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(RESEARCH ARTICLE)

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Sugarless chewing gum and postoperative ileus following abdominal surgery in two referral hospitals in the Southwest Region of Cameroon

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Abstract

Background: Postoperative ileus is common after abdominal surgery and usually delays recovery. It is hypothesized that chewing gum accelerates postoperative transit recovery. Sugarless chewing gum may therefore produce the same effect after abdominal surgery.

Method: A randomized control trial was carried out for a period of 3 months in two referral hospitals in the southwest region of Cameroon. A total of 100 patients were randomly selected and divided into 2 groups: case group (n=50) and control group (n=50). In the case group, patients chewed sugarless gums for 30 minutes every 8 hours, until resumption of intestinal transit. Data were collected using a structured data collection form to assess the occurrence of first flatus, first bowel sound, resumption of feeding and length of hospital stay. Patients' demography, surgical indication, intra operative and postoperative management was the same in both groups. Sugarless chewing gum was well tolerated by all patients.

Results: The first flatus occurred in 23 hours post operation in the case group and 33 hours in the control group **(p=0.019),** return of bowel sound occurred in 19 hours post operation in the case group and 27 hours in the control group **(P=0.020),** patients resumed feeding in 23 hours post operation in the case group and 34 hours in the control group (P=0.006).The mean hospital stay was 3.08 ±4.14 days in the case group and 4.42±5.33 days in the control group.

Conclusion: Our study suggests that Sugarless chewing gum stimulates bowel motility and therefore helps ameliorates postoperative ileus.

Keywords: Postoperative Ileus; Sugarless Chewing Gum; Abdominal Surgery; Flatus; Bowel Sound; Hospital Stay

1. Introduction

Postoperative ileus (POI) is a common complication following abdominal surgery, characterized by insufficient bowel movement leading to the inability to tolerate oral intake, delayed gastrointestinal function, and increased length of hospital stays [1]. It constitutes a considerable burden on both patients and healthcare systems globally, contributing to increased morbidity, healthcare costs, and delays in recovery [2]. Prolonged postoperative ileus (PPOI) is the form that does not resolve after 72 hours post-operation [3]. This form has been associated with prolonged admission time, high costs of health care and increased morbidity [4].

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Symptoms may include abdominal distension, decreased bowel sounds, constipation, and difficulty resuming oral intake. If these symptoms persist, complications such as dehydration, electrolyte imbalance, pneumonia, and sepsis may occur[5].The frequency of POI in the initial week following surgery exhibits substantial variation, estimated to range from 3% to 50%, largely attributable to the dearth of consensus on defining abnormal recovery duration for intestinal motility[6]

Globally, it is estimated that POI affects 10-30% of patients after elective surgery, with higher rates reported in emergency procedures [7]. The prolonged hospital stay associated with POI can lead to increased healthcare costs, estimated at $1.5 billion annually in the United States [8]. In high-income countries, the incidence of POI remains a significant concern. Data indicate that postoperative ileus can affect up to 15-20% of patients who undergo procedures such as colon resections and abdominal surgeries [9]. In a study conducted in sub-Saharan Africa, POI in patients undergoing major abdominal surgery had an incidence of approximately 25%, highlighting the need for better surgical and postoperative care practices in these regions [10].

The Global Burden of Disease Study indicates that while the incidence of POI may be consistent globally, the healthcare responses vary dramatically due to socioeconomic factors [11]. For instance, a study conducted in the UK suggested that enhanced recovery protocols could significantly reduce POI incidence and associated healthcare costs [12]. In high-income countries (HIC), studies have established clear pathways for management and prevention of POI, employing multimodal approaches including early mobilization, restriction of opioid analgesia, and the use of pharmacological agents such as prokinetics[13][14]. The challenges encountered in implementing effective management protocols for POI in LMIC are multifaceted. Amidst limited healthcare infrastructure, surgical patients frequently experience longer recovery periods due to inadequate postoperative monitoring and support [15]. Moreover, cultural factors and patient adherence to medical recommendations can further complicate management efforts [16]. Global studies suggest that practitioners face distinct challenges in LMIC, which often do not reflect the best-practice protocols established in HIC [17][18][19]. Consequently, the question arises about the compatibility of interventions such as sugarless chewing gum in these contexts.

