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Factors Influencing Immunization in Children Attending Kampala International University Teaching Hospital, Bushenyi District, Western Uganda

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ABSTRACT

The study aimed to identify factors affecting immunization in children under one year of age at Kampala International University Teaching Hospital in Bushenyi District, Western Uganda. 418 child-caregiver pairs were recruited, and data was collected, coded, and entered into Epi info version 7. A structured interviewer-administered questionnaire was used for analysis. Factors associated with immunization coverage were determined through bivariate and multivariate logistic regression analyses. The majority of caretakers were female (100%), with the majority of children aged 4-6 months. The majority of caretakers were between the ages of 21 and 29, had at least a secondary education, were married, housewives, and had more than two children. 69.8% of children had been fully vaccinated for the recommended time, while 14.1% and 16.1% had not been vaccinated at all. Factors affecting immunization completion included secondary education or higher, attending postnatal care sessions, delivery from a designated health facility, and good vaccination knowledge of the caregiver. 69.8% of children aged one year and below are fully vaccinated for the recommended time.
Keywords: Immunization of children, Health facility, Child deaths, Caregivers, Postnatal care.

INTRODUCTION

According to the World Health Organization (WHO), "Immunization" was defined as a practice whereby a person is made immune or resilient to an infectious disease, usually by the administration of a vaccine [1]. WHO initiated and launched the Expanded Programme on Immunization (EPI) in 1974 which was afterwards adopted by all countries in the 1980s to ensure maximum protection of children [2]. Globally, it is estimated that more than 50% of mortality in pre-school-aged children is due to diseases that are preventable and treatable through simple and affordable interventions such as a vaccine [3],[4]. In 2016, the World Health Organization (WHO) estimated that 5.6 million children under five years old died, translating into 15,000 deaths every day [3]. In 2014, about 18.7 million children did not receive the 3rd dose of the Diphtheria-Pertussis-Tetanus (DPT3) vaccine and 70% of them were living in ten developing countries of which Uganda is inclusive [5]. In Africa, the biggest number of children remain unvaccinated and under-vaccinated despite the fact that there has been remarkable progress in the provision and support of immunization services [6]. Full childhood immunization coverage varies widely from only 11% of children of ages 12 to 23 Months in Chad to 78% in Zambia in Sub-Saharan Africa [7]. According to [8], vaccine coverage rates remain well below the WHO goal of 90%, with 82% of the children receiving the measles vaccine and 78% completing the three-dose series of pentava- lent vaccine in the Sub-Saharan African Countries. In East Africa, complete basic childhood vaccination status is low according to the WHO vaccination schedule [9]. Childhood full basic vaccination coverage among children

aged 12–23 months in East Africa is 69.21% (95% CI: 69.20, 69.21%), and this varies significantly across countries [10]. This variation may be because of inequalities in access to immunization programs and the views of populations about the value of childhood immunization. Kenya with a population of 45 million has 15% (5,939,306 people) below the age of five and reports an overall basic vaccination of 77% of children aged 12-23 months [11]. The Uganda Demographic Health Survey report showed that, 96% of children received the BCG vaccination, 95 % the first dose of DPT-HepB-Hib, 95% the first dose of polio, and 87 % the first dose of the pneumococcal vaccine. 80% of children received a measles vaccination. Unfortunately, there was a decline in the immunization coverage for subsequent doses, with 79 % of children receiving the recommended three doses of DPT-HepB-Hib, 66 % the three doses of polio, and 64 % the three doses of the pneumococcal vaccine [12]. Routine immunization coverage for Polio, DPT and Measles in Bushenyi district for children of 12 to 18 Months averages 53.3% The district coverage for Bushenyi-Ishaka, Igara East and Igara West being 69.3%, 67.7% and 69.5% respectively for the year 2014 (MOHDR, 2015/16; BDHDR, 2015/16). These coverage rates are all below the target score of 80% as per UNEPI Standards and hypothetically attributed to many factors including lack of awareness about repeat visits to achieve complete immunization among parents, high levels of illiteracy and low socio-economic status (poverty level) of residents. It is on this background that the proposed study seeks to determine the status of incomplete immunization and seeks to investigate factors affecting immunization of children under 1 year of age attending KIU Teaching Hospital in Ishaka, Bushenyi district.

