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Factors Influencing Utilisation of Immunisation Services among Children Under Five Years in Lira Municipality Lira District Northern Uganda

Olila Daniel

Faculty of Clinical Medicine and Dentistry Kampala International University Uganda.

ABSTRACT

This study investigated the factors influencing the utilization of immunization services among children under 5 years in Lira Municipality, Lira district, Northern Uganda. Utilizing a community-based cross-sectional design with quantitative data collection methods, 380 mother-infant pairs were randomly selected from residents of Lira Municipality. Univariate, bivariate, and multivariate logistic regression analyses were conducted using STATA software version 14.0 to identify significant factors affecting immunization service utilization. The study found that 77.63% (295/380) of children under 5 years utilized immunization services, with the highest utilization observed among male children (82.71%). Factors significantly influencing utilization included mothers' education level (aOR 7.46, 95%CI 2.17 – 25.65, P=0.001), religion (Muslims vs. Christians: aOR 0.15, 95%CI 0.07 – 0.32, P<0.001), rudeness of health workers (aOR 3.50, 95%CI 1.73 – 7.06, P<0.001), awareness of subsequent immunization schedules (aOR 0.38, 95%CI 0.20 – 0.70, P=0.002), possession of a child immunization card (aOR 0.34, 95%CI 0.19 – 0.63, P=0.001), and understaffing at health facilities (aOR 2.87, 95%CI 1.43 – 5.78, P=0.003). The study highlights the importance of addressing these factors to improve immunization coverage, which currently falls below the global target recommended by WHO and UNICEF.

Keywords: Immunization services, Children, Under-Vaccinated, Unvaccinated, Mothers, No versus Yes.

INTRODUCTION

Immunization is defined as the process of injecting or vaccinating an individual to receive active protection against a particular illness. Utilization of immunization services is defined as the provision and uptake of immunization services [1]. Immunizing children is one of the public health interventions which has been proven to be effective for reducing child morbidity and mortality, and attaining high levels of coverage with potent vaccines administered at the appropriate ages [2, 3, 4]. Globally, it is estimated that more than 50% of mortality in children under five years of age is due to diseases that are preventable and treatable by utilization of simple and affordable interventions like a vaccine [5]. 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 [5]. According to WHO, immunization prevents about 2 to 3 million deaths annually that could have resulted from vaccine preventable diseases (VPDs) such as diphtheria, tetanus, pertussis, and measles; and an additional 1.5 million deaths could be avoided if global vaccination coverage improves [6]. In 2014, about 115 million (86%) of infants worldwide received three doses of diphtheria-tetanus-pertussis (DTP3) vaccine, and 129 countries reached at least 90% coverage of DTP3 vaccine [7]. This increased to 116 million (86%) of infants worldwide, while only 126 countries reached at least 90% coverage of DTP3 vaccine [6]. Still, about 18.7 million infants worldwide were not reached with routine immunization services in 2014. In Africa, despite the fact that there has been remarkable progress in provision and supporting immunization services; the biggest number of children remain unvaccinated and under-vaccinated [8]. In Africa, Immunization rates for children under 5 years are steadily behind any other region in the world and it was estimated to be between 37% - 76% [9]. The immunization coverage in Africa is negatively influenced by many factors including inadequate provision of vaccines, location of services, poor infrastructure, negative perceptions towards vaccines among other factors [10]. In Sub Saharan Africa (SSA), the utilization of immunization varies widely from only 11% of

children of ages 12 to 23 Months in Chad to 78% in Zambia [11]. According to [12], 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 pentavalent vaccine in the Sub-Saharan African Countries. SSA has the highest under-five mortality rate of the entire world and accounts for 40% of the total deaths in this age group. This is mainly due to vaccine- preventable diseases [13]. In 2014, it was reported that only Zimbabwe among the Sub-Saharan region was estimated to have met the Global Vaccine Action Plan threshold of 80% or higher coverage of diphtheria–tetanus-pertussis vaccine (DTP3), a benchmark used to measure performance of routine vaccine delivery system [14]. Similarly, in East African countries such as Kenya and Tanzania, immunization coverage continues to average between 41% - 68% for most of the child hood immunizable diseases [15]. However, immunization coverage in Uganda varies with different geographical locations and is lower in rural settings [16]. In Hoima, one of the rural Ugandan districts coverage for DPT3 among children aged 12–23 months is administratively estimated at 72% for DPT3 and measles at 76%. These are all below the district and the national targets of 85% for DPT3 and 90% for measles [17] and may partly explain the frequent outbreaks of vaccine preventable diseases. Major childhood diseases in Uganda include measles, tuberculosis, poliomyelitis, pertussis (whooping cough), diphtheria, tetanus, hepatitis B, Haemophilus influenzae and neonatal tetanus. However, some 48% of children under the age of five were un-immunized or under-immunized - meaning they started immunization but did not complete the schedule [16]. Between 2000 and 2010, the percentage of children who were fully immunized increased from 56% to 85% under Uganda's Expanded Program on Immunization (EPI). However, it had subsequently declined to below 80% over the 2007 – 2011 period [18]. Haemophilus Influenza type B, (Hib) is the leading cause of childhood meningitis in Uganda with a case fatality of up to 30 – 40% [19]. Children who survive Hib meningitis face permanent disability including: brain damage, paralysis of the legs, hearing loss and mental retardation [18]. Whereas the Uganda MoH is committed to achieving 90% immunization coverage of all Ugandan children below 5 years, the trend in most parts of Uganda like Lira district in Northern Uganda remains low [20]. According to the New vision report of 2013, Lira District was reported among the 11 Districts lagging behind in routine immunization. [21] also reported a failed target of Districts achieving the 80% Coverage of DTP-3 vaccine in all Districts. This was why there was a need to carry out a study to determine the factors influencing the utilization of immunization services among children under 5 years of age in Lira Municipality, Lira district.

