GAVIN PUBLISHERS

Journal of Vaccines, Immunology and Immunopathology

Research Article

Pertet AM, et al. J Vaccines Immunol: JVII-122.
DOI: 10.29011/2575-789X. 000022

Factors Associated with the Timeliness of Rotavirus Vaccine in Children Attending a Paediatric Casualty in a Public Hospital, Nairobi County, Kenya

Anne M. Pertet[1*], Lucy W Kanja[2], Lydia Kirika[1]

[1]Great Lakes University, Nairobi, Kenya

[2]Ministry of Health, Kenya

[*]**Corresponding author:** Anne M. Pertet, Great Lakes University of Kisumu, Along Mtongwe Road, Nairobi, Kenya. Email: apertet@gmail.com

Citation: Pertet AM, Kanja LW, Kirika L (2017) Factors Associated with the Timeliness of Rotavirus Vaccine in Children Attending a Paediatric Casualty in a Public Hospital, Nairobi County, Kenya. J Vaccines Immunol: JVII-122. DOI: 10.29011/2575-789X. 000022

Received Date: 16 December, 2017; **Accepted Date:** 24 December, 2017; **Published Date:** 30 December, 2017

Abstract

Background: Rotavirus causes gastroenteritis that may be severe particularly in infants and young children. Rotavirus vaccines are safe and cost-effective against gastroenteritis, and are free in all public facilities in Kenya. The purpose of our study was to establish factors related to completeness rotavirus vaccine in children aged below one year attending a pediatric casualty in a public Hospital.

Methods: The study design was analytical with a cross-sectional aspect study using quantitative methods of data collection. Health belief model guided this research. Factors studied included, perception, i.e., perceived threats (susceptibility, seriousness or severity of rotavirus disease), and perceived benefits of the vaccine and barriers to the rotavirus vaccination, and social demographic factors. The analysis was done using Statistical Package for the Social Science (SPSS) version 19.

Results: From the 350 children studied, 89% were below ten weeks old. Most mothethese children (93%) were delivered in a health facility. Ninety-five (95%) and 93% had received their rotavirus vaccine given at the recommended 6 and 10 weeks respectively. Chi square statistics showed a significant association between maternal knowledge of rotavirus disease and rotavirus vaccine and completion status, (p-value = <0.001, OR 2.99) and (p-value = <0.002, OR 2.1) respectively. Children born to older mothers (=>25 years) were twice more likely to complete the vaccination compared to children of young mothers (p-value = 0.014, OR = 2.349). There was also a significant association between maternal education and completeness of the rotavirus vaccine, (p-value = 0.021). Binary regression analysis conducted on all the variables which showed a positive association, indicated that the education of the mother best explained the completeness of rotavirus vaccine. Pearson Product-moment correlation coefficient indicated a positive correlation between the completeness of the rotavirus vaccine and mother's age (r=0.162, p=0.010), knowledge of rotavirus disease (r=.162, p=0.002) and of rotavirus vaccine (r=.186, p=<.001).

Conclusion: Perception of the rotavirus disease and vaccination did not influence the completeness of rotavirus vaccination. However maternal knowledge of rotavirus and maternal education influenced completeness of rotavirus vaccination.

Introduction

Rotavirus disease which is transmitted by the oral-faecal route is highly contagious and resilient. Though rotavirus is the leading cause of severe and fatal diarrhoea in infants and young children worldwide, there is no specific antiviral treatment and antibiotics. Rotavirus diarrhoea accounts for an estimated five percent of all deaths in children less than five years, and is responsible for millions of hospitalizations and clinic visits each year, [1, 2]. While rotavirus deaths and hospitalizations vary by region, majority (95 percent) of deaths in young children are found in low-income countries of Africa and Asia, [3]. A study carried out in four surveillance sentinel sites in Kenya, indicated that among children admitted with gastroenteritis, rotavirus accounted for 35% to 52% of infections, and over 40% of cases admitted with acute gastroenteritis in children under five years of age. Rotavirus infection causes 4471 deaths, 8781 hospitalizations, and 1,443,883 clinic visits among children with diarrhoea aged five years and below annually in Kenya. Children between the ages 6–11 months are most affected, [4].

