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ORIGINAL RESEARCH

Comparison Of Immediate and Early Oral Feeding Regimens Following Uncomplicated Caesarean Sections in Ile-Ife, Nigeria: A Randomised Controlled Trial

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Abstract

Background: Current evidence has dispelled the traditional practice of withholding oral feeding until return of bowel function following uncomplicated caesarean section (CS). Early initiation of oral feeding post-CS has been demonstrated to be safe and beneficial for postoperative gastrointestinal function and patient recovery.

Objective: To evaluate the safety and benefits of immediate oral feeding (IOF) compared with early oral feeding (EOF) after uncomplicated CS.

Methods: One hundred and sixty-two consenting women undergoing uncomplicated CS under regional anaesthesia were randomised equally into the IOF and EOF groups. Oral feeding was commenced in the IOF and EOF groups 2 hours and 6 hours post-CS, respectively.

Results: There were no statistically significant differences in time intervals to return of bowel sounds (120.0 vs. 240.0 min, $P=0.056$), passage of flatus (900.0 vs. 1,120.5 min, $P=0.131$), passage of stool (1,920.0 vs. 2,139.5 min, $P=0.234$), ambulation (608.5 vs. 892.5 min, $P=0.379$) and eligibility for discharge ($1,648.7 \pm 614.9$ vs. $1,709.7 \pm 541.5$ min, $P=0.509$) between the IOF and EOF groups. Women in the IOF group established breastfeeding (300.0 vs $1,278.0$ min, $P=0.020$) and commenced regular diet (604.4 ± 29.7 vs 840.0 ± 0 min, $P<0.001$) significantly earlier than women in the EOF group. There were no statistically significant differences in the occurrence of ileus and severe/paralytic ileus ($P=1.000$ each) and postoperative fever ($P=0.620$) between the two groups.

Conclusion: Oral feeding can be safely started 2 hours after an uncomplicated CS, offering advantages such as earlier breastfeeding initiation and earlier start of a regular diet compared to EOF.

Keywords: *Caesarean birth, Complicated Caesarean section, Ileus, Paralytic ileus, Post-CS oral feeding, Regional anaesthesia.*

Introduction

The traditional practice of delaying commencement of oral feeding post-Caesarean section (CS) until auscultation of normoactive bowel sounds and/or passage of flatus/stool by the patient is not justified by current evidence. This traditional practice was based on the belief that early initiation of oral feeding exacerbated the transient postoperative ileus following CS. This could result in abdominal distension and pain, anorexia, nausea and vomiting, which could be complicated by aspiration, wound breakdown, and anastomotic leaks, consequently increasing postoperative morbidity and length of hospital stay.^[1,2] It has, however, been demonstrated that the duration of postoperative ileus following uncomplicated CS is relatively short, with a rapid return of bowel function.^[3-5] Moreover, there is evidence that bowel activity does not completely cease postoperatively, and gastric motor and myoelectrical activity remain sustained after intra-abdominal surgery.^[6,7] Furthermore, physiologically, even without stimulation by oral intake, up to two litres of gastrointestinal juices are secreted into the gut daily, most of which the small intestine readily absorbs.^[6,8] Oral nutrition can thus be safely tolerated by the patient in the immediate postoperative period.^[8] In our setting, CS are predominantly performed under regional anaesthesia, which is associated with a lower risk of aspiration than general anaesthesia and may influence the safety of immediate postoperative oral feeding.

Many studies and meta-analyses have demonstrated the safety and benefits of early initiation of oral feeding following CS, including, but not limited to, reduced body protein depletion, rapid return to normal diet, early ambulation, and reduced analgesic requirements. Other benefits include reduced postoperative sepsis, improved wound healing, earlier initiation of breastfeeding, higher

maternal satisfaction, faster postoperative recovery, and shorter hospital stay.^[1,3,4-6,9] While many studies globally compare early with delayed feeding, only a few randomised controlled trials (RCTs) have compared immediate with early oral feeding post-CS.^[5,10-13] Within the available literature, there is no published study comparing immediate versus early oral feeding post-CS conducted in Nigeria, where the timing of commencement of oral intake post-CS remains variable. There is also no meta-analysis or systematic review on the subject. This study sought to compare immediate and early oral feeding following uncomplicated CS in a tertiary hospital in Nigeria.