Statement of the problem

It is the right of every child to be immunized against the childhood immunizable diseases and it's the duty of every parent/caretaker to ensure this [22]. However, according to Ministry of Health, the utilization of immunization services for childhood immunizable diseases remains low in Uganda [20]. Many strategies have been used to improve and sustain utilization of routine childhood immunization services; one of which is establishing outreach immunization services. Outreach immunization services are used globally to engage vulnerable individuals and communities with limited geographical access to health facilities [23, 24]. Despite the universal childhood immunization program, coverage rates are still low and they decline for subsequent doses. According to Uganda Demographics and Health Survey, 96% of children received the BCG vaccination, 95%, dose of polio 0, 95% received the first dose of DPT- Hep B-Hib, and 87% the first dose of the PCV and 80% of children received a measles vaccination [18]. The URCS quarterly project reports of July 2012–June 2014 showed that there were 738 routine immunizations defaulters out of the households visited in Lira District in 2014 [25]. The above reports indicate a gap which needs to be filled by conducting a research on utilization of immunization services. It has been noted that often the factors relevant for health-seeking behavior is not considered during program implementation [23]. Unfortunately, there is hardly any documented literature which gives information about utilization of immunization services and associated factors in Lira Municipality. For the above reason, this study sought to find out the socio-cultural factors associated with incomplete routine immunization of children under 5 years of age in Lira municipality in Lira District to ensure that parents support the utilization of immunization of their children thus promoting more infant survival and improved health.

METHODOLOGY

Research Design

The study design was cross sectional and descriptive [26], employing quantitative data collection methods. It was a cross sectional type of design because it involved collection of data from a single point in time. Cross-sectional study design is used when studying different groups of people in the groups of people who differ in the variable of interest but share other characteristics like, educational background, economic among others. Quantitative data collection method was used because it enabled the researcher to collect numerical data and perform quantitative analysis using statistical procedures

Area of Study

The study was conducted in Lira Municipality, a major town in Lira District in Northern Uganda. The Municipality has four divisions; Adyel, Ojwina, Railway and Central divisions. Lira municipality is bordered by Pader District to the north, Otuke District to the northeast, Alebtong District to the east, Dokolo District to the southeast, Apac District to the southwest and Kole District to the west. The main municipal, administrative and commercial center in the district, Lira, is located 110 kilometres (68 mi), by road, southeast of Gulu, the largest city in Northern Uganda. The coordinates of the district are: 02 20N, 33 06E (Latitude: 02.3333; Longitude:33.1000). In 2012, the population of Lira District was estimated at about 403,100. The majority of the population are ethnic Langi and the predominant language spoken is Luo.

Study Population

The study population comprised of mothers or caretakers of children under five years of age living in the four divisions in Lira Municipality who will be present at the time of the study.

Inclusion criteria

i. All care takers/mothers of children under 5 years of age who were present during the time of the study.
ii. All care takers/mothers of children under 5 years of age who were residents of the four divisions in Lira Municipality.
iii. All care takers/mothers who were 18 years of age and above.

Exclusion criteria

i. Mothers of children under 5 years of age who were not present at the time of the study.
ii. Mothers of children under 5 years of age who never consented to the study.
iii. Mothers of children outside the age bracket.
iv. Mothers of children under 5 years of age who were not living within the four divisions in Lira Municipality.

Sample Size determination

The overall sample size was estimated using Kish and Lesley formula [27]. This formula was used because it is appropriate for determining proportions of a variable in a given population.

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

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).

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

$$N = \frac{3.841 \times 0.247}{0.0025}$$

$$N = \frac{0.948727}{0.0025}$$

N= 379 Respondents
Therefore,
380 respondents participated in the study

Sampling Techniques

All the 4 divisions in Lira Municipality constituted the sample frame. To give a fair representation of utilization among children under 5 years of age in Lira Municipality, consecutive sampling was used. As such, all the 4 divisions were selected for the study.

Selection of Parishes and Villages

Simple random sampling technique was used to select the parishes where the study was conducted. The names of the parishes in each division were written on pieces of paper, folded, put in a container and the lid closed. The container was shaken vigorously to make sure the folded pieces of papers were mixed up. The lid of the container was opened and then folded pieces of papers were picked randomly until half of the parishes in each division were selected. The names of the parishes in the pieces of paper which were picked were used. The same technique was used to choose the villages where the study was conducted.

Selection of Households

Households were mapped and numbered according to the mapping strategy. Systematic sampling technique was used. Systematic sampling is a type of probability sampling method in which sample members from a larger population are selected according to a random starting point but with a fixed, periodic interval. This interval, called the sampling interval, was calculated by dividing the

population size by the desired sample size. Houses were selected at a calculated periodic interval (from a random start). This method was used to ensure that each house gets an equal probability of being selected. The first household was selected through simple random sampling followed by the selection of every other third house in that order.

Selection of Respondents in Households

In each village, based on the proportionate distribution of respondents in the communities, individuals were contacted at the household level. Purposive sampling technique was adopted in selecting eligible respondents; this was on the premise of having a child under 5 years of age in the household. For each of the households approached, it was first determined whether the household had a child under 5 years of age verbally confirmed that they had slept at the house the night before, and were willing to consent to the study procedures. If there were more than two children in that age bracket within a given household, those to participate in the study were chosen through simple random sampling.

Data sources

Data was collected from both primary and secondary sources. Primary data was collected from the respondents using researcher administered questionnaires in Lira Municipality and Secondary data was accessed from the internet, other documents plus related Journals, electronic books, library books, research dissertations.

Study Procedure

Before entry into the villages to conduct the data collection, the researcher went to the chair persons LC 1 with introductory letters from the University and sought for permission to do data collection in the chosen villages. The researcher explained the purpose of the study to the study participants after which they were given opportunities to ask questions and their questions were answered accordingly. Written consent was sought from the study participants. Those who consented to participate in the study were recruited to participate in the study and they were given to complete the self-administered study questionnaires whereas those who refused to consent were exempted from the study.

Data collection Instrument

Data was collected by the use of pre tested semi-structured questionnaires that is researcher administered. As stated in [28], "questionnaires can be designed to determine facts about the subject or persons known by the subject; facts about events or situations known by the subject; or beliefs, attitudes, opinions, levels of knowledge or intentions of the subject. The data collection instrument or the questionnaire was prepared after consulting with the immediate supervisor at the university and was self-administered to mothers who knew how to read and write. Participants who were illiterates were helped to fill the question by the researcher but whatever was filled in the questionnaire was their actual response. The questionnaire was composed of 4 sections with each section covering each of the specific objectives of the study. The questionnaire was composed of closed ended questions will require dichotomous responses which require ticking yes or no. Other questions had multiple choices which required the respondents to choose the most appropriate answers.