Incidence and severity of rotavirus infections have declined significantly in countries that have added rotavirus vaccine to their routine childhood immunization policies, [5]. In Kenya, rotavirus vaccines were introduced as part of a comprehensive approach to control diarrheal disease, along with other interventions including oral rehydration therapy, breastfeeding, zinc treatment, and improvements in water and sanitation in July 2014, [4]. The vaccine is given in two doses at six weeks and ten weeks of age or to children below one year of age who have not been vaccinated at the scheduled times. Since the introduction of the vaccine is relatively recent in Africa, studies conducted on completeness of the rotavirus vaccine are few. Descriptive studies held in various parts of Africa show that many children aged less than one year do not complete two doses of rotavirus vaccine. The rate of completion ranges from 30% to 67%, [3,6].

The few studies that have assessed factors associated with rotavirus uptake in Africa have focused on social demographic factors and knowledge as it related to immunization in general and are not specific to rotavirus. These studies have shown that as age increases, vaccine uptake also increases, [6-9]. Other studies have indicated that likelihood of a child receiving full immunization rose with maternal educational attainment, [10-12]. Nonetheless, these African studies focused on social and demographic factors as they relate to uptake and virtually none were on behavioural aspects. A behavioural study conducted in Nigeria, showed that only one third (27.5%) of the respondents considered rotavirus a disease very serious disease. When mothers when mothers were asked to rate their likelihood of using the new vaccine on a scale of one to seven, with one being "absolutely not" and seven being "absolutely yes," the mean score was 5, showing a high likelihood of using a new vaccine. However, when asked to rank the likelihood of having their child vaccinated against rotavirus from 1 ("definitely not get") to 7 ("definitely get"), only 29% ranked between 1 to 2, showing a low likelihood having their child vaccinated [13].

Since this is a new vaccine, there are gaps in studies looking at factors related to rotavirus vaccine uptake in Africa. The Health Belief Model which attempts to explain and predict health behaviours guided this study. Our research question was whether mothers' knowledge and perception of the rotavirus disease and vaccine were related to the completion of the rotavirus vaccine.

Methodology

Study Design

We used a cross-sectional study with an analytical aspect. The outcome variable was the completeness of the two doses of vaccines, i.e., completed or not completed. An Infant was categorized as having completed the vaccine if he/she had received two doses of RV1 (Rotarix) or three doses of RV5 (RotaTeq) following the recommended schedule. Information on vaccination status was obtained from Mother Child Health Booklet (MCHB), and Road to Health (RTH) vaccination card, and not by recall. The independent variables that explained the outcome were: perceived threats (susceptibility, seriousness or severity of rotavirus disease), and perceived benefits of the vaccine and barriers to the rotavirus vaccination. Social demographic factors were the intervening variables.

The Study Site and Study Population

Mbagathi hospital which is in Nairobi County, Kenya was selected because it was the first public health facility to introduce rotavirus vaccine in May 2014. All routine immunizations are offered free. These are; BCG, DPT-Hep-Hib, Pneumococcal, Oral polio, Inactivated Polio, Measles, rotavirus and Tetanus for pregnant women. Children with missed vaccinations are referred to Maternal Child Health (MCH) clinic which offers vaccines.

The study population were children aged 11 weeks to 12 months who had attended the paediatric casualty (which operates 24 hours from Monday to Friday) for therapeutic services, screening for compliance and completion of immunization. The enumerators interviewed the mothers as they exited from the hospitals.

Sample Size and Sampling Technique

Fisher et al. (1998) ($n=Z^2pq/d^2$) formula for population ≥ 10000 was used to calculate the sample size [13]. Where: n= the desired sample size; Z=normal standard deviation (usually set at 1.96 which corresponds to 95 percent confidence level); p= the proportion in the target population estimated to have characteristic being measured (rotavirus vaccine uptake); q= proportion of population without the characteristic, d= Level of statistical

significance of 95% = (0.05). We chose a p of 0.5 because there was no data on uptake of rotavirus vaccine in Kenya. This formula gave a sample size of 384. Since our population was less than 10,000, the sample size was adjusted using the formula nf = n/1+n/N. In this formula nf = the desired sample size (when the population is less than 10,000); n = the calculated sample size (when the population is greater than 10,000), and N= the estimated population size. This population in our case was 1807 children who were on the list retrieved from immunization permanent register and computer records in the casualty department. Using this formula, we arrived at a sample size of 315 children. Systematic random sampling technique was used to ensure an equal chance **(**probability) of selecting each child aged a year and below to participate in the study. Every fifth child was selected.

