## Original Research Article

# Factors influencing incomplete immunization among under five years old children at CHUK hospital, Nyarugenge district, Rwanda

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### ABSTRACT

**Background:** Low-income countries still have challenges with vaccine-preventable diseases, despite improvement in immunization coverage in Rwanda, cases of drop out and incomplete immunization persists.
**Methods:** The study adopted descriptive cross-sectional approach with the use of quantitative and qualitative techniques on a population of 186 guardians/mothers with their under five children. Convenience sampling techniques was used to draw study sample size of 127 that attends the clinic and approval to participate in the study. Data was obtained from validated study instruments and immunization records over a period of one month.
**Results:** Study results showed that religion (p=0.01), gender (p=0.03), age (p=0.009) and educational status (p=0.04) influenced incomplete immunizations. About 78 (61.4%) respondents are unaware that vaccines prevents specific diseases, while 61 (48.0%) were too busy with other duty at the time of immunizations and 89 (70.1%) Participants do not see the need to complete the immunization. Furthermore, the age of the mother Knowledge of child immunization and hospital delivery were statistically significant with (p<0.05). Immunization cards and histories verified showed about 120 (94.4%) children were fully immunized, 46(24.5 %) were partially immunized and 67 (52.8%) children immunized before age one.
**Conclusions:** A number of children were not fully immunized in their first year of life; others were inappropriately vaccinated. Emphasis made on completion of immunization schedule.

**Keywords:** Influencing Factors, Incomplete immunization, Under five years old children, CHUK hospital, Nyarugenge district, Rwanda

## INTRODUCTION

Every year more than 10 million children in low- and middle-income countries die before they reach their fifth birthdays.[1] Many preventable diseases like measles and polio especially in developing countries such as Rwanda are scaling up approach to eliminate the existence of vaccine preventable diseases and part of effort to achieve Sustainable development goals (SDGs) on universal access to health care and reduction in child mortality. The

expanded programme on immunization (EPI) established in 1974 against six vaccine preventable diseases including diphtheria, polio, tuberculosis, measles, pertussis and tetanus.[2,3]

One major way to reduce child morbidity and mortality from common vaccine preventable diseases (VPDs) is immunization. Routine immunization is intended to reach all infants upto 11 months of age with nine available vaccines to protect them from the following VPDs; tuberculosis, poliomyelitis, diphtheria, neonatal tetanus,

pertussis, hepatitis B, haemophilus influenzae type b, measles, streptococcus pneumonia and rotavirus infections VPDs have caused more than 20 per cent of death for children under five worldwide.[4] As per the Rwandan immunization schedule it's recommended that a child receive basic immunizations within the first 12 months.

In most of these countries poor functioning health service delivery system impedes the efforts to meet immunization targets, especially for children living in hard to reach zones and displaced population.[5,6] Most die because they do not access effective interventions that would combat common and preventable childhood illnesses. Infant immunization is considered essential lifesaving and cost effective medical intervention which reduces childhood morbidity and mortality from diseases.[7]

In Nigeria a study by showed that the perception, political will, infrastructures, beliefs and practices affects utilization of immunization services.[8] In Uganda most children (84%) received one dose of immunization and only 37% received all the five doses, while report showed that about 63% of mothers are not aware when their children need their next immunization doses in order to complete the immunization schedule.[9] Furthermore, in Kenya study showed that apart from the level of education and age, respondents' socioeconomic and cultural factors were not significantly associated with vaccine uptake.[1]

Rwanda national under five mortality rate stands at 52 per 1000 live births, sub-Saharan Africa accounts for two thirds of global deaths and the progress has been slowed down due to lack of preventive care and treatment, weak health system and socio-economic stagnation due to political instability, conflicts and HIV/AIDS. Rwandan EPI started to report high number of children who failed to receive 3rd dose of penta valent vaccine. The number of unimmunized children which declined from 2002 to 2006, started to increase again from 2007 to 2010. Unimmunized children with penta 3, Rwanda, 2010 was 74261. EPI data base, 2009. All districts are well performing in respect to this indicator (100% of them with dropout rate less than 10%).

