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Effect of Short Message Service On Prevention of Missed Childhood Immunization Among Mothers Attending Immunization Clinics in Selected Hospitals in Lagos State, Nigeria

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Abstract:

Immunization against childhood diseases remain a significant public health needs in Nigeria. It is one of the major interventions recommended to reduce infants' morbidity and mortality. Hence, the research assessed the effect of SMS reminder on prevention of missed childhood immunization among mothers attending infant welfare clinics in selected hospitals in Lagos state. A quasi-experimental design was used. The purposive sampling technique was utilized to collect data from 268 mothers of infants less than 12 months who attended the selected hospitals during the study. Self- structured questionnaire was used as an instrument for data collection. Data was analysed using SPSS version 22 software. T-test statistics test of difference was used in testing the hypotheses at 0.05 level of significance. This study concluded that SMS reminder has a tremendous positive effect in The findings of the study showed that there was no significant difference [t(135) = 1.00, *P* = .319] between the mean score [(M = 0.99, SD = 0.121] of missed vaccinations in the control group and the mean score [(M = 0.97, SD = 0.170] of missed vaccinations in the intervention group in the pre-

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intervention stage (PENTA 1). Also, findings of the study revealed that there was a significant difference between the mean of the number of missed vaccination in the control group and the mean of the number of missed vaccination in the intervention group in the first and second intervention (PENTA 2 and PENTA 3). The study recommended among others that there should be a full-scale implementation of the SMS reminder system in hospitals, because SMS reminders have shown to have a tremendous effect in increasing the number of vaccination and rate of completion.

Keywords: Short Message Service, Missed immunization, infants, Pentavalent Vaccine,

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Introduction

Inadequate uptake and break of immunization against childhood diseases remains a significant public health problem in Nigeria. The reasons for incomplete vaccination and non-uptake of immunization services are poorly publicised (Holte, Maestad &Jani 2012). Uptake of immunization has decline over the years and it was observed that many children under-five years come down with diseases that could have been prevented through immunization. Complete immunization is not only important for the immunized infants but also for the general population (WHO, 2017). Vaccine preventable diseases (VPDs) belong to the group of disease burden that could be prevented by immunization of entire target population with hypothetical vaccine 100% effective against the strain included in it. However, in Nigeria, the diseases with accessible vaccines are: Tuberculosis, Pertussis, Measles, Hepatitis, Diphtheria, Tetanus, Yellow fever, Poliomyelitis, Heamophilus influenza, Meningitis (WHO, 2019).

Globally, vaccine preventable diseases are responsible for 30% of under-five children deaths. Nigeria childhood immunization coverage has being reducing over the years (NPHCDA, 2015). Regardless of all measures put in place to promote immunization, Nigeria still has one of the lowest rates in Africa with infant mortality rate of 69 per 1000 live births (National Primary Health Care Development Agency, 2015). According to CDC (2016) immunization coverage in Nigeria is below GVAP goals of 90%, putting a substantial number of infants at high risk of vaccine preventable diseases. Furthermore, it has been estimated that out of six million Nigerian children born every year, more than 1.5 million fail to get fully immunized by their first birthday (NIC, 2015).

Globally, the death of about 30% of infants is due to vaccine preventable diseases. Majority of morbidity and mortality of infants caused by vaccine preventable diseases occur as a result of missed or break in immunization. Infants' mortality remains a public health issue with great concern and it is high in sub-Saharan Africa despite global decline. The risk of a child dying before completing five years of age is highest in the World Health Organization (WHO) African Region with an estimated rate of 74 per 1000 live births, around 8 times higher than what is obtainable in the WHO European Region which is 9 per 1000 live births (WHO, 2016).

The use of Reminder system for immunization has shown to improve health care-seeking behaviour and it is recommended for application in routine and supplemental immunization activities (Jani, 2008). One major problem with childhood immunization in Nigeria is missed timing of vaccination and incomplete vaccination. There are reports of incomplete vaccinations, which deprive infants from being immunized against preventable disease at the right time. According to survey report conducted in Nigeria, only 49% of children in Nigeria take first dose of pentavalent vaccine (penta1) while about 33% take third dose of pentavalent vaccine (penta3) increasing the dropout between penta1 and penta3 to about 31% (NICS&MICS, 2016). Infant missing the time for vaccination makes them vulnerable to contracting or spreading diseases at that early stage of their lives (CDC, 2016). In all, missed immunization is harmful in that; it does not only prevent Nigeria from experiencing increase in immunization coverage; it has also leads to the resurgence of vaccine preventable diseases.

Two problem stands out in the country, first despite the expressed desire to increase immunization coverage holistically, missed immunization persist (Landoh, et al., 2016).