Data Collection Methods

We used quantitative methods to collect data. A structured questionnaire with closed-ended questions and Likert scale statements were used to obtain the data. The survey included: social demographic factors, knowledge, and mother's perception of the rotavirus disease and vaccination and barriers. Eleven questions which required yes/no answers were used to assess the mother's knowledge of rotavirus disease and vaccine. Yes, was coded as 1 and no was coded 0. Behavioural variables were measured on a 5-point Likert scale. Statements on the seriousness of rotavirus included: rotavirus is a severe disease; is a leading killer of children, young, children are more at risk or susceptible. Statements on benefits of the vaccination included; rotavirus vaccination reduces severity and childhood deaths caused by diarrhoea; measurement of the barriers involved statements dealing with distance to the health facility, availability of and accessibility to rotavirus vaccine and fear of side effects. Composite variables were estimated by adding up the score each mother obtained for each of these variables.

Reliability and Validity

Two health workers were trained on how to fill the responses in the questionnaire, how to get the consent from the mothers and ethical considerations. Pre-testing and piloting of the data collection tool was carried out to minimize bias and strengthen the validity and reliability of the results. It included a check on whether the instrument gave consistent results, whether it covered all the variables, the length of time the enumerators took to fill a questionnaire, appropriateness of the language used in the survey as well as determining the problematic items. The pre-testing and piloting were done at a health facility which was not part of the study using 10 % of the sample (35 respondents). A test and re-test were conducted on the randomly selected respondents. At the end of the pretesting, errors, challenging questions, sensitive questions were identified and corrected before the actual study was conducted. Necessary modifications of the tool were made in order to improve level of instrument's reliability and validity.

Ethical Considerations

Ethical approval was obtained from Great Lakes University of Kisumu Institution Review Board and permission to conduct the study was obtained from Mbagathi Hospital. An explanation of the nature of the study, benefits or risks and ethical considerations were given to the mothers before the interview and informed consent obtained. The respondents were informed of the precautions that will be taken to protect the confidentiality and on parties who will or may have access to the information. The respondents' name was not recorded, but a code was used in the questionnaire. Participation in the study was voluntary. The mothers were free to withdraw at any time during the interview. The respondents were also informed that they would not be required to pay to participate in the study and neither will there be any monitory compensation for participating. They were assured that their responses would not be attributed to them and their names and identities will not be recorded. The interview was performed in a secluded place where there were no interruptions to ensure privacy. All questionnaires were kept under lock and key.

Approach to Data Analysis

Data was entered in Ms-Excel 2007 windows and Statistical Package for the Social Science (SPSS) version 19 was used for analysis. Data cleaning included checking for errors in responses, omissions, exaggerations, inconsistencies, missing values, outliers, and biases. The dependent/outcome variable was a dichotomous variable (Complete or incomplete rotavirus vaccine). Complete rotavirus vaccine was defined as 1 if the child received both recommended doses and incomplete as 0 if a child had not received any dose or received one dose of rotavirus Vaccine. The analysis explored the relationship between the dependent and the predictor variables which were; maternal age, mother's level of education, mother's knowledge and perception. A One-Way Analysis of Variance (ANOVA) was used to compare the effect of the various factors on the completeness of the rotavirus vaccine. A t-test was conducted to compare continuous variables, maternal age, knowledge of rotavirus disease, and knowledge of rotavirus vaccine, perceptions of the threat of disease, benefits of vaccination and barriers in accessing vaccine and rotavirus uptake. Pearson chi-square statistic was used in categorical data to evaluate how likely it is that any observed difference between the sets arose by chance. Binary logistic regression was then used to establish which amongst the explanatory variables found significant from the chi-square best explained the completeness of the rotavirus vaccine. The results were described using odds ratio (OR=1, >1, and <1). OR=1 indicates that exposure does not affect odds of outcome, OR>1, exposure is associated with higher odds of outcome and OR<1 exposure is associated with lower odds of outcome). A $P<0.05$ was considered significant.

