

# Use of short text message reminders to improve attendance of postnatal care at a referral maternity hospital, Kenya, 2016—A randomised controlled trial

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## Abstract

**Introduction:** Globally about 830 women die daily due to complications of pregnancy and child birth out of which 550 occur in Sub-Saharan Africa, with about 8,000 maternal deaths occurring annually in Kenya. 66% of maternal deaths occur within the first week and 85% of maternal deaths occur within two weeks post-delivery. Attendance of postnatal services during this time could significantly reduce morbidity and mortality. We determined effectiveness of short text message (SMS) in reducing failure-to-attend rates (FTA) of postnatal clinic at the largest maternity hospital in Nairobi, Kenya. **Methods:** We conducted a hospital-based randomised controlled trial. Women who delivered between March and May 2016 at Pumwani Maternity Hospital were recruited, enrolled and randomised into SMS (intervention) or no SMS (control) arms. Women were masked to which arm they belonged during randomisation but were unmasked during the appointments as the intervention had been sent. The investigators were not masked. Reminders were sent three days prior to and on the morning of the appointment. Relative Risk (RR) at 95% Confidence Interval were calculated to estimate the effectiveness of intervention at two and six-weeks. **Results:** We enrolled 754 women, with 377 randomly assigned into each arm. There were no differences in socio-demographic characteristics between the study arms at baseline. After two-weeks, women in the intervention arm had an 80% reduction in FTA risk (RR=0.2, 95% CI 0.1–0.3). After six weeks, women in the intervention arm had a 60% reduction in FTA risk (RR=0.4, 95% CI 0.2–0.6). Among participants, 80 (42.1%) women at two-weeks and 30 (41.7%) women at six-weeks cited forgetting appointment as the most common reason for failing to attend postnatal clinic. **Conclusion:** SMS reminders were effective in reducing failure-to-attend clinic appointments. We recommend the use of SMS reminder strategy for postnatal care.

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## CITATION

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## Introduction

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Postnatal care (PNC) includes services provided to women and newborns immediately after delivery and up to six months post-delivery as currently practiced in Kenya [1]. The services provided during the postnatal period are critical in the lives of mothers and their newborns as an estimated 60% of the world's 270,000 annual maternal deaths occur within 48 hours post-delivery, and two thirds occur within the first week with more than 85% occurring within two-weeks of child birth [3]. Currently, the rates of provision of skilled care are lower post-delivery when compared to rates before and during delivery yet provision of quality PNC services could reduce ill health and even death associated with this period [2].

The World Health Organisation (WHO) guidelines recommend that all women should receive postnatal care within 48 hours post-delivery and follow up in PNC clinics for at least 42 days (6 weeks) [3]. In Kenya, the postnatal care guidelines recommend that all women should attend PNC clinics within 48hours, two-weeks, four to six-weeks and at six-months post-delivery but generally women do not attend routine PNC clinic consultation, except for serious or fatal complications, or when they are taking their children for example, for routine immunisation. The Government of Kenya introduced the Free Maternity Services Policy (FMSP) in 2013 as a strategy to increase hospital delivery, postnatal care attendance and to reduce maternal and perinatal mortality. The free maternity policy seeks to ensure that PNC services are accessible free of charge for the patient alongside other services like antenatal care and skilled attendance at delivery.

According to the Kenya Demographic and Health Survey (KDHS) report of 2014 [4], only 51% of the 39% of women who delivered at home sought postnatal care services at the health facility within 48 hours post-delivery and data from the Kenya District Health Information System (DHIS), 2015, showed that nationally, postnatal care coverage was only 53% and 55% for Nairobi County. Low uptake of PNC services has also been experienced in other countries like Pakistan where about 23% of women seek the services post-delivery [4-5]. There is no recent documentation in Kenya on the proportion of women who attend postnatal care clinics at two-weeks and four to six-weeks postpartum.

Documentation from various studies conducted in other countries have shown that patients cite reasons like forgetting date, time and place/location of the clinic as a reason for failing-to-attend their scheduled clinics [5–9]. Some strategies developed to mitigate the challenges include use of innovative technologies such as short message service (SMS), telephone calls, e-mail reminders, fax services or sending letters. In Nigeria, failure-to-attend the postnatal care was reduced by 22% with use of SMS reminders [9]. The SMS have also been successfully employed for various health applications including promoting adherence to drug treatments for chronic diseases, reminding patients to return for their scheduled appointments and it was shown that SMS were more effective as reminders and also cost effective [10]. A study done in Kenya in the year 2012 showed that in rural areas, mean phone ownership was 39% compared to urban regions where it was 58%, and in Nairobi 84% of individuals owned phones [11]. In this study, we assessed the effectiveness of SMS reminders in reducing failure-to-attend rates (FTA) of PNC clinic among women who delivered at Pumwani Referral Maternity hospital.