Methods

Study setting, design and duration

This open-label RCT was conducted in the Department of Obstetrics, Gynaecology and Perinatology at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, an 842-bed tertiary teaching hospital located in south-west Nigeria. The Department has antenatal, postnatal, gynaecology, and labour wards, as well as an operating theatre. The Labour Ward records about 2,000 births annually, with a CS rate of 48.5%.^[14] Obstetric patients are admitted and managed in consultant-led units, with resident doctors and house officers working under the supervision of consultants. The study was conducted between August 2022 and January 2023.

Inclusion and exclusion criteria

All consenting women who underwent elective and emergency uncomplicated CS under regional anaesthesia were recruited for the study. Exclusion criteria included CS involving bladder, ureteral, intestinal or uterine artery injury, intraoperative blood loss > 1,000 ml, extensive adhesions/adhesiolysis or/and

extensive bowel handling, general anaesthesia, women with prolonged obstructed labour or obstructed labour with features suggestive of sepsis or/and peritonitis, women with severe and uncontrolled medical conditions or/and requiring intensive care, and women with chronic gastrointestinal disorders such as chronic constipation, irritable bowel syndrome, malabsorption disorders.

Sample size determination

The sample size for this study was calculated using the formula for an RCT with a categorical primary outcome variable.^[15] The primary outcome measure in this study was the occurrence of paralytic ileus.

$$n = \frac{1}{(1-f)} \times \left[\frac{2 \times (Z_{\alpha} + Z_{\beta})^2 \times P \times (1-P)}{(P_0 - P_1)^2} \right]$$

where: n = minimum sample size; P_0 = proportion of study participants in the early feeding group expected to develop ileus symptoms. A previous study in the study centre by Orji *et al.* put this at 15%^[9]; P_1 = the proportion of study participants in the immediate feeding group expected to develop ileus symptoms. This was set at a 20% increase over P_0 , i.e., 35%; f = the proportion of study participants expected to be lost to follow-up. This was put at 10% (0.1); Z_{α} = Standard normal deviation for a two-tailed alpha error of 0.05 = 1.96; Z_{β} = Standard normal deviation for a power of 80% = 0.84; $P = \frac{P_0 + P_1}{2} = 0.25$. Substituting into the formula gave a sample size of 81 per study group.

Randomisation, study group allocation and blinding

Study participants were selected by consecutive recruitment. Selected study participants were equally allocated to the immediate oral feeding (IOF) or early oral feeding (EOF) group using a computer-generated list of random numbers (from www.randomization.com). The

numbers were generated by a statistician who was unaware of the study objectives and protocol. Concealment of allocation by the statistician was done by writing the group names (designated as IOF or EOF) on sheets of paper or cards, and placing these papers/cards inside sealed, sequentially numbered opaque envelopes, which were securely kept in a container in the postnatal ward and drawn consecutively to randomize eligible and consenting study participants into either of the study groups, until completion of the study. Neither the principal investigator nor the research assistants were aware of the randomisation sequence. However, because this was an open-label RCT, the principal investigator and research assistants who assessed the study outcomes were not blinded to the group assignment.

Having confirmed their eligibility for the study, patients scheduled for an elective or emergency CS were counselled before the procedure (in the antenatal clinic and antenatal ward for elective cases, and in the antenatal ward and labour ward for emergencies), and written informed consent was obtained for participation in the study. Once a patient consented to participate in the study, a sealed envelope bearing the patient's serial number was opened, and the patient was allocated to the study group indicated on the sheet of paper or card inside. After the CS, the intraoperative findings were reviewed, and patients were reassessed to determine whether they remained eligible to participate in the study. If they were no longer considered eligible based on intraoperative findings (such as bladder, ureteral, intestinal, or uterine artery injury; blood loss >1,000 ml; extensive adhesions/adhesiolysis; and/or extensive bowel handling), they were excluded from the study.

Study procedure

The CS and anaesthesia for the study participants were performed according to

standard guidelines, as routinely done for all patients. Postoperative care (which was similar for all the study participants) was routine and in accordance with the departmental protocol. Postoperatively, all patients received intravenous fluids: 1 litre 5% dextrose saline, alternating with 1 litre normal saline, 8-hourly, until establishment of oral feeding. They also received intravenous cefuroxime 750 mg 8-hourly, intravenous diclofenac 75 mg 12-hourly, and intravenous paracetamol 1 g 8-hourly, all for the first 48 hours, after which they were converted to oral doses of cefuroxime 500 mg bid and paracetamol 1 g tds for 5 and 3 days, respectively.