Results

Social Demographic Factors

A description of the social demographic background of the mothers is given in (Table 1).

Baseline characteristics	Variable	Number	Percentage
Maternal age in years	≥20	46	13.1
	21-25	103	29.4
	26-30	134	38.3
	31-35	36	10.3
	≥36	31	8.9
Mean age in years	26.9 ±5.5 (range 16-44 years)		
Mother's Education	None	5	1.4
	Primary	106	30.4
	Secondary	155	44.1
	Tertiary	84	24.1
Marital status	Single	62	17.7
	Married	267	76.3
	Divorced	14	4.0
	Widowed	4	1.1
	Separated	3	0.9
Mother's Religion	None	9	2.6
	Catholic	121	34.7
	Protestants	173	49.6
	Muslim	32	9.1
	Indigenous	14	4.0
Distance to the health facility in Kilometres	≤ 5 km	225	64.3
	>5km	125	35.7
Mean distance in km	5.2±3.6		

Table 1: Demographic Characteristics of the Mothers n=350.

Young and adolescent mothers (≤25 years) comprised 42.5% of total respondents. Close to 2/3rd of the respondents had gone beyond the basic primary school level of education. Only 1.0% of the respondents reported having no formal education. Over 3/4 (77%) of the respondents were married. Half of them were Protestants (50%). Majority (64.3%) of respondents had proximity to the health facility (< less than five kilometers).

Characteristics of the Children

Children demographic backgrounds are as shown in (Table 2).

Baseline characteristics	Variable	Number	Percentage
Gender	Male	174	49.7
	Female	176	50.3
Children Age in weeks	<6 weeks	184	52.7
	7-10 weeks	127	36.3
	>10 weeks	39	11.1
Mean age	13± 6.7 weeks		
Place of Delivery	Home	23	6.6
	Health Facility	327	93.4
MCHB or CWC	Card seen	341	97.4
(Recall) MCHB or CWC	Card not seen	9	2.6
Received first dose	First dose at 6 weeks	318	95.1
	First dose at 7 & above	15	4.5
Received second dose	Second dose at 10 weeks	301	92.9
	Second dose at 11weeks and above	10	3.2
Rotavirus vaccine completeness	Incomplete	46	13.1
	Complete	304	86.9

Table 2: Demographic Characteristics of the Children n=350.

The total number of children studied was 350. The proportion of males and females were almost the same (49.7%) and (50.3%) respectively. About half (53%) of the children were below six weeks old. Most children (93%) were delivered at the health facility. The majority (97 %) had Mother and Child Health Booklet (MCHB) or Child Welfare Card (CWC) which were seen at the time of the study. Ninety-five (95%) had received their first dose at six weeks while 93% had received their second dose at ten weeks. Overall, 89% of the children had completed the two doses at the recommended time. Responses on what triggered mothers to take their children for immunization are given in (Table 3).

Trigger	Percent
Advice from a health worker	74.0
Experience of rotavirus disease	70.3
Mass Media	60.4
Advise from friends	42.2
Illness of a family member	30.0

Table 3: Cue to action (rotavirus vaccination).

The Table shows that advice from a health worker and experience of rotavirus disease were essential cues to taking the children for vaccination (Figure 1).

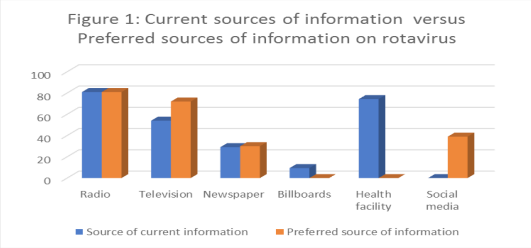

Figure 1: Current sources of information versus Preferred sources of information on rotavirus.

