

## **Chewing Gum to Promote the Recovery of Gastrointestinal Motility After a Cesarean Section**

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### **Abstract**

The purpose of this paper is to review and synthesize evidence from literature that explores the effects of chewing gum on gastrointestinal (GI) motility for women post-cesarean section (CS). Decreased GI motility after invasive abdominal surgeries, such as a CS, can result in complications including decreased time to lactation, GI problems, discomfort or decreased healing time. With over one million CSs performed annually world-wide, supportive nursing interventions to improve GI motility can work to better the outcomes and well-being in mothers post-CS. Research demonstrates that the simple administration of chewing gum after a CS may increase GI motility. This literature review, including ten randomized controlled trials (RCT), reports primary outcomes of chewing gum on the following indicators of GI recovery: a) bowel sounds, b) flatulence and c) defecation. Each study addressed the population of pregnant women post-CS, evaluating chewing gum as a potential nursing intervention. Nine RCTs produced statistically significant results demonstrating improved GI motility in post-CS patients, and one RCT showed insignificant yet supportive results of chewing gum. These experimental studies recognize chewing gum as effective in restoring GI motility more rapidly than usual post-operative care in post-CS patients. Additionally, the rapid return of GI motility provided secondary benefits to mothers, improving their healing time and comfort. This research supports consideration of adding chewing gum as a nursing intervention to improve care for women undergoing CSs worldwide.

**Keywords: Cesarean Section, Gastrointestinal Motility, Chewing Gum**

### **1. Introduction**

When a person thinks of chewing gum, its use as a nursing intervention does not typically come into mind. Nevertheless, it may take a respectable place in the nursing field as a stimulator of bowel recovery post-operatively. After a cesarean section (CS), a woman's gastrointestinal (GI) motility is impaired due to several factors including manual handling of the intestines, trauma to the abdominal area, inflammation, opioid analgesic administration and anesthesia<sup>1, 2</sup>. With over one million CSs performed annually worldwide, it is essential to take this impairment in bowel function seriously<sup>3</sup>. According to Kalff et al., the disruption in GI motility can lead to paralytic ileus, or the halt of normal GI peristaltic motor activity caused by a surgical procedure. Post-operative ileus can further result in several negative consequences such as a lengthened recovery period and hospital stay, increased pain and decreased patient satisfaction<sup>4</sup>. Consequently, it is necessary to discover and implement an effective and feasible nursing intervention that will restore GI motility post-CS.

In order to contemplate an effective intervention, the benefits of chewing gum on GI activity must be examined. The mechanical action of chewing sends signals to the GI system so that it can prepare for food to be digested by secreting enzymes and facilitating movement<sup>4</sup>. However, because the consumption of food is not initially well-tolerated post-

operatively, chewing gum may be a feasible alternative to initiate bowel motility. This recovery of GI motility can be determined based on the presence of bowel sounds, flatus and defecation<sup>5</sup>. This literature review and synthesis will explore the use of chewing gum, a non-invasive, non-pharmacological intervention, to stimulate GI motility as evidenced by the return of these three factors (bowel sounds, flatulence and defecation).

Nursing practice can include chewing gum, but it is not currently common practice, because there is a need for synthesized findings to support new policies. The purpose of this literature review and synthesis is to analyze available research to justify whether or not this intervention should be included in hospitals' post-CS protocols to stimulate GI recovery post-operatively in comparison to usual post-operative protocols. The current body of evidence behind the intervention will first be reviewed, including ten randomized controlled experimental studies. Next, the research will be analyzed and critiqued to discover the strengths and weaknesses of the current knowledge base. Finally, the evidence will be synthesized to validate and provide recommendations for the use of this intervention in future nursing practice. Although having a woman chew gum after undergoing a CS may seem unusual, its use as a nursing intervention may prove to be a benefit for this population.

