

Efficacy of Chewing Gum versus Early Mobilization on Bowel Motility for Children After Abdominal Surgery

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Abstract

Post-operative ileus is a major focus of concern for nurses because it increases duration of hospitalization, cost of care and post-operative morbidity. **Aim:** this study aimed to determine the efficacy of chewing gum versus early mobilization on bowel motility for children after abdominal surgery. **Design:** a quasi experimental research design. **Subjects and method:** a convenience sample of 90 children aged from 6 to 18 years. **Setting:** this study was conducted at the pediatric surgery unit in Assuit University Children's Hospital. **Tools:** two tools were used to collect the necessary data, a structured questionnaire and bowel motility monitoring sheet. **Method:** A pilot study was carried out on 10% of children to test the clarity and applicability of the sheet. **Results:** revealed that (56.7%) of the chewing gum group and (43.3%) of the early mobilization group return their bowel sound during 12-<24 hrs, time to return of bowel sound, passage of first flatus, first feces, return of appetite, time of liquid and regular diet were statistically significant difference in the chewing gum group while only time to passage of first flatus and first feces were statistically significant difference in the early mobilization group. **Conclusion:** it was found that chewing gum was slightly more effective than early mobilization but the difference was not statistically significant. **Recommendation:** the use of chewing gum and early mobilization as routine interventions to improve bowel motility for children after abdominal surgery.

Keywords: Abdominal surgery, Bowel motility, Chewing gum, Children & Early Mobilization.

Introduction

Post-operative ileus is an absent or abnormal peristalsis after surgery causing a functional obstruction without mechanical blockage. A physiologic ileus can occur up to 72 hours after surgery. Post-operative ileus is a major focus of concern for surgeons because it increases duration of hospitalization, cost of care and post-operative morbidity (Venara et al., 2016)

Chewing gum during the postoperative period has been investigated to determine whether it decreases the occurrence of postoperative ileus and decrease the duration of postoperative ileus (Zhu et al., 2014). It is a safe and easy modality that can be utilized in most patients. There are no specific guidelines regarding chewing gum, but much of the current literatures recommend chewing a stick of sugarless gum every 8 hours as long as the patient has low risk of aspiration, has an appropriate level of cognition and no oral disease preventing this activity (Short et al., 2015).

Post-operative children are at increased risk for ileus formation related to decreased peristalsis. Early mobilization reduces post-operative abdominal distension by increasing gastro-intestinal tract and abdominal wall tone and stimulating peristalsis (Hinkle & Cheever, 2014).

It is role of the nurse to help children resolved early from post-operative ileus after abdominal surgery and assessed children for return of bowel motility (Lynee et al., 2013). Nurses use many non-pharmacologic treatment to enhance bowel motility such as early enteral nutrition, early mobilization, psychological pre-operative preparation and among them the use of chewing gum also has emerged as a new, simple, readily available and cost effective modality for decreasing post-operative ileus (Nimarta et al., 2013).

Significance of the study

Despite a number of advances in perioperative care and surgical techniques, post-operative ileus remains one of the commonest challenges in surgery and commonly seen following abdominal surgery. Post-operative ileus is an inevitable event after major abdominal surgery and it is considered the most important factor for prolonged hospital stay (Stewart & Waxman, 2010). It impacts greatly on children's recovery even after uncomplicated abdominal surgery and one of the commonest factors affecting healthcare costs in surgical children (Asgeirsson, 2010).

Previous researchers found that chewing gum and early mobilization are from non-pharmacological methods that decrease post-operative ileus (Lafon & Lawson, 2012). In spite of the importance of these methods, the researcher did not find valuable researches that had been carried out in our country (Egypt). So, this study was conducted to determine the efficacy of chewing gum versus early mobilization on bowel motility for children after abdominal surgery.

Aim of the study

This study aimed to determine the efficacy of chewing gum versus early mobilization on bowel motility for children after abdominal surgery.

Research hypotheses

- 1) The time to passage of first flatus and first feces is shorter in the chewing gum and early mobilization among children in the studied groups than in the control group.
- 2) The time of first meal and postoperative hospital stay is shorter among children in the studied groups than in the control group.
- 3) There is a difference between chewing gum group and early mobilization among children in the studied groups.