Shows that health facility and radio were the primary sources of information on vaccination. Most of the information was from the radio and health facility as shown in (Figure 1). While the radio and television were also preferred sources of information, no mother mentioned the health facility as the preferred source. Social media which was not in the list of the current sources of information was mentioned as a preferred source. Only 3.4% of the mothers had access to reading materials such as fliers and posters, fact sheets.

Knowledge of Rotavirus Disease and Vaccination

Knowledge and Perception of Rotavirus Disease and Rotavirus Vaccination: Mother's knowledge of rotavirus disease and vaccine questions required yes/no answers. A yes scored 1, and a no scored 0. The scores were summed to get a composite score of the knowledge. Using these scores, those mothers whose score fell below the 50th percentile were termed as having inadequate knowledge. The mean score of 7 questions on knowledge of the disease was 2.9± SD 2.5. Fourteen (14%) of the mothers termed as having inadequate knowledge of the disease. Knowledge of the vaccine which had 10 issues, had a mean score of 6.7 ± SD 2.7. Thirty-six (36%) of the mothers had the inadequate understanding of vaccine. Likert scores of 1-5 were used to get the mother's perception of severity and susceptibility to rotavirus disease (threats), their perception of the benefits of the vaccine and barriers to the access of the vaccine. Only 29% of the mothers perceived rotavirus as a serious threat, while 98% considered the vaccination to be beneficial. Threat had a mean score of 2.4± 0.3, benefits, 3.4± 0.5 and barriers 2.6± 0.8. This indicates a good perception of the vaccine and poor perception of the threats.

Factors Associated with Completeness of the Rotavirus Vaccine: Results show a significant difference in the mean Likert scores when children with incomplete vaccination were compared to those with complete vaccination. These include the age of the mother, (M=25.0, SD=5.4) versus complete immunization (M=27.2, SD=5.5); knowledge of rotavirus disease, incomplete vaccination (M=1.9, SD=2.0) versus complete vaccination (M=3.08 SD 2.5); knowledge of rotavirus vaccine, incomplete vaccination (M=5.4, SD=2.4) versus complete vaccination (M=6.86 SD 2.7). There was no significant difference in the Likert scores for incomplete vaccination and complete vaccination by the mother's perception. A one-way analysis of variance (ANOVA) was conducted to compare the effect of the various factors on the completeness of the rotavirus vaccine. There was a significant effect of the mother's age [F (1, 350) = 6.7, p= 0.010], knowledge of rotavirus disease [F (1, 350) = 9.4, p = 0.002], and knowledge of rotavirus vaccine [F (1, 350) = 12.5, p=<0.001]. However, there was no significant effect of perception of threats, benefits, and barriers of the mothers whose children were fully vaccinated of children and those with incomplete vaccination. Specifically, our results suggest that perception did not have any effect on completeness of rotavirus vaccine. A Pearson product-moment correlation coefficient was computed to assess the relationship between the knowledge and perception and completeness of the rotavirus vaccine. The result indicates that there was a positive but weak correlation between maternal age (r=0.137, p 0.010), knowledge of rotavirus disease (r=.162, p 0.002), knowledge of rotavirus vaccine (r=.186 p=< 0.001) and completeness of the rotavirus vaccine. The variance explained by these factors was only 12%, which means that 88% of the variance was unexplained. The mothers' knowledge of disease and vaccine was positively correlated with the age of the mother, r=0.143, p 0.007 and r=0.160, p 0.003 respectively.

Association Between Social Demographic Characteristics and Completeness of the Rotavirus Vaccine: Since the social demographic variables were categorical (dichotomous variable), Pearson chi-square was used to evaluate how likely it was that any observed difference between the sets arose by chance. There was no significant difference between completeness of the rotavirus vaccine by the sex of the infant, (chi-square = 1.5, Fishers exact test OR= 0.6573, p-value = 0.2). There was a significant association between maternal education and age with the completeness of the rotavirus vaccine, (chi-square =9.729 df 3, p-value = 0.021 and (Chi-square = 6.25, p value=0.012) respectively. Children of mothers who were above 25 years were twice more likely to have completed immunization than those born to mother's below 25 years (OR = 2.349, p-value =0.014). Eleven yes/no questions (yes scored 1 and a no scored 0) were used to assess the mothers' knowledge on rotavirus. From the composite scores calculated, the level knowledge was defined as high or low using the 50th percentile. A chi-square test indicated a significant association between maternal knowledge about rotavirus disease and rotavirus vaccine completion status, (Pearson Chi-Square = 10.19 df 1, p-value = <0.001, OR 2.99) and (Pearson Chi-Square = 9.78 df 1, p-value = <0.002, OR 2.1) respectively. These results indicate that children of mothers with adequate knowledge about rotavirus disease and vaccination were more likely to be immunized. There was no significant association between the mother's perception of threat the rotavirus disease, mother's perceptions of barriers, of