Women in the IOF and EOF groups were given 100 ml of clear water at 2 hours and 6 hours post-CS, respectively, calculated from the time of completion of skin closure at CS. They were then advanced to 100 ml of semi-solid diet (pap), followed by the regular diet, at 4-hour intervals if they tolerated the water and pap (absence of nausea or vomiting).

Bowel sounds were auscultated 2-hourly from the completion of skin closure at CS until normoactive bowel sounds were heard. Bowel sounds were auscultated over all four quadrants of the abdomen, beginning in the right lower quadrant, listening over each quadrant for at least 60 seconds. Bowel sounds were documented as absent only after listening in all four quadrants. The time to return of normoactive bowel sounds was noted and recorded.

Study participants were each given a sheet of paper and a pen, which they used to record the time(s) they passed the first flatus and first stool, the time of establishment of breastfeeding, and the first time they were able to get out of bed unaided. These records were used to calculate the time intervals to passing flatus, passing stool, establishment of breastfeeding, and ambulation, taking the time of completion of skin closure at CS as the zero hour.

Study participants were interviewed about symptoms of nausea, vomiting, and watery stools. Abdominal distension was assessed clinically by measuring abdominal girth at the level of the umbilicus with a tape measure and recording the value. The first abdominal girth measurement was taken immediately after CS to establish a baseline. Subsequent measurements were taken 2-hourly until normoactive bowel sounds returned and then daily until the women were discharged from the hospital.

Axillary body temperature was measured quarter-hourly during the first postoperative hour, then half-hourly for 2 hours, hourly for 4 hours, and thereafter 4-hourly with a clinical thermometer until the women were discharged. The time from skin closure at CS to the patient's eligibility for discharge was noted and recorded. Maternal satisfaction with the timing of initiation of oral feeds was assessed on the second postoperative day, using a visual analogue scale, a 10 cm straight horizontal line, where 0-4 meant "not satisfied", 5, "neutral", 6-7, "satisfied" and 8-10, "highly satisfied". Each woman marked a point on the line representing her level of satisfaction, and the point was recorded.

Operational definitions

The following operational definitions were used in this study:

Uncomplicated CS: A CS that does not involve any bladder, ureteral, intestinal or uterine artery injury, no uterine atonia, with intraoperative blood loss < 1,000 ml. [16,17]

Immediate oral feeding: Commencement of oral feeding within 2 hours of CS. [10]

Early oral feeding: Commencement of oral feeding after 2 hours but within 12 hours post-CS. [8,9,11]

Delayed oral feeding: Commencement of oral feeding after 12 hours of CS or following return of bowel sounds/movements. [8,9,11]

Normoactive bowel sounds: Clicks, gurgles, or borborygmi (loud and prolonged gurgles); 5-30 bowel sounds per minute are considered normoactive.^[18] Bowel sounds of < 5 and >30 per minute are hypoactive and hyperactive, respectively.

Establishment of breastfeeding: Baby can easily put their mouth around the nipple, latch on properly, breastfeed for 5-10 minutes, and breastfeeding is comfortable for the mother.^[19]

Ileus: The presence of hypoactive bowel sounds (<5 per minute [18]), abdominal distension, and no passage of flatus or bowel movements after the first operative day, with or without nausea or vomiting.^[7]

Severe ileus/paralytic ileus: Ileus symptoms persisting for more than 24 hours or requiring placement of a nasogastric tube.^[7]

Postoperative febrile morbidity: Temperature >38°C on two separate occasions, 6 hours apart postoperatively, excluding the first 24 hours after CS.^[7]

Time to eligibility for discharge: The time from completion of skin closure at CS until the woman is considered eligible for discharge. A woman was considered eligible for discharge if she could tolerate solid food without vomiting, had passed flatus or stool, and had no febrile morbidity for at least 24 hours postoperatively.^[7]

Statistical analysis

Data from this study were analysed using IBM SPSS version 25. Normality of the data distribution was tested using the Kolmogorov-Smirnov test. Data were reported as mean $\pm$ standard deviation (SD) for normally distributed variables and as medians and interquartile

ranges (IQR) for non-normally distributed variables. Associations between categorical independent and outcome variables were assessed, where applicable, using the chi-square test. Continuous variables were compared using an independent samples t-test for normally distributed data and the Mann-Whitney U test for non-normally distributed data. Statistical significance was set at $p < 0.05$.

Ethical considerations

Ethical approval for this study was obtained from the Research and Ethics Committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria (Protocol Number: ERC/2022/06/04). The trial is registered with the Pan African Clinical Trial Registry (PACTR202303749998721).