Quality control Measures

The researcher developed a semi-structured questionnaire which was pretested on 10% of the sample size in Bar Sub County before application to the study area since it had a similar setting. Double checking was done on all questionnaires for completeness and approval for storage was made by the principal investigator.

Validity of the research instruments

Validity refers to the extent to which a measurement instrument actually measures what it is meant to measure [29]. It is the ability of a data collection instrument to measure what it was formulated to measure. Content validity of the data collection tool for this study was done doing a pilot study in a nearby district, both the content and face validity were checked during the pilot study which were tested by the experts in the field of immunization.

Reliability

According to [29], reliability or precision refers to the degree of similarity of the results obtained when the measurement is repeated on the same subject or same group. To address reliability for this study the questionnaire was administered to a small group of mothers of children aged 0- 59 months at different time intervals.

Data Management

The questionnaire responses were edited for accuracy without changing the meaning given in the response. Responses were manually coded and arranged properly for presentation analysis. It also involved data cleaning during data entry to ensure quality inputs. Data was then exported to STATA version 140, exploratory data analysis was carried out to check the levels of missing values, presence of influential outliers, and independence of errors, multicollinearity and normality [30].

Data Analysis Plan

Data was analyzed by the use of STATA version 14.0. Continuous variables were described in terms of mean, standard deviation, min, max, skewness, kurtosis and median (inter-quartile range, IQR) meanwhile categorical variables were described in

percentages. Continuous variables were compared using Mann-Whitney test and categorical variables were compared using Chi-square test or Fischer's exact test as appropriate. Binary and multivariate logistic regressions were run to assess the factors influencing utilization of immunization services. Significant Variables at bivariate analysis and Variables having P<0.25 level in the bivariate analysis were included in the final binary logistic regression analysis, to identify independent factors. The forward stepwise regression method was applied to get a list of best predictors and any statistical test was considered significant at P level less than 0.05 in the final model. Findings were summarized in form of tables, pie charts and graphs as well as plain text models to determine factors influencing the utilization of immunization services.

Ethical considerations

Approval of ethical clearance was secured from Kampala International University-Western Campus Institutional Research and Ethics committee (KIUWC-IREC) who then award me with data collection clearance letter for collecting information and ensured that the study adhered to the principles of scientific integrity and honesty. Data collection was preceded by a letter of introduction from the Dean's office as prerequisite for carrying out the study. The researcher got permission from the authorities of Lira Municipality and the authorities of the different villages to enable data collection at the at the various study sites. After permission was granted, the authorities introduced the researcher to the in-charge of chair persons L.C 1 who then introduced the researcher to the respondents. The written informed consent of the respondents was obtained after the purpose and objectives of the study had been identified and well explained to the respondents. The respondents were informed that their participation was purely on voluntary terms and that their withdrawal of consent/participation would not affect their relationship with the researcher nor the health institutions. The study was purely for academic purposes and all the information given was treated with confidentiality and numbers instead of names were used to identify the respondents [31].

RESULTS

The Socio-Demographic Characteristics of the Study Participants

The researcher sampled a total of 380 participants table 1 below shows the socio-demographic characteristics of the study participants. Majority of the study participants 46.84% (178/380) were in the age group of 18 – 25 years, were not educated 35.26% (134/380) and more than of the participants 57.11% (217/380) were unemployed. The highest proportion of study participants were 68.95% (262/380) were from urban areas of residence, belonged to Christian religion 41.05% (156/380) with more than half of the participants 53.68% (204/380) being married in addition to having female children under five years of age 65.00% (247/380). More than half of the mothers 53.42% (203/280) had a monthly income of less than 300,000 Ugandan Shillings, had children below five years of age who were of first birth order 54.74% (208/280) and finally, less than half of the study participants 45.53% (173/380) found it hard to leave their work so as to take their children for immunization.

Table 1: Frequency table showing socio-demographic characteristics of the study participants

CATEGORY	OPTIONS	FREQUENCY(n)	PERCENTAGE (%)
Age of Mothers	18 – 25 years	178	46.84
	26 – 35 years	100	26.32
	≥ 36 years	102	26.84
	TOTAL	**380**	**100**
Education Level	Not educated	134	35.26
	Primary	125	32.89
	Secondary	63	16.58
	Post-secondary	58	15.26
	TOTAL	**380**	**100**
Employment status	Employed	163	42.89
	Unemployed	217	57.11
	TOTAL	**380**	**100**
Residence	Rural	118	31.05
	Urban	262	68.95
	TOTAL	**380**	**100**
Religion	Christian	156	41.05
	Muslim	80	21.05
	Born again	82	21.58
	Others	62	16.32
	TOTAL	**380**	**100**
Marital Status	Single	90	23.68
	Married	204	53.68
	Divorced	55	14.47
	Widowed	31	08.16
	TOTAL	**380**	**100**
Gender of the child	Male	133	35.00
	Female	247	65.00
	TOTAL	**380**	**100**
Monthly Income	Less than 300,000	203	53.42
	300,0000 or more	177	46.58
	TOTAL	**380**	**100**
Birth Order of the child	First	208	54.74
	Second	86	22.63
	Third or more	86	22.63
	TOTAL	**380**	**100**
Busy Schedule at Work	Yes	173	45.53
	No	207	54.47
	TOTAL	**380**	**100**

Health Worker Related Characteristics

Table 2 shows the health worker related characteristics of mothers who participated in this study. Majority of the mothers 55.79% (212/380) stated that they had ever heard immunization campaigns on radio with 54.74% (208/380) saying that there was high level of mobilization for immunization by health workers in the community. Almost half of the study participants 52.63% (200/380) said that they had not been told about the benefits of immunization by health workers during antenatal care. When they take their children for immunization, majority of the mothers 52.37% (199/380) said that they always find health workers available. A high proportion of study participants 62.37% (237/380) complained that the health workers were rude to them whenever they took their children for immunization meanwhile 52.89% (201/380) of the mothers stated that the health workers used abusive languages. When asked if the health workers gave then information about the upcoming immunization schedule, less than half of the study participants 48.95% (186/380) said yes and lastly, only 23.68% (90/380) of study participants said that the health workers refuse to immunize their children for one reason or the other.