vaccination, and benefits of protection of the rotavirus vaccine, (p-value = > 0.05). The binary regression analysis conducted on all the variables which showed a positive association, indicated that the education of the mother best explained the completeness of rotavirus vaccination, ((Wald = 4.423 df 1, p-value = 0.035, OR 0.286).

Discussion

The purpose of this study was to identify factors associated with the completion of the rotavirus vaccine on schedule in children attending a Paediatric casualty in a Public Hospital, Nairobi County, Kenya. Measurement of the outcome variable (completeness of the rotavirus vaccine) was accurate as it depended on the card and not recall. The results show that mothers were reasonably well educated as only a few had no formal education. Though information on rotavirus was available from varied media including health facilities, nonetheless few had access to reading materials. This access would have been useful given that mothers were quite literate. We found that most children were compliant with timeliness recommendation which requires a child to receive their first and second dose of rotavirus vaccine at 6 and 10 weeks respectively. On demographic factors, we found that maternal age and education were associated with the completeness of the rotavirus vaccine. Children of mothers who were above 25 years and those with primary level education were more likely to complete the rotavirus vaccination. Maternal knowledge of rotavirus and perceived benefits of the vaccination were also associated with the completeness of the rotavirus vaccine. We found that the mothers' knowledge of disease and vaccine was positively correlated with the age of the mother meaning older women were more likely to have knowledge and experiences of vaccination benefits and schedules compared to younger women hence are more likely to vaccinate their children. The mother's perception of rotavirus disease or vaccine did not have any effect on completeness of rotavirus vaccine. Furthermore, access to the health facility (distance) and availability including cost of the vaccine were not barriers to the completeness of the rotavirus vaccine.

The high intake of the rotavirus vaccine of about 90%, after its introduction, was higher than that of another study conducted in South Africa which reported an uptake of rotavirus vaccine of 67% [3]. The low rate of uptake in the South African study was explained by the fact that the vaccine was new and there were logistical challenges of introducing a new vaccine such as distance to the health facility (accessibility) fear of side effects and affordability. These factors were not barriers in our study. We established that mothers aged over 25 years were more likely to complete the vaccination. The results were consistent with those of other studies from Africa which found that children born to younger mothers (less than 25 years) were less likely to complete the rotavirus vaccine, [8,9]. Mother's education was also associated with rotavirus completeness of the rotavirus vaccine. These results are consistent with those of other studies conducted in developing countries which indicated that education level of the mother was related to vaccination status of their children. Studies done in Ethiopia and Nigeria concluded that children born to mothers with secondary school education or higher were more likely to receive rotavirus vaccination compared to those whose mothers had no education, [6, 9-12].-

Our study indicated a poor perception of the threats of the disease but a good perception of the vaccine. These results are consistent with the results done in Nigeria [13] which showed that only third of the mothers considered the rotavirus disease severe disease.

Strengths of the Study

Studies conducted in Africa so far on rotavirus were descriptive while other studies which showed relationships were on immunization uptake in general and not specific to rotavirus. To best of our knowledge so far, this is the first study conducted on completeness of the rotavirus vaccine and factors related to it in Kenya, thus a significant contribution to the rotavirus Vaccine knowledge base for future research. Our study is amongst the first to establish factors related to completeness of the rotavirus vaccine in Africa. Our study further used Health Belief Model (HBM) which attempts to explain and predict health behaviours.