Children in developing countries like Uganda do not receive the full series of basic immunization [13]. According to Nyakato, only 36% of Ugandan one-year-olds are fully immunized [14] and thus there is a problem of incomplete routine immunization of children aged 0–1 year old. Children who have not been fully immunized are also at greater risk of becoming infected with serious vaccine-preventable diseases [15]. Vaccine Preventable Diseases (VPDs) account for about a quarter of the 8 million deaths occurring annually among children under five years of age especially in low-income countries such as Uganda [16]. Although various studies have investigated factors responsible for incomplete routine immunization in Uganda, most of the studies have been extensively conducted in all other parts of Uganda like in Central, Eastern, Eastern, and North-Eastern parts of Uganda with limited studies done in the Bushenyi district. As such, there is limited literature, which is made worst by the existence of old literature and limited current statistics on factors influencing incomplete immunization of children in Ishaka-Bushenyi. The current study will therefore be carried out to ascertain the factors responsible for immunization incompletion of children aged 0–1year old attending KIU teaching hospital, in order to fill the information gap.

METHODOLOGY

Study Design

The study used a cross-sectional design approach. Data for the study was collected once in time without any intervention or follow-up. Quantitative data collections methods were used to enable the researcher to collect numerical data and perform quantitative analysis using statistical procedures. Closed form questionnaires were used to generate responses and data for analysis of the factors affecting immunization coverage among children age one year and under attending KIUTH.

Area of Study

This study was conducted at Kampala International University Teaching Hospital in Ishaka-Bushenyi, Western Uganda amongst child – care giver pairs attending the immunization clinic. The hospital operates an out and in patient pediatrics unit that attends to child health services. The KIUTH pediatrics unit works

7 days in a week providing a range of services to children and neonates

Study Population

The study population was parents/ caregivers of children one year and under attending the in and out patient pediatrics units of KIUTH.

Inclusion criteria

- All caregivers/mothers of children between 0-1 years of age who had brought their children to receive care from KIU teaching hospital.
- Caregivers who consented to participate in the study.
- Caregivers who were living with the child since birth because they were able to give enough information about the child.
- Caregivers who were above 18 years of age.

Exclusion criteria

i. Caregivers who had not been living with the child since birth because they could not give enough information about the child.
ii. Caregivers below 18 years.
iii. Caregivers who seemed not mentally stable.

Sample Size Determination

The sample size was determined using the Kish and Leslie sample size formula given below, (Kish, and Leslie, 1965).

$$N = \frac{Z^2PQ}{D2}$$

Where:

N = The required sample size

Z = The confidence level at 95% (standard value of 1.96).

D = Precision given as +/-0.05 (Margin of error).

P= Proportion of children that received all basic vaccinations is 55.8% (Uganda Bureau of Statistics, 2016).

Q = (1-P).

$$N = \frac{1.96 \times 1.96 \times 0.558 \times 0.442}{0.052}$$

N= 379 Respondents

Considering a 10% non-response rate, a total of 418 children – caregiver pairs were recruited in the study.

Sampling technique

Convenient sampling was used to obtain the sample for the study. All subjects who met the inclusion criteria at the pediatrics unit and consented to take part in the study were recruited until the desired sample size was attained.

Study procedure

The purpose of the study was explained to the study participants after which they were given opportunities to ask questions which were answered accordingly. Written consent was sought from the study participants. Those who consented to take part in the study were then recruited to participate in the study and were given to complete the study questionnaires. During data collection, face-to-face-interviews were used to collect data from the caretakers of children under 1 year of age.

Data collection tools

The data was gathered using a structured interviewer-administered questionnaire that has four sections: (1) socio-demographic characteristics, (2) immunization coverage, and (3) parent / caretaker factors. The questionnaires contained closed-ended items for ticking yes or no and selecting from a variety of possible alternatives and fill-in items. The completed questionnaires were collected by the principal investigator from each research assistant after they had been administered in order to ensure their completeness.

Data Processing and analysis

Questionnaire tools were checked for accuracy and data completeness before being coded and entered into Epi info version 7, which was then exported to SPSS version 22.0 for analysis. To summarize the variables, descriptive statistics were used. The frequencies and percentages of the variables were summarized using figures and tables. To determine factors associated with immunization coverage, bivariate and multivariate logistic regression analyses were performed. To control for confounding, variables with a p - value of 0.2 in a bivariate analysis were included in a multivariate logistic regression model. To determine the strength of the association, the adjusted odds ratio (AOR) with corresponding 95% confidence interval (CI) was computed, and a p-value of 0.05 was considered statistically significant. The Hosmer and

Lemeshow test was used to determine the goodness-of-fit of the final logistic regression model, yielding a p-value of 0.35.

Quality control

The questionnaire was pretested amongst selected willing participants at KIUTH however these were not included in the final sample. The collected data was checked for completeness and consistency of information collected immediately after the questionnaire was completed.

Ethical considerations

Ethical approval was obtained from the Faculty of Clinical Medicine and Dentistry at Kampala International University's Western Campus, and an introduction letter was written to seek permission for data collection from KIUTH management. Before being recruited for the study, respondents were asked to provide both written and verbal consent.