Table 2: Health Worker related Characteristics of study participants

CATEGORY	OPTIONS	FREQUENCY(n)	PERCENTAGE (%)
Immunization Campaign on Radio	Yes	168	44.21
	No	212	55.79
	TOTAL	**380**	**100**
High Mobilization on Immunization	Yes	208	54.74
	No	172	45.26
	TOTAL	**380**	**100**
Immunization Education during ANC	Yes	180	47.37
	No	200	52.63
	TOTAL	**380**	**100**
Availability of health workers	Yes	199	52.37
	No	181	47.63
	TOTAL	**380**	**100**
Rudeness of Health workers	Yes	237	62.37
	No	143	37.63
	TOTAL	**380**	**100**
Abuse from Health workers	Yes	201	52.89
	No	179	47.11
	TOTAL	**380**	**100**
Information about subsequent immunization schedules	Yes	186	48.95
	No	194	51.05
	TOTAL	**380**	**100**
Clean Immunization site	Yes	166	43.68
	No	214	56.32
	TOTAL	380	100
Refusal by health workers to immunize children	Yes	90	23.68
	No	**290**	**76.32**

Health System Characteristics of the study participants

Shown in table 3 below are the frequencies and percentages of health system characteristics of the study participants. The table shows that majority of the study participants 58.95% (224/380) were in possession of child immunization card, were staying less than 5 km from the nearest health facility 40.26% (153/380) and had no vaccination posts near to their 69.74% (265/380). Vast majority of the study participants 75.00% (285/380) delivered from the health facility, but more than half of the participants 53.68% (204/380) don't have access to immunization services within the community with 62.89% (239/380) staying the health facilities are understaffed much as 55.79% (212/380) accepted that there was adequate immunization coverage. Lastly, when asked about immunization outreaches, 52.63% (200/380) said that immunization outreaches were being organized in their communities.

Table 3: Frequency table for health services characteristics of study participants

CATEGORY	OPTIONS	FREQUENCY(n)	PERCENTAGE (%)
Possession of Child Immunization Card	Yes	224	58.95
	No	156	41.05
	TOTAL	**380**	**100**
Distance to Nearest health facility	<5 km	153	40.26
	5 – 10 km	134	35.26
	> 10 km	93	24.47
	TOTAL	**380**	**100**
Vaccination post near home	Yes	115	30.26
	No	265	69.74
	TOTAL	**380**	**100**
Delivered from a health facility	Yes	285	75.00
	No	95	25.00
	TOTAL	**380**	**100**
Access to Immunization services in community	Yes	176	46.32
	No	204	53.68
	TOTAL	**380**	**100**
Understaffing at the health facility	Yes	239	62.89
	No	141	37.11
	TOTAL	**380**	**100**
Adequate coverage of immunization services	Yes	212	55.79
	No	168	44.21
	TOTAL	**380**	**100**
Immunization outreaches	Yes	180	47.37
	No	200	52.63
	TOTAL	**380**	**100**

The Level of Utilization of Immunization Services Among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda.

Table 4 shows that 72.89% (277/380) of the study participants received the BCG vaccine, 74.47% (283/380) received the DPT 1 vaccine. On the other hand, DPT 2 was received by 71.05% (270/380) of the children under 5 years of age meanwhile 60.79% (231/380) received the DPT vaccine. Pertaining to the polio vaccine, 72.11% (274/380) received the OPV 0, 74.47% (283/380) received the OPV 1, 73.68% (280/380) received OPV 2 whereas 60.79% (231/380) received the OPV 3 vaccine. Lastly, 61.58% (234/380) of study participants received the measles vaccine. Overall, 52.89% (201/380) of the children under 5 years of age had received all the doses of vaccines as per the national schedule.

Table 4: Level of utilization of the Individual Immunization services

VACCINE	STATUS	FREQUENCY(n)	PERCENTAGE (%)
BCG	Received	277	72.89
	Not Received	103	27.11
	TOTAL	**380**	**100**
DPT 1	Received	283	74.47
	Not Received	97	25.53
	TOTAL	**380**	**100**
DPT 2	Received	270	71.05
	Not Received	110	28.95
	TOTAL	**380**	**100**
DPT 3	Received	231	60.79
	Not Received	149	39.21
	TOTAL	**380**	**100**
OPV 0	Received	274	72.11
	Not Received	106	27.89
	TOTAL	**380**	**100**
OPV 1	Received	283	74.47
	Not Received	97	25.53
	TOTAL	**380**	**100**
OPV 2	Received	280	73.68
	Not Received	100	26.32
	TOTAL	**380**	**100**
OPV 3	Received	231	60.79
	Not Received	149	39.21
	TOTAL	**380**	**100**
Measles	Received	234	61.58
	Not Received	146	38.42
	TOTAL	**380**	**100**
Overall Vaccination Status	Complete	201	52.89
	Incomplete	94	24.74
	Not Immunized	85	22.37
	TOTAL	**380**	**100**

Overall Level of utilization of immunization

Table 7 below shows the overall level of utilization of immunization services among children under 5 years of age in Lira Municipality. Results showed that immunization services were utilized by 77.63% (295/380) of the children under 5 years of age meanwhile 22.37% (22.37/380) of the children under five years of age did not utilize the immunization services.