Secondly, it is not fully reviewed why caregivers missed out on something as important as immunization. Several strategies such as; new initiative of reaching every child in all wards (REW) employed to improve childhood immunization in Nigeria did not achieve the desired result leading to a dropout rate approximately 30% infants' mortality yearly. One sector of children that is mostly affected by incomplete immunization is children living in rural communities (Restrepo-Mendez, et al.,2016). Although living in rural areas has its own drawback, it does mask other reasons for incomplete vaccination such as the caregiver or mother forgetting that the child has not being immunized, or caregiver becoming so busy she forgets immunization appointments.

While few studies have been conducted on reasons for missed immunization, little or no evaluations of the strategies to reduce missed immunization have been reported in Nigeria. More especially as it relates to the use of SMS reminders. The researcher through clinical experience and records has observed the effect of missed immunization and missed opportunities for immunization in the community. Missed opportunities are threats to achieving full immunization coverage and by introducing SMS reminders the question arises whether it can increase the immunization coverage in a cost-effective manner. To this end the study sought to investigate the effect of SMS reminders on prevention of missed childhood immunization among mothers attending immunization clinics in two selected General Hospitals in Lagos state. This study specifically:

1. assessed the effect of SMS reminders in the uptake of childhood immunization in experimental group compared to the control group; and
2. determined the other factors influencing missed immunization.

Research Questions

The following research questions were raised for this study:

1. What is the effect of SMS reminders in the uptake of childhood immunization in experimental group compared to the control group?
2. What is the other factors influencing missed immunization?

Research Hypotheses

The following hypotheses were postulated for this study:

1. There is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the pre-intervention stage in the routine immunization program
2. There is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the post- intervention in the routine immunization program
3. There is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the second intervention (PENTA 3) in the routine immunization program

Methodology

A quasi-experimental research design was used to assess the effect of SMS on prevention of missed childhood immunization among mothers attending immunization clinics in two selected General Hospitals in Lagos state. The study population targeted mothers of infants less than (<) 12 months of age (taking the first dose of pentavalent

vaccine) attending immunization clinics in the two selected General Hospitals in Lagos state. The sample size of 268 was derived from the population using Leslie Kish (1965) formula. A purposive sampling technique was used to select mothers of infants who are less than 12 months. This technique was appropriate because the mothers attending the immunization clinics in these units were selected by the researcher to meet the intention of this study.

The instrument used for this study was a well-structured, developed questionnaire in form of test-paper. Face and content validity of the instrument was ensured by presenting the instrument to experts in the field of Nursing Science who ensured that the questions in the research instrument are relevant to the research objectives. Alterations were made based on expert advice. Unclear and ambiguous items were reframed before the instrument was administered for data collection. A pilot study was used to ensure reliability of the research instrument. This was done by homogenous population who met the inclusion criteria but in a different setting. It involved 10% of the total population size. The research instrument was administered to twenty-seven (27) respondents that were not among the experimental and control groups while a repeat of the administration of instrument (test-retest method) was done to the same mothers in order to establish the consistent interpretation of its contents and to ensure reliability of the instrument. Reliability of the instrument was tested using Pearson's Product Moment Correlation statistics which yielded reliability values of 0.83 and 0.87 for the section on Penta 2 and Penta 3 interventions respectively.

The data collection was in three major sessions which include: pre- intervention session, intervention session and post-intervention session. Data collected were analysed using descriptive and inferential statistics.

Results

Research Question 1: What is the effect of SMS reminders in the uptake of childhood immunization in experimental group compared to the control group?

Table 1: Vaccination for Second Visit (PENTA 1) [Pre-intervention]

Variables	Options	Control Group N (%)	Experimental Group N (%)
Immunization status on the appointed day	Number of participants	136	132

Table 2: Effect of SMS reminders in the uptake of childhood immunization compared to the control group.(Vaccination for Second Visit (PENTA 2) [First Intervention]:

Variables	Options	Control Group N (%)	Experimental Group N (%)
Immunization status on the appointed day	Missed Vaccination	81(59.6)	7(5.3)
	Was Vaccinated	55(40.4)	125(94.7)

Source: Researcher Field Result (2020)

Table 3: Vaccination for Third Visit (PENTA 3): [Second intervention]

Variables	Options	Control Group N (%)	Intervention Group N (%)
Immunization status on the appointed day	Missed Vaccination	102(75.0)	23(17.4)
	Was Vaccinated	34(25.0)	109(82.6)

Source: Researcher Field Result (2020)

The effect of SMS reminders in the uptake of childhood immunization in experimental group compared to the control group is shown in the table above. The table shows the information of the respondents on immunization visit before and after thge use of SMS in the control and experimental group. In the control group, the immunization status for the second visit was 81(59.6%) for participants that missed vaccination. In the experimental group, the missed vaccination was 7(5.3%). It is reported in the study that 55 (40.4%) of the participants indicated that they have completed the second dose of vaccination within the time frame set for the vaccination..After the use of SMSin the control group, 102 (75.0%) of the participants missed vaccination, and only 34 (25.0%) were vaccinated. While in the experimental group only 23(17.4%) missed immunization after SMS reminders.