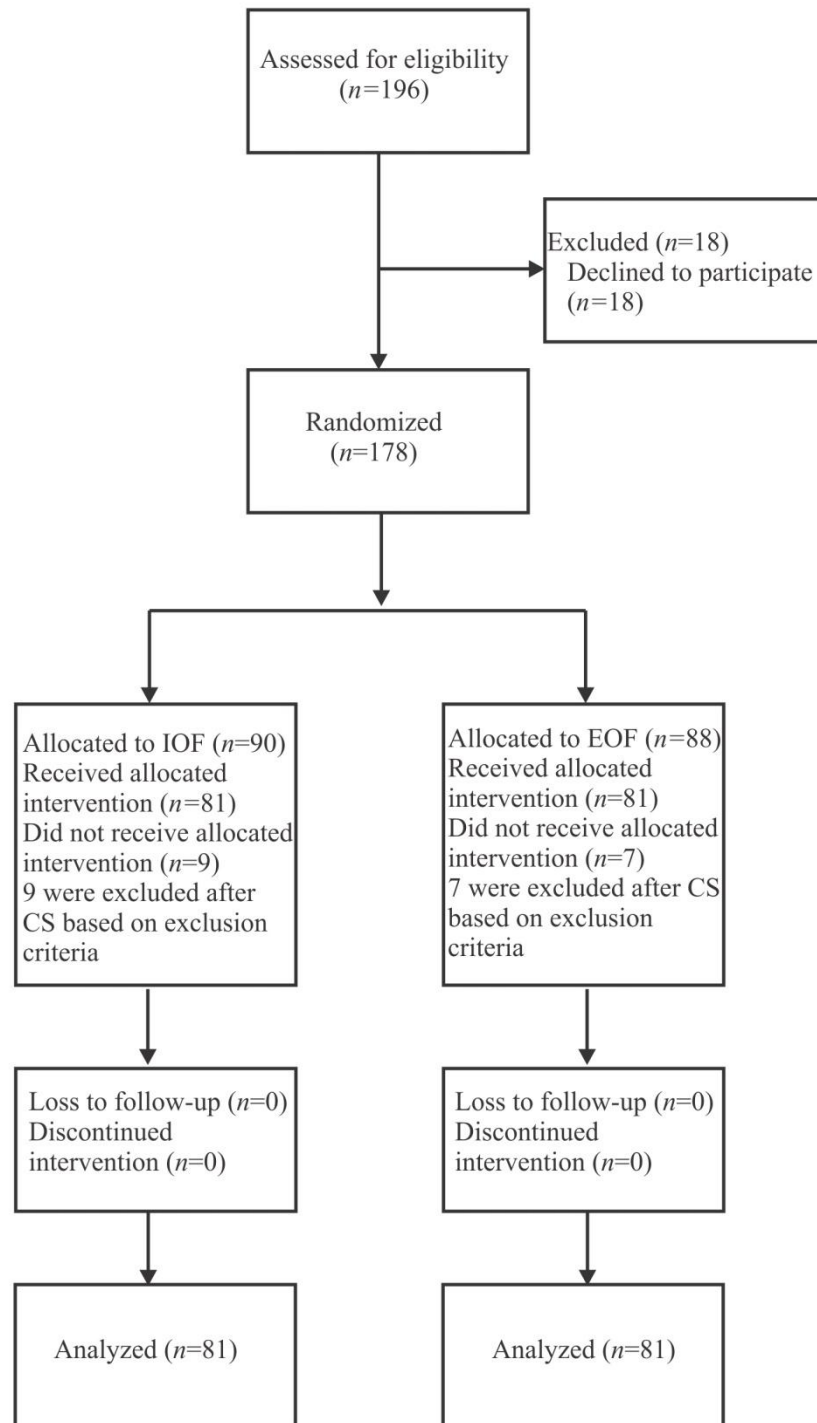
Results

The CONSORT diagram for this study is presented as Figure 1.

Baseline characteristics of the study participants

The mean $\pm$ SD age and gestational age (GA) of the study participants were 31.7 ± 6.0 years and 38.4 ± 2.1 weeks, respectively, and the median (IQR) parity was 1 (0-2). The most common CS indication was a previous CS (61, 37.7%), with a mean estimated blood loss (EBL) of 499.4 ± 240.8 ml. Other baseline characteristics are shown in Table I. There were no statistically significant differences in the baseline characteristics between the two study groups. (Table I).