## Methods

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### Study design

This was a hospital based randomised control trial (RTC) where women delivering at a hospital from March 2016 through to May 2016 were recruited, enrolled, randomised into either control or intervention arm and followed up at the two and six-week visit.

### Study site and population

The study was conducted at Pumwani Maternity Hospital, located in Nairobi County, Kenya. The hospital provides maternal services in an urban setting. In 2016, Pumwani Maternity Hospital recorded a total of 17,353 births (average of 48 deliveries per day).

### Study participants

We included all women who delivered at Pumwani Maternity Hospital during study period and had a mobile phone with SMS features in their household (regardless of ownership as long as it belonged to one of the household members), and gave informed

written consent. We excluded women who delivered at home or other facilities and those who refused to consent.

## **Interventions**

For the Intervention arm, an automated SMS was sent twice before each visit to the women. The first SMS was sent three days prior to the appointment and the second SMS was sent on the morning of the scheduled appointment in addition to the usual reminders. The SMS read as follows; “Dear (Name), Good morning, this is to remind you to attend postnatal clinic on at Pumwani Maternity Hospital. Thank you”. It was a one-way message sent in the morning and delivery report obtained for each SMS sent.

For the control arm, –the mothers were not sent any SMS reminders but were provided with the usual reminders which included recording the date for the PNC clinic attendance on the mother child booklet at discharge and informing the mother verbally about the next date of the subsequent visit.

## **Outcomes**

The primary outcome of interest was Failure-to-attend (FTA) rate with secondary outcome being reasons for or not attending the PNC clinic.

Using intent to treat, we analysed FTA using the number who came back for the two-week and six-week visit in each arm as the numerator and the number randomised into each arm as the denominator.

## **Sample size and assumptions**

Sample size calculation was done using STATA version 14.1 statistical software. Assuming 5% level of significance, two-sided test, 80% power, a ratio of 1:1 for intervention and control, a minimum of 294 participants per treatment arm (total sample size of 588) was required to detect a difference in FTA rates of 11.6% (from 45% for control versus 33.4% for intervention). We assumed that 45 % of the women did not attend PNC based on the DHIS scorecard data of 2015 that indicated that 55% of women in Nairobi County attended postnatal care.

## **Randomisation and Sampling strategy: Sequence generation**

Randomisation was done using computer generated random numbers that the principal investigator generated both for the intervention and the control arms. These numbers were printed on papers of the same colour and size and put in envelopes of the same colour and size.

## **Allocation of concealment**

Discharged women in the postnatal wards were recruited with the assistance of the nurses on duty in the maternity ward. Those who gave informed written consent were enrolled and the computer generated random numbers that were in sealed envelopes were issued to the women. The women opened the envelopes and handed back the numbers to the research assistants at a different desk. These numbers were used to randomise into either arm. The process went on until the sample size was achieved for each arm.

## **Masking**

Masking was achieved by ensuring that the envelopes for both arms were the same color and size. The women were masked on which arm of the study they belonged to during randomisation but they were unmasked during the follow up visits at two and six-weeks because the intervention was sent to them. Nurses reviewing the women at the MCH clinic were masked as to which arm of the study the women belonged to. The principal investigator and research assistants involved in the data collection process were not masked.

## **Data collection**

We used standardised paper-based questionnaires which we administered face-to-face to the women during enrollment, at two weeks and six weeks clinic visit. We made follow-up phone calls to all the participants a week after each scheduled appointment. At enrollment, we collected socio-demographic data and identifying information, and during follow up phone calls, we collected data on reasons for attendance or non-attendance of PNC clinics.

## Statistical methods

Epi info™ version 7 and excel software were used for data management and analysis.

Descriptive statistics was used to analyse the socio demographic characteristics of the participants with categorical variables being compared using the chi-square test.