Subjects & Method

Research Design: The quasi experimental research design was utilized in this study.

Setting: This study was conducted at the pediatric surgery unit in Assiut University Children's Hospital.

Subjects: The study subjects included a convenience sampling of 90 children from 6 to 18 years after abdominal surgery. They were divided into three groups with the same type of surgery: Group I for chewing gum, Group II for early mobilization and group III control group receive routine hospital care.

Sample size

The sample size was calculated based on the census of 2016 at the pediatric surgery unit in Assiut University Children's Hospital. The total number of children performed abdominal surgery aged from 6 to 18 years was 116. The sample size was calculated by Slovin's formula. $n = N / (1 + Ne^2)$ Where, n = sample size, N = total population number (116), and e = margin error (0.05).

A total of 90 children were included in this study, children were separated into three groups: the chewing gum group (30 children), the early mobilization group (30 children) and the control group (30 children). A simple random sample was used to assign children equally into three groups by writing the names of the subjects on slips of paper, put the slips into a bowl and select slips randomly the first one for chewing gum, the second slip for early mobilization and the third one for control group. Study group I received chewing gum, study group II

received early mobilization and group III were the control group who received only routine hospital care.

Inclusion Criteria included

- Children who had undergone any type of abdominal surgery.
- Children aged 6-18 years.
- Children who were fully conscious, oriented and were able to follow instructions.

Tools of data collection

Two tools were used to collect the required data for this study:

Tool I: A structure questionnaire

It was developed by the researcher to collect the required information and included two parts:

Part (1): Personal data of the studied children as (age and gender)

Part (2): Medical data related to child's surgery (types of abdominal surgery, indication of abdominal surgery as emergency or elective, hospital stay before surgery, type of anaesthesia and duration of surgery).

Tool II: Bowel motility monitoring sheet

It was developed by the researcher based on the study by (Jaimez, 2012) and was included the following information: time of the first flatus, time of the first passage of stool, time of feeding tolerance (oral intake) and post-operative hospital stay.

Method of data collection

- Research proposal was approved from the Ethical Committee in the faculty of Nursing.
- An official permission was obtained from the director of pediatric surgery unit in Assiut university children hospital to collect the necessary data for this study.
- A pilot study was carried out on 10% of children to test the clarity and applicability of the sheet and to estimate time needed to fulfill each sheet. There were no modification done so, the children were included in the total sample of the study.
- Tool I & Tool II were developed by the researcher and were tested for its contents validity by 5 experts in both pediatric nursing and pediatric surgery fields and content validity index was 0.96 for tool I and 0.97 for tool II.
- The reliability of the tools was elicited by alpha Cronbach test and it was $r=0.841$ for tool II.

Field of the work

This study was carried out through a period of seven months from the beginning of February (2018) to the end of August (2018). The researcher went to hospital five days per week, three times per day after explaining the aim and nature of the study to parents of the studied children and obtained written parent consent for participation of their children in the study. Confidentiality and privacy of the researcher was asserted and explained to parent that this data were

used only for the purpose of the study. The time needed for every child in the chewing gum group was about 30 minutes (about 20 minutes for applying intervention and 10 minutes for filling questionnaire sheet from child's sheet and reassess the children for return of bowel sound). The time needed for every child in the early mobilization group was difficult to be estimated as it was different from child to another according to his tolerance to walk. The time needed for every child in control group was 10 minutes for filling questionnaire sheet.

Assessment of personal and medical data of children was done by the researcher by using tool I (part 1 and part 2) for all three groups.

Intervention

Chewing gum: In the study group children were asked to chew one stick of commercially available sugar-free gum within the first 4 hours after surgery when the child was fully conscious and oriented for 20 minutes according to the study of **Akbar et al., 2013** three times a day with three hours interval differ according to his return to surgery unit after operation. This sequence at 8:00 am, 1:00 pm and 6:00 pm from the first day postoperative this treatment was based on study by **Quah et al., 2006** until passage of first flatus based on the study of **Bang et al., 2008**. Bowel sounds were evaluated after the children had finished chewing the gum for 10 minutes, 3 times a day using a stethoscope at the 4 quadrants of the abdomen, for one minute per quadrant (**Toskulkao, 2016**).

