Is Uncomplicated Caesarean Delivery Safer Following the Ultra-short Stay Post-operative Management Protocol than the Traditional Protocol? A randomized Controlled Trial

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ABSTRACT

Background*: Caesarean delivery is currently the commonest major operation in Obstetrics worldwide, and is presently safe. Post-operative management protocols should therefore be reviewed to reduce hospital stay after the procedure, with post-operative safety guaranteed.*

Methods: *This was a randomized controlled trial conducted in 3 centres in Bayelsa state, South-south Nigeria. Federal Medical Centre, Yenagoa; Niger Delta University Teaching Hospital, Okolobiri, and Diete-Koki Memorial Hospital, Opolo with 179 women who just had uncomplicated Caesarean delivery were randomized into ultra-short stay(90) and traditional groups(89). The ultra-short stay group had minty chewing gums for 2 hours after surgery, started ambulating and taking orally from 6 hours(regular diet from 12 hours); and urethral catheter discontinued 6-12 hours post-operative. The traditional group commenced ambulation 12-24 hours, oral intake initiated and urethral catheter discontinued at 24 hours post-operative. In the ultra-short stay group, wounds were exposed and patient discharged at 36-48 hours post-operative. In the traditional group, patient was*

discharged on day 3-5. Both groups were counselled on wound care at discharge. Safety outcomes were recorded during the postnatal visits.

Results: *There was no difference in occurrence of spinal headache(X^2<0.01,p=0.977), wound sepsis(X^2<0.01,p=0.983), and puerperal sepsis(X^2=2.05,p=0.153) between the 2 groups, but a higher rate of readmission in the traditional than the ultra-short stay group(X^2=4.14,p=0.042). There was no maternal mortality.*

Conclusion: *Safety(spinal headache, wound sepsis, puerperal sepsis) after uncomplicated Caesarean, is the same in the ultra-short stay and the traditional protocol, which has a higher readmission rate. The ultra-short stay post-operative management protocol is therefore recommended after uncomplicated Caesarean section.*

Keywords: safety, spinal headache; wound sepsis; puerperal sepsis; readmission.

INTRODUCTION

Caesarean section/delivery is a major surgical procedure in obstetric practice. It is performed when there are reasons (indications) that it is the safer option of delivery, than the vaginal delivery; for the mother, baby/babies, or both. It is the commonest major surgical procedure currently done in Obstetrics worldwide, and is presently a relatively safe procedure.[1] It is important that post-operative management protocols are reviewed, that will reduce duration of hospital stay after the procedure, without compromising its safety post-operatively. The duration of hospital stay following uncomplicated Caesarean delivery also has important socioeconomic implications.[1-3] Although most studies have not found increased morbidity associated with early discharge following Caesarean delivery, antecedents to post-Caesarean infectious morbidities have not been adequately studied.[4-6]

The commonest complications in Caesarean delivery are postpartum haemorrhage, wound infection and puerperal sepsis (including postpartum endometritis).[7] Administering prophylactic antibiotics and ensuring haemostasis prior to closure of the abdomen have helped decrease the incidence of these complications.[7,8] It can generally be stated that the longer the operative procedure, the greater the likelihood of post-operative complications. Intra-operative complications include injury to the bladder (and rarely ureteral injury) or bowel (especially in the presence of adhesions from previous surgery), and anaesthetic complications. Spinal headache is a post-operative anaesthetic complication. It is often believed to be aggravated by use of larger spinal needle gauge (traumatic), multiple punctures, and early sitting up and ambulation after having a subarachnoid block.[9]

Safety may be measured in terms of the possible intra-operative complications, post-operative complications like febrile and infectious(surgical site infections) morbidities, readmission and maternal mortality.[2]

Objectives of the study were to determine and compare the safety following uncomplicated Caesarean delivery, in women who had the ultra-short stay and the traditional post-operative management protocol and to determine possible intra-operative antecedents of wound sepsis in uncomplicated Caesarean section.

Definition of terms

Uncomplicated Caesarean Section is a caesarean delivery in which there was no occurrence of an untoward condition or event intra-operative or immediate post-operative which may have necessitated the performance of a more complex procedure.

Wound sepsis is contamination of the Caesarean section wound by micro-organisms that can result in delayed wound healing or wound breakdown. It is characterized by painful redness, swelling or induration of wound edges; significant serous, sero-purulent or frank purulent wound discharge with or without dehiscence or breakdown of the wound.