RESULTS

Socio-demographic characteristics of care takers and children aged I year and below at KIUTH

At KIUTH, a total of 418 child-caregiver pairs were recruited. The caretakers of children under the age of one were all female (100%). The majority of the children were female (227/54.3%) and aged 4–6 months (205/49.0%). The majority of the caregivers, who were all female, were between the ages of 21 and 29, (214/51.1%), had at least a secondary education (105/25.1%), were married by marital status (215/51.4%), were mostly housewives (56.4/56.4%), and had more than two children (169/40.4 %) as shown in Table 1 and Figure 1.

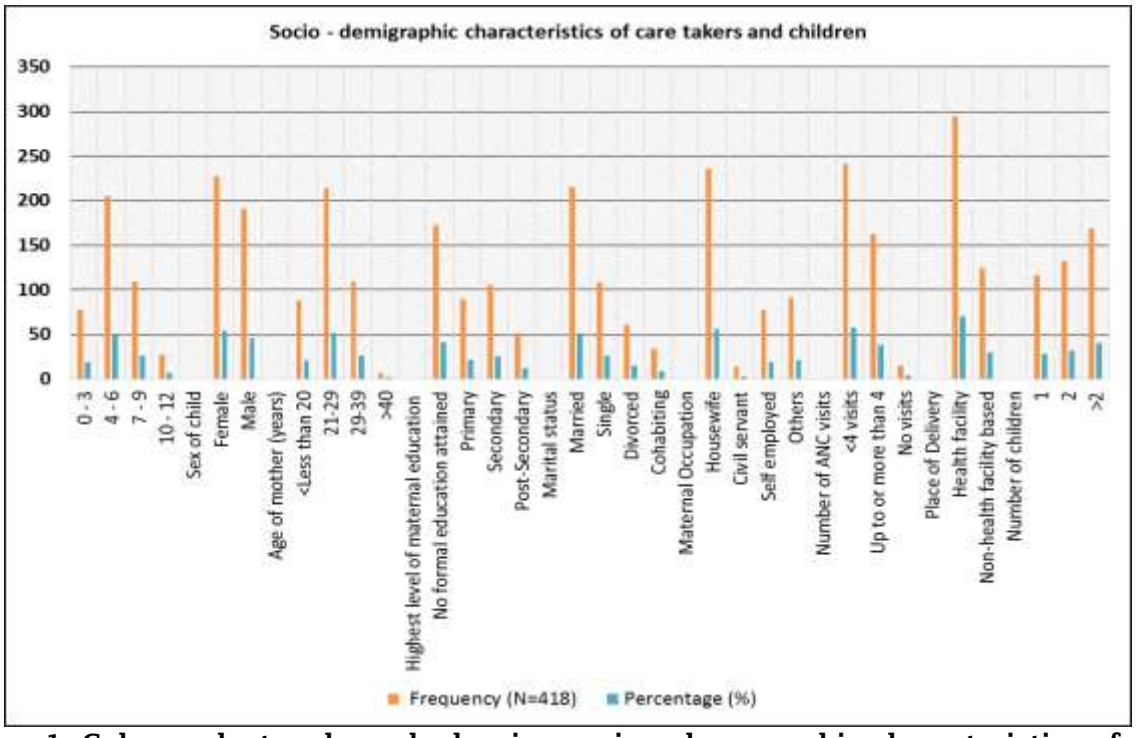

Figure 1: Column clustered graph showing socio – demographic characteristics of care takers and children aged I year

Table 1: Table showing Socio-demographic characteristics of care givers and children aged I year and below at KIUTH

Characteristics	Category	Frequency (N=418)	Percentage (%)
Age of child (Months)	0 - 3	77	18.4
	4 - 6	205	49.0
	7 - 9	109	26.1
	10 - 12	27	6.5
Sex of child	Female	227	54.3
	Male	191	45.6
Age of mother (years)	<Less than 20	88	21.0
	21-29	214	51.1
	29-39	109	26.1
	>40	7	1.7
Highest level of maternal education	No formal education	172	41.1
	Primary	90	21.5
	Secondary	105	25.1
	Post-Secondary	51	12.2
Marital status	Married	215	51.4
	Single	108	25.8
	Divorced	61	14.6
	Cohabiting	34	8.1
Maternal Occupation	Housewife	56.4	56.4
	Civil servant	14	3.3
	Self employed	77	18.4
	Others	91	21.7
Number of ANC visits	<4 visits	241	57.6
	Up to or more than 4	162	38.7
	No visits	15	3.6
Place of Delivery	Health facility	294	70.3
	Non-health facility	124	29.6
Number of children	1	117	28.0
	2	132	31.5
	>2	169	40.4

Maternal characteristics of mothers of under 1-year children attending KIUTH

Majority of the mothers that took part in the study had delivered from a designated health facility 294 (70.3%), had a tetanus virus vaccine 1-2 times 170 (40.7%), had attended ANC <4 times 241 (57.6%) prior to delivery, didn't attend any post-natal care session 270 (64.6%), had a good score of vaccination knowledge 216 (51.7%), had a monthly average income of less than 100,000 Shs 294 (70.3%) and were staying in a less than 30 minutes walkable distance from a designated health center 258 (61.8%) and as shown in Table 2 and Figure 2.

