

Acceptance of mobile phone short message service for childhood immunisation reminders by Nigerian mothers

Kelechi Kenneth Odinaka, Benedict Onyeka Edelu¹, Kingsley Ihedioha Achigbu

Department of Paediatrics, Federal Medical Centre, Owerri, Imo State, ¹Department of Paediatrics, University of Nigeria Teaching Hospital, Enugu, Nigeria

Abstract

Background: Missed immunisation appointments are a common occurrence among Nigerian children, and it is due largely to forgetfulness on the part of the parents/caregivers. Although the use of mobile phones is widely available to Nigerian mothers, the readiness of Nigerian mothers to accept a mobile phone short message service (SMS) for interacting with immunisation providers, specifically, for tracking immunisations appointments, notifying absence of vaccines and accessing other vaccine information remains uncertain.

Aim: The aim of this study was to assess the acceptance of mobile phone text messaging for childhood immunisation reminders by Nigerian mothers as well as its determinants.

Methods: A descriptive cross-sectional, questionnaire-based study carried out over 3 months (June–August 2017) at the Federal Medical Centre, Owerri, Nigeria.

Results: A total of 253 mothers were interviewed. About 27% of the mothers reported to have missed their babies' immunisation appointments in the past. Mothers who are currently married ($\chi^2 = 5.954, P = 0.015$) and those with higher levels of education ($\chi^2 = 13.001, P = 0.005$) were significantly less likely to forget their child's immunisation dates. Majority (75.9%) believe that reminders will reduce missed immunisation appointments. A greater proportion (61.7%) of the mothers would accept a phone reminder for their babies' immunisation appointments. Many (76.9%) of them were willing to pay for such services.

Conclusion: Forgetfulness is one of the major reasons for missed immunisation appointments among mothers in Nigeria. Considering the acceptance of SMS by the majority of the mothers studied, there is no doubt that its adoption in Nigeria will create a positive impact in improving immunisation of children in Nigeria.

Keywords: Immunisation, mobile phone, Nigerian mothers, short message service

Address for correspondence: Dr. Kelechi Kenneth Odinaka, Department of Paediatrics, Federal Medical Centre, Owerri, Imo State, Nigeria.

E-mail: kellymed112@yahoo.com

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INTRODUCTION

Immunisation is a cost-effective public health intervention that ensures child survival.¹ It plays a crucial role to achieve sustainable development goal 3. Despite the clear evidence in reducing vaccine-preventable diseases morbidity and

mortality, the adherence to routine childhood immunisation in most Sub-Saharan Africa countries, including Nigeria is unsatisfactory.² National data suggest that only about 21% of children 12–23 months received all required immunisation before their first birthday.²

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One of the major barriers to delivering routine childhood immunisation, especially in resource-poor countries, is the difficulty health-care providers have in communicating with parents regarding the need for and timeliness of vaccination.³

Vaccination reminder and recall systems are cost-effective methods through which parents of children in need of vaccination are identified and contacted to bring their children for vaccination.⁴ There are several ways of notifying/reminding parents and guardians notably the use of traditional methods such as face-to-face communication, pamphlets, immunisation cards and recently newer technologies. The use of modern technology to serve as immunisation appointment reminders has increased over the past few years. It includes the use of E-mails, computer-generated auto-dialer phone calls and mobile phone text-messaging systems, known as short message service (SMS).^{5,6} The use of mobile phone technology to serve as immunisation reminder may be viewed as an effective way of improving adherence to immunisation schedule because mobile phones are a common commodity across age, gender and socioeconomic group.^{4,5}

Globally, mobile phone use is rapidly increasing, with an estimated five billion mobile phone users worldwide at the end of 2017.⁷ The rising use of mobile phones suggests more people will have access to technology and this would create a platform that would facilitate easy dissemination of vaccination appointments. Mobile phone technology has proved effective in increasing outpatient clinic attendance.⁶ In Guatemala, a low-income country in Central America, the mothers accepted and were willing to pay for SMS reminders for their children's immunisation.³ SMS reminders have been shown to reduced dropout rate in the routine immunisation in Kenya and Zimbabwe, it significantly improved the uptake for pentavalent, oral polio vaccine and pneumococcal vaccines.^{8,9} SMS reminders have also been used to improve immunisation coverage of hard to reach areas and urban streets in Bangladesh.¹⁰

Although the use of mobile phones is widely available to Nigerian mothers, the readiness of Nigerian mothers to accept a mobile SMS for interacting with immunisation providers, specifically, for tracking immunisations appointments, notifying absence of vaccines and accessing other vaccine information remains uncertain. This study, therefore, sought to assess the acceptance of mobile phone text messaging for childhood immunisation reminders by Nigerian mothers as well as its determinants.