Table 5: The overall level of utilization of immunization services

Immunization services	Frequency	Percentage	95% CI
Not Utilized	85	22.37	18.16 – 26.58
Utilized	295	77.63	73.42 – 81.84

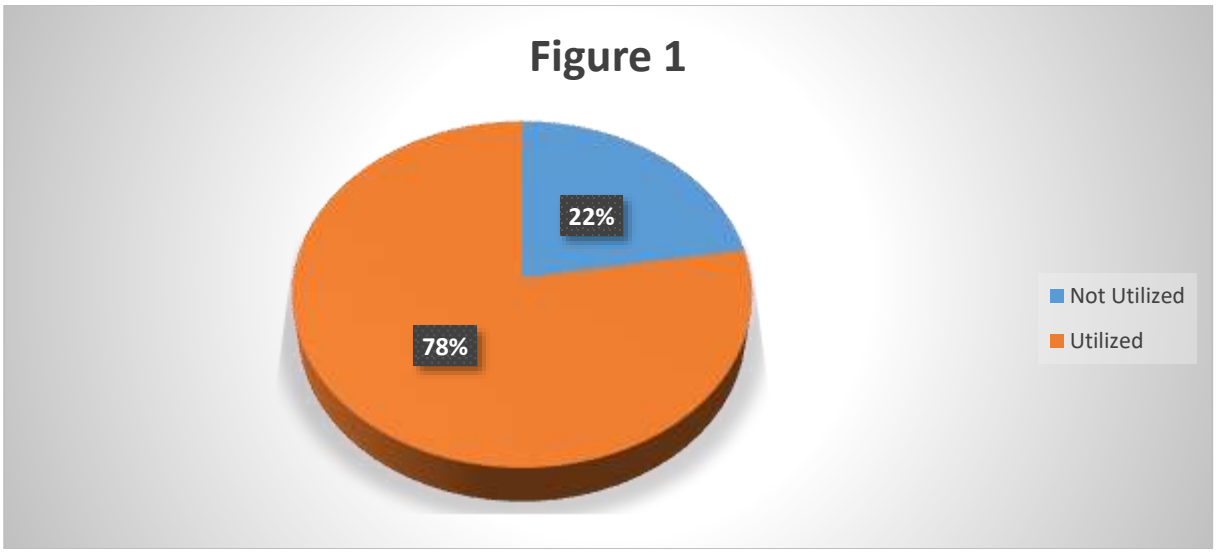

Figure 1: Pie chart showing the overall level of utilization of immunization services

Gender-Specific Utilization of Immunization Services

Table 6 shows the gender-specific utilization of immunization services among children under 5 years of age in Lira Municipality. Immunization services were utilized highest by male children 82.71% (110/133) with a 95% confidence interval of 76.20-89.22. Immunization services were least utilized by female children 74.90% (185/247) with a 95% CI of 69.45-80.34. The difference in the utilization of immunization services between males and females was not statistically significant with a P value of 0.081 and a chi square value of 3.035.

Table 6: Gender-Specific Level of Utilization of Immunization Services

Gender of the children	Total	Utilization of Immunization Services		Chi Square (X^2)	P Value
		Not Utilized Count, % (95% CI)	Utilized Count, % (95% CI)		
Male	133	23 17.29% (10.78-23.80)	110 82.71% (76.20-89.22)		
Female	247	62 25.10% (19.66-30.55)	185 74.90% (69.45-80.34)	3.035	0.081

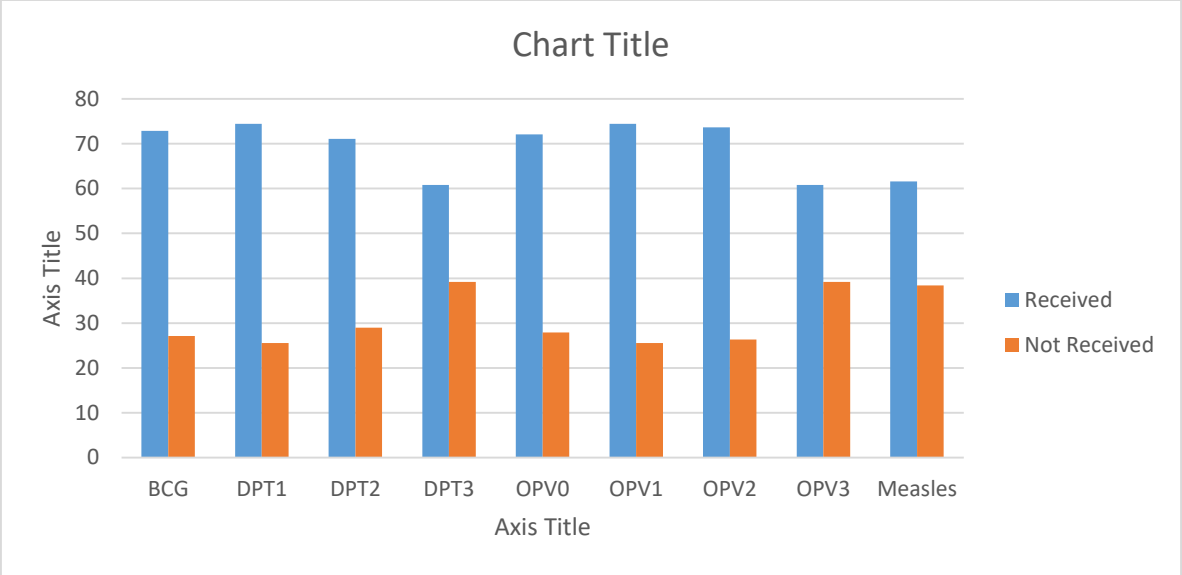

Figure 1: Bar Graph showing Level of utilization of the Individual Immunization services

The Socio-Demographic Factors Influencing Utilization of Immunization Services among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda

In order to establish the socio-demographic factors influencing utilization of immunization services among children under 5 years of age in the study area, a bivariate logistic regression was run and the results of the analysis are shown in table 7 below. Education level of the mothers, Religion of the mothers and Birth order of the children were the only socio-demographic factors which statistically influenced utilization of immunization services among the children under 5 years of age in the study area. Children with mothers who had secondary level of education were 6.50 times more likely to utilize immunization services than children who had uneducated mothers (cOR 6.50, 95%CI 2.21 – 19.10, P=0.001). Children with Muslim mothers were 84% less likely to utilize immunization services than children who had Christian mothers (cOR 0.16, 95%CI 2.21 – 19.10, P<0.001). Then finally, children who had a birth order of 3 or more were 49% less likely to utilize immunization services than children who had a birth order of 1 (cOR 0.51, 95%CI 0.29 – 0.90, P<0.019).