According to RDHS 2014-2015 the trends in vaccination coverage shows that the fully vaccinated children increased from 84% and stabilized at 87%, In addition the existing literature does not clearly explain why despite the favourable conditions for utilization of immunization services among children below five years regimen and completion rate is still high, no study that has been done to establish why other children are still not fully immunized.

This study seeks to identify specific factors associated with incomplete immunization coverage in order to advance improved intervention, policies/strategies therefore raising overall immunization coverage. The

result of this study will also help to inform the government to consider the important contributing factors for incomplete vaccination while planning to improve vaccination program in order to benefit children who are under five years old and reduce the mortality rate.

### *Main objective*

To determine the factors influencing incomplete immunization among children under five years seeking healthcare services in CHUK hospital in Nyarugenge district.

### *Specific objectives*

To determine the factors associated with incomplete immunization among (0-5 years) children, to identify the rate of complete immunization coverage among the (0-5 years) children and to determine the barriers to complete childhood immunization.

### *Research questions*

What are the factors associated with incomplete immunization? What is the rate of immunization coverage among children under five years? What are the barriers to complete childhood immunization?

### *Conceptual review*

Immunization is given to protect an individual from disease through the introduction of alive, killed or partial component of the invading organism into the individual's system, though other diseases were also added to the EPI program.[10,2] An immunized person is protected against that disease by means of antibodies circulating in his/her blood or presents in the cells of the tissues of his/her body. It is considered important for improving child survival.[4] In a cross sectional study by on missed opportunities and immunization coverage of 418 children under two years in the slum areas of Nairobi Kenya, it was found that to missed opportunities arising from shortage of Polio vaccine that was reported in the period proceeding to and during the survey (Figure 1).[10]

Among the factors influencing complete child Immunization in Bangladesh were the knowledge, attitude and practice of parents of fewer than five children.[11] In Uganda study by the study revealed that a child born in a health unit was more likely to be up to-date with their vaccination compared to a child born at home who are more prone to incomplete or non-vaccination.[9]

In Kenya, a cluster survey with sample size of 204 children aged 9-23 months was carried out by the study revealed that immunization coverage declined with increasing distance from the vaccination clinics and there was strong associated with annual patterns of rainfall.[10]

Determinants of childhood vaccination uptake still remain complex, and are dependent on various socioeconomic, demographic factors and also supply and demand factors, including maternal education.[11,12,13] There was an obvious significance in children's vaccination pattern with mother's education level in Ghana, just same as the study by in Jamaica and Ethiopia a case control study by that found that a child's birth orders, mother's age, knowledge about immunization benefits and perception of vaccine side effects, were determinant factors of incomplete child immunization.[14,15,16] Antenatal care service, cultural practices, beliefs, fear of side effects, illiteracy, lack of money and being too busy were the other maternal factors.[17,18]

## METHODS

This study was undertaken in CHUK referral hospital a referral district hospital located in Kigali, Rwanda. Kigali has a land coverage area of 281.9 m² with an estimated population of one million people. The city of Kigali is divided into three districts. It is presently inhabited by approximately one million inhabitants. CHUK hospital is located in the center of Kigali city in the district of Nyarugenge. It is the main public health institution in the country and a referral hospital; it has 576 numbers of staff. The hospital specialized in internal medicine, surgery, pediatrics gynaecology and obsteric, ENT, dermatology, ophthalmology and others. The study was conducted within the period from February 2016 to May 2017.

This study adopted a cross sectional study with both quantitative and slight qualitative approach. In this type of research study, either the entire population or a subset thereof is selected, and from these individuals, data are collected to help answer research questions of interest. Cross-sectional design gathers information about X and Y that represents what is going on at only one point in time.[19]

The target population in the study was children under five years old in company of their mothers/guardian and attending paediatrics department services in CHUK hospital. According to hospital management, an average of 207 children visits the hospital for paediatric services between Januarys to august. In this regard, the study target population of 186 children under five years old in company of their mothers/guardian and attending paediatrics department services in CHUK hospital (Table 1).