The proportion of women who failed to return for each visits was calculated using the numbers enrolled in each arm as the denominator and numbers that turned up for each visit as the numerator (intention to treat used). We calculated risk ratios and their corresponding 95% confidence intervals (C.I) to test for the effectiveness of the intervention and p value of  $\leq 0.05$  was considered statistically significant.

## Ethical considerations

All women who participated in the study gave informed written consent prior to being enrolled. Women who declined to consent were offered the routine PNC services and not considered for the study. We received ethical approval from the Institutional Research and Ethics Committee (IREC) of MOI University approval number 0001566.

## Results

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The 825 patients who were discharged during the study period were screened and 754 (91.4%) who met the eligibility criteria were enrolled and randomly assigned into the two arms of the study; a total of 377 women in the intervention arm and 377 women in the control arm (Figure 1: Randomization of women into intervention and control arms, Pumwani Maternity Hospital, Kenya 2016.)

Comparison of the intervention and the control group showed successful randomisation as the participants in the two arms of the study had similar attributes before implementation of the SMS intervention (Table 1). During the two-week visit, the absolute FTA in the intervention was 8.2 % (31/377) for women in the intervention arm and 42.2 % (159/377) for women in the control arm. This difference was statistically significant (p-value of

0.0001) (Figure 2: Randomization of women into intervention and control arms, Pumwani Maternity Hospital, Kenya 2016.) and in the intent to treat analysis at two-weeks, women in the intervention arm (SMS) had an 80% reduction in the risk of FTA (RR 0.2 (95% CI 0.1 - 0.3, p value  $< 0.05$ ) as shown in (Table 2).

At six- weeks, the absolute failure-to-attend the visit was 6.6% (25/377) for women in the intervention arm and 13.8% (52/377) for women in the control arm. This difference was statistically significant (p value of 0.0001) (Figure 2). During the same six-week visit, women in the intervention arm (SMS) had a 60% reduction in the risk of FTA (RR 0.4 (95% CI 0.2 - 0.6, p value  $< 0.05$ ) (Table 2).

Women cited various reasons why they attended the postnatal clinic. The main reason which was similar during both visits was receiving an SMS reminder. At two-weeks, 307 (88.7%) and at six weeks, 317 (88.8%) cited this as a reason in the intervention group while those in the control group cited bringing their children for vaccination as a reason (Table 3).

Forgetting date and time for the clinic appointment was the main reason why women did not attend the scheduled appointments. Sixty-nine (43.4%) women at two weeks visit, and 28 (53.8%) women at six-weeks, in the control arm for example, cited this as a reason (Table 4).

A total of 1,508 SMS were sent to all the respondents in the intervention arm over the study period and the cost of sending one SMS was Ksh.1 (US \$0.01) and each of the 377 participant in the intervention arm received 4 SMS text messages, giving a total cost of Ksh.1508 (US \$15.08) for sending the SMS texts. Registration of the website that hosts the SMS gateway (Sema time) which was used to automatically send SMS texts to all participants cost Ksh.8400 (US \$84). There were no employees contracted to send the reminders as it was an automated system with no employee costs. The overall cost for the SMS intervention during the study period was Ksh.9, 908 (US \$99.08).

## Discussion

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Differences in turning up for scheduled appointments between the groups was observed suggesting that the intervention was successful in reducing failure-to-attend rates. Although the turn up was lower than the WHO recommendations where all women should receive PNC services post-delivery [2], clinic attendance especially for the intervention group in this study was higher than the reported national coverage of 65% PNC attendance in urban settings [3].

The greatest absolute difference between the intervention and control group was noted during the two weeks visit where the FTA between the intervention and control was reduced by 80% percent compared to 60% percent during the six weeks visit. This means that the SMS intervention was successful in reducing FTA rates for women in the intervention group by 80% during the scheduled two weeks visit and 60% during the scheduled six weeks visit. The two weeks visit is the most beneficial time to attend scheduled appointments as about 75% of maternal deaths in the postpartum period are known to occur within this time period [12]. In addition, as the SMS intervention was more successful during the two weeks visit it might indicate that this appointment could be a particularly good target for the SMS interventions.

Although the intervention was effective for the entire intervention group in reducing FTA rates during both visits; the effect was less during the six weeks visit. This could be possibly due to the fact that most women who turned up for the six weeks visit which coincided with the new born immunisation appointment or might be the effect of phone calls asking them reasons for not attending the first two weeks as this was a kind of reminder to attend the next visit at six weeks. Since the postnatal care services are integrated in the maternal and child health clinic in most health facilities, it is important to note that successful integration is key in providing a complete package for mother and child.