Research highlighting the use of sugarless chewing gum has gained traction in recent years, theorizing that the act of chewing stimulates gastrointestinal motility through cephalic-phase responses and secretion of digestive enzymes [20]. As illustrated in a multicenter study, patients who chewed gum after colorectal surgery experienced a statistically significant reduction in the duration of postoperative ileus [21]. However, while such findings are promising, the applicability of these methodologies in various contexts remains to be thoroughly explored.

In Cameroon, the healthcare system struggles with resource constraints, and studies assessing postoperative outcomes, including POI, remain sparse [22]. The variation in postoperative care and the general reliance on traditional methods of recovery may contribute to higher rates of POI. While some local studies suggest minimal use of interventions such as early mobilization and gum chewing, there is scant evidence regarding their efficacy in reducing POI specifically in this setting [23]. A study carried out in Yaoundé, Cameroon, showed that after an open appendectomy, patients managed with chewing gum, passed out flatus as well as had bowel activities 2 days earlier than those not giving chewing gum [24]. Thus, exploring the potential benefits of sugarless chewing gum as a management strategy in the context of postoperative care in Cameroon provides a unique opportunity to bridge the gap between established knowledge and real-world applicability.

1.1. Study objectives

1.1.1. Main objective

The main objective of this study is to determine the effect of sugarless chewing gum on postoperative ileus post abdominal surgery in a resource limited setting.

1.1.2. Specific Objectives

- To compare the time taken for the resolution of postoperative ileus in the group of patients chewing gum versus control group.
- To compare the hospital stay in the group of patients chewing gum versus control group.

1.2. Hypothesis

The null hypothesis for this study is that there is no difference in the duration of POI when sugarless gum is chewed compared to when it is not.

2. Materials and methods

A prospective randomized controlled trial was carried out in the surgical and maternity units of the Limbe and Buea Regional Hospitals. These hospitals are both teaching and referral hospitals in the South West Region of Cameroon. The study was carried out for a period of 3 months.

2.1. Inclusion criteria

We included patients in Surgical and maternity units in both hospitals who underwent open abdominal surgery and accepted to take part in the study

2.2. Exclusion criteria

- Patients less than 18 years of age.
- Patients with documented allergies to the contents of chewing gum
- Patients who will be unconscious or unable to chew gum post-surgery

2.3. Sample size

We sampled 100 participants matching them in a 1:1 ratio for cases and controls.

2.4. Procedures

2.4.1. Administrative

Ethical Approval was obtained from the Institutional review board of the Faculty of Health Sciences University of Buea (IRB FHS-UB) followed by administrative authorization from the Regional delegation of public health and Directorates of the Limbe and Buea Regional Hospitals as well as the department/unit heads.

2.4.2. Recruitment of study patients and data collection

A pretested questionnaire was used for one-to-one interviews with the consenting participants. A questionnaire was then administered to collect data on socio-demographic profile, Surgical indications, determinants and outcome of ileus.

2.5. Data management and Analysis

Those in the case group were given sugar-less gums which they chewed one stick of sugarless gum (xylitol) for 30 minutes every 8 hours, starting from the first postoperative day until the first bowel movement. No gum was given to the control group. All patients received the same postoperative care. All patients were ambulated on day one post operation. Epidural analgesia was not used. Time of first flatus, first bowel sound, resumption of feeding and hospital stay were noted. Data were entered in to Microsoft Excel and analyzed using Epi info 7 and Microsoft excel.

The chi square test (Fisher's exact test where appropriate) was used to compare the proportion of cases to the controls with outcome variables like timing of first flatus, first bowel sound, feeding and hospital stay.

The independent t test was used to compare the mean time of first flatus, first bowel sound, and resumption of feeding and length of hospital stay.