CONSORT DIAGRAM



IOF= Immediate oral feeding
EOF= Early oral feeding
CS= Caesarean section

Figure 1: The CONSORT diagram

Table I: Baseline characteristics of the study participants

Characteristic	Total (%), n=162	IOF Group (%), n=81	EOF Group (%), n=81	P-value
Age (years)				
Mean $\pm$ SD	31.7 $\pm$ 6.0	31.0 $\pm$ 6.3	32.4 $\pm$ 5.7	0.168 ^a
<20	5 (3.1)	5 (6.2)	0 (0)	
20-29	52 (32.1)	27 (33.3)	25 (30.9)	
30-39	90 (55.6)	41 (50.6)	49 (60.5)	
$\geq$ 40	15 (9.3)	8 (9.9)	7 (8.6)	
Parity				
Median (IQR)	1 (0-2)	1 (0.5-2)	1 (0-2)	0.386 ^b
0	44 (27.2)	20 (24.7)	24 (29.6)	
1-2	85 (52.5)	43 (53.1)	42 (51.9)	
3-4	32 (19.8)	17 (21.0)	15 (18.5)	
$\geq$ 5	1 (0.6)	1 (1.2)	0 (0)	
Gestational age (weeks)				
Mean $\pm$ SD	38.4 $\pm$ 2.1	38.3 $\pm$ 2.4	38.4 $\pm$ 1.8	0.818 ^a
<37	19 (11.7)	10 (12.3)	9 (11.1)	
37-41	140 (86.4)	69 (85.2)	71 (87.7)	
$\geq$ 42	3 (1.9)	2 (2.5)	1 (1.2)	
Indication for CS**				
Previous CS	61 (37.7)	25 (30.9)	36 (44.4)	0.070 ^c
Hypertensive disorders of pregnancy	23 (14.2)	13 (16.0)	10 (12.3)	
Cephalopelvic disproportion	23 (14.2)	11 (13.6)	12 (14.8)	
Fetal distress	19 (11.7)	10 (12.3)	9 (11.1)	
Fetal malpresentation	18 (11.1)	8 (9.9)	10 (12.3)	
Antepartum haemorrhage	9 (5.6)	6 (7.4)	3 (3.7)	
Maternal request	17 (10.5)	5 (6.1)	12 (14.8)	
Others	38 (23.5)	19 (23.5)	19 (23.5)	
Type of anesthesia				
Spinal	153 (94.4)	78 (96.3)	75 (92.6)	0.383 ^c
Combined spinal-epidural	9 (5.6)	3 (3.7)	6 (7.4)	
Category of CS				
Emergency	99 (61.1)	51 (63.0)	48 (59.3)	0.599 ^c
Elective	63 (38.9)	30 (37.0)	33 (40.7)	
Mean duration of CS $\pm$ SD (min)	64.7 $\pm$ 22.1	61.9 $\pm$ 18.9	67.4 $\pm$ 24.6	0.113 ^a
Mean $\pm$ SD/Median (IQR) EBL (ml)	499.4 $\pm$ 240.8	450 (400-550)	504.4 $\pm$ 198.1	0.793 ^a

CS: Caesarean section; EBL Estimated blood loss; Mean $\pm$ SD reported for normally distributed data and Median (IQR) for non-normally distributed data; **Multiple CS indications in some women in both groups, hence $n > 81$;

^aStudent t-test; ^bMann-Whitney U test; ^cChi-square test

Comparison of return of gastrointestinal function, commencement of normal diet, ambulation, establishment of breastfeeding and eligibility for discharge between the study groups

There were no statistically significant differences in time to return of bowel sounds (120.0 min vs 240.0 min, $P=0.056$), passage of flatus (900.0 min vs 1,120.5 min, $P=0.131$),

passage of stool (1,920.0 min vs 2,139.5 min, $P=0.234$), ambulation (608.5 min vs 892.5 min, $P=0.379$), and eligibility for discharge ($1,648.7 \pm 614.9$ min vs $1,709.7 \pm 541.5$ min, $P=0.509$) between the two groups. However, women in the IOF group established breastfeeding (300.0 min vs 1,278.0 min, $P=0.020$) and commenced a regular diet (604.4 ± 29.7 min vs 840.0 ± 0 min, $P<0.001$) significantly earlier than those in the EOF group (Table II).