Puerperal sepsis is bacterial infection of the female reproductive tract following delivery (vaginal or caesarean). Signs and symptoms include fever (temperature > 38^0 C), lower abdominal pain and tenderness on the uterus, with malodorous purulent vaginal discharge or lochia.

Spinal headache is also called post-dural puncture headache and occurs as a complication of the puncture of the dura mater that covers the subarachnoid space, with leakage of cerebrospinal fluid, during spinal anaesthesia (subarachnoid block). It may be severe, involving the frontal and occipital portions of the head, sometimes radiating to the neck and shoulders. It may also cause neck stiffness in extreme cases.

Readmission is when the patient afhter caesarean delivery and has been discharged home, is readmitted into the hospital at any other time within the first 6 weeks of delivery.

'Traditional' hospital stayis when the patient is discharged after 3 to 5 days, following caesarean delivery. This is what is commonly practised in most units presently.

Ultra-short hospital stay is when the patient is discharged home at 36-48 hours post-operative, and less than 3 days. This protocol is what is being tested.

MATERIALS AND METHODS

This was a multi-centre randomized controlled trial, of the parallel design with allocation ratio of 1:1,[10] carried out between April 2024 and April 2025, among booked antenatal patients at the Federal Medical Centre, Yenagoa (FMC-Y); the Niger Delta University Teaching Hospital (NDUTH), Okolobiri; the Diete-Koki Memorial Hospital (DKMH), Opolo; all in Bayelsa state, South-south Nigeria. Ethical clearance for the study was obtained from the Research Ethics Committee of the Federal Medical Centre, Yenagoa: FMCY/REC/ECC/2024/JANUARY/655, **protocol number: 716**. Trial registration was done at completion of the study, with the Pan African Clinical Trials Registry(PACTR), unique identification number **PACTR202509662932971**.

Participants were patients who just had uncomplicated Caesarean delivery for various indications, and were in the recovery room, fully awake. Women excluded were those who did not give consent; were outside the reproductive age group which is 15-49 years;[11] or had any

medical condition that required management by other specialities post delivery that may warrant prolonged hospital stay; and Immunosuppressed or HIV positive women with features of the Acquired Immune Deficiency Syndrome(AIDS); women who had prolonged labour or prolonged rupture of membranes, which are factors that increase the risk of sepsis.

A total of 180 eligible consenting patients were consecutively recruited into the study. Randomization was done using computer generated random numbers (unstratified balanced allocation from WinPepi)[12] and random allocation concealment done using sealed opaque envelopes numbered from 1 to 60 for each centre. In this way, recruited patients were randomised into either of two groups representing the arms of the study: group A (traditional protocol) and group B (ultra-short stay protocol).

An independent observer picked the envelopes consecutively at the time the eligible patient got to the recovery room after an uncomplicated Caesarean delivery, A total of 90 women were allocated into the ultra-short stay group and 89 (one of the women inadvertently allocated here in one of the centres had a iatrogenic bladder injury intra-operatively, so she was subsequently excluded reducing the participants to 89)into the traditional group**.** The sealed envelope picked was placed within the patients' case notes. All the surgeries were performed by Consultants and Senior Registrars in the Department of Obstetrics and Gynaecology of the respective hospitals.

At recruitment in the recovery room, the women in the ultra-short stay group were given minty (menthos) chewing gums to chew for at least 2 hours and the appropriate sections of the proforma and interviewer-administered questionnaire (containing patient biodata and intra-operative information) were filled. The protocol (specific interventions) for the ultra-short stay protocol was placed at the nursing station on the ward for attention of the nursing staff. Those for the traditional protocol (group A) were managed according to normal unit protocol.

All patients in group A (traditional protocol) were commenced on graded oral sips at 24 hours post-operative and regular diet 12 hours later; ambulated within 24 hours (sitting out of bed from 12 hours and walking around ward from 24 hours) post-operative and had urethral catheter discontinued 24 hours after surgery. Intravenous fluids dextrose water alternating with normal saline was given at a rate of 1 litre 8-hourly for at least the first 24 hours after surgery and until oral intake was well established. Analgesics, intramuscular pentazocine at 30mg 6-hourly, suppository diclofenac 100mg 12-hourly for 72 hours and intramuscular paracetamol 600-90mg 8-hourly were administered for the first 24 hours after surgery. Antibiotics, usually intravenous ceftriaxone, genticin(optional) and metronidazole at 1g 12-hourly, 80mg 8-hourly and 500mg 8-hourly respectively were also given for the first 48-72 hours. Antibiotics were converted to the oral equivalents when the intravenous regimen was completed and analgesics to oral paracetamol at 1g 8-hourly, and oral diclofenac 50-100mg 12-hourly respectively. The wound was inspected and exposed on the fifth post-operative day and patient subsequently discharged home.