3. Result

In all we included 50 cases and 50 controls.

Table 1 Unit distribution of participants

	Maternity	**Surgical**	**Total**
Case	26	24	50
Control	26	24	50
Total	52	48	100

Table 2 Socio-demographic characteristics in the study population

Variable	Case Group (n=50)	Control Group (n=50)	x^2 ,df p value
Age(years)*			
18-25	11(22)	6(12)	8.69,6
26-35	17(34)	21(42)	0.19#
36-45	13(26)	9(18)	
46-55	4(08)	11(22)	
56 and above	5(10)	3(06)	
Gender*			
Male	17(34)	13(26)	0.76,1
Female	33(66)	37(74)	0.38#
Marital status*			
Single	24(48)	18(36)	2.08,2
Married	24(48)	31(62)	0.35#
Widowed	2(04)	1(02)	
Level of Education*			
Primary	0(00)	4(08)	4.17,2
Secondary	17(34)	16(32)	0.12#
Tertiary	33(66)	30(60)	
Occupation*			
Unemployed	3(06)	8(16)	3.68,3
Public	11(22)	11(22)	0.293#
Private	20(40)	21(42)	
Student	16(32)	10(20)	

*Information presented as relative frequency and percentages, n=absolute count, #=p value gotten from chi square test.

Table 3 Distribution of relevant patient history

	Previous Surgery	Electrolyte imbalance	Constipation	Co-mobidity	Intestinal disease	Sepsis	Drugs	Total
Case (n=50)	9	2	1	8	0	1	4	25
Control (n=50)	1	0	0	2	1	1	0	5
Total	10	2	1	10	1	2	4	30

More than half of the study population were aged <35 years. There were more females than males. More than half were married, educated and work in the private sector

3.1. Diagnosis and Operative findings

In the case group, 26 were surgical cases, 24 were obstetrics and gynecological cases and 2 were urological cases compared to the control group with 23 surgical cases, 26 obstetrics and gynecological cases and 1 urological case. 90% were major surgeries.

Table 4 Surgery Indications

Variable*	**Case group (n=50)**	**Control group (n=50)**	**X2,df P value**
Major surgical indication			
A-Emergency			
Appendicular abcess	1(2)	0(0)	45.05,45 0.46
Generalised Peritonitis	1(2)	1(2)	
Hemoperitoneum	4(8)	3(6)	
Perforated Peptic ulcer	1(2)	1(2)	
Ruptured Ectopic Pregnancy	1(2)	1(2)	
Emergency C.S	17(34)	17(34)	
B- Elective			
Acute Catarrhal Appendicitis	5(10)	7(14)	
Elective C.S	2(4)	4(8)	
Strangulated Inguinal Hernia	2(4)	4(8)	
Inguinoscrotal Hernia	2(4)	0(0)	
Cervical intraepithelial neoplasm (II)	1(2)	0(0)	
Symptomatic Uterine fibroids	1(2)	4(8)	
Postpartum Hemorrhage	1(2)	0(0)	
Perforated uterus	1(2)	0(0)	
Intestinal Obstruction	2(4)	1(2)	
Benign prostatic Hyperplasia	1(2)	1(2)	
Prostate Cancer	1(2)	0(0)	
Minor surgical indication			
Spigelian Hernia	1(2)	0(0)	
Supra umbilical Hernia	3(6)	3(6)	
Umbilical Hernia	2(4)	3(6)	

3.2. Duration of surgery and Anesthesia

The mean duration of surgery in minutes in the case group was 65.8 ± 44.9 compared to 62.5 ± 37.0 in the control group. All surgeries were done using general anesthesia.