The majority of maternal deaths (75%) occur in the postnatal period and delay in attending scheduled appointments for the required interventions risk increasing maternal and perinatal complications [2]. A study in Nigeria by Adanikin ((2014), demonstrated that text message reminders compared

to historic reminders were more effective in reducing absolute FTA the postnatal care clinics. The study demonstrated an absolute reduction of 21.5% between the intervention (SMS)group compared to control (no SMS) group [9]. The same study by Adanikin showed that the SMS intervention had a 50% reduction of FTA for the participants in the intervention group. Although this particular study by Adanikin did not disaggregate the FTA rates by two and six weeks visit as has been done in our study. Both studies show that SMS reminders are successful in reducing the FTA rates at postnatal care clinics.

The main reason for not honouring appointments from this study was attributed to forgetting the appointment date while those who honoured appointments cited being sent a reminder as one of the main reasons. These reasons for failure-to-attend or attendance of the scheduled clinics are similar to those found in a study in Australia by Sawyer in 2002 where they were studying effectiveness of telephone reminders in improving attendance at adolescent clinic and they found similar reasons among the study participant [13]. The introduction of the Free Maternity Policy on 1 June 2013, made postnatal care access free in Kenya, alongside other maternal services [16]. Cost is therefore not a major reason for women not to attend postnatal care clinics.

In Kenya, mobile phone penetration was at 88.1% by the year 2016 which was an increase from the previous years, and there were an estimated 37.8 million subscribers by the end of 2016 [14]. Exploring the benefits of using SMS technology in improving postnatal care indicators is worthwhile as postnatal care clinic attendance in Kenya is low [1,3]. The total amount of money spent on sending SMS texts in the study was low (US \$99.08) and also no staff were required to be trained to send SMS texts, as this was an automated system making it worth exploring[15–17]. SMS reminders are therefore affordable when compared to the benefits they offer to women who attend their scheduled PNC appointments.

### Limitations of the study

Despite ascertaining the delivery of the short text message, it was difficult to know whether the recipient had actually read the message as it was a one-way communication. A two-way communication is recommended as it allows the

recipient to reply if they have received and read the reminder. Secondly, for the participants who were using phone numbers that belonged to other household members like their spouses, it was difficult to know whether they read SMS messages or if they were informed that an SMS had been sent to them. Making follow up calls a week after scheduled appointments may have also reminded the control arm of their appointments indirectly especially for the six weeks visit.

## Conclusion

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SMS reminders were effective in reducing the failure-to-attend rates during both visits with the greatest reduction noted during the two weeks visit compared to six weeks visit. Study participants who attended scheduled clinics cited being sent reminders as a main reason for attendance while those who failed to attend their appointments cited forgetting dates and time as their main reason.

## Recommendations

This randomised control trial demonstrated the feasibility of using SMS reminder intervention for increased attendance of postnatal care clinics. Owing to the growth of technology and mobile phone usage, we recommend further research to evaluate whether the intervention would be effective in other health facilities with different settings, for example a rural setting. We also recommend the use of an SMS reminder strategy for postnatal care nationally.

## Competing interests

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The authors declare no competing interest.

## Authors' contributions

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VAO, EW, ZG, EO, MO, JG, were involved in the development of the study design and implementation plan. VA was the principal investigator for the study. VAO, EW, ZG, EO, MOO were responsible for implementation of the study and EW and ZG for overall supervision. VAO, ZG and, EO did the quantitative analysis. VAO wrote the initial draft of the paper. All authors

critically reviewed the manuscript and approved the final version.

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## Tables and figures

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**Figure 1:** Randomization of women into intervention and control arms, Pumwani Maternity Hospital, Kenya 2016.

**Figure 2:** Absolute failure-to-attend rates for the participants during the two- and six-week visit at Pumwani Maternity Hospital, Kenya, 2016.

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**Table 1:** Baseline characteristics of study participants at Pumwani Maternity Hospital, Kenya 2016.