Early mobilization: In the study group II started early mobilization a few hours after surgery by asking child to dangle their legs, stand at the bedside for a few minutes and then walk three times per day (**Aarts et al., 2013**). The child walks at least the length of hallway. Listening to the bowel sound after the child returned back to the bed. This intervention was undertaken until post-operative day two (POD 2) or hospital discharge, whichever came first (**Fiore et al., 2017**).

After the intervention in both group I & group II the children were evaluated for their outcomes using tool II.

The control group: Group III control group received routine hospital care, the children were interviewed three to fulfill bowel motility monitoring sheet using tool II.

Ethical Considerations

The ethical research consideration in this study include the following

- Research proposal was approved from Ethical Committee in the Faculty of Nursing.
- There was no risk for the study subjects during application of the research.

- The study was following common ethical principles in clinical research.
- Written consent was obtained from parents that are willing to participate in the study, after explaining the nature and purpose the study.
- Parents were assured that the data of this research will not be reused without second permission.
- Confidentiality and anonymity were assured.
- Parents and children had the right to refuse participation and or withdrawing from the study without any rational any time.

Statistical analysis

Data entry and data analysis were done by using SPSS program (Statistical Package for Social Science) version 20. Data were presented as number, percentage, mean and standard deviation. Chi-square test and Fisher exact test were used to compare qualitative data and independent T-test used to compare quantitative data. P value considered statistically significant when $p < 0.05$.

Results

Table (1): Personal data of the studied children.

Personal data	Group I(n= 30)		Group II(n= 30)		Group III (n= 30)		P-value ¹	P-value ²	P-value ³
	No.	%	No.	%	No.	%			
Child's age / years							0.981	0.126	0.109
6 - < 9 yrs	9	30.0	9	30.0	10	33.3			
9 -< 12 yrs	7	23.3	8	26.7	10	33.3			
12 -< 15 yrs	9	30.0	9	30.0	2	6.7			
15 -18 yrs	5	16.7	4	13.3	8	26.7			
Range	6.0 – 17.0		6.0 – 17.0		6.0 – 17.0		0.976	0.634	0.508
Mean ± SD	10.73 ± 3.23		10.80 ± 3.24		10.57 ± 3.72				
Child's gender							0.121	0.273	0.196
Male	19	63.3	13	43.3	18	60.0			
Female	11	36.7	17	56.7	12	40.0			

Group I: Chewing gum

Group II: Early mobilization

Group III: Control group

Chi-square test

P-value¹: Comparison between group I and group IIP-value²: Comparison between group I and group IIIP-value³: Comparison between group II and group III

Independent samples t-test

Table (2): Comparison between the efficacy of chewing gum versus early mobilization on bowel motility for children after abdominal surgery.

	Group I (n= 30)	Group II (n= 30)	Group III (n= 30)	P-value ¹	P-value ²	P-value ³
	%	%	%			
Return of bowel sound/ hours						
<12 hrs	36.7	33.3	23.3	0.186	0.002*	0.166
12- <24 hrs	56.7	43.3	30.0			
≥ 24hrs	6.7	23.3	46.7			
Passage of first flatus/ hours						
<12 hrs	26.7	26.7	10.0	0.664	0.004*	0.032*
12- <24 hrs	43.3	33.3	16.7			
≥ 24hrs	30.0	40.0	73.3			
Passage of first feces / hours						
<24 hrs	30.0	26.7	16.7	0.243	0.000*	0.015*
24-48hrs	60.0	46.7	20.0			
> 48hrs	10.0	26.7	63.3			
Return of appetite / hours						
< 24 hrs	56.7	46.7	26.7	0.606	0.046*	0.271
24-48hrs	36.7	40.0	53.3			
>48 hrs	6.7	13.3	20.0			
Time of liquid diet / hours						
< 12 hrs	23.3	20.0	3.3	0.672	0.009*	0.080
12- < 24 hrs	40.0	33.3	20.0			
24- 48hrs	30.0	30.0	50.0			
> 48hrs	6.7	16.7	26.7			
Time of soft diet/ hours						
<24 hrs	23.3	16.7	6.7	0.657	0.164	0.481
24-48 hrs	50.0	46.7	53.3			
> 48 hrs	26.7	36.7	40.0			
Time of regular diet/ days						
< 2 days	26.7	26.7	10.0	0.955	0.030*	0.053
2-3 days	43.3	40.0	26.7			
> 3 days	30.0	33.3	63.3			