Limitations of the Study

The study was conducted in a health facility and on a study population that had easy access to a health facility. Thus, the completeness of the rotavirus vaccine might have been overestimated, and hence results cannot be generalized to the general population. Similar studies are needed at the household level and in a rural community. The study used a quantitative method and thus limited mother's answers to choices available and did not explore the 'whys' of the behaviour. The study also focused on only the mother's behaviour and did not look at the health facility factors which could have been related to the uptake of the vaccine.

Conclusions

Mothers had a good perception of the benefits vaccine, but poor perception of the threats of rotavirus disease. Our results suggest that perception of threats, benefits of vaccine and barriers to access of vaccination did not have any effect on completeness of rotavirus vaccine. Mothers were receptive to the rotavirus vaccine (Rotarix) despite being a new vaccine in public facilities. Thus, completion of the of rotavirus vaccine was high. However, this could be explained by the fact that the first and second dose of rotavirus vaccine is given together with Oral polio, DPT-Hep-Hib, and pneumococcal vaccines which are given routinely in Kenya's immunization schedule and thus the mothers did not have

much choice. These results demonstrate a successful integration of rotavirus vaccine into the existing EPI schedule in Kenya, an indication of an efficient immunization programme. Despite this good performance defaulter tracing mechanism is required to trace the few children who did not complete the vaccinations Children of older mothers, mothers who had gone past primary school, and mothers who were more knowledgeable of the rotavirus disease and benefits of vaccination were more likely to complete the immunization. Specifically, our results suggest that perception did not have any effect on completeness of rotavirus vaccine, and education of the mother best explained the completeness of rotavirus vaccination.

References

1. Tate JE, Burton AH, Boschi-Pinto C, Steele AD, Duque J, et al. (2012) Estimate of worldwide rotavirus-associated mortality in children younger than five years. Lancet Infectious Diseases 12: 136-141.
2. Liu L, Johnson HL, Cousens S, et al. (2012) Global, regional, and national causes of child mortality: Lancet 379: 2151-2161.
3. Seheri LM, Page NA, Mawela MP, Mphahlele MJ, Steele AD (2012) Rotavirus vaccination within the South African Expanded Programme on Immunisation. Vaccine 30: C14-20.
4. World Health Organization, UNICEF. Ending Preventable Child Deaths from Pneumonia and Diarrhoea by 2025: The integrated Global Action Plan for Pneumonia and Diarrhoea (GAPPD) 2013.
5. Jiang V, Jiang B, Tate J, Parashar UD, Patel MM (2010) Performance of rotavirus vaccines in developed and developing countries: Human Vaccines 6: 532-542.
6. Etana B and Deressa W (2012) Factors associated with complete immunization coverage in children aged 12-23 months in Ambo Woreda, Central Ethiopia. BMC Public Health 12: 566.
7. Nnenna TB, Davidson UN, Babatunde OI (2013) others' knowledge and perception of adverse events following immunization. In Enugu, South - East, Nigeria. J Vaccines Vaccin 4: 20-22.
8. Salmon DA, Smith PJ, Pan WK, Navar AM, Omer SB, et al. (2009) Disparities in preschool immunization coverage associated with maternal age. Hum Vaccin 5: 557-561.
9. Etana B and Deressa W (2012) Factors associated with complete immunization coverage in children aged 12-23 months in Ambo Woreda, Central Ethiopia. BMC Public Health 12: 566.
10. Kusuma YS, Kumari R, Pandav CS, Gupta SK (2010) Migration and immunization: determinants of childhood immunization uptake among socioeconomically 72 disadvantaged migrants in Delhi, India. Trop Med Int Health 15: 1326-1332.
11. Brown VB and Oluwatosin OA (2012) Socio-demographic factors associated with childhood immunization uptake in Akinyele Local Government Area, Oyo State, Nigeria. Afr J Med Sci 41: 161-167.
12. Wiysonge CS, Uthman OA, Ndumbe PM, Hussey GD (2012) Individual and contextual factors associated with low childhood immunization coverage in sub-Saharan Africa: A multilevel; analysis PLoS ONE 7: e37905.
13. Mugenda A and Mugenda O (2003) Research methods, quantitative and qualitative Approaches. ACTS Press; Nairobi, Kenya 2003.