All patients in group B(ultra-short stay) commenced graded oral fluids at 6 hours post-operative, gradually graded to semi-solids, then intravenous fluids were discontinued; and regular diet was commenced at 12 hours post-operative. They sat out of bed from 6 hours post-operative and walked around the ward from 12 hours post-operative. Urethral catheter was discontinued 6-12 hours after surgery. Same analgesics and prophylactic antibiotics (48 hours) were given as in the traditional protocol. The wound was inspected and exposed on the second post-operative day (36-48 hours post-operative) and patient subsequently discharged home on the same day without schedule for home visits, but with customer care lines to call if necessary.

In both groups, packed cell volume (PCV) was done on the second post-operative day. Patients were instructed and taught how to clean the wound with methylated spirit two to three times a day at home until the 2 weeks postnatal visit. The section of the proforma and interviewer-administered questionnaires on safety measures was filled on discharge and at the 2 and 6 weeks post-natal visits.

Data analysis was done using the IBM SPSS statistical software version 25. Data was presented in text and tables. Analysis done included the use of descriptive statistics such as mean, proportion and standard deviation to summarize the quantitative variables. Association between categorical variables was tested using Chi-square and differences in group means were assessed using t-test. A confidence level of 95% was used with the level of significance set at a p-value of <0.05.

RESULTS:

There were 179 women who had uncomplicated Caesarean delivery, who were randomized into 90 women for the ultra-short stay post-operative management protocol and 89 for the traditional protocol. Eight women dropped out of the protocols, two in the traditional group (one had severe post-partum haemorrhage, acute kidney injury and had prolonged hospital stay; the other had voiding difficulties at removal of urethral catheter which resulted in prolonged hospital stay). Six women in the ultra-short stay protocol group, dropped out of the protocol; reasons ranging from post-operative blood transfusions, signs of wound sepsis at wound exposure on discharge leading to postponement of the discharge, to post-partum pregnancy-induced hypertension, all extending hospital stay.