Research Question 2: What is the other factors influencing missed immunization?

Table 4: Other factors influencing missed immunization (Vaccination for second Visit (PENTA 2)

Variables	Options	Control Group N (%)	Intervention Group N (%)
Reason for your child missing immunization date	Child sick	7(5.1)	5(3.8)
	I forgot	72(52.9)	0.(0.0)
	I don't have transport	2(1.5)	2(1.5)
	Took the child to another facility	2(1.5)	0(0.0)
	I traveled out of town	6(4.4)	0(0.0)
	Child died	5(3.7)	0(0.0)
	Others	23(16.9)	14(9.4)

Table 5: Other factors influencing missed immunization (Vaccination for Third Visit (PENTA 3)

Variables	Options	Control Group N (%)	Experimental Group N (%)
Reason for your child missing	Child sick	30(22.1)	0(0.0)
	I forgot	38(27.9)	0(0.0)

immunization date	I don't have transport	8(5.9)	0(0.0)
	Took the child to another facility	2(1.5)	2(1.5)
	Child died	1(0.7)	0(0.0)
	Others	7(5.1)	5(3.8)

Other factors affecting missed immnuization among the particpants are indicated in the table above. It was fevealed that the reason for the missed immunization were child illness accounting for 7 (5.1%) of the amount, 72 (52.9%) of the participants said they forgot in the control group, no one forgot in the experimental group. Other reasons for missed immunization according to the respondents were seen in 2(1.5%) that don't have transport, 2(1.5%) took the child to another facility, 6(4.4%) traveled out of town, 5(3.7%) indicated that the child died and 23(16.9%) in the control group indicated that it was due to other reasons. In the PENTA 3 the reason-giving for missed appointments were child sickness has reported by 30(22.1%). In the control group, those who forgot to keep appointments were 38(27.9%), 8(5.9%) said they don't have means of transportation, 2(1.5%) took the child to another facility, a (0.7%) child died.

Test of Hypotheses

Hypothesis 1: There is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the pre-intervention stage in the routine immunization program

Table 6: Difference in the number of missed childhood immunization between the control and intervention group in the pre-intervention stage

Hypothesis	Control Group			Experimental group			T Sig
	N	SD	Mean	N	SD	Mean	
Ho_1	136	0.121	0.99	132	0.170	0.97	t= 1.00 P=0.319

The result of the test of hypothesis one showed that there was no significant difference [t(135) = 1.00, *P* = .319] between the mean [(M = 0.99, SD = 0.121] of missed vaccinations in the control group and the mean[(M = 0.97, SD = 0.170] of missed vaccinations in the intervention group in the pre-intervention stage (PENTA 1). Based on the hypothesis result, we accept(fail to reject) that there was no significant difference in the number of missed childhood immunization between the control group and the intervention group in the pre-intervention stage(PENTA 1) of the routine immunization program.

Hypothesis 2: There is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the post- intervention in the routine immunization program

Table 7: Difference in the number of missed childhood immunization between the control and intervention group in the post-intervention stage

Hypothesis	Control Group			Experimental group			T Sig
	N	SD	Mean	N	SD	Mean	
Ho_2	136	0.493	0.40	132	0.222	0.95	t= -11.696 P=0.000

The result of the test of hypothesis two result showed that there was a significant difference between the mean of the number of missed vaccination in the control group and the mean of the number of missed vaccination in the intervention group in the first intervention (PENTA 2). The 132 participants who received the SMS reminder intervention(intervention group)[(M = 95.0, SD = 0.22] compared to the 136 participants in the control group [M = 0.40, SD = 0.493] demonstrated significantly better vaccination completion scores in the first intervention, t(135) = 11.7, *P* = .000.

Based on the hypothesis result, we reject hypothesis two that says there is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the first intervention (PENTA 2) of the routine immunization program. We hereby declare that there was a significant difference in the number of missed childhood immunization between the control group and the intervention group in the first intervention (PENTA 2) owning to the (SMS) intervention.

Hypothesis Three: There is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the second intervention (PENTA 3) in the routine immunization program.