Table 7: Results of Bivariate Logistic Regression Showing Socio-Demographic Factors Influencing Utilization of Immunization Services among Children Under 5 Years in Lira Municipality

VARIABLE	CATEGORY	UTILIZATION OF IMMUNIZATION		AOR	95% CI	P VALUE
		NO=85 n (%)	YES=295 n (%)			
Age of Mothers	18 – 25 years	41 (23.03)	137 (76.97)		Reference	
	26 – 35 years	26 (26.00)	74 (74.00)	0.85	0.48 – 1.50	0.579
	≥ 36 years	18 (17.65)	84 (82.35)	1.40	0.75 – 2.59	0.289
Education Level	Not educated	41 (30.60)	93 (69.40)		Reference	
	Primary	26 (20.80)	99 (79.20)	1.68	0.95 – 2.96	0.073
	Secondary	04 (06.35)	59 (93.65)	6.50	2.21 – 19.10	**0.001***
	Post-secondary	14 (24.14)	44 (75.86)	1.39	0.68 – 2.80	0.364
Employment status	Employed	43 (26.38)	120 (73.62)		Reference	
	Unemployed	42 (19.35)	175 (80.65)	1.50	0.92 – 2.42	0.105
Residence	Rural	23 (19.49)	95 (80.51)		Reference	
	Urban	62 (23.66)	200 (76.34)	0.78	0.46 – 1.34	0.367
Religion	Christian	19 (12.18)	137 (87.82)		Reference	
	Muslim	37 (46.25)	43 (53.75)	0.16	0.08 – 0.31	**<0.001***
	Born again	17 (20.73)	65 (79.27)	0.53	0.26 – 1.09	0.083
	Others	12 (19.35)	50 (80.65)	0.58	0.26 – 1.28	0.175
Marital Status	Single	22 (24.44)	68 (75.56)		Reference	
	Married	40 (19.61)	164 (80.39)	1.33	0.73 – 2.40	0.350
	Divorced	17 (30.91)	38 (69.09)	0.72	0.34 – 1.53	0.395
	Widowed	06 (19.35)	25 (80.65)	1.35	0.49 – 3.71	0.563
Gender of the child	Male	23 (17.29)	110 (82.71)		Reference	
	Female	62 (25.10)	185 (74.90)	0.62	0.37 – 1.06	0.083
Monthly Income	Less than 300,000	46 (22.66)	157 (77.34)		Reference	
	300,0000 or more	39 (22.03)	138 (77.97)	1.04	0.64 – 1.68	0.884
Birth Order of the child	First	41 (19.71)	167 (80.29)		Reference	
	Second	16 (18.60)	70 (81.40)	1.07	0.57 – 2.04	0.827
	Third or more	28 (32.56)	58 (67.44)	0.51	0.29 – 0.90	**0.019***
Busy Schedule at Work	Yes	33 (19.08)	140 (80.92)		Reference	
	No	52 (25.12)	155 (74.88)	0.70	0.43 – 1.15	0.160

cOR= Crude odds ratio. CI= Confidence interval. P Value is Significant at 0.05 level.

The Health Worker Related Factors Influencing Utilization of Immunization Services among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda

Table 8 shows results of a bivariate logistic regression which was run to establish health worker related factors influencing utilization of immunization services among children under 5 years in Lira Municipality, Lira District, Northern Uganda. Results of the analysis showed that Rudeness of health workers and being informed by the health workers about subsequent immunization schedules were the only two health worker related factors influencing utilization of immunization services among children under 5 years of age within the study area. Study participants with who said health workers were not rude were 3.58 times more likely to make their children to utilize immunization services (cOR 3.5, 95%CI 1.96 – 6.54, P<0.001). On the other hand, mothers who were not given information about subsequent immunization schedule by the health workers were 63% less likely to make their children to utilize immunization services (cOR 0.37, 95%CI 0.22 – 0.622, P<0.001).

Table 8: Results of Bivariate Logistic Regression to show Health Worker Related Factors Influencing Utilization of Immunization Services among Children under 5 Years of Age

VARIABLE	CATEGORY	UTILIZATION OF IMMUNIZATION		cOR	95% CI	P VALUE
		NO=85 n (%)	YES=295 n (%)			
Immunization Campaign on Radio	Yes	37 (22.02)	131 (77.98)		Reference	
	No	48 (22.64)	164 (77.36)	0.97	0.59 – 1.57	0.886
High Mobilization on Immunization	Yes	46 (22.12)	162 (77.88)		Reference	
	No	39 (22.67)	133 (77.33)	0.97	0.60 – 1.57	0.896
Immunization Education during ANC	Yes	39 (21.67)	141 (78.33)		Reference	
	No	46 (23.00)	154 (77.00)	0.93	0.57 – 1.50	0.756
Availability of health workers	Yes	52 (26.13)	147 (73.87)		Reference	
	No	33 (18.23)	148 (81.77)	1.59	0.97 – 2.60	1.59
Rudeness of Health workers	Yes	70 (29.54)	167 (70.46)		Reference	
	No	15 (10.49)	128 (89.51)	3.58	1.96 – 6.54	**<0.001***
Abuse from Health workers	Yes	44 (21.89)	157 (78.11)		Reference	
	No	41 (22.91)	138 (77.09)	0.94	0.58 – 1.53	0.813
Information on subsequent schedules	Yes	26 (13.98)	160 (86.02)		Reference	
	No	59 (30.41)	135 (69.59)	0.37	0.22 – 0.622	**<0.001***
Clean Immunization site	Yes	36 (21.69)	130 (78.31)		Reference	
	No	49 (22.90)	165 (77.10)	0.93	0.57 – 1.52	0.779
Refusal by health workers to immunize	Yes	20 (22.22)	70 (77.78)		Reference	
	No	65 (22.41)	225 (77.59)	0.99	0.56 – 1.74	0.970

cOR= Crude odds ratio. CI= Confidence interval. P Value is Significant at 0.05 level

The Health System Factors Influencing the Utilization of Immunization Services among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda

Possession of immunization card and Understaffing at the health facilities were found to be the health system factors influencing utilization of immunization services among children under 5 years in Lira Municipality as presented in table 9 below. Mothers who never possessed a child immunization card were 70% less likely to utilize immunization services as compared to mothers who were in possession of child immunization card (cOR 0.30, 95%CI 0.18 – 0.50, P<0.001). Mothers who said there was no understaffing at the health facilities were 3.17 times more likely to utilize immunization services than mothers said there was understaffing at the health facilities (cOR 3.17, 95%CI 1.76 – 5.73, P<0.001).