Table II: Times to return of gastrointestinal function, commencement of normal diet, ambulation, establishment of breastfeeding and eligibility for discharge of the study participants

<i>Time interval (min) to</i>	<i>Total, n=162</i>	<i>IOF Group, n=81</i>	<i>EOF Group, n=81</i>	<i>P-value</i>
Return of bowel sound	146.5 (120.0-360.0)	120.0 (120.0-360.0)	240.0 (120.0-360.0)	0.056 ^a
Passage of flatus	960.0 (600.0-1,461.5)	900.0 (540.0-1,290.0)	1,120.5 (600.0-1,627.5)	0.131 ^a
Passage of stool	2,100.0 (1,200.0-2855.3)	1,920.0 (1,080.0-2,576.8)	2,139.5 (1,265.8-2,920.0)	0.234 ^a
Commencement of normal diet	721.5 ± 220.0	604.4 ± 29.7	840.0 ± 0	<0.001 ^{b*}
Ambulation	720.0 (480.0-1,200.0)	608.5 (464.8-1,305.0)	892.5 (483.5-1,143.8)	0.379 ^a
Establishment of breastfeeding	549.0 (150.8-1,545.0)	300.0 (126.5-1,440.0)	1,278.0 (300.0-1,560.0)	0.020 ^{a*}
Eligibility for discharge	1,679.6 ± 577.8	1,648.7 ± 614.9	1,709.7 ± 541.5	0.509 ^b

*Mean ± SD reported for normally distributed data and Median (IQR) reported for non-normally distributed data; a Mann-Whitney U test; b Student t-test; *Statistical significance.*

Comparison of gastrointestinal symptoms and postoperative complications between the study groups

Two (2.5%) and 3 (3.7%) women in the IOF and EOF groups, respectively, had nausea (P=1.000), while 2 (2.5%) in each group had vomiting (P=1.000). Only 1 (1.2%) woman in the IOF group had abdominal distension, ileus

and severe/paralytic ileus, and none in the EOF group (P=1.000). Whereas only 1 (1.2%) woman in the IOF group had postoperative fever, 3 (3.7%) women in the EOF group had postoperative fever (P=0.620). These differences were not statistically significant. No woman in either group had diarrhoea (Table III).

Table III: Postoperative complications of the study participants

<i>Complication</i>	<i>Total (%), n=162</i>	<i>IOF Group (%), n=81</i>	<i>EOF Group (%), n=81</i>	<i>P-value^a</i>
Nausea	5 (3.1)	2 (2.5)	3 (3.7)	1.000
Vomiting	4 (2.5)	2 (2.5)	2 (2.5)	1.000
Diarrhea	0	0	0	-
Abdominal distention	1 (0.6)	1 (1.2)	0	1.000
Ileus	1 (0.6)	1 (1.2)	0	1.000
Severe ileus/paralytic ileus	1 (0.6)	1 (1.2)	0	1.000
Postoperative fever	4 (2.5)	1 (1.2)	3 (3.7)	0.620

^a Fisher's exact test

Comparison of the level of satisfaction with the timing of commencement of oral feeding between the study groups

An equal number of women expressed satisfaction with the timing of commencement

of oral intake in both groups (79, 97.5% vs 78, 96.2%). The mean satisfaction scores between the two groups were comparable (8.7 ± 1.2 vs 8.4 ± 1.4, P=0.159) (Table IV).

Table IV: Level of satisfaction of the study participants with the timing of commencement of oral feeding using a visual analogue scale

<i>Level of satisfaction</i>	<i>Total (%), n=162</i>	<i>IOF Group (%), n=81</i>	<i>EOF Group (%), n=81</i>	<i>P-value</i>
Mean ± SD	8.5 ± 1.3	8.7 ± 1.2	8.4 ± 1.4	0.159 ^a
Not satisfied	2 (1.2)	1 (1.2)	1 (1.2)	
Neutral	3 (1.9)	1 (1.2)	2 (2.5)	
Satisfied	23 (14.2)	10 (12.3)	13 (16.0)	
Highly satisfied	134 (82.7)	69 (85.2)	65 (80.2)	

Table V: Relationship between baseline characteristics of the study participants and postoperative return of bowel sounds, passage of flatus and passage of stool

