to harmful stimuli, and make them feel happy. Sometimes, patients can even release pain or irritation by chewing gum. Chewing gum has great benefits in relieving pain compared to analgesics. It has the advantage of being noninvasive, inexpensive and convenient, and avoiding the side effects caused by analgesics.[40] Another study concluded that chewing gum was a relaxing procedure that improved mental health and reduced labor stress.[25] Our study reported similar results; mothers who chewed gum during childbirth experienced less pain than those in the control group.

In the current study, there was no significant difference between the groups in terms of trait anxiety before the intervention, but in the state anxiety, there was a significant difference between the groups before the intervention. After the intervention, during the progress of labor in the active phase, when the anxiety of women increased, chewing gum use significantly reduced the anxiety of women immediately after the intervention compared with the control group. Additionally, intragroup comparison showed a significant difference in both groups. The issue was due to the progress of labor, which increased the women's anxiety.

A study was carried out on the effects of chewing gum unaccompanied by sugar on anxiety in nulliparous women during the active phase of labor. The anxiety scores of the exposed group were markedly lower than those of the control group.[26] By comparing the findings of our research with those of other studies, it is obvious that people were affected. Similar to the findings of other studies, chewing gum is a technique for relaxation.[25] Our research revealed that the anxiety score in the intervention group was significantly lower than that in the control group.

A limitation of this study is that participants' perceptions of pain intensity during labor and anxiety were influenced by their individual genetic and psychological characteristics. These factors were mitigated by random group assignment. A key strength of this study is using chewing gum as a distraction intervention that not only significantly reduces pain and anxiety during the parturition process but is also easily accessible and cost-effective.

Conclusion

This study showed that chewing gum could reduce pain intensity and anxiety in primiparous women who delivered vaginally. Therefore, distraction (chewing gum) can be used as a reducer of pain and anxiety, a method that is easy to use and effective for childbirth, does not pose any risk to maternal and fetal health, and can be safely used as routine care during labor. Further research is recommended to validate the effect of chewing gum. Also, it is recommended to conduct a study to control pain after cesarean delivery.

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Authors' Contribution

FML was responsible for the conceptualization and design of this study. FML, SHO and AGH contributed to the literature review. Data collection was conducted by FML, SHO, AGH, and FB. HGH undertook the statistical analysis. FML drafted the manuscript and reference check. All authors critically reviewed and approved the final version of the manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Conflict of Interest: None declared.

Declaration on the use of AI

The authors declare that no artificial intelligence tools were used in the preparation of this manuscript.

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