Group I: Chewing gum

Group II: Early mobilization

Group III: Control group

Group I: Chewing gum

* Statistically significant differences

P-value¹: Comparison between group I and group IIP-value²: Comparison between group I and group IIIP-value³: Comparison between group II and group III

Group III: Control group

Chi-square test

Table (3): Comparison between the efficacy of chewing gum versus early mobilization on post-operative hospital stay.

	Group I (n= 30)	Group II (n= 30)	Group III (n= 30)	P-value ¹	P-value ²	P-value ³
	%	%	%			
Post-operative hospital stay/ days						
< 2 days	26.7	26.7	6.7	0.840	0.095	0.206
2-<4 days	43.3	33.3	36.7			
4-7 days	23.3	30.0	40.0			
> 7 days	6.7	10.0	16.7			

Group I: Chewing gum

Group II: Early mobilization

Group III: Control group

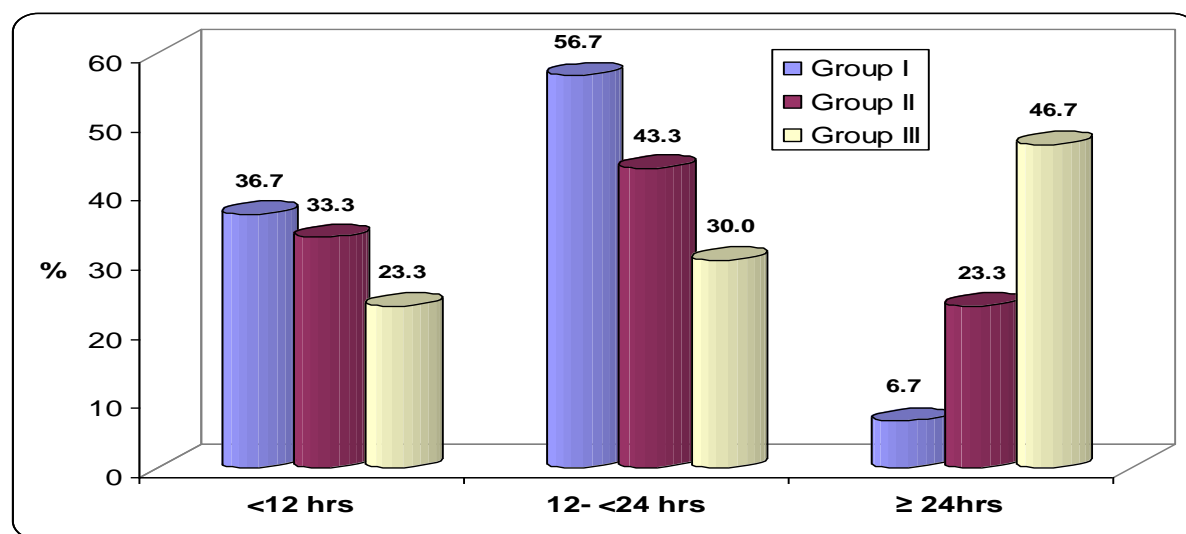
P-value¹: Comparison between group I and group IIP-value²: Comparison between group I and group IIIP-value³: Comparison between group II and group III**Figure (1): Return of bowel sound in the three groups**

Table (1): Shows personal data of the studied children. Regarding child's age more than one quarter (30%) was from (6 - < 9 years) and (12 - < 15 years) in both group I & II while about one third (33.3%) in group III was in age group from (6 - < 9 years) and (9 - < 12 years). Finding revealed that male constituted 63.3%, 43.3% and 60% in group I, group II and group III. It was noticed that there was no statistically significant difference between the three groups.