Table 2: Maternal characteristics of mothers of under 1-year-old children attending KIUTH

Characteristics	Category	Frequency (N = 418)	Percentage (%)
Place of delivery	Health facility	294	70.3
	Home	124	29.6
ANC attended	<4 visits	241	57.6
	Up to or more than 4	162	38.7
	No visits	15	3.6
PNC check ups	None	270	64.6
	Once	130	31.2
	≥ 2 times	18	4.2
TT immunization	None	132	31.5
	1-2 times	170	40.7
	≥ 3 times	116	27.8
Average monthly income (,000 Shs)	< 100k	294	70.3
	100k-200k	111	26.6
	> 200k	13	3.1
Distance to health facility (in walk time)	≤ 30 minutes	258	61.8
	31-60 minutes	61	14.5
	> 60 minutes	99	23.7
Immunization Knowledge	Good	216	51.7
	Poor	202	48.3

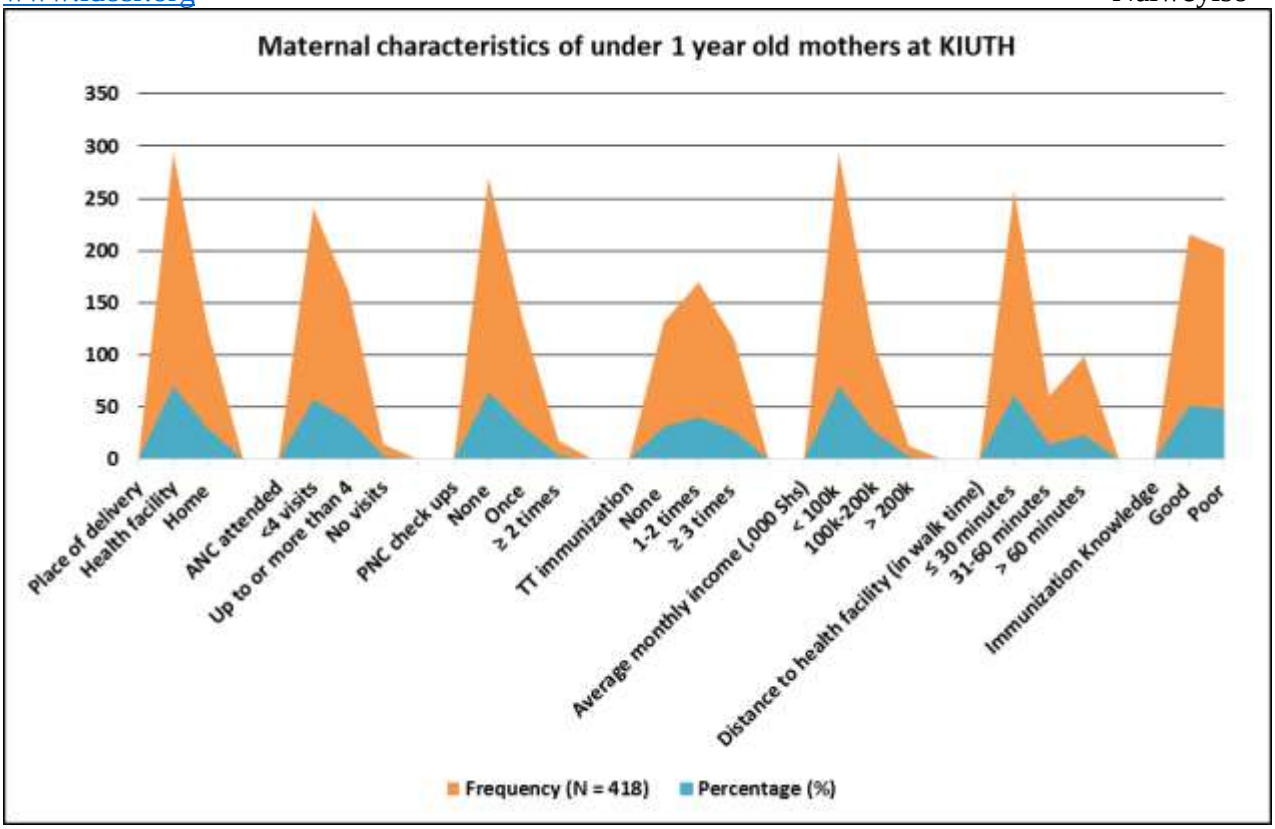

Figure 2: Area chart showing maternal characteristics of mothers of under 1-year-old children attending KIUTH