3.3. Postoperative findings

The mean time of return of bowel sound, first flatus and feeding in the study is shown below

Table 5 Mean time of return of bowel sound, first flatus, feeding and hospital stay

Variable	**Case Group Mean time ±S.D (in hour)**	**Control Group Mean time ± S.D (in hour)**	**T value**	**P value**
Return of bowel sounds	19.22 ±14.14	27.18 ±19.33	2.34	0.020
Passage of flatus	23.58 ± 15.95	32.52 ±21.33	2.37	0.019
Feeding	23.48 ± 15.41	33.74 ±20.80	2.78	0.006

3.4. Length of Hospital stay

In this study, patients in the case group stayed shorter in the hospital compared to patients in the control group. Mean hospital stay in case group was 3.08 ± 4.14 days compared to 4.42 ±5.33 days in control group.

4. Discussion

Postoperative ileus (POI) is a common complication after abdominal surgeries, which can lead to prolonged hospital stay, increased healthcare costs and can significantly affect patient recovery [27]. Two phases have been identified in the pathophysiology of POI: the inflammatory phase and the neural phase [28]. Mechanoreceptors and pain receptors are stimulated during skin incision and during bowel manipulation, which results in the neural phase [28]. This activation initiates a neuronal response that inhibits bowel movement and is dependent on the availability of substance P and α-calcitonin [28]. The gut wall's production of inflammatory mediators causes the inflammatory phase [28]. Mast cells begin to activate and de-granulate as a result of the inflammatory cascade that is initiated by manipulating the gut [28]. Neutrophils are drawn to the intestinal wall by the cytokines and chemokines released by local macrophages, which are activated by these activated mast cells [28].

Traditional methods for managing POI, such as nasogastric suction and parenteral nutrition, are often invasive and can lead to additional complications [29]. However, gum chewing has been known to stimulate the cephalic-vagal reflex, leading to increased GI hormone secretion and improved intestinal motility[30].

The main objective of this research was to evaluate the time required for post-operative ileus to resolve in the gum chewing group compared to the control group. We observed that patients who chewed gum experienced a notably shorter duration of post-operative ileus. Our results showed that, irrespective of the surgical indications, chewing gum post-surgery may aid in stimulating bowel movement, leading to quicker resolution of ileus. Several research has explored its effect on ileus [21, 24, 26, 31]. Studies have been carried out in different surgical settings and even though there is no consensus on the type of gum and duration of chewing, the results indicates a statistically significant reduction in the duration of ileus [21]. Our findings align with those of Van Den Heijkant et al. [22], who studied the effect of chewing gum in patients who underwent colorectal surgery, and with Ngowe et al. [25], who investigated its impact on patients who underwent open appendectomy. However, a meta-analysis carried out in 2015 using 12 studies, indicated that even though gum chewing is a safe and tolerable means of reducing ileus, the degree of improvement is small and of limited clinical significance [26]. This was probably because of the significant heterogeneity of the included studies.

In our study, we found the following factors to be associated with postoperative ileus. More patients had previous abdominal surgery, constipation, electrolyte imbalance and co-morbidities like Diabetes and Hypertension in the case group compared to the control group. This was probably because there were more aged patients in the case group than the control group. Increase age was seen to be directly proportional to co-morbidities like diabetes mellitus and hypertension [27]. Also, patients in the case group had a more significant drug history than the control group probably because of the history of previous surgeries and comorbidities. These findings are similar to a study by Singh et al [29] but different from the studies by Van Den Heijkant et al [22] and Bhatti et al [32] where the above determinants were similar in both groups. This was probably because these studies were done after a single surgical procedure; ileostomy and colectomy respectively compared to our study, which consider a range of surgical procedures.

The type and duration of surgery, anesthesia and postoperative management was similar in both groups. However, there were more emergency surgeries in the case group compared to the control group. This is similar to study by Singh et al[29] but different from a study by Kumar et al[31], which was based on major emergency surgeries.