## 2. Methodology

First, the research process to find evidence behind chewing gum in promoting GI motility post-CS will be explained. The databases utilized in the primary search included PubMed, CINAHL and WorldCat. The search terms to define the intervention were "chewing gum" and "gum." For the clinical problem, "cesarean section," "cesarean delivery," "post-operative," "gastrointestinal motility" and "ileus" were also applied. These search words were placed in combination with the Boolean operators "AND" and "OR" as necessary to specify the search. The arrangement of terms that yielded the most significant results was "chewing gum" and "cesarean section." Searches were further narrowed to peer-reviewed research journal articles published within the past ten years.

On CINAHL, the selected search terms produced 18 total articles. Three of these articles were systematic reviews and meta-analyses, seven were randomized controlled trials (RCT), five were commentaries on other studies and the remaining three were unrelated. Similarly, on PubMed, six results were systematic reviews and meta-analyses (three were repeated articles), nine were RCTs, seven were commentaries and three were unrelated. Finally, on WorldCat, 14 articles were produced: two systematic reviews and meta-analyses, five RCTs, one commentary and five unrelated articles. In total, this search resulted in three different peer-reviewed systematic reviews and meta-analyses, 12 RCTs and eight commentaries. The most recent (2016) systematic review and meta-analysis was chosen to support findings of this paper. Two of the 12 RCTs were not in English, and thus ten RCTs were chosen to be synthesized (See Table 1 for citation information for each study).

The ten RCTs, all single-blinded, were chosen because this type of study produces a high level of evidence. While a double-blinded study provides for the highest level of evidence, it was not possible for patients to be unaware that they were chewing gum. Researchers mentioned how the women in the experimental group that chewed gum were uninformed of why they were chewing it or of the exact nature of the study. For the nature of this study, it was still concluded that the single-blinded RCT method, although not without flaw, was feasible and effective in determining the return of GI motility in patients post-CS<sup>1</sup>.

Articles were published from the years 2009-2016 in journals from several fields including anesthesia, obstetrics and gynecology, general medicine and nursing. These journals were all international from countries including Turkey, Taiwan, Iran, China and the United Kingdom. The sample sizes ranged from 50 to 388. Although the locations and types of hospitals differed amongst studies, each focused on women post-CS who chewed gum as a means to recover GI motility. Overall, the search process was thorough in discovering the depth and breadth of research and evidence behind this intervention. For further information on each of the ten RCTs, see Table 1

Table 1. Review of chewing gum as an intervention

Author(s)	Question	Intervention	Comparison	Sample	Outcome
Abd-El-Maeboud, KHI; Ibrahim, MI; Shalaby, DAA; & Fikry, MF <sup>6</sup>  2009	Is chewing gum postoperatively a safe and effective way to promote the recovery of bowel motility after a cesarean section?	<u>Dose:</u> One stick of sugarless gum  <u>Chewing time:</u> 15 minutes  <u>Frequency:</u> Every two hours after surgery until first passage of flatus	Routine Post-CS care	200 pregnant women undergoing elective cesarean sections under general anesthesia at Sin Shams University Maternity Hospital	Mean time to first <b>bowel sounds</b> (10.9 h vs 15.6 h), passage of <b>flatus</b> (17.9 h vs 24.4 h), <b>defecation</b> (21.1 h vs 30.0 h) and <b>discharge</b> from hospital (40.8 h vs. 50.5 h) was significantly shorter in the experimental group compared to the control group
Kafali, Hasan; Duvan, Candan Iltemir; Gozdemir, Elif; Simavli, Serap; Onaran, Yuksel; & Keskin, Esra <sup>7</sup>  2009	Does chewing gum play a role in recovery of bowel function after a cesarean section?	<u>Dose:</u> One piece of sugarless gum  <u>Chewing Time:</u> One hour  <u>Frequency:</u> Begin two hours post-operatively, repeat three times daily	Routine Post-CS care	150 pregnant women at term admitted to the Fatih University Medical Hospital for non-complicated labor	Time to <b>bowel sounds</b> (5.9 h vs 6.1 h) and time to first <b>flatus</b> (22.4 h vs 31 h) was significantly shorter in gum-chewing group. Total length of <b>hospital stay</b> was also shorter for gum-chewing group (2.1 days vs 2.3 days), but results were not statistically significant
Shang, Hongkai; Yang, Yang; Tong, Xiaowen; Zhang, Lijun; Fang, Aiming; Hong, Ling <sup>8</sup>  2010	Does gum chewing post-operatively accelerate the return of bowel function and reduce morbidity rates and length of hospital stay in patients undergoing cesarean deliveries?	<u>Dose:</u> One piece chewing gum  <u>Chewing Time:</u> 30 minutes  <u>Frequency:</u> Three times each day for at least 30 minutes after return from operating room until defecation or discharged	Routine Post-CS care	388 women having cesarean sections under spinal anesthesia at the Linyi Women and Children's Hospital of Shandong Province	The gum-chewing group had earlier passage of <b>flatus</b> (34.6 h vs 39.9 h) and <b>bowel sounds</b> (18.2 vs. 23.2 h) compared to the control group. No difference in time to first <b>defecation</b> , <b>lactation</b> , or time to <b>discharge</b> between two groups
Ledari, Farideh Mohsenzadeh; Barat, Shanaz	Does chewing gum after a cesarean section	<u>Dose:</u> one stick of sugarless gum	Routine Post-CS care	100 women in the gynecology ward of Babol University of Medical Sciences	Time to first <b>bowel sounds</b> heard was significantly shorter in gum-chewing group