Immunization coverage of under-1-year-old children attending KIUTH

The majority of children under 1-year children attending KIUTH had been fully vaccinated for the recommended time 291 (69.8%), while those partially vaccinated at the time of the study accounted for 59 (14.1%) and 68 (16.1%) of the children had not been vaccinated at all as shown in Table 3 and Figure 3.

Of those fully immunized, 257 (88.3%) had immunization cards as a record of confirmation, were as 34 (11.7%) had no card but their caretakers were very certain by a recall that they had been fully immunized as shown in Table 3 and Figure 5. Of those partially immunized, 29 (49.2%) had immunization cards whereas 30 (50.8%) had no records but their caretakers were very certain on recall as shown in Table 3 and Figure 5.

Table 3: Immunization coverage of children under 1-year-old children attending KIUTH

Immunization coverage status	Frequency	Percentage
Immunization coverage		
Fully	291	69.8
Partial	59	14.1
None	68	16.1
Of fully immunized (n=291)		
Have card (Seen)	257	88.3
No card (Recall)	34	11.7
Of the partially immunized (n=59)		
Have card (seen)	29	49.2
No card (Recall)	30	50.8

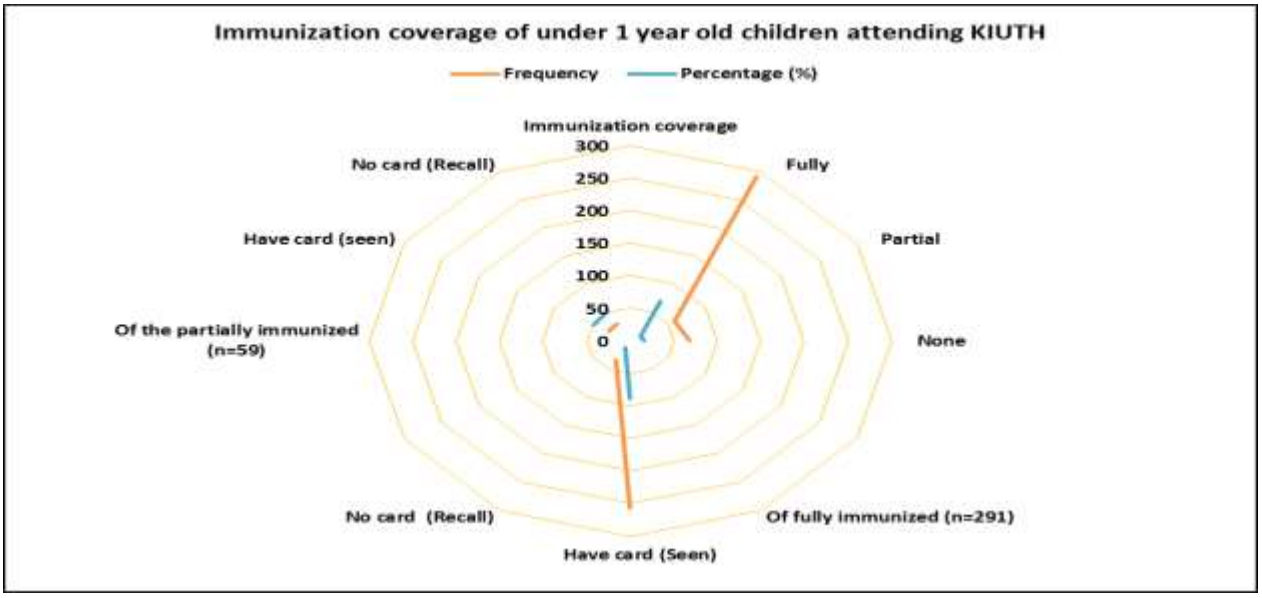

Figure 3: A radar chart showing immunization coverage of children under 1-year children attending KIUTH