Variable	Intervention		Control		P-value
	N	(%)	n	(%)	
<b>Age group</b>					
15-25	206	54.6	215	57	0.059
26-35	159	42.2	138	36.6	
36-45	12	3.2	24	6.4	
<b>Marital status</b>					
Cohabiting	31	8.2	40	10.6	0.165
Divorced	4	1.1	3	0.8	
Married	317	84.1	321	85.2	
Single	25	6.6	13	3.5	
<b>Parity</b>					
2	302	80.1	289	76.7	0.512
4	66	17.5	77	20.4	
≥4	9	2.4	11	2.9	
<b>Level of Education(woman)</b>					
No Formal Education	5	1.3	2	0.5	0.355
Primary Education	108	28.7	101	26.8	
Secondary Education	204	54.1	199	52.8	
Tertiary Education	60	15.9	75	19.9	
<b>Level of Education(spouse)</b>					
No Formal Education,	5	1.3	2	0.5	0.312
Primary Education	59	15.7	74	19.6	
Secondary Education	214	56.8	199	52.8	
Tertiary Education	99	26.3	102	27.1	
<b>ANC Attendance</b>					
Yes	129	34.2	130	34.5	0.095
No	112	29.7	82	21.8	
Don't know	132	35.0	165	43.8	
<b>Alternative mobile phone ownership</b>					
Family member	17	6.5	19	7.6	0.802
Own	5	1.9	6	2.4	
Spouse	230	91.6	235	90	
<b>Mode of delivery</b>					
Caesarian section	93	47.5	103	52.6	0.431
SVD	284	50.7	274	49.3	



**Table 2:** Efficacy of the intervention at the two and six-week visit for the study participants at Pumwani Maternity Hospital, Kenya, 2016

Visit	Intervention Arm n=377		Control Arm n=377		RR(95%CI)	P-value
	Attended n (%)	Failed to attend n(%)	Attended n (%)	Failed to Attend n (%)		
Two-week visit	346 (91.8)	31(8.2)	218 (57.8)	159 (42.2)	0.2(0.1-0.3)	<0.05
Six-week visit	357 (94.7)	20 (5.3)	325 (86.2)	52 (13.8)	0.4(0.2-0.6)	<0.05

**Table 3:** Reasons for attending the scheduled PNC clinics among study participants at Pumwani Maternity Hospital, Kenya 2016

Intervention Arm			
2 Week visit Reason	n(%)	6 Week visit Reason	n(%)
Was sent a reminder	307 (88.7)	Was sent a reminder	317(88.8)
Had complications	21 (6.1)	Had complications	21 (5.9)
Brought the child for vaccination	12 (3.5)	Brought the child for vaccination	12 (3.4)
Was advised on the importance of PNC	6 (1.7)	Was advised on the importance of PNC	6 (1.7)
		Reliable transport to the facility	1 (0.3)
<b>Total</b>	346(100)	<b>Total</b>	357

**Table 3 (Suite):** Reasons for attending the scheduled PNC clinics among study participants at Pumwani Maternity Hospital, Kenya 2016

<b>Control Arm</b>			
<b>2 Week visit Reason</b>	<b>n(%)</b>	<b>6 Week visit Reason</b>	<b>n(%)</b>
Brought the child for vaccination	112(51.4)	Brought the child for vaccination	161(49.5)
Was advised on the importance of PNC	56 (25.7)	Was advised on the importance of PNC	65(20.0)
Spouse/guardian /parent/friend recommended this facility	23 (10.6)	Reliable transport to the facility	42 (12.9)
Had complications	14 (6.4)	Spouse/guardian /parent/friend recommended this facility	29 (8.9)
Child was unwell	9 (4.1)	Child was unwell	14(4.3)
Reliable transport to the facility	4 (1.8)	Had complications	14 (4.3)
<b>Total</b>	<b>218(100)</b>	<b>Total</b>	<b>325(100)</b>