<p>&amp; Delavar, Mouloud Agani<sup>9</sup></p> <p>2012</p>	<p>promote recovery of bowel function?</p>	<p><u>Chewing Time:</u> One hour</p> <p><u>Frequency:</u> Three times each day immediately after recovering from anesthesia</p>		<p>with local (spinal) anesthesia from June 2010 to March 2011</p>	<p>compared to non-gum-chewing group (21.9 h vs 26.1 h). Time to first <b>defecation</b> also shorter in experimental group (30.7 h vs 38.4 h). Time to first <b>flatus</b> also shorter for experimental group (24.8 h vs 30 h). Time to first feeling of <b>hunger</b> also shorter for experimental group (11.8 h vs 15.4 h)</p>
<p>Ledari, Farideh; Mohsenzadeh; Barat, Shanaz; Delavar, Mouloud Agajani; Banihosini, Seyed Zahra; and Khafri, Soriya<sup>10</sup></p> <p>2013</p>	<p>Does chewing gum after a cesarean section stimulate bowel motility and decrease duration of postoperative ileus in nulliparous women?</p>	<p><u>Dose:</u> one piece sugar-free gum</p> <p><u>Chewing Time:</u> One hour</p> <p><u>Frequency:</u> Three times per day until discharge</p>	<p>Routine Post-CS care</p>	<p>60 women with local anesthesia (spinal) in gynecology ward of Rouhani Hospital of Babol between June 2010 and March 2011</p>	<p>The group chewing gum had a significantly shorter time period before first <b>bowel sounds</b>, (21.9 h vs 26.1 h) first <b>bowel movement</b> (20.89 h vs 27.93 h), feeling of <b>hunger</b> (10.37 h vs 16.33 h), passing of <b>flatus</b> (25.02 h vs 31.08 h) and <b>defecation</b> (31.17 h vs 40.08 h)</p>
<p>Jakkaew, Bordin and Charoenkwan, Kittipat<sup>11</sup></p> <p>2013</p>	<p>What are the effects of gum chewing on recovery of bowel function after a cesarean section?</p>	<p><u>Dose:</u> One piece sugarless gum along with conventional feeding protocol</p> <p><u>Chewing Time:</u> 30 minutes</p> <p><u>Frequency:</u> Morning, noon, evening and bedtime until first flatus</p>	<p>Routine Post-CS care</p>	<p>50 pregnant women who had cesarean sections at the Department of Obstetrics and Gynecology, Faculty of Medicine, Chiang Mai University from September 2010 - December 2010</p>	<p>Median time to first <b>flatus</b> was shorter in the gum-chewing group compared to that of the control group (36.37 h vs 41.33 h). Trend towards less abdominal <b>cramping</b> on days one and two in experimental group. No difference in other dependent variables between groups</p>
<p>Ajuzieogu, OV; Amucheazi, A; Ezike, HA; &amp; Abam, DS<sup>12</sup></p> <p>2014</p>	<p>Is chewing gum a cost-effective, comfortable management of postoperative ileus?</p>	<p><u>Dose:</u> One piece sugarless gum</p> <p><u>Chewing Time:</u> 30 minutes</p> <p><u>Frequency:</u> Three times</p>	<p>Routine Post-CS care</p>	<p>180 pregnant women at University of Nigeria Teaching Hospital, Enugu in collaboration with three adjoining satellite specialist obstetric hospitals,</p>	<p>Mean time to first <b>bowel sounds</b> (21.9 h vs 26.1 h), passage of <b>flatus</b> (24.8 h vs 30.0 h), and first <b>defecation</b> (30.7 h vs 40 h) was significantly shorter in gum-chewing group compared to control</p>