The sample size was determined using Slovin's formula.

$$n = N/1 + N(e)2$$

Where n is the sample size, N is the population size i.e. 186, e is the desired level of precision (0.05) and

$$n = \frac{186}{1+200(0.05)2} = 127 \text{ respondents.}$$

**Table 1: Target population.**

| Month | No. pediatric patients |
|-------|------------------------|
| January | 26 |
| February | 23 |
| March | 21 |
| April | 22 |
| May | 19 |
| June | 28 |
| July | 20 |
| August | 27 |
| Total | 186 |

*Source Pediatrics registry CHUK 2017

Inclusion criteria are the characteristics that the respondents must have in order to be included in the study (Trochim, 2006), the respondents are expected to meet the following criteria; all children below 5 years in company of their mothers/guardian attending the paediatrics department at the CHUK hospital and who have agree to consent to participate in the study. Exclusion criteria are the characteristics that the respondents lack in order not to be included. All children above 5 years were excluded from the study and also those whose parents/guardian have refused to consent for the study.

Convenience sampling, collecting data from children aged 0-5 years together with their parent or guardians who were available at CHUK hospital till the target sample is attained. The questionnaire was developed in English, and was translated to Kinyarwanda and back translated to English and will be pre-tested in one of the blocks following which the post pre-tested questionnaire will be reviewed and validated.

In this study, scientific research methods were applied to design the data collection tool as well as the selection of the samples. Using critically assessed instruments, scientific sampling techniques will be followed to minimize information bias. The selection was target women or guardian accompanying children below 5 years to CHUK hospital. This is because it is such women/care takers that would give unbiased information about the immunization of their children who were supposed to have completed immunization schedules for DPT, Polio and Measles within a period of one year (12 months) after birth. Selecting respondents without children in this group (0-5 years) would lead to giving of incorrect data

Interviewer administered questionnaires was used. The questionnaire was developed according to the research question and the objectives of the study. Research Assistants were trained for a consecutive period of three days to interpret the questions in English and Kinyarwanda as well as the data collection procedures.

The thoroughly trained Research Assistants administered the questionnaire in approximately twenty minutes each. Child vaccination status was determined through inspection of the child's immunization card by the study interview. Information on demographic and socio-economic factors was obtained from self-identified and reporting by the mother and caretaker. The respondents were easily interviewed by four well trained Research Assistants. Given that the questionnaire is interviewer administered, to enhance the response rate and save time and money for emailing and collecting the questionnaires.

Data analysis is a systematic organization and synthesis of research data, a testing of the research hypothesis using the data. The data collected was analyzed using the Statistical Package for Social Sciences (SPSS). Frequency charts, proportions and tables was used in data presentation. Correlation analysis was used to determine the association between the dependent (utilization of essential immunization services by children under five) and independent variables (SECDs, predisposing factors enabling factors, need factors, characteristics and women's/guardian knowledge about completing immunization of children. A probit regression model by Heckmann was used for analysis

The protection of the rights of human subjects has become high priority among members of scientific and health care communities. The researcher sought approval of this research project proposal from the health sciences research & ethics committee of university teaching hospital Kigali. Before attempting to collect any data, consent was sought from respondents before collecting data. Informed consent for the respondents was done in writing that participation was voluntary and the purpose of the study and participation needed from the respondents were explained. Throughout the course of the study high level of ethical code in terms of confidentiality, anonymity of respondent and respect of persons were maintained.

## RESULTS

A total of 127 study respondents participated in the study and with the following background characteristics; the predominant age category of the study participants were those in the age cohort between 26 to 35 years, 60 (47.2%). Study participants were predominantly married 87 (68.5%). About 40 (31.5%) of the respondents had primary education and 57 (44.9%) had Secondary level education. Furthermore, about 75 (59%) respondents were Christians. Also, the study found out that 29 (22.8%) of the children whose parents were interviewed were first born. Findings with regards to family income showed that 42 (33.0%) had a monthly income of between 50,000 and 100,000Rwf. The size of the family can sometimes influence the parents on child immunization, it is this respect that the respondents were asked to state the number of children they have. The results showed that majority of the respondent 60 (46.2%)

were of the family size of 4-6 and 55 (42%) of family size of 1-3 respectively (Table 2).