The secondary goal of this study was to compare the length of hospital stay, in-hospital morbidity, and mortality between the intervention and control groups. Although patients who chewed gum had a significantly shorter hospital stay, there was no statistically significant difference in post-operative complications between the groups. This concurs with findings by Ngowe et al. [27], who reported that chewing gum reduced hospital stays by an average of 2 days in patients with acute appendicitis. Other related studies did not report on hospital stay length, and those that did were either mixed (emergency and elective) or elective only [25, 26, 28, 29]. While the early resolution of ileus observed in this study may have contributed to the reduced hospital stay, a closer examination of post-operative complications showed that patients who did not chew gum experienced more complications requiring additional procedures compared to those who did. This difference in complications, although not statistically significant, might have led to the longer hospital stays in the control group. Previous research on the impact of chewing gum on ileus was not focused on acute peritonitis due to gastroduodenal perforations [33, 34]. In low-resource settings, which are often

underrepresented in research, our study provides timely insights. Chewing gum, which is easily accessible and affordable, may help reduce the duration of post-operative ileus, facilitating earlier discharge.

Our study has the following strength;

- To the best of our knowledge, our study has the largest sample size of similar studies.
- This study is the first in Cameroon to be done using multiple surgical indications.
- Our study considers a multi-facility approach eliminating the specificities found in using a single facility.
- The outcome of ileus used in our study is simple and easily applicable in our hospitals

Our study had the following limitations;

- Lack of matching and control of confounders such as;
  Non-measurement of serum electrolytes.
- Comparing POI in different surgical procedures for example, urological and gastrointestinal surgery.
- History of previous surgery, opioid use, comorbidities etc were not similar in both groups.
- Limited study period
- Some of the patients had incomplete records, so information relating to past history was solely on what the patient says.
- First passage of flatus, as an outcome of postoperative ileus was subjective. This was because some patients don't remember passing out flatus especially when asleep.
- The presence of bowel movements does not fully rule out the presence of ileus. So its use as an outcome may not be accurate.

In spite of these limitations, this study is to be a baseline for future multicenter studies

5. Conclusion

Return of bowel sounds, first passage of flatus, resumption of feeding and Length of hospital stay ; were all shorter in the case group as compared to the control group. Therefore, the use of sugarless chewing gum in the postoperative period is a cheap, save and effective way of reducing postoperative ileus, thereby ensuring quicker recovery, reduced hospital stay and reduced cost and should be suggested to patients following abdominal surgery.

Compliance with ethical standards

Disclosure of conflict of interest

We, authors of the paper titled " Sugarless Chewing Gum and Postoperative Ileus Following Abdominal Surgery in two referral hospitals in the southwest region of Cameroon". Declare that there are no conflict of interest regarding the publication of this manuscript.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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Authors short profile

	**Dr. Bertrand Kealebong Asonglefac** is a distinguished researcher and academic author with a focus on public health and epidemiology. He is the coordinator for Africa with American Solidarity care and has been involved in a number of clinical trials for the Ministry of Public health in Cameroon. He is graduate from the Faculty of Health Sciences, University of Buea and a holder of Masters in Public Health from Brunel University London, UK.
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	**Professor Elroy Patrick Weledji** holds a BSc (Hons) in Physiology, an MSc (Lond) in Neurological Science, an MBBChBAO (Ireland), and an FRCS (Edinburgh). He is currently a Professor of Surgery in the Faculty of Health Sciences at the University of Buea, Cameroon, where his main research interests are gastrointestinal surgery, coloproctology, and surgical oncology. In addition to his academic credentials, Professor Weledji is a member of the British Association of Surgical Oncology (BASO) and was the first non-European member of the European Society of Coloproctology (ESCP). He has also received fellowships from both organizations, including an ESCP fellowship in pelvic floor surgery in St Gallen, Switzerland, in 2015, and a BASO Ronald Raven fellowship in the Aintree Hepatobiliary Centre in the UK in 2016. Professor Weledji has published over 150 papers and a book entitled 'Theoretical and Clinical Aspects of Surgery in the Tropics".
	**Professor Ngowe Ngowe** Marcelin is a distinguished professor of General Surgery affiliated with University of Buea, University of Douala and University of Yaoumde 1 in Cameroon and the Bordeaux University in France. He was the Dean of the faculty of Health sciences, University of Buea with over 100 publications.