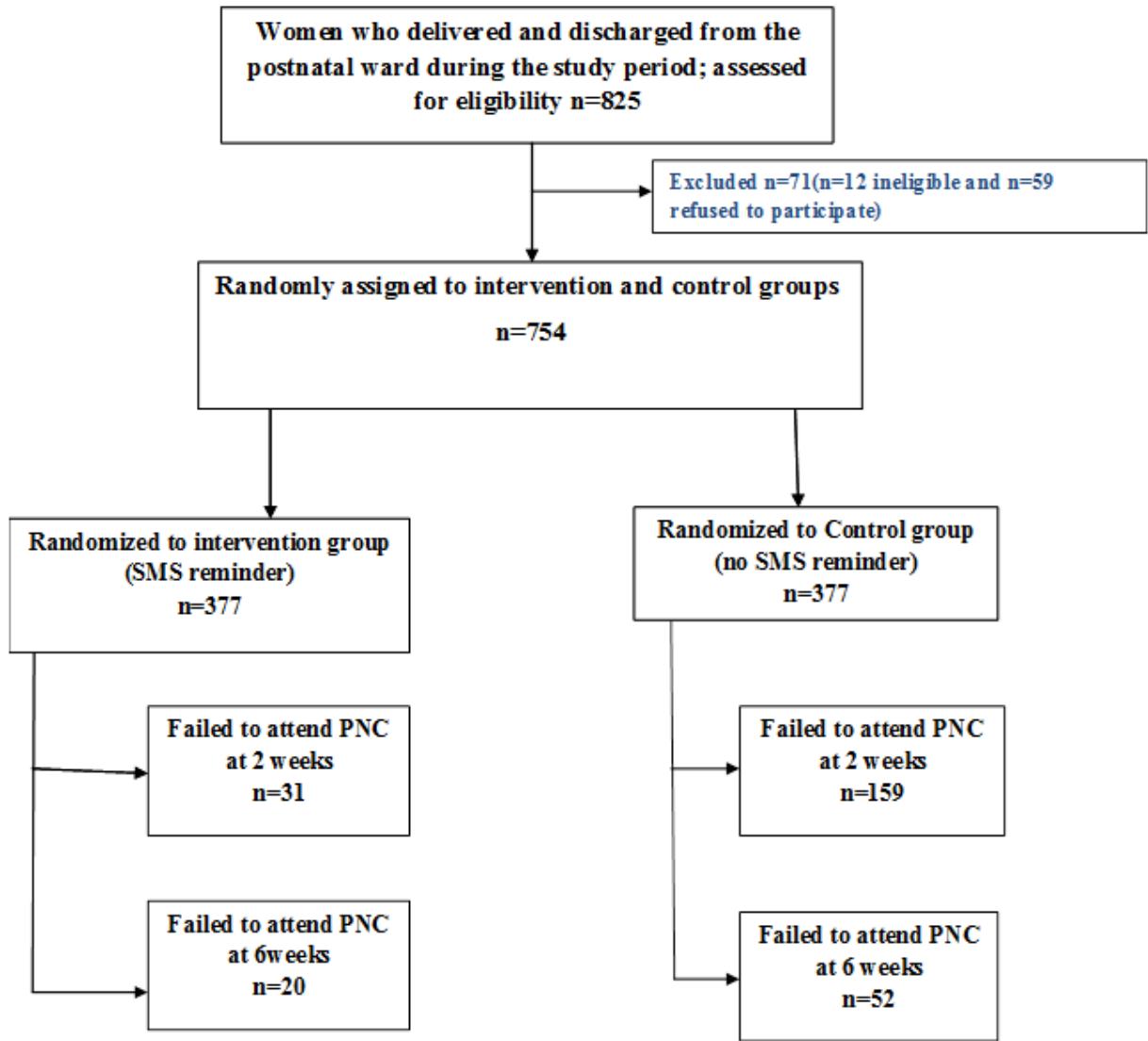
**Table 4:** Reasons for not attending the scheduled appointments among study participants, Kenya, 2016

<b>Intervention Arm</b>			
<b>2 Week visit Reason</b>	<b>n(%)</b>	<b>6 Week visit Reason</b>	<b>n(%)</b>
Forgot	19 (61.3)	Unfriendly staff at the clinic	11 (55)
Travelled and no facility nearby	6(19.4)	Travelled and no facility nearby	6 (30)
Unfriendly staff at the clinic	6(19.4)	Forgot	2(10)
		Spouse did not allow	1(5)
<b>Total</b>	<b>31(100)</b>	<b>Total</b>	<b>20(100)</b>