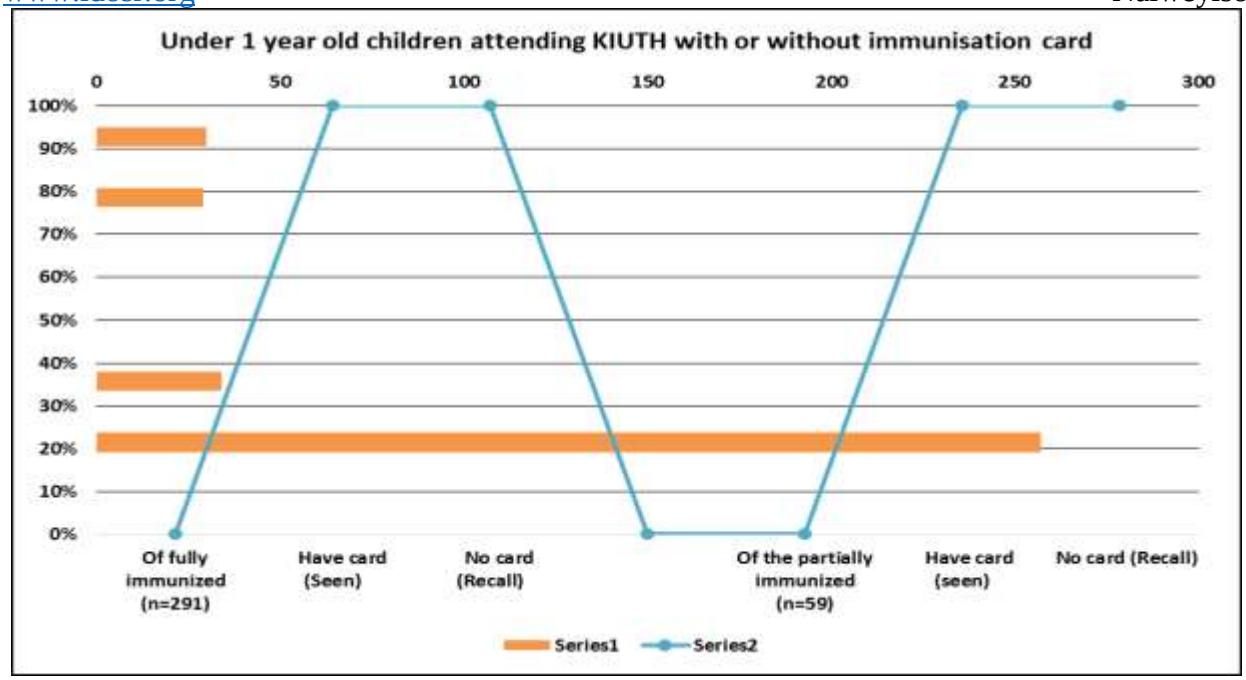

Figure 4: Stacked line –clustered column chart showing Children under 1-year-old children attending KIUTH with and without vaccination cards

Table 4: Knowledge of immunization vaccines by caretakers of children under 1-year-old children attending KIUTH

Vaccines	Frequency (N=418)	Percentage (%)
BCG vaccination against TB, an injection on the left forearm that usually causes a scar	147	35.1
OPV 1 drops are applied in the mouth at 6 weeks of birth to prevent polio.	181	43.3
OPV 2 drops applied in the mouth at 10 weeks of age to prevent polio	201	48.0
OPV 3 drops are applied in the mouth at 14 weeks of age to prevent polio.	247	59.0
DPT1 injection usually given in the right thigh at 6 weeks of age.	93	22.2
DPT 2 an injection usually given in the right thigh at 10 weeks of age.	108	25.8
DPT 3 was an injection usually given in the right thigh at 14 weeks of age.	149	35.6
Rotavirus 1 was given as drops in the mouth at 6 weeks from birth.	180	43.0
Rotavirus 2 was given as drops in the mouth at 10 weeks of age	236	56.4
Rotavirus 3 was given as drops in the mouth at 14 weeks of age	139	33.2
Measles an injection usually given on the left upper arm at 9 months of age	314	75.0

Measles vaccine 314 (75.0 %) was the most well-known among caregivers, followed by polio vaccine 247 (59.0 %) and rotavirus vaccine 236. (56.4 %) as shown in Table 4 and Figure 5.