METHODS

A descriptive cross-sectional, questionnaire-based study undertaken over a 3-month period (June–August 2017) at the immunisation clinic of Federal Medical Centre Owerri, Imo State, Nigeria. The clinic offers all the vaccines in the National Programme on Immunisation schedule and monitors the growth and development of children from birth to 5 years. It serves the people of Owerri and its environs.

A minimum sample size of 230 was calculated using the formula:¹¹

$$nf = \frac{n}{1 + \frac{(n)}{N}}$$

Where nf = the desired sample size when the population is <10,000

n = the desired sample size when the population is more than 10,000

N = the estimate of the population size.

To make up for non-responders, 10% attrition rate was used, and the sample size was increased to 253. All consecutive mothers coming into the clinic were enrolled until the sample size was attained. A structured, self-administered questionnaire was given to mothers of children attending immunisation clinic at the hospital. Information sought included demographic details, misplaced or lost immunisation card and immunisation appointment as well as acceptance of phone SMS as immunisation reminders. Ethical clearance was obtained from the Ethics Committee of the Federal Medical Centre, Owerri.

Data collected was entered and analysed using IBM SPSS software version 20 (IBM Corp, Armonk, NY USA). Frequencies and percentages of categorical variables were calculated. The mothers' demographic variables were tested using the Chi-square test for the effect on forgetting their babies' immunisation dates. The response of mothers on the benefit of SMS reminders was presented on a Likert scale and tested against their educational background for significance. $P = 0.05$ was considered as statistically significant. The results are presented as prose, tables and figure.

RESULTS

A total of 253 mothers were interviewed. 107 (41.9%) of them was aged between 20 and 29 years, followed by those between 30 and 39 years (98/38.7%). 207 (81.4%) were

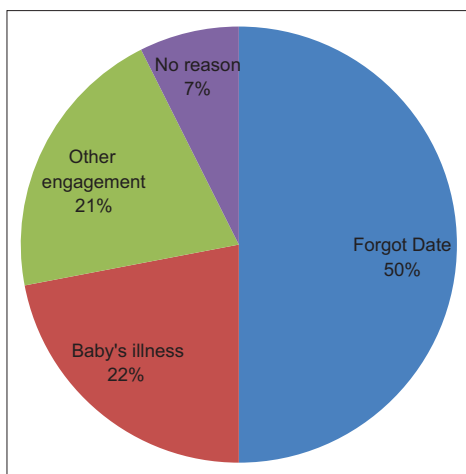


Figure 1: Reasons for missed immunisation appointment

currently married. Majority of the mothers were Igbos 214 (84.6%) and Christians 230 (90.9%). Only 14 (5.5%) of the mothers had no formal education, with 159 (62.8%) having tertiary education [Table 1].

68 (26.8%) of the mothers reported that have missed their babies' immunisation appointments in the past. Half (50%) of the mothers that missed their babies' immunisation appointments were due to forgotten date. This is shown in Figure 1. Sixty-five of the mothers (25.7%) had gone to the immunisation centre without their babies' immunisation cards, of which 40 (61.5%) were due to loss of cards. Mothers who are currently married ($\chi^2 = 5.954, P = 0.015$) and those with higher levels of education ($\chi^2 = 13.001, P = 0.005$) were significantly less likely to forget their child's immunisation dates [Tables 2 and 3]. Most (244/253, 96.4%) of the mothers own at least one phone, with 164/244, (67.2%) owning smartphones.

Majority (192/253, 75.9%) believe that reminders will reduce missed immunisation appointments. A greater proportion (156/253, 61.7%) of the mothers would accept a phone reminder for their babies' immunisation appointments.

181 (71.5%) of the mothers agree/strongly agree that SMS reminders will be beneficial. Education has a positive influence on the perceived benefit of phone SMS reminders, ($\chi^2 = 33.757, P = 0.001$) as shown in Table 4. 194 (76.7%) of the mothers were willing to pay for SMS vaccination appointment reminders.

Ninety-two of the 178 (51.7%) of the mothers who responded will prefer a day notice for their immunisation appointment reminder [Table 5].