**Table 1: Distribution of respondents with regards to personal characteristics (n=127).**

| Variable | Category | N (%) |
|---|---|---|
| Gender | Male | 57 (44.9) |
| | Female | 70 (55.1) |
| Grouped ages in years | <25 | 25 (19.6) |
| | 26-35 | 60 (47.2) |
| | 36-45 | 40 (27.2) |
| | >45 | 2 (1.6) |
| Marital status | Married | 87(68.5) |
| | Single | 18 (14.2) |
| | Divorced | 10 (7.9) |
| | Widow | 12 (9.4) |
| Level of education | Bachelor degree | 18 (14.2) |
| | Secondary level | 57 (44.9) |
| | Primary level | 40 (31.5) |
| | Illiterate | 12 (9.4) |
| Religion status | Christian | 75 (59.0) |
| | Muslim | 42 (33.0) |
| | Others | 10 (8.0) |
| Household size | 1 -3 | 55 (42.3) |
| | 4 -6 | 60 (46.2) |
| | 7 -9 | 15 (11.5) |
| Order of birth | First | 29 (22.8) |
| | Second | 22 (17.3) |
| | Third | 28 (22.0) |
| | Fourth | 18 (14.1) |
| | Fifth | 18 (14.1) |
| | Over 5 | 12 (9.4) |
| Monthly income | <50,000 RWF | 15 (11.8) |
| | 50,000-100,000 RWF | 42 (33.0) |
| | 101,000-200,000 RWF | 40 (31.4) |
| | >200,000 RWF | 30 (23.6) |

Result on knowledge of immunization among children less than five years immunization coverage rate assessed by respondents' identification. About 78 (55.3%) responses showed that OPV 2 drops applied in the mouth at 10 weeks of age to prevent polio. Also 89 (63.1%) responded that OPV 3 drops applied in the mouth at 14 weeks of age to prevent polio and 78 (55.3%) responded that rotavirus 2 given as drops in the mouth at 10 weeks of age (Table 3).

The study participants' response on factor that influence incomplete immunizations showed that about 45 (35.4%) are not aware that vaccines prevents specific diseases, about 78 (61.4%) responses showed that they were too busy with other duty at the time of immunizations. About 61 (48.0%) of respondents are not aware of the need to complete the immunization schedule while about 89 (70.1%) had fear of the side effects. Also about 66 (52.0)

of the respondents response showed that the reason for incomplete immunization are due to vaccine not available and forgetting the date of the appointment 89 (70.1%) (Table 4).

**Table. 2. The distribution of respondents knowledge of Vaccination received by children under five years in CHUCK, Rwanda during study period. (n=127).**

| Vaccines | N (%) |
|---|---|
| BCG vaccination against TB, an injection on the left forearm that usually causes a scar. | 45 (31.9) |
| OPV 1 drops applied in the mouth at 6 weeks of birth to prevent polio. | 66 (46.8) |
| OPV 2 drops applied in the mouth at 10 weeks of age to prevent polio | 78 (55.3) |
| OPV 3 drops applied in the mouth at 14 weeks of age to prevent polio. | 89 (63.1) |
| DPT1 injection usually given in the right thigh at 6 weeks of age. | 25 (17.7) |
| DPT 2 an injection usually given in the right thigh at 10 weeks of age. | 33 (23.4) |
| DPT 3 an injection usually given in the right thigh at 14 weeks of age. | 45 (31.9) |
| Rotavirus 1 given as drops in the mouth at 6 weeks from birth. | 55 (39.0) |
| Rotavirus 2 given as drops in the mouth at 10 weeks of age | 78 (55.3) |
| Rotavirus 3 given as drops in the mouth at 14 weeks of age | 45 (31.9) |
| Measles an injection usually given on the left upper arm at 9 months of age | 85 (60.2) |

Further study findings showed that respondents views on factors influencing incomplete immunization among children under five years for children who have ever received vaccination to include religion (p=0.01) and gender (p=0.03). Furthermore, other factors influencing incomplete immunization among children under five years for children who have ever received vaccination from the study based on participants responses showed that age of the participants (p=0.009) and educational level of the study participants (p=0.04) (Table 5 and 6).