Table 9; Results of a Bivariate Logistic Regression to show The Health System Factors Influencing the Utilization of Immunization Services among Children Under 5 Years in Lira Municipality

VARIABLE	CATEGORY	UTILIZATION OF IMMUNIZATION		cOR	95% CI	P VALUE
		NO=85 n (%)	YES=295 n (%)			
Has Child Immunization Card	Yes	31 (13.84)	193 (86.16)		Reference	
	No	54 (34.62)	102 (65.38)	0.30	0.18 – 0.50	**<0.001***
Distance to Nearest health facility	<5 km	30 (19.61)	123 (80.39)		Reference	
	5 – 10 km	37 (27.61)	97 (72.39)	0.64	0.37 – 1.11	0.111
	> 10 km	18 (19.35)	75 (80.65)	1.02	0.53 – 1.95	0.961
Vaccination post near home	Yes	30 (26.09)	85 (73.91)		Reference	
	No	55 (20.75)	210 (79.25)	1.35	0.81 – 2.25	0.253
Delivered from a health facility	Yes	67 (23.51)	218 (76.49)		Reference	
	No	18 (18.95)	77 (81.05)	1.31	0.73 – 2.35	0.356
Access to Immunization in community	Yes	44 (25.00)	132 (75.00)		Reference	
	No	41 (20.10)	163 (79.90)	1.33	0.82 – 2.15	0.254
Understaffing at the health facility	Yes	69 (28.87)	170 (71.13)		Reference	
	No	16 (11.35)	125 (88.65)	3.17	1.76 – 5.73	**<0.001***
Adequate coverage of immunization	Yes	48 (22.64)	164 (77.36)		Reference	
	No	37 (22.02)	131 (77.98)	1.04	0.64 – 1.69	0.886
Immunization outreaches	Yes	41 (22.78)	139 (77.22)		Reference	
	No	44 (22.00)	156 (78.00)	1.05	0.65 – 1.70	0.856

cOR= Crude odds ratio. CI= Confidence interval. P Value is Significant at 0.05 level

Multivariate Logistic Regression to Determine Factors Independently Influencing the Utilization of Immunization Services among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda.

A multivariate logistic regression was run to establish the independent predictors of utilization of immunization services among the study participants and the results are shown in table 10 below. Factors with p-value less than 0.20 at bivariate logistic regression analysis were considered for multivariate analysis. Through a stepwise logistic regression with removal of least significant variable in each step, the following factors were found to significantly influence the utilization of immunization services; Mothers' education level; Secondary versus no education (aOR 7.46, 95%CI 2.17 – 25.65, P=0.001), Religion; Muslims versus Christians (aOR 0.15, 95%CI 0.07 – 0.32, P<0.001), Rudeness of health workers; No versus Yes (aOR 3.50, 95%CI 1.73 – 7.06, P<0.001), Being informed about subsequent immunization schedules; No versus Yes (aOR 0.38, 95%CI 0.20 – 0.70, P=0.002), having a child Immunization card; No versus yes (aOR 0.34, 95%CI 0.19 – 0.63, P=0.001), and understaffing at the health facility; No Versus Yes (aOR 2.87, 95%CI 1.43 – 5.78, P=0.003).

Table 10: Multivariate Logistic Regression to Determine Factors Independently Influencing the Utilization of Immunization Services among Children Under 5 Years in Lira Municipality

VARIABLE	CATEGORY	UTILIZATION OF IMMUNIZATION		aOR	95% CI	P VALUE
		NO=85 n (%)	YES=295 n (%)			
Education Level	Not educated	41 (30.60)	93 (69.40)		Reference	
	Primary	26 (20.80)	99 (79.20)	1.91	0.94 – 3.91	0.075
	Secondary	04 (06.35)	59 (93.65)	7.46	2.17 – 25.65	**0.001***
	Post-secondary	14 (24.14)	44 (75.86)	1.29	0.54 – 3.08	0.569
Employment status	Employed	43 (26.38)	120 (73.62)		Reference	
	Unemployed	42 (19.35)	175 (80.65)	1.52	0.83 – 2.81	0.569
Religion	Christian	19 (12.18)	137 (87.82)		Reference	
	Muslim	37 (46.25)	43 (53.75)	0.15	0.07 – 0.32	**<0.001***
	Born again	17 (20.73)	65 (79.27)	0.54	0.24 – 1.23	0.143
	Others	12 (19.35)	50 (80.65)	0.64	0.26 – 1.61	0.344
Gender of the child	Male	23 (17.29)	110 (82.71)		Reference	
	Female	62 (25.10)	185 (74.90)	0.98	0.51 – 1.90	0.957
Birth Order of the child	First	41 (19.71)	167 (80.29)		Reference	
	Second	16 (18.60)	70 (81.40)	1.34	0.61 – 2.95	0.469
	Third or more	28 (32.56)	58 (67.44)	0.81	0.40 – 1.65	0.567
Busy Schedule at Work	Yes	33 (19.08)	140 (80.92)		Reference	
	No	52 (25.12)	155 (74.88)	0.81	0.44 – 1.50	0.507
Availability of health workers	Yes	52 (26.13)	147 (73.87)		Reference	
	No	33 (18.23)	148 (81.77)	1.50	0.82 – 2.76	0.187
Rudeness of Health workers	Yes	70 (29.54)	167 (70.46)		Reference	
	No	15 (10.49)	128 (89.51)	3.50	1.73 – 7.06	**<0.001***
Information on subsequent schedules	Yes	26 (13.98)	160 (86.02)		Reference	
	No	59 (30.41)	135 (69.59)	0.38	0.20 – 0.70	**0.002***
Has Child Immunization Card	Yes	31 (13.84)	193 (86.16)		Reference	
	No	54 (34.62)	102 (65.38)	0.34	0.19 – 0.63	**0.001***
Distance to Nearest health facility	<5 km	30 (19.61)	123 (80.39)		Reference	
	5 – 10 km	37 (27.61)	97 (72.39)	0.66	0.34 – 1.31	0.239
	> 10 km	18 (19.35)	75 (80.65)	1.001	0.44 – 2.32	0.982
Understaffing at the health facility	Yes	69 (28.87)	170 (71.13)		Reference	
	No	16 (11.35)	125 (88.65)	2.87	1.43 – 5.78	**0.003***

aOR= Adjusted odds ratio. CI= Confidence interval. P Value is Significant at 0.05 level