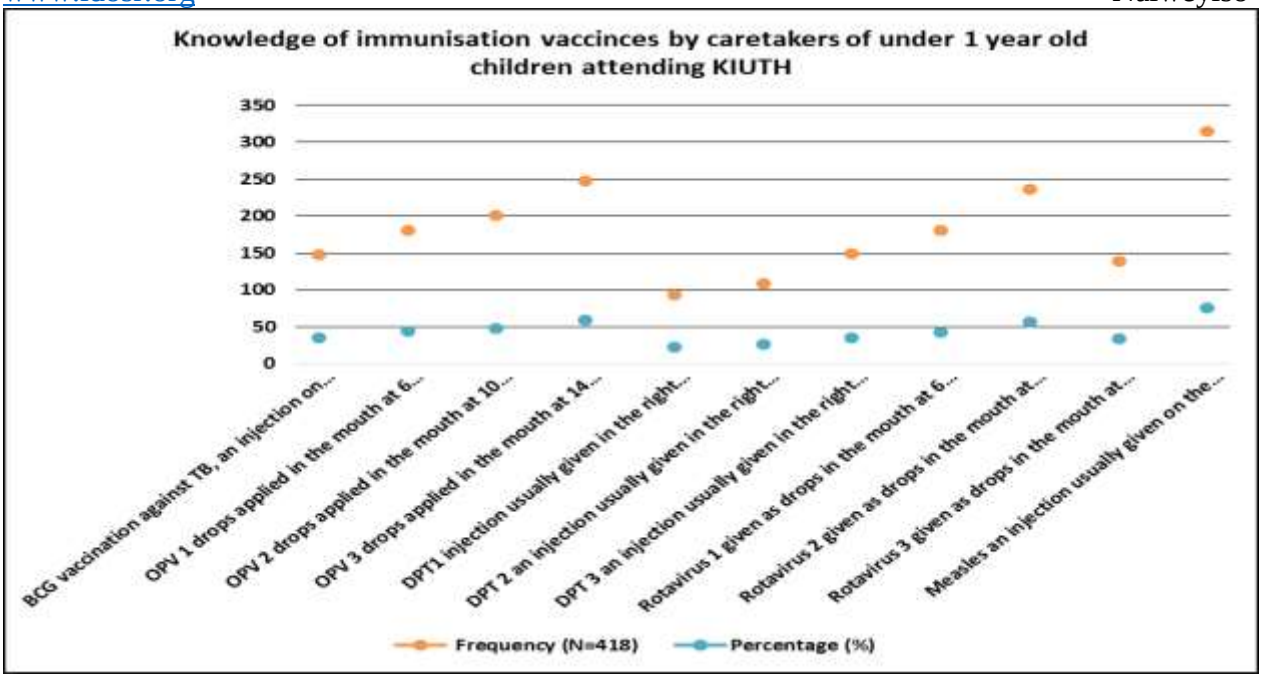

Figure 5: Marked line graph showing Knowledge of immunization vaccines by caretakers of children under 1-year-old children attending KIUTH

Bivariate and multivariate analysis of factors associated with immunization status of children under 1-year children attending KIUTH

Caretakers with secondary education or higher were more likely than the rest of the education categories to have their children fully immunized on time [AOR=2.08, 95% CI (1.00 – 3.58), p=0.027], attending postnatal care sessions increased the odds of immunization completion by 1.5 times [AOR=1.54, 95% CI (0.82 - 2.80), p=0.012], delivering from a designated health facility increased the odds of immunization completion by 1.5 times [AOR=1.53, 95% CI (0.30 - 2.66), p=0.038] and good vaccination knowledge of the caregiver increased the likelihood of immunization completion four times more than poor knowledge [AOR=4.07, 95% CI (3.05 - 6.00), p=0.001] as shown in Table 5.

Table 5: Bivariate and multivariate analysis of factors associated with immunization status of children under 1-year-old children attending KIUTH

Characteristics	Category	Fully immunized		Odds Ratio (95% CI)				p-value
		Yes	No	COR		AOR		
Mothers' age in years	≤ 24	52	62	1.63	0.92–2.61	1.50	0.90 - 2.50	0.248
	25-34	181	49	1.48	0.90–2.28	1.32	0.70 - 2.08	0.312
	≥ 35	62	29		1		1	
Maternal education	No education	64	84		1		1	
	Primary	31	17	1.30	0.71–2.45	1.25	0.70 - 2.40	0.132
	Secondary	136	21	1.65	1.06–2.70	1.51	0.88 - 2.50	0.118
	Secondary, above	64	13	2.69	1.28–5.68	2.08	1.00 – 3.58	**0.027** *

PNC check ups	None	154	113		1		1	
	Once	121	13	1.31	0.80–2.05	1.26	0.82 - 2.22	0.184
	≥ 2 times	18	0	1.90	0.97–3.65	1.54	0.82 - 2.80	**0.012***
Place of delivery	Health facility	204	16	1.84	0.48 – 3.85	1.53	0.30 - 2.66	**0.038***
	Home	62	43		1		1	
ANC attended	None	36	51		1		1	
	1-2 times	111	64	1.34	0.21 – 3.35	1.33	0.92 - 3.30	0.286
	≥ 3 times	128	12	1.20	0.55 – 3.07	1.43	0.45 - 2.00	**0.010***
Distance to health facility (in walk time)	≤ 30 minutes	241	25	2.32	0.71 – 4.52	2.03	0.85 - 3.62	0.215
	31-60 minutes	26	35	1.86	0.55 – 3.85	1.88	0.58 – 3.90	0.175
	> 60 minutes	18	59		1		1	
Immunization Knowledge	Good	208	1	4.51	2.94–6.85	4.07	3.05 - 6.00	**<0.001***
	Poor	66	112		1		1	