The multiple regressions was estimated using probit regression model to show the independent variables including Age of the mother, Education levels, marital status, Literacy levels, Household size, Hospital delivery and Birth order that influenced respondent that have ever received immunization. The regression was done at 95% confidence level and the results showed that three main variables with (p<0.05), age of the mother, knowledge of child immunization and hospital delivery (Table 7).

The gender of immunized children in the study showed that about 67 (52.8%) were male, while 60 (47.2%) were female. The statistics of the children with immunization card showed that about 120 (94.4%) had immunization card while 7 (5.6%) have no card (Table 8).

**Table 3: Distribution of respondents views on factors influencing incomplete immunization among children under five years for children who have ever received vaccination.**

| Factors influencing incomplete immunization | | |
|---|---|---|
| | Yes (%) | No (%) |
| Vaccine prevent the specific diseases | 82 (64.6) | 45 (35.4) |
| Mothers not aware about the need to complete immunization schedule | 66 (52.0) | 61 (48.0) |
| Too busy with other duty at the time of immunization | 78 (61.4) | 47 (38.6) |
| Forgetting the appointment | 89 (70.1) | 38 (29.9) |
| The knowledge on immunization activities enhances the completion of immunization. | 95 (77.1) | 32 (22.9) |
| Vaccine not available | 66 (52.0) | 61 (48.0) |
| Fear of the side effects | 89 (70.1) | 38 (29.9) |

**Table 4: Distribution of respondents views on factors influencing complete immunization among children under five years for children who have ever received vaccination.**

| Complete immunization coverage among children aged below five years. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Study variables | | Strongly agree | Agree | Not sure | Disagree | Strongly disagree | Chi-square | df | P value | Inter-pretation |
| Gender | Male | 10 | 6 | 1 | 7 | 1 | 9.650* | 2 | 0.03 | Significant |
| | Female | 35 | 7 | 7 | 6 | 0 | | | | |
| Religion | Christian | 20 | 35 | 15 | 5 | 5 | 11.314* | 4 | 0.01 | Significant |
| | Muslim | 15 | 12 | 11 | 1 | 1 | | | | |
| | Others | 5 | 3 | 2 | 0 | 0 | | | | |

*5 cells (50.0%) have expected count less than 5. The minimum expected count is 0.31.

**Table 5: Distribution of the relationship between incomplete immunization coverage among children aged below five years and other variables at level of 0.05 significant difference of p value.**

| Influencing variables | | In complete immunization coverage among children aged below five years N (%) | | P value | Interpretation |
|---|---|---|---|---|---|
| **Age in years** | 26-35 | 55 | 5 | 0.009 | Significant |
| | 36-45 | 28 | 12 | | |
| | >45 | 0 | 5 | | |
| **Education level** | Not educated | 28 (19.9) | 2 (4.3) | 0.04 | Significant |
| | Primary level | 35 (24.8) | 4 (8.7) | | |
| | Secondary level | 75 (53.2) | 27 (58.7) | | |
| | Bachelor degree | 2 (1.4) | 13 (28.3) | | |
| **Monthly income** | <50,000 RWF | 2 (1.4) | 13 (28.3) | 0.2374 | Not significant |
| | 50,000-100,000 RWF | 75 (53.2) | 27 (58.7) | | |
| | 101,000-200,000 RWF | 35 (24.8) | 4 (8.7) | | |
| | > 200,000 RWF | 28 (19.9) | 2 (4.3) | | |