CONSORT FLOW CHART

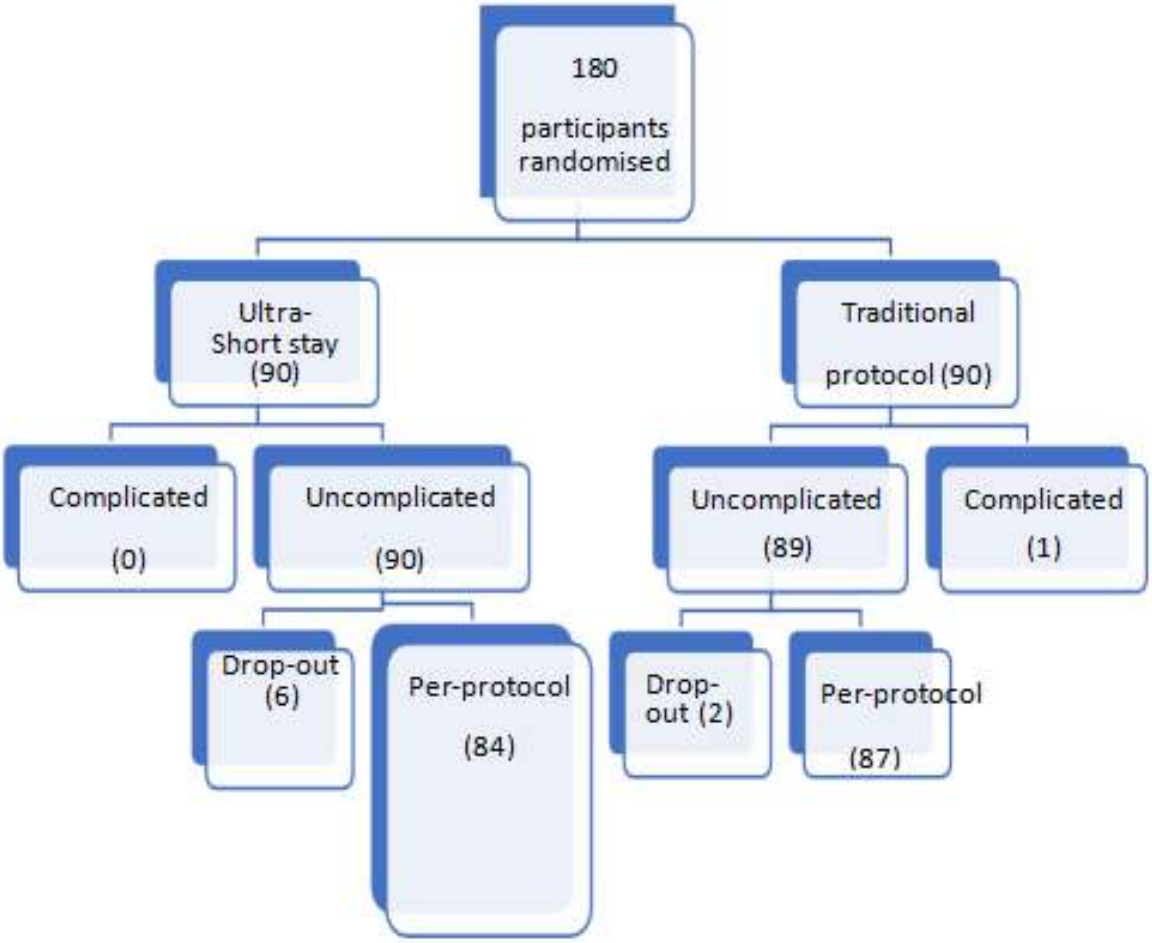

Figure 1: Flow diagram showing randomization to analysis

Most of the participants were married women (93.3% in each group respectively) between the ages of 19 and 45 years. The 2 groups were comparable in age, parity, marital status, religion, tribe, except educational status where there were slightly more educated women in the ultra-short stay than the traditional protocol group ($X^2 = 7.82$, p-value = 0.020). There was no statistically significant difference in other obstetric and intra-operative variables between the 2 groups, apart from cadre of surgeon, where more consultants did the surgeries in the ultra-short stay protocol group compared to the traditional group ($X^2 = 10.71$, p-value = 0.001). The Surgeons were consultants in 84.4% and 62.9% respectively; senior registrars in 15.6% and 37.1% of the participants in the ultra-short stay and traditional groups respectively.

Table I: Sociodemographic characteristics of participants

Characteristic	Traditional (n =89)	Ultra-short (n = 90)	t/÷^{2}	P-value
	Frequency (%)	Frequency (%)		
Age (years)	32.0 ± 4.6	32.2 ± 5.4	3.13	0.371*
= 24	7 (7.9%)	5 (5.6%)		
25 - 29	17 (19.1%)	27 (30.0%)		
30 - 34	38 (42.7%)	32 (35.6%)		
= 35	27 (30.3%)	26 (28.9%)		
Marital status:				
Single	6 (6.7%)	6 (6.7%)	2.40	0.301*
Married	83 (93.3%)	84 (93.3%)		
Educational status:				
No formal	0 (0%)	2 (2.2)	7.82	0.020*
Secondary	34 (38.2%)	19 (21.1%)		
Tertiary	55 (61.8%)	69 (76.7%)		
Religion:				
Christianity	86 (96.6%)	90 (100%)	3.09	0.079*
Islam	3 (3.4%)	0 (0%)		
Tribe:				
Ijaw	54 (60.7%)	58 (64.4%)	1.85	0.764*
Yoruba	2 (2.2%)	3 (3.3%)		
Ibo	16 (18.0%)	18 (20.0%)		
Hausa	4 (4.5%)	2 (2.2%)		
Other	13 (14.6%)	9 (10%)		

Table II: Post-operative outcome variables for safety with intention-to-treat analysis