Table 1: Demographic characteristics of the mothers

	Frequency (%)
Age (years)	
<20	19 (7.5)
20-29	106 (41.9)
30-39	98 (38.7)
>40	30 (11.9)
Total	253 (100.0)
Educational background	
No formal education	14 (5.5)
Primary	22 (8.7)
Secondary	58 (22.9)
Tertiary	159 (62.8)
Total	253 (100.0)
Marital status	
Married	207 (81.8)
Others*	44 (17.4)
No response	2 (0.8)
Total	253 (100.0)
Number of children	
1	85 (33.6)
2	78 (30.8)
3	41 (16.2)
4	22 (8.7)
>4	27 (10.7)

*Others: Single/widowed/separated/divorced

Table 2: Marital status and missed immunisation date

Marital status	Have you ever missed your child's immunisation date?		Total, frequency (%)
	Yes, frequency (%)	No, frequency (%)	
Married	49 (23.7)	158 (76.3)	207 (100)
Others*	18 (40.9)	26 (59.1)	44 (100)
Total	67 (26.7)	184 (73.3)	251 (100)

*Others: Single/widowed/separated/divorced. $\chi^2 = 5.954, P = 0.015$

Table 3: Educational status and missed immunisation date

Highest level of education	Have you ever missed your child's immunisation date?		Total (%)
	Yes (%)	No (%)	
No formal	7 (50.0)	7 (50.0)	14 (100)
Primary	11 (50.0)	11 (50.0)	22 (100)
Secondary	17 (29.3)	41 (70.7)	58 (100)
Tertiary	33 (20.8)	126 (79.2)	159 (100)
Total	68 (26.9)	185 (73.1)	253 (100)

$\chi^2 = 13.001, P = 0.005$

DISCUSSION

An immunisation card is one way of reminding mothers about their babies' next immunisation date. Despite possessing immunisation cards, some mothers still forget their babies' immunisation date and others misplace their babies' immunisation cards. It was observed that majority of the mothers who missed their immunisation appointment were due to forgetfulness. This finding supports the need for immunisation reminders to minimise missed vaccination. Education and being in marriage have a positive influence in remembering immunisation dates.

Table 4: Response of mothers on the benefit of short message service reminders related to their educational background

Educational status	Do you agree that phone reminders will be beneficial						Total (%)
	Strongly agree (%)	Agree (%)	Indifferent (%)	Disagree (%)	Strongly disagree (%)	No response (%)	
No formal	2 (14.3)	4 (25.6)	3 (21.4)	3 (21.4)	1 (7.1)	1 (7.1)	14 (100.0)
Primary	5 (22.7)	11 (50.0)	2 (9.1)	2 (9.1)	2 (9.1)	0 (0.0)	22 (100.0)
Secondary	13 (22.4)	20 (34.4)	15 (25.9)	4 (6.9)	3 (5.2)	3 (5.2)	58 (100.0)
Tertiary	76 (47.8)	50 (31.4)	15 (9.4)	12 (7.5)	1 (0.6)	5 (3.1)	159 (100.0)
Total	96 (37.9)	85 (33.6)	35 (13.8)	21 (8.3)	7 (2.8)	9 (3.6)	253 (100.0)

$\chi^2=33.757$, $P=0.001$

Table 5: Preferred time for reminders to be sent to the phone numbers of mothers

Time	Frequency (%)
On day of appointment	48 (27.0)
A day before appointment	92 (51.7)
A week before appointment	32 (18.0)
Others	6 (3.4)
Total	178 (100.0)

Majority of the mothers in our study accepted and were willing to receive SMS immunisation reminders. This corroborates the study by Balogun *et al.* in Lagos¹² and Brown *et al.*¹³ in Ibadan. The more educated mothers were more likely to accept SMS immunisation reminders compared to mothers who were not well educated. This is similar to the findings by Balogun *et al.*¹² in Lagos. This supports the influence of maternal education on adopting practices that would ensure child survival, especially with regard to immunisation.

Majority of the mothers in the study were willing to pay for SMS reminders unlike the observation of Balogun *et al.* in Lagos about 8 years ago.¹² A possible explanation for this difference could be that our study was conducted when the cost of SMS was reduced to 4 Naira while that of Balogun *et al.*¹² was carried out when the cost of SMS was 15 Naira. This may imply that if SMS is made free, most mothers will accept it.

Sending an SMS to registered mothers 1 day before their scheduled immunisation to serve as a reminder to them was the most preferred time. This is similar to the findings of Balogun *et al.*¹² This finding shows that sending SMS to mothers 1 day before their immunisation will reduce the likelihood of missed vaccination. One limitation of the study was conducted in an urban setting, and the findings may not be applicable in rural settings.

CONCLUSION

Forgetfulness is one of the major reasons for missed immunisation appointments among mothers in Nigeria. Considering the acceptance of SMS by the majority of the mothers studied, there is no doubt that its adoption in Nigeria will create a positive impact in improving the immunisation of children in Nigeria.

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Conflicts of interest

There are no conflicts of interest.

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