**Table 6: Multiple regression results for variables influencing children who have ever received vaccination (n=127).**

| Variables | Coefficients | Std. err. | Z | p>z |
|---|---|---|---|---|
| Age of the mother | 0.0244554 | 0.0097349 | 2.51 | 0.012 |
| **Education levels of the mother** | 0.0043201 | 0.0764338 | 0.06 | 0.955 |
| **Marital status** | 0.0422274 | 0.0682121 | 0.62 | 0.536 |
| **Knowledge of child immunization** | 0.3535173 | 0.1201865 | 2.94 | 0.003 |
| **House hold size** | 0.026588 | 0.0186464 | 1.43 | 0.154 |
| **Hospital delivery** | 0.3969529 | 0.0932731 | 4.26 | 0.000 |
| **Birth Order** | -0.0717265 | 0.028731 | -2.50 | 0.013 |
| **Constant** | -0.0251874 | 0.234446 | -0.11 | 0.914 |
| Multiple regression number of observation=187, Wald chi2(8)=90.42, Prob >chi2 =0.0000, Pseudo R2 = 0.0628. | | | | |

**Table 7: The distribution of children by sex and presence of immunization card.**

| Variables | | N (%) |
|---|---|---|
| **Gender** | Male | 67 (52.8) |
| | Female | 60 (47.2) |
| **Immunization card** | | |
| Present | | 120 (94.4) |
| Absent | | 7 (5.6) |

Findings on the general immunization status of the study participants based on the reflection on the Immunization cards and histories verified showed that about 120 (94.4%) of the children were observed to be fully immunized according to immunization cards and mothers/guardian histories while 46 (24.5%) were partially immunized and Some 67 (52.8%) of the children were immunized before the age of one year. Furthermore, barriers to complete childhood immunization were that. Immunization time passed was cited by 12 (26.1%) of the respondents; while about 6 (13%) were unaware of the need for immunization, 5 (10.9%) were unaware of the need to return for 2nd, 3rd dose and 6 (13%) did not know the place/time of immunization (Table 9).

**Table 8: Immunization coverage and reasons for not immunizing child (n=127).**

| Variables | N (%) |
|---|---|
| **Immunization status** | |
| Not Immunized | 1 (0.79) |
| Partially Immunized | 6 (4.72) |
| Fully Immunized | 120 (94.5) |
| Fully immunized before 1 year | 67 (52.76) |
| Fully immunized after 1 year | 60 (47.24) |
| **Reasons for not immunizing the child** | |
| Immunization time passed | 12 (26.1) |
| Unaware of the need for immunization | 1 (13) |
| Not knowing the place/time of immunization | 6 (13) |
| Unaware of the need for 2nd & 3rd dose | 5 (10.9) |
| Mother & child sick | 5 (10.9) |
| Fear of side effect or reaction | 3 (6.5) |
| No apparent reason | 3 (6.5) |
| Immunization time passed & staff was rude | 3 (6.5) |
| Others | 3 (6.5) |

Major reasons given concerning hindrances encountered from taking their children for immunization were: inconvenient time of immunization 10 (20.9%), vaccine not available 8 (16.7%), child ill and when taken to the clinic was not. immunized 7 (14.6%) and mother too busy 6 (12.5%). Other reasons given were reported in the table below. Among the reasons that motivates study respondents with children who had received some or all the immunizations, about 43 (26.4%) said that they benefited from the integrated health services; and had desire to raise a healthy child. The benefit of child card at hospital, school, birth certificate 10 (6.1%) and lastly, prior knowledge of immunization schedules 29 (17.8%) (Table 10).