Table 8: Difference in the number of missed childhood immunization between the control and intervention group in the second intervention

Hypothesis	Control Group			Experimental group			T Sig
	N	SD	Mean	N	SD	Mean	
Ho_3	136	0.493	0.40	132	0.222	0.95	t= -11.696 P=0.000

The result of the test of hypothesis three showed that there was a significant difference between the mean of missed vaccination in the control group and the mean of missed vaccination in the intervention group in the second intervention (PENTA 3). The 132 participants who received the SMS reminder intervention(intervention group)[(M = 0.83, SD = .435] compared to the 136 participants in the control group [M = 0.25, SD = 0.375] demonstrated significantly better vaccination completion scores, t(135) = 12.58, *P* = .000.

Based on the hypothesis result, we reject hypothesis three that says there is no significant difference in the number of missed childhood immunization between the control group and the intervention group in the second intervention (PENTA 3) of the routine immunization

program. We hereby declare that there was a significant difference in the number of missed childhood immunization between the control group and the intervention group in the second intervention (PENTA 3) owning to the (SMS) intservention.

Discussion

The result of the hypothesis test on the effect of SMS intervention on immunization uptake was the same in the two hypotheses tested. There was a significant difference in missed childhood immunization between the control group and the experimental group in the intervention stages (PENTA 2 and PENTA 3). The baseline result (hypothesis one tested) indicated that there was no significant difference between the control group and the experimental group in the pre-interventions stage, hence any change in the number of vaccination in the intervention group can be attributed to the intervention(SMS used). The outcome of this test is consistent with extant and earlier literature on the use of short message reminders to improve immunization coverage. It was revealed that in the control group the immunization status for the second visit was 81(59.6%) for participants that missed vaccination, while in the experimental group, the missed vaccination was 7(5.3%). In the control group, 102(75.0%) of the participants missed vaccination, and only 34(25.0%) were vaccinated. While in the experimental group only 23(17.4%) missed immunization. Specifically, the result agrees with the findings of Donewell (2015) who reported that the proportion of those who did not delay in receiving antigens at 6, 10, and 14 weeks was significantly small compared to those in the non-intervention. The result also corroborates the findings of Pop-Eleches (2011) who reported an increase in adherence to anti-retrovirals was attributed to the use of SMS message reminders for its routine uptake.

The study by Frank and Mary (2018) who reported that nearly all the SMS-reminder studies helped improve patient medication compliance and appointment reminders, also supported the findings from this study. Areas of difference are in the report of participants who reported numerous benefits from using SMS reminders, including ease of use, relative inexpensiveness, minimal risks. Studies that explored other demographics also agree with the findings of this study. Literacy, movements of the population, health facilities, and remoteness of the area were considered descriptively in this study, thus future extensive study on these criteria may throw up interesting findings. Frank and Mary (2018) submitted that the SMS reminder system is undisputedly a highly qualified tool for increasing vaccination uptake, their study still pointed out the need for other incentives. This is where past works may defer with this work in scope, hence future studies on SMS reminder can incorporate this gap. In all, it can be summarised that text messages appear to be an effective reminder mechanism to promote improved patient appointments and medical compliance.

Conclusion

. SMS reminder has a tremendous positive effect in increasing the rate of completion of immunization uptake in the selected Hospitals in Lagos state. There was a marked significant difference in the number of missed immunization in the group where SMS reminders were used. In the study, the number of those that missed immunization in the control group was far higher than the number that missed immunization in the experimental group. Over 75.0% of

the participants missed vaccination in the control group at PENTA 3 while only 17.4% missed immunization in the experimental group. It can be concluded that the use of SMS-reminder in this study has shown that improve patient medication compliance and appointment reminders can be attained irrespective of the inherent problem of missed immunization that has been an obstacle to improving immunization coverage among infants.

Another conclusion that can be drawn from these findings is that despite the similar characteristics between the control group and experimental group, SMS reminders were able to improve perceived severity and perceived susceptibility of the related health condition by increasing awareness of the knowledge about the condition. The study hereby concludes that SMS reminder is undisputedly a highly qualified tool for increasing vaccination uptake and reducing the proportions of missed immunization in routine immunization.

Recommendations

Based on the findings of the study and the implications examined, the following recommendations were made:

1. Government and other concerned institutions should come up with policy efforts to address areas where technology can play role in reducing the missed vaccination status in immunization. To this end, there should be a full-scale implementation of the SMS reminder system in hospitals, because SMS reminders have shown to have a tremendous effect in increasing the number of vaccination and rate of completion.
2. The use of SMS reminders can go beyond the hospital's responsibility. A broad-based plan to send multiple reminders from different opinion leaders might increase uptake of immunization. This will involve the incorporation of religious leaders, guardians, and community leaders into the SMS reminder system.
3. Transportation to the place of immunization was adduced as one of the reasons for missed immunization, hence provision has to be made for women to attend routine immunization.
4. Other incentives can be used to increased immunization uptake among women with infant children. Incentives such as cash transfer on the condition that one completes immunization can be considered. The use of phone calls and counseling provisions should be set up along with SMS reminders

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