		daily from six hours postoperatively until first flatus		all were primigravida with spinal anesthesia from February through November of 2013	group. Patients were satisfied, no side effects reported
Sahin, Ebru & Terzioğlu, Fusun <sup>2</sup> 2015	What effect does chewing gum, early oral hydration and early ambulation have on intestinal motility after a cesarean section?	<u>Dose:</u> One piece sugar-free gum <u>Chewing Time:</u> 15 minutes <u>Frequency:</u> Every two hours, starting two hours after surgery until passage of flatus	Early oral hydration - 50 mL then 100 mL/hour Early mobilization - 3x/day for 10-15 Routine Post-CS care	240 women (8 groups of 30) undergoing cesarean sections at the Ordu Obstetrics and Child Diseases Hospital Obstetrics Service between March and November, 2011	Gum chewing alone significantly decreased time to <b>bowel sounds</b> (11.76 h vs 16 h), <b>flatus</b> (22.8 h vs 29.01 h) and <b>bowel movement</b> (68.27 h vs 78.91 h) compared to control
Lee, Jian Tao; Hsieh, Mei-Hui; Cheng, Po-Jen & Lin, Jr-Run <sup>5</sup> 2016	Does chewing xylitol gum contribute to gastrointestinal recovery after a cesarean section?	<u>Dose:</u> One piece of xylitol gum or non-xylitol gum <u>Chewing Time:</u> 15 minutes <u>Frequency:</u> Every two hours post-cesarean section until first flatus	Routine Post-CS care	120 women in major medical center and local hospital in Taiwan between October 1 <sup>st</sup> and December 30 <sup>th</sup> , 2010	Group chewing xylitol gum had shortest time to first <b>bowel sounds</b> (6.9 h), followed by group chewing non-xylitol gum (8 h), followed by the control group (12.8 h). Both gum-chewing groups had a significantly shorter time to first <b>flatus</b> (16.6 h and 17.5 h vs 24.3 h) compared to the control group, but these two groups did not differ significantly. Three groups did not differ significantly in time to first <b>defecation</b>
Cevik, Semra Akkoz & Baser, Muruvvet <sup>13</sup> 2016	What are the effects of chewing gum and bed exercises on gastrointestinal motility after a cesarean section?	<u>Dose:</u> One piece sugarless gum <u>Chewing Time:</u> 15 minutes <u>Frequency:</u> Every two hours, starting two hours after the surgery for	Moving for five minutes every two hours for eight hours Routine Post-CS care	120 (three groups of 40) women over the age of 19 who underwent cesarean sections at the Cengiz Gokcek Gynecology and Obstetrics Hospital Surgery Services in Gazintep City Centre	Time to first presence of <b>bowel sounds, flatus</b> and <b>defecation</b> were shorter in the gum chewing group compared to exercise and control groups.  No results were statistically significant