Variables	Traditional (n = 89)	Ultra-short (n = 90)	t/ $\div^2$	P - value
Post-op complication				
Yes	18 (20.2%)	18 (20.0%)	0.001	0.970
No	71 (79.8%)	72 (80.0%)		
Wound sepsis				
Yes	7 (7.9%)	7 (7.8%)	< 0.01	0.983
No	82 (92.1%)	83 (92.2%)		
Spinal headache				
Yes	12 (13.5%)	12 (13.3%)	< 0.01	0.977
No	77 (86.5%)	78 (86.7%)		
Puerperal sepsis				
Yes	2 (2.2%)	0 (0.0%)	2.05	0.153*
No	87 (97.8%)	90 (100%)		
Readmission				
Yes	4 (4.5%)	0 (0.0%)	4.14	0.042*
No	85 (95.5%)	90 (100%)		

There was no statistically significant difference between the 2 groups in most of the safety measures assessed. The rate of post-operative complications was similar in both groups (20.2% and 20.0% for the traditional and ultra-short stay groups respectively) in both the intention-to-treat and per-protocol analyses. However there was more readmission in the traditional group (the 4 women readmitted were in the traditional group, 2 for postpartum pregnancy-induced hypertension and 2 for wound sepsis) during the puerperium. The readmission was within the first 2 weeks post-partum. About 5 of the 14 participants who had wound sepsis were seen in the gynae emergency unit with complaints of seropurulent discharge from wound or partial wound dehiscence, 3 (2 readmitted) were managed on out-patient basis. Most of the other women who had wound infections (some had stitch abscesses) were seen and managed in the postnatal clinic. There was no maternal mortality among the participants in the study. The results were comparable in both the intention-to-treat and per-protocol analysis.

Table III: Post-operative outcome variables for safety, per-protocol

Variables	**Traditional (n = 87)**	**Ultra-short (n = 84)**	**t/ $\div^2$**	**P – value**
Post-op complication				
Yes	17 (19.5%)	13 (15.5%)	0.49	0.485
No	70 (80.5%)	71 (84.5%)		
Wound sepsis				
Yes	6 (6.9%)	4 (4.8%)	0.35	0.552
No	81 (93.1%)	80 (95.2%)		
Spinal headache				
Yes	12 (13.8%)	10 (11.9%)	0.14	0.712
No	75 (86.2%)	74 (88.1%)		
Puerperal sepsis				
Yes	2 (2.3%)	0 (0.0%)	1.95	0.162*
No	85 (97.7%)	84 (100%)		
Readmission				
Yes	4 (4.6%)	0 (0.0%)	3.96	0.047*
No	83 (95.4%)	84 (100%)		

Table IV: Bivariate analysis of possible intra-operative antecedents of wound infection.

Variable	Wound sepsis (n = 179) Yes (n = 14)	No (n = 165)	X^2	P-value
Surgeon				
Consultant	8 (57.1%)	124 (75.2%)	2.16	0.142
Senior Registrar	6 (42.9%)	41 (24.8%)		
Skin incision				
Pfannenstiel	12 (85.7%)	162 (98.2%)	14.79	0.001*
Joel-Cohen	0 (0.0%)	2 (1.2%)		
Midline	2 (14.3%)	1 (0.6%)		
Surgery duration				
= 60 minutes	6 (42.9%)	91 (55.2%)	10.25	0.006*
61 – 120 minutes	5 (35.7%)	69 (41.8%)		
> 120 minutes	3 (21.4%)	5 (3.0%)		
Skin sutures				
Absorbable	14 (100%)	163 (98.8%)	0.17	0.679
Non-absorbable	0 (0.0%)	2 (1.2%)		

Bivariate analysis of possible intra-operative antecedents of wound sepsis with the two groups combined, showed statistically significant difference only in duration of surgery and type of skin incision. Longer surgeries (X^2=10.25, p-value=0.006) and the subumbilical midline incision (X^2=14.79, p-value=0.001) were significant antecedents of wound sepsis.

DISCUSSION

There is a need to review the current traditional post-operative management protocol which has a hospital stay of 3 to 5 days after uncomplicated Caesarean delivery. Studies have shown that earlier discharge after uncomplicated Caesarean delivery is not associated with increased post-operative morbidity.[2,4-6] This randomized controlled trial set out to investigate the post-operative safety of uncomplicated Caesarean delivery in terms of spinal headache, wound sepsis, puerperal sepsis, readmission and maternal mortality. And to compare these safety measures between women who had the traditional post-operative management protocol, and women who had earlier hospital discharge of 36 to 48 hours (ultra-short stay) after uncomplicated Caesarean delivery. There was no maternal mortality among the participants of this study. There was no statistically significant difference in these safety measures between the 2 groups, except in the readmission rate which was significantly higher in the traditional group.