**Table10: Factors that hinder immunization (n=127).**

| Factors that hinder immunization | N(%) |
|---|---|
| Inconvenient time of immunization | 10 (20.9) |
| Lack of vaccines | 8 (16.7) |
| Refusal by health worker because the child is sick | 7 (14.6) |
| The mother/guardian is too busy with other activities | 6 (12.5) |
| Family problem e.g. mother ill | 5 (10.4) |
| Child is sick and not taken for immunization | 3 (6.3) |
| Distance of immunization centre (far) | 2 (4.2) |
| No health worker at duty station (Vaccinator) | 2 (4.2) |
| Waiting time too long | 2 (4.2) |
| Health worker refusing to give immunization because the mother/guardian lost the Immunization card | 1 (2.1) |
| Health workers are rude | 1 (2.1) |
| Forget the return date | 1 (2.1) |
| Vaccinator absent & vaccine not available | 1 (2.1) |
| Reasons that motivate respondents to immunize children | |
| Benefit of integrated health services | 43 (26.4) |
| Desire to raise a healthy child | 43 (26.4) |
| Prior knowledge of immunization schedules | 29 (17.8) |
| Benefit of child card at hospital, school, birth certificate | 10 (6.1) |
| Clear understanding of immunization | 6 (3.7) |
| Availability of experts at the health facility | 3 (1.8) |
| Distance to health facility | 1 (0.6) |
| Others | 28 (17.2) |

**DISCUSSION**

The result of this study have shown that the child's mother's age, level of education and marital status along with the child's place of residence, child's place of delivery, child's birth order and gender were statistically significant on regression analysis and are associated with incomplete child immunization. In addition to these are antenatal visit, household size and child's household wealth index of the household. The finding with regards to child's mother's age is in line with study conducted in Ethiopia, where age of the mother appear to have a positive influence on acceptance of full immunization of children.[20] Other study findings that are similar are the study by which showed that mother's education (secondary and above), place of delivery, antenatal visits and age of the household head had a positive and significant effect on the probability of child achieving full immunization status.[21,17]

The study further showed that respondents religion (p=0.01) and gender (p=0.03) influenced incomplete immunization among the under five years children. This finding is in line with findings in the study by that showed that some religious bodies discourage their members from accepting immunization, especially among those who experienced adverse effects.[22-24]

The study findings further indicate that the age of the mother, literacy levels and place of delivery were positively related to the utilization of immunization services in Rwanda while birth order was found to be negatively related to child immunization. This findings are in line with that found education level of the respondents (p=0.0402) and awareness about the government immunization program (p=0.001) was significantly associated with delayed completion of immunization regime among children.[25]

The size of household was among the determinant of child receiving full immunization.[17,26] This finding agrees with which showed that large family size is associated with poor household up keep resources, hence children are not availed of the necessary health care services including access to immunization services. The study findings on the rate of immunization coverage among children less than five years obtained from the review of Immunization cards and guardian histories showed that majority of the children were fully immunized. Average number of the children in the study was immunized before the age one.

Finally, with regards to the barriers to complete childhood immunization, majority of the response were that Immunization time passed, they were unaware of the need for immunization, unaware of the need to return for 2nd and 3rd dose; and did not know the place/time of immunization. Major reasons given concerning hindrances encountered from taking their children for immunization were, inconvenient time of immunization, vaccine not available, and child have adverse effect when immunized.[17,25,27]

## CONCLUSION

Study showed that household size had a negative and significant effect on the probability of a child being fully immunized. Marital status of the mother, place of delivery, antenatal visits and literacy level of the mother had a positive effect on the level of immunization coverage. Also occupation and source of income have slight influence on immunization completion. The study reveals high levels of missed opportunities in the administration of routine childhood vaccinations. A substantial number of children were not fully immunized by the end of their first year of life; even when they are fully immunized, a sizeable number received their vaccines inappropriately, either early, delayed or in a different sequence from the recommended schedule. Further result of study on factor that influences incomplete immunizations includes respondent religion, gender, and age of the participant and educational level of the study participants. Other factors are not being aware that vaccines prevent specific diseases, too busy with other duty at the time of immunizations and unaware of the need to complete the immunization schedule. Generally, three main variables influence incomplete immunization from the study respondent age of the mother, Knowledge of child immunization and hospital delivery. The general immunization status as reflected on the Immunization cards and histories verified reveal good status.

### Recommendations

This study contributes to the documentation of patterns of routine immunization uptake in urban settlements in Kigali and similar settings. Based on the study findings, there is a need to create more awareness on the essence of both young and old mothers who have children who have not been immunized to go for immunization. Through the relevant ministry (ministry of health) the researcher recommends widening the campaign on family planning through educating women who are at the reproductive age the importance of having the manageable number of children who can get enough support.

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