Baseline characteristic	Time intervals (min)					
	Return of bowel sound	P-value ^a	Passage of flatus	P-value ^a	Passage of stool	P-value ^a
Age (years)						
<30	120 (120-360)	0.702	893.5 (540-1322)	0.051	1,920 (1080-2340)	0.053
≥30	180 (120-360)		1126.0 (660-1560)		2265 (1200-2941.3)	
Parity						
0	120 (120-360)	0.177	900 (512.3-1365.5)	0.102	1,890 (1056-2410.5)	0.084
1-5	195 (120-360)		1017.5 (646.5-1484.8)		2120 (1300.5-2880)	
Gestational age (weeks)						
<37	120 (120-360)	0.177	1,200 (516-1560)	0.903	1,430 (1050-2781)	0.215
37-42	180 (120-360)		960 (600-1461.5)		2100 (1265.8-2880)	
Category of CS						
Elective	120 (120-345)	0.023*	900 (540-1322)	0.001*	1,800 (1080-2490)	0.003*
Emergency	240 (120-360)		1,190 (703.5-1833.8)		2,400 (1680-2990)	
Type of anaesthesia						
Spinal	180 (120-360)	0.159	960 (600-1442)	0.778	2,100 (1200-2850)	0.886
Combined spinal-epidural	120 (120-180)		875 (450-2235)		1413 (1231-2781)	
Duration of CS (min)						
≤60	137 (120-360)	0.708	960 (600-1481)	0.616	2,040 (1200-2880)	0.984
>60	168 (120-360)		1005 (600-1500)		2100 (1080-2635)	
EBL (ml)						
≤500	120 (120-360)	0.847	960 (600-1440.5)	0.218	1,920 (1095-2617.5)	0.243
>500	168 (120-360)		1103 (720-1557.5)		2100 (1322-2995)	

^aMann-Whitney U test; *Statistical significance*Relationship between baseline characteristics of the study participants and postoperative return of bowel function*

Compared with women who had emergency CS, those who had elective CS had a significantly earlier return of bowel sounds (120 min vs 240 min, $P=0.023$), passage of flatus (900 min vs 1,190 min, $P=0.001$), and passage of stool (1,800 min vs. 2,400 min, $P=0.003$). There were

no statistically significant associations between other baseline characteristics and postoperative return of bowel function (Table V).

Relationship between baseline characteristics of the study participants and satisfaction with the timing of the initiation of oral feeding

More women who underwent CS at term were significantly more likely to be satisfied than those who had CS before term (141, 98.6% vs 16, 84.2%, $P=0.013$). There were no statistically

significant associations between other baseline characteristics of the study participants and their

satisfaction with the timing of commencement of oral feeding (Table VI)

Table VI: Relationship between baseline characteristics of the study participants and satisfaction with the timing of commencement of oral feeding

<i>Baseline characteristic</i>	<i>Satisfaction</i>		<i>P-value^a</i>
	<i>Satisfied (%)</i>	<i>Not satisfied (%)</i>	
Age (years)			
<30	54 (94.7)	3 (5.3)	0.339
≥30	103 (98.1)	2 (1.9)	
Parity			
0	41 (93.2)	3 (6.8)	0.138
1-5	116 (98.3)	2 (1.7)	
Gestational age (weeks)			
<37	16 (84.2)	3 (15.8)	0.013*
37-42	141 (98.6)	2 (1.4)	
Category of CS			
Elective	63 (100.0)	0 (0)	0.157
Emergency	94 (94.9)	5 (5.1)	
Type of anaesthesia			
Spinal	148 (96.7)	5 (3.3)	0.942
Combined spinal-epidural	9 (100.0)	0 (0)	
Duration of CS (min)			
<60	89 (95.7)	4 (4.3)	0.400
>60	68 (98.6)	1 (1.4)	
EBL (ml)			
<500	105 (97.2)	3 (2.8)	0.645
>500	52 (96.3)	2 (3.7)	

CS: Caesarean section; EBL Estimated blood loss; ^aChi-square test; *Statistical significance

Discussion

In this study, there were no statistically significant differences in the times to return of bowel sounds, passage of flatus and stool, ambulation, and eligibility for discharge, between the IOF and EOF groups, consistent with reports by other authors.^[5,10-12] However, subgroup analyses revealed that emergency CS was associated with significantly later return of bowel sounds, passage of flatus and stool compared to elective CS in our study. This may not be unrelated to the fact that emergency CS may be more technically difficult than elective/planned CS. Operative difficulty correlates positively with long surgery duration, excessive bowel handling, and increased blood loss, all of which exaggerate the inflammatory

response to surgical trauma, thereby prolonging the duration of the transient ileus that occurs postoperatively.^[20] Increased intraoperative blood loss may trigger traumatic sympathetic, endocrine, and inflammatory stress responses that inhibit gut motility.^[21] Excessive operative blood loss can also cause intestinal myocyte dysfunction from bowel ischemia.^[22] These may explain the delayed return of bowel function in women who had emergency CS in this study. Women in the IOF group in this study established breastfeeding and commenced a normal diet significantly earlier than those in the EOF group. Teoh *et al.*^[11] and Weinstein *et al.*^[23] corroborated our study findings of reduced times to commencement of regular diet and breastfeeding in women who had IOF. Early establishment of a regular diet attenuates