Previous studies have shown that early discharge following uncomplicated caesarean section had various benefits to the mother, baby, family and community at large. Such benefits include reduced risk of nosocomial infections, smooth initiation and maintenance of breastfeeding, better patient satisfaction and perception of Caesarean section (also better perception by their care-givers/significant others), enhanced psychosocial well-being, earlier family bonding, and reduced cost.[2,4-6,13-17]

The rates of wound infection in the study were relatively low (7.9% and 7.8% in the traditional and ultra-short stay protocols respectively). This is in contrast to a study done in south-western Nigeria, where the rate of wound sepsis was 21.4% and 21.7% for the short stay and traditional groups respectively, both of which were also comparable.[2] The lower rate of wound infection in this study may probably be due to the less strict criteria used to identify cases of wound sepsis. Though another similar study also done in South-western Nigeria also revealed low rates of wound sepsis, that wound infection rates among short and prolonged hospitalized patients following Caesarean delivery were also not significantly different (6% and 10% respectively).[18] Most of these previous studies of early discharge following Caesarean section had comparable rates of this post-operative complication in both patients who had early discharge and those who had a longer stay. The occurrence of spinal headache (13.5% and 13.3% in the traditional and ultra-short stay groups respectively) was relatively low compared to a previous study where the overall prevalence of spinal headache was found to be 42.7% with women who had emergency Caesarean delivery at higher risk.[19] Another study stated that the overall incidence of spinal headache after intentional dural puncture varied from 0.1 to 36%, but about 3.1% with atraumatic spinal needles.[9] So the type of Caesarean section (elective/emergency) and type of spinal

needle used may be more likely risk factors for spinal headache, than the post-operative management protocol employed. Puerperal sepsis (diagnosis made clinically) rate was also relatively low in the study: 0% and 2.2% in the ultra-short stay and traditional protocol groups respectively; both of which were not significantly different. Post-Caesarean endometritis has been seen as an important and substantial cause of maternal morbidity and is often associated with a significant increase in the length of hospital stay.[20] Studies have suggested that meticulous prophylactic antibiotic use would reduce the risk of endometritis after elective Caesarean delivery, though may not reduce the incidence of other infective morbidities.[2,21,22]

The rate of readmission was seen to be significantly lower in the ultra-short stay group (0.0% and 4.5% respectively). A previous study showed 1.0% and 1.1% readmission rates in the short stay and traditional group respectively.[2] However, another study showed that short post-operative hospital stay, with other obstetric conditions (postpartum haemorrhage, major puerperal infection and some hypertensive disorders) appeared to increase the risk of readmission in women who had Caesarean delivery.[23] The reasons for readmission in this study were hypertensive disorders (50%) and wound sepsis(50%).

The 2 antecedents for wound sepsis identified in the study were increased duration of surgery and midline skin incisions. Previous studies have also shown that prolonged duration of surgery was associated with post-operative infections, which prolong hospital stay.[2,16,17]

Conclusion

The post-operative safety (spinal headaches, wound sepsis and puerperal sepsis) of uncomplicated Caesarean delivery is the same in the ultra-short stay and in the traditional post-operative management protocols, though women managed with the traditional post-operative protocol are more likely to be readmitted to the hospital in the puerperium. Longer duration of surgery and midline incisions are significant antecedents of wound sepsis. The ultra-short stay post-operative management protocol is therefore recommended in view of its potential benefits with no compromise to safety. Also improved surgical techniques that reduce operating time, with transverse suprapubic skin incisions.

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Nil

Limitations

1. Incidental or accidental complications may occur post-operatively that may prolong hospital stay (like post-operative adhesive intestinal obstruction from one or more previous abdominal surgeries, paralytic ileus, urinary complications), these were not considered in the study, though occurrence of these events were almost non-existent in this study.
2. Some safety measures like febrile morbidity occurring at home after discharge may be subjective since the woman may not have recorded her temperature with a thermometer. This was not considered in the study.
3. Fetal and neonatal outcomes were

not considered in this study.

4. One of the centres used had low eligible patient turn-out, so some participants were subsequently recruited (with their left-over concealed envelopes) from the other 2 centres to make up the sample size, hence the number of participants were not uniformly distributed in all the centres as initially planned.

Conflict of interest

There are no conflicts of interest

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