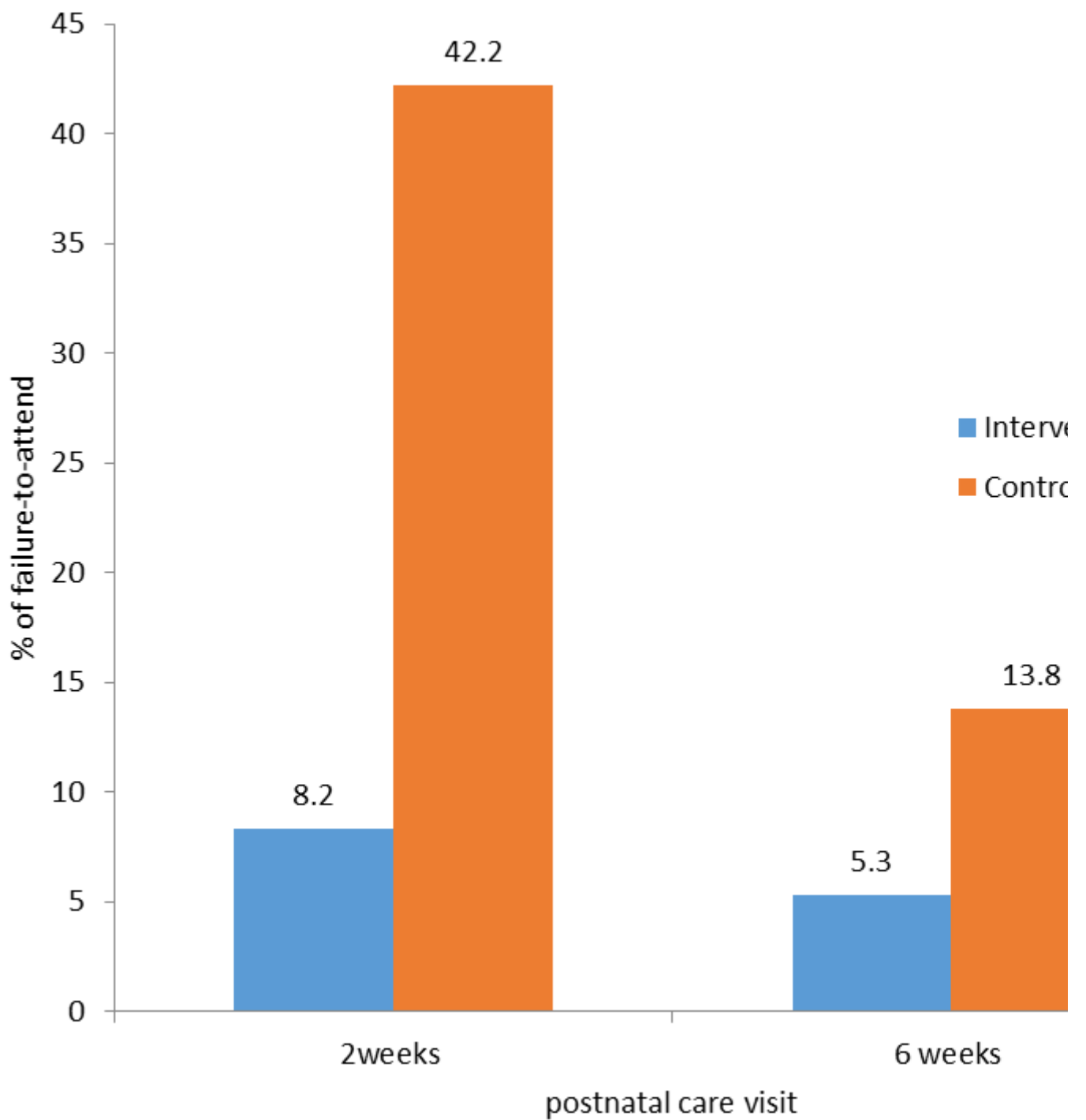
**Table 4 (Suite):** Reasons for not attending the scheduled appointments among study participants, Kenya, 2016

<b>Control arm</b>			
<b>2 Week visit Reason</b>	<b>n(%)</b>	<b>6 Week visit Reason</b>	<b>n(%)</b>
Forgot	69 (43.4)	Forgot	28(53.8)
No need to attend	60 (37.7)	No need to attend	11(21.2)
Travelled and no facility nearby	11 (6.9)	Lack of transport	9 (17.3)

Lack of transport	9 (5.7)	Spouse did not allow	4 (7.7)
Spouse was not around	8 (5.0)		
Spouse did not allow	2 (1.3)		
<b>Total</b>	<b>159(100)</b>	<b>Total</b>	<b>52(100)</b>



**Figure 1:** Randomization of women into intervention and control arms, Pumwani Maternity Hospital, Kenya 2016.



**Figure 2:** Absolute failure-to-attend rates for the participants during the two- and six-week visit at Pumwani Maternity Hospital, Kenya, 2016.