eight hours or  
until  
flatulence

### 3. Synthesis and Findings

#### 3.1 Independent Variables

First, both the dependent and independent variables will be compared across the studies. The independent variable consistent through all RCTs was chewing gum after CS while in a hospital or birth center. Each study had slightly different intervention administration procedures/protocols including: a) variations in types of gum, b) frequency and length of time of chewing gum, and c) differences in post-CS timing the gum was first administered in relation to recovering from anesthesia. The type of gum did not seem to have a significant overall impact on the recovery of bowel motility, but Lee et al. did suggest that chewing xylitol gum resulted in bowel sounds being present about one hour before they were heard when chewing non-xylitol gum<sup>1</sup>. This literature review was not able to identify how the impact of the *length* of time chewing gum impacted outcomes, but previous research suggests that chewing gum for longer intervals or increased frequency had more rapid bowel recovery after various abdominal surgeries<sup>6</sup>. The criteria of when to begin the intervention post-CS differed across studies, but this aspect also did not appear to have an important influence on the outcomes. It is evident that chewing gum had beneficial outcomes when compared to routine post-CS care, while specific types of chewing gum, length of time, and post-CS administration time need further investigation to maximize these outcome benefits.

#### 3.2 Dependent Variables

The dependent variables across the ten RCTs will next be compared and contrasted. Although the three primary outcomes focused on in this analysis (time to first bowel sounds, flatus and defecation) were consistent across the majority of studies, some researchers also included other dependent variables such as time to discharge, patient satisfaction, time to feelings of hunger, post-operative antiemetic need and post-operative analgesic need. These additional variables may add extra support to the tolerability and feasibility of the intervention, but they did not directly affect the results of the studies regarding the three highlighted dependent variables. For further information on the variations in both independent and dependent variables of each RCT, see Table 1.

#### 3.3 Data Collection And Analysis

In order to evaluate the benefits of the post-CS outcomes for women after chewing gum, the strength of each study was evaluated to understand their level of scholarly contribution. This literature review included a wide variety of sample groups from international studies (see methods section), strengthening consideration for generalizability of this intervention to diverse populations. To access sufficiently large enough samples for each study, all of the research teams in this literature review utilized convenience sampling within their approach to gathering subjects. While this type of sample recruitment leaves room for some bias from the researchers, this method is acceptable with this type of vulnerable population and thus did not take away from the strength of the experiment. In relation to instruments, each of the ten studies utilized a stethoscope to record the first presence of bowel sounds. The reliability and validity of the stethoscopes were not declared in the studies. However, most authors mentioned that this data was collected by trained professionals.

Each study also utilized either self-report or researcher-report forms to record the data on flatulence and defecation. The reliability and validity of these forms were not specified by the researchers in any of the RCTs. It is not possible to determine the reliability of these instruments, but the researcher and patient self-reports demonstrated face validity. Determining bowel sounds, flatulence and defecation is a relatively straightforward process, especially when performed by trained professionals, and thus the results of these studies are still considered high levels of evidence in support of the intervention. Additionally, the data analysis instruments were reliable, valid and largely similar across the ten RCTs, adding strength to the evidence.

### 3.4 Significance Of Results

Next, the overall statistical significance of each of the ten experimental studies will be evaluated. Five of the RCTs had gum-chewing groups with significantly shorter times to the presence of the first bowel sounds, flatulence and defecation compared to the control groups<sup>2, 6, 9, 10, 12</sup>. One trial similarly resulted in a shorter time interval before these three primary outcomes compared to the control group, but the results were not statistically significant<sup>13</sup>. Two of the studies showed the experimental group having a significantly shorter time interval before first bowel sounds and flatulence, but not a significantly shorter time before first defecation<sup>5, 8</sup>. One study also resulted in a significantly shorter time in the gum-chewing group to the presence of bowel sounds and flatulence but did not test for the time before first defecation<sup>7</sup>. The final study resulted in the experimental group having a shorter time span before the presence of flatus compared to the control group, but time to first bowel sounds was not recorded and time to first defecation was not statistically significant<sup>11</sup>. Although some RCTs produced more powerful results on various outcomes analyzed, the overall results suggested that chewing gum after a CS is an effective intervention to promote GI motility.