postoperative metabolic response to surgical stress, counteracts postoperative protein and skeletal muscle catabolism, enhances anabolism, and provides energy for optimal wound healing and functional recovery.^[24,25] The incidence of hyperglycemia from postoperative insulin resistance is also reduced with earlier postoperative feeding and establishment of a regular diet, consequently reducing the risks of surgical site infection, postoperative morbidity and mortality.^[26]

Early initiation of breastfeeding (ideally within one hour post-birth) is an important predictor of continued breastfeeding postpartum.^[27] Delayed initiation of breastfeeding following CS is associated with maternal-infant separation, reduced infant suckling ability, decreased infant receptivity, insufficient breast milk production, and shortened breastfeeding duration.^[27] Given the many infant health benefits of breastfeeding, including fewer childhood illnesses, lower blood pressure and cholesterol levels, lower prevalence of obesity, improved intelligence, and higher educational and economic attainment in adulthood ^[27,28], the earlier establishment of breastfeeding is a significant benefit of immediate feeding post-CS found in this study.

Overall, maternal satisfaction with the timing of oral feeding initiation was similar between the two groups in this study. In contrast to our study findings, Teoh *et al.* ^[11] reported that women fed 30 minutes post-CS expressed higher satisfaction than those fed 2 hours post-CS. This may not have been unconnected with the sweeter taste of the fruit juice that the former were fed compared to the clear water received by the latter. In this study, women in both groups received clear water. Subgroup analyses revealed that women who underwent CS at term were significantly more satisfied with the timing of commencement of oral feeding than women who had preterm CS in the study. The level of maternal satisfaction may be influenced by the quality of care received, the cost of care, and the

attitude of attending health personnel, among others, none of which were explored in this study.

This study found no significant differences in the occurrence of ileus symptoms and postoperative febrile morbidity between the feeding groups. This was similarly the finding of Mulayim *et al.* ^[5], Ahmed *et al.* ^[10], Teoh *et al.*, ^[11] Jalilan *et al.*, ^[12] and Weinstein *et al.* ^[20] This supports the view that oral feeding can safely be commenced in the immediate postoperative period following uncomplicated CS. Moreover, the non-significant difference in the return of bowel function between the feeding groups in our study corroborates the finding that bowel function returns rapidly following uncomplicated CS, usually within 2-3 hours after surgery; bowel function is not completely interrupted following abdominal surgery.^[6,7] The traditional delay in commencing oral feeding post-CS until auscultation of normal bowel sounds and/or passage of flatus/stool by the patient is, therefore, not justified.

Strengths and limitations of the study

The generalizability of our study findings is limited by its single-centre study design. Factors that may have influenced the reported levels of maternal satisfaction in this study, such as maternal satisfaction with the quality of care received, the cost of care, and the attitude of attending health personnel, were not explored. The times of passage of first flatus, stool, ambulation, and establishment of breastfeeding were self-recorded/reported by the study participants and may have been prone to recall errors. Recall errors were minimised by providing study participants with pens and sheets of paper to write down these times immediately after they passed the first flatus or stool, ambulated, and established breastfeeding. This study provides good-quality evidence on the safety and benefits of immediate oral feeding following uncomplicated CS. Selection bias was

reduced by concealing the allocation/randomisation sequence from the principal investigator and research assistants who assigned study participants to the oral feeding groups. The absence of blinding, however, was a potential source of performance and detection bias. Within the limits of available literature, this is the first study comparing immediate and early oral feeding following uncomplicated CS in Nigeria. This study not only contributes to the existing body of knowledge/evidence on the safety and benefits of immediate oral feeding post-CS, but also provides indigenous data that can inform earlier postoperative feeding for patients who undergo uncomplicated CS, with the potential to optimise postoperative outcomes and enhance healing and recovery.

Conclusion

Oral feeding can be safely commenced immediately (two hours) following uncomplicated CS, with the benefits of earlier establishment of breastfeeding and commencement of a regular diet compared with early postoperative feeding (6 hours post-CS). Immediate postoperative feeding is not associated with increased risks of ileus or postoperative complications compared to EOF.

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participants. All authors read and approved the final manuscript.

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