Table (2): Shows comparison between the efficacy of chewing gum versus early mobilization on bowel motility for children after abdominal surgery. It was found that there were no statistically significant difference between group I and group II regarding return of bowel sound, passage of first flatus, passage of first feces return of appetite, time of liquid diet, time of soft diet and time of regular diet.

Finding revealed that there was statistically significant difference between group I and group III regarding return of bowel sound, passage of first flatus, passage of first feces, return of appetite, time

of liquid diet and time of regular diet while there was no statistically significant difference between group I and group III regarding time of soft diet. It was found that there were statistically significant difference between group II and group III regarding passage of the first flatus and passage of first feces while there were no statistically significant difference between group II and group III regarding return of bowel sound, return of appetite, time of liquid diet, time of soft diet and time of regular diet.

Table (3): Presents comparison between the efficacy of chewing gum versus early mobilization on post-operative hospital stay. It was noticed that there was no statistically significant difference between group I & group II. It was noticed that there was no statistically significant difference between group I and group III. It was noticed that there was no statistically significant difference between group II & group III.

Figure (1): Shows return of bowel sound in the three groups. It was found that (36.7, 33.3 and 23.3) in

group I, group II and group III respectively returned their bowel sound < 12hrs while only (6.7%) returned their bowel sound ≥ 24 hrs in the chewing gum group in compared with (23.3%) in the early mobilization group and (46.7%) in the control group.

Discussion

Chewing gum mimics food intake and is considered as a kind of sham feeding. The physiologic mechanism for the enhanced recovery of bowel motility by chewing gum after abdominal surgery is assumed to be the activation of the cephalic-vagal pathway, which is stimulating intestinal myoelectric activity in an attempt to counteract activation of the gastrointestinal μ opioid receptors. This response leads to both humoral and nervous stimulation of bowel motility. Given this, chewing gum might be a safe and inexpensive way to provide the benefits of early stimulation of the gastrointestinal tract (Fanning & Valea, 2011).

In the present study return of bowel sound was earlier in the chewing gum group than the control group and the difference between groups was statistically significant. This finding was consistent with Sanjay et al., (2012) in their study about role of gum chewing on the duration of postoperative ileus following ileostomy closure done for typhoid ileal perforation who reported that appearance of bowel sound was significantly earlier in the study group.

This finding was disagreement with Ajay et al., (2018) in their study postoperative ileus: a study on the role of chewing gum to reduce its duration who found that the mean time for appearance of bowel was not statistically significant.

Regarding passage of the first flatus and first feces, it was statistically earlier in the chewing gum group than the control group as stated in this study first and second hypothesis. These findings were went on line with Bahena et al., (2010) who found that gum-chewing could hasten the recovery of flatus and defecation.

This finding was disagreement with Andersson et al., (2015) who reported that the mean time to first flatus and defecation was shorter in the intervention group although the difference was not significant. (Bonventre et al., 2014, Forrester et al., 2014 & Zaghiyan et al., 2013) also found no significant difference in time to flatus and defecation after gastrointestinal operation between gum-chewing and control groups

In the present study return of appetite was significant earlier in the chewing gum group than the control group. This finding was in agreement with Sanjay et al., (2012) who found that the mean time taken to experience the feeling of hunger was significantly

shorter in the study group in comparison to the control group.

This finding was disagreement with Ajay et al., (2018) who reported that the mean time taken for the feeling of hunger was short in the study group, but it was not significant.

Regarding the time of liquid diet and time of regular diet, it was noted that chewing gum group starting liquid and regular diet earlier than the control group as stated in this study third hypothesis. The difference was statistically significant. This finding was congruent with Crainic et al., (2009) who stated that the chewing gum group started to tolerate liquids taken orally earlier and Binbin et al., (2017) who reported that there was a statistically significant reduction in the time to start feeding for the chewing gum group.

Regarding efficacy of chewing gum on post-operative hospital stay, it was notable that the length of post-operative hospital stay was shorter in the chewing gum group than the control group as stated in this study fourth hypothesis but the difference was not statistically significant.