In summary, the ten studies analyzed in this synthesis were entirely RCTs, demonstrating a strong level of evidence. Although each was also single-blinded, it would not have been feasible to have these experiments conducted using a double-blinded method. Moreover, while there were some variations across studies with independent and dependent variables, the majority of the experiments included assessing if chewing gum had an effect on time to first bowel sounds, flatus and defecation. Despite the fact that the data collection instruments were not determined reliable or valid within the studies, it was concluded that the self-report forms had face validity and that the other collection instruments were completed by trained professionals. Although each RCT slightly differed in results on the three outcome variables, the synthesis of all results indicated that chewing gum after a CS decreased the time interval before the first presence of bowel sounds, flatulence and defecation. This evidence suggested that the intervention is useful in stimulating recovery of GI motility after a CS more rapidly than usual post-operative care.

## 4. Recommendations

After synthesizing the studies, recommendations for both clinical practice and future research will be presented. First, after compiling evidence from the ten RCTs, it was determined that chewing gum could stimulate GI motility in women post-CS as evidenced by a more rapid return of bowel sounds, flatulence and defecation compared to normal post-operative care. Therefore, it is suggested that hospital policies and procedures take this into consideration. It is recommended that the intervention be included in the post-operative protocol for all women after undergoing CSs. In support of evidence-based practice, nurses should offer chewing gum to their patients after learning about and explaining its significance. Physicians should also be willing to speak to patients of the intervention's effectiveness and feasibility for patient recovery and overall well-being post-CS.

Additionally, more research should be done on populations beyond women undergoing cesarean deliveries. Though there is previous research on chewing gum after some additional abdominal surgeries, the body of evidence should be expanded – especially considering this is a straightforward and cost-effective intervention. Other surgeries and procedures must be experimentally studied to determine if this intervention may be incorporated into all evidence-based post-abdominal surgery protocols. Furthermore, it would be beneficial to obtain more solid evidence on the specific details of chewing gum, such as the minimal amount of time that it may be effective in stimulating significantly more rapid bowel recovery. Because of chewing gum's suggested success in promoting GI motility after a CS, further research should be done to expand its benefits to other populations, while this intervention should also be incorporated into post-CS procedural guidelines to improve patient recovery and satisfaction after a cesarean delivery.

## 5. Conclusion

The effects of a CS on a woman's GI system cannot be overlooked. There are several aspects of abdominal surgery that lead to an impaired digestive system which can consequently cause post-operative complications such as an ileus<sup>1, 4</sup>. Until a mother's GI system is functioning properly, she cannot optimally care for herself and her newborn,

resulting in negative health outcomes for both the mother and baby. Furthermore, certain complications associated with post-operative ileus can lead to a longer hospital stay, increased expenses and decreased satisfaction and comfort<sup>4</sup>. Implementing a simple, feasible intervention, such as chewing gum, in hospitals and birth centers worldwide is necessary to improve post-operative recovery and maternal health after a CS. The ten RCTs reviewed and synthesized produced significant results that suggested chewing gum after a CS can stimulate the return of GI motility as evidenced by a more rapid recovery of bowel sounds, flatulence and defecation compared to usual post-CS care. Evaluation and critique of each of these research reports found that the level of evidence is strong, adding to the credibility of these findings and recommendations. With such a low-cost, straightforward and effective intervention with no reported side effects, there is little risk for using this intervention in post-CS protocols worldwide. Through the simple act of chewing gum, we could potentially improve the health and well-being of the over one million mothers each year that deliver via CS<sup>3</sup>.

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