DISCUSSION

A total of 418 child-caregiver pairs attending KIUTH between November and December 2021 were studied to determine the factors influencing immunization coverage of 1-year old and under children in the study site. According to sociodemographic classification, the majority of the children 227 (54.3%) were female and aged between 4 and 6 months 205. (49.0 %). This pattern of child classification based on age and gender is consistent with previous studies in northern Uganda and Ethiopia [17],[18]. The consistency with previous studies may be attributed to the fact that there is not much difference in infant population characteristics between Uganda and Ethiopia. [19]. All the care takers that were encountered in this study were female who by majority ages of 21 and 29, (214/51.1%), had at least a secondary education (105/25.1%), were married by marital status (215/51.4%), were mostly housewives (56.4/56.4%), and had more than two children (169/40.4 %). This pattern of sociodemographic classification is consistent with the findings of the most recent Uganda demographic and health survey, which found that the Ugandan population was, on average, young and literate with at least a primary education. This pattern of demographics in adult mothers can be attributed to Uganda's deliberate immunization program, which began in the late 1980s, and universal primary education, which has seen the population grow to these age ranges and literacy levels [20],[21]. The study found that 69.8% of children under the age of one attending KIUTH are fully vaccinated, 14.1% are partially vaccinated, and 16.1% have no record of vaccination at all, not even by the recall of the caretakers. This immunization coverage is higher than the Ministry of Health's reported average national coverage of 55% in 2019 via the Ministry's Health Management Information System [20]. Suffice it to note that the 2016

national demographic survey found higher average coverage of 61 per cent of town areas, so it's not surprising that KIUTH has coverage of 69.8 per cent because it's located in the Bushenyi Ishaka municipality [22]. Previous studies in Nepal and Bangladesh have reported an immunization coverage above 60% thereby conquering the findings of this study [23],[24]. This consistency can be attributed to the fact that Nepal and Bangladesh use the same WHO-adopted immunization guidelines that Uganda does [1]. An interesting statistic to note in this study is the 16.1% of children who had no vaccination record at all, with no caretaker recalling having attempted the exercise. This finding is unusual in that it contradicts the expected outcomes of Uganda's immunization policies, where a net has been cast to capture every child under the immunization programs, but it is not surprising given that a nearly similar percentage of non-vaccination, at 16 percent, was recently reported in a northern Uganda community. [18]. Following bivariate and multivariate analysis of factors associated with full immunization, caretaker education of secondary and above p=0.027, attending two or more postnatal care sessions p=0.012, delivering from a designated health facility p=0.038, attending antenatal care more than thrice p=0.010, and good vaccination knowledge of the caretaker 0.001 were significantly associated with immunization completion among the one-year-old and under attending KIUTH. A number of studies including in three of them in Ghana, Malawi and Georgia, all found a significant association between care taker education, postnatal care, antenatal care, and knowledge and immunization coverage, correlating with KIUTH findings [25]-[27]. Based on available evidence, this significant relationship between these factors and immunization coverage can be attributed to the physical engagement of the service provider, in this case, the health centres, with the consumers, who in this case are caretakers and, in turn, the actual children. The importance of immunization is usually emphasized by service providers during direct engagements of antenatal care, postnatal care, and delivery from the health centre, and this has been shown to influence immunization uptake, thus improving coverage in the long run [19]. Just like in Nigeria and studies in 3 other Asian nations, education was found to be a predictor of immunization status in children aged one year and under who attended KIUTH. This can be attributed to the positive effect of education on changing caretakers' attitudes and their ability to make informed decisions that favour the importance of immunization [28]-[32].

CONCLUSION

The complete immunization coverage of children aged one and below attending KIUTH was 69.8%. Education of caregivers, attendance at postnatal care, delivery at a designated health facility, attendance at antenatal care, and good vaccination knowledge are predictors of immunization coverage of children aged one year and under from KIUTH-served communities.

Recommendations

Caretaker education has been found to be a predictor of immunization coverage which forms a basis of our recommendations; we recommend that deliberate child health education programs on immunization be extended to mothers during both the prenatal and postnatal periods, as we believe this will improve coverage. We also advocate for a more comprehensive study that takes into account other potential influencing factors such as health-care system factors and caregiver attitudes and perceptions about immunization.

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