This finding goes on line with Fitzgerald et al., (2009) who found that the length of post-operative hospital stay was not statistically significant, but disagreement with Ajay et al., (2018) who found that the patients in the study group discharged early than the control group, and it was the only finding in this study which was statistically significantly also Sanjay et al., (2012) reported a statistically significant shorter hospital stay in the study group.

Early mobilization improves circulation, accelerates peristalsis and lowers postoperative abdominal distention by increasing abdominal wall tonus and gastrointestinal system functions. Early ambulation aids in the restoration of normal bowel function, allows patients to more easily pass flatus and stool, and resume normal bowel habits. Patients are encouraged to walk for their overall well-being but also in an effort to resolve more quickly ileus and to relieve the associated cramps and bloating (Malik et al., 2013).

Regarding efficacy of early mobilization on bowel motility for children after abdominal surgery, it was found that return of bowel sound was earlier in early mobilization group, but the difference was not statistically significant. This finding was disagreement with John et al., (1990) in their study about the effect of ambulation on recovery from postoperative ileus who found that ambulation appears to have no overall effect on promoting an early recovery of normal gastrointestinal myoelectric activity.

As regard passage of first flatus, it was significantly earlier in the early mobilization group as stated in this

study first hypothesis. This finding was similar to **Yuan et al., (2018)** in their study about enhanced recovery program in liver resection surgery who reported that time to first flatus after surgery was significantly shorter in the Enhance Recovery after Surgery (ERAS) group than in the control group.

In the present study, passage of first feces was significantly earlier in the early mobilization group as stated in this study second hypothesis and the difference was statistically. This finding was in agreement with **Raue et al., (2004)** who researched whether a "Fast-Track" multimodal rehabilitation program improved outcomes after laparoscopic sigmoidectomy. The fast track multimodal group was out of bed on day 0 of surgery and for extended lengths beginning on day 1 post-operatively. Fast track patients had bowel movements 1 day earlier than the control group, also **Leonard, (2018)** found that going for short walks around the hospital after surgery will help move food through the intestines and stimulate a bowel movement

Regarding return of appetite, time of liquid diet, time of soft diet and time of regular diet, it was earlier in the early mobilization group than the control group as stated in this study third hypothesis but the difference was not statistically significance. This finding was in agreement with **Rothman et al., (2016)** in their study about the impact of early ambulation in the pediatric postoperative appendectomy who reported that return appetite and start feeding was earlier in the study group but there was no statistically significant difference.

Regarding efficacy of early mobilization on post-operative hospital stay, it was shorter in the early mobilization group as stated in this study fourth hypothesis but the difference was not statistically significant between early mobilization group and control group. This finding agree with **Rothman et al., (2016)** who found early ambulation has an impact on length of stay but disagree with **Robert & Massey, (2010)** who found that early mobilization had no effect on time to discharge.

Regarding efficacy of chewing gum versus early mobilization on bowel motility for children after abdominal surgery, it was found that there were no statistically significant difference between chewing gum and early mobilization group regarding return of bowel sound, passage of first flatus, passage of first feces return of appetite, time of liquid diet, time of soft diet and time of regular diet. There is no study supported this findings as some studies examine chewing gum alone and others examine early mobilization alone and only one study done by **Hidayah et al., (2015)** who demonstrated that the use of early mobilization plus chewing gum was effective

on recovery of gastrointestinal motility after cesarean section.

As regarding efficacy of chewing gum versus early mobilization on post-operative hospital stay, it was noticed that there was no statistically significant difference between chewing gum group and early mobilization group and this finding disagree with what was mentioned in this study fifth hypothesis and there is no study supported this finding.

Conclusion

It was found that chewing gum was slightly more effective than early mobilization in improving bowel motility after abdominal surgery in children

Recommendations

Based on the results of the current study, the following recommendations are suggested

1. Educational programs should be provided to increase knowledge and skills for nurses in applying non-pharmacological intervention to improve bowel motility after abdominal surgery.
2. Chewing gum and early mobilization should be incorporated as one of the post-operative ileus management modalities in daily practice.
3. Conducting a further study for evaluating the effect of chewing gum and early mobilization on postoperative ileus among abdominal surgery children using a larger sample and different geographical areas in Egypt.

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