DISCUSSION

The Level of Utilization of Immunization Services Among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda

This study revealed that immunization services were utilized by 77.63% (295/380) of the children under 5 years of age meanwhile 22.37% (22.37/380) of the children under five years of age did not utilize the immunization services. The level of utilization of immunization found in this study is promising though more can still be done to improve it further because the decision of a single mother not to take her child for immunization put the children in the entire community at risk. The finding of the present study is similar to the results of a study done in Amach Sub-County, Lira District located in Northern part of Uganda [32]. The probable reason for the agreement in the study findings could be because both studies were conducted in the same region which happens to be Northern Uganda. The study findings revealed that utilization of immunization services for children under 5 years of age for measles is low at 61.58% which is below the recommended target by WHO of 85%. These findings are in line with what was found in a study conducted by Canavan et al whose findings showed that majority of children had not received all vaccine doses recommended by WHO implying that not all those children who were started on BCG completed schedules [33]. In this study, the

proportion of children utilizing the BCG vaccine (72.89%) was higher than those utilizing the first dose of the polio vaccine (72.11%). This finding indicates there are still missed opportunities and highlight the challenge of introducing early polio vaccine which should be given within 24 h after birth. In our study, there was a decline in coverage of immunization from BCG at birth (72.89%) to measles (61.58%). Overall, the dropout rate between BCG vaccine and measles vaccine was around 11.31%. Our findings are in agreement with those in Nigeria, Guinea, and Uganda [34]. A plausible reason to explain reduction in the proportion of full vaccination coverage when children get older compared to vaccines received after birth may be due to logistical problems but also the fact that some mothers may not understand the routine immunization schedule [35] or may not choose to come back after adverse events following the first contact with the immunization system. Immunization uptake revealed high utilization of initial antigens which are BCG and birth polio given at birth and first pentavalent, polio, rotavarix and pneumococcal vaccines given at 6 weeks while the utilization of subsequent antigens given at 10 weeks, 14 weeks, 9 months shows a significant decline. This compares well with a study done in a peri-urban area in Kenya which revealed that utilization of first antigens was high followed by a declining trend in subsequent visits [36]. The utilization of immunization services which stands at 77.63% in the present study is low compared to the 85% global covered coverage reported by in 2014 by the centers of disease control [37]. The difference in the study findings could be because the previous study was a wider study whereas the present study was a smaller study done in one a single municipality in northern part of the country. Immunization has been regarded as the key strategy to curb communicable diseases which are number one killer of children aged under five [38]. Furthermore, the figure found in the present study is low compared to the results of a study done in Kenya which revealed that immunization was highly utilized at 91% [39]. The discrepancy in the study findings could be because of the variation in the sampling techniques which were utilized in that the previous study employed systematic random sampling meanwhile the present study made use of simple random sampling. The figure of 77.63% found in the present study is higher than the results of a study conducted by [40] which revealed that 45% of the study participants fully utilized the immunization services. The discrepancy in the study finding can be explained by the difference in the study designs used in the two studies in that the previous study utilized case-control design whereas the present study employed the cross-sectional study design. The result of the present study is not in agreement with the results of a study conducted in Gambia which reported that 45% fully utilized immunization services [41]. Stock out of vaccines could lead to a low level of utilization of immunization services, it is therefore crucial for health facilities to have focal persons for immunization whose duty is to ensure the smooth running of immunization services. Similarly, [42] also report a rate of utilization of immunization services which is lower than what was reported in the present study. [43] in their study reported that 49.8% of the study participants utilized immunization services, this figure is lower than the 77.63% found in the present study. The disagreement in the study findings might have risen from the fact that the previous was conducted among children less than 2 years whereas the present study was conducted among children less than 5 years of age. Additionally, [22] in their study conducted in Hoima district.

The Socio-Demographic Factors Influencing Utilization of Immunization Services among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda

The second sepecific objective of the present study was to determine the socio-demographic factrors influencing the utilization of immunization services among children under 5 years of age in Lira Municipality. Results showed that Mothers' education level; Secondary versus no education (aOR 7.46, 95%CI 2.17 – 25.65, P=0.001) and Religion; Muslims versus Christians (aOR 0.15, 95%CI 0.07 – 0.32, P<0.001) were the socio-demographic factors independently affecting utilization of immunization services among the study participants. Mother's level of education; This study showed that mother's level of education had a positive influence on utilization of immunization among children under 5 years of age. Education helps to improve health seeking behavior of an individual. This finding is consistent with other literatures like [44, 45], that found that maternal education was a significant predictor of utilization of immunization services because highly educated mothers will be more aware of the importance of immunization. The role of maternal education as an important predictor of utilization of immunization services has also been shown by [46, 47]. In contrast, in study conducted in Libya by [48], there was no significant relationship between immunization status and mothers' educational level. Religion of the Mothers; this is consistent with the result of the research conducted in Nigeria by [49]. Misconception by Muslims affects the immunization uptake in Lira municipality as such there is need for religious leaders of the Muslim religion to swing in action and encourage their followers to take their children for immunization. To the contrary, the

findings of the present study is not in line with the findings of a study done about utilization of immunization services among children aged under five in Kirinyaga County, Kenya [39]. Furthermore, a study done on utilization of outreach immunization services among children in Hoima District found that religion was not a significant predictor. This finding is not in agreement with findings of the present study. Religion and spirituality are integral components of socio-demographics (rural culture) and influence perceived vulnerability to infection and perceived severity to infection [50]. Religious leaders are highly esteemed, and their authority can convince members of their congregations to accept or reject vaccination [51]. A WHO report from polio endemic region in Nigeria states that only a total of 16% children were adequately vaccinated in that region; the main reason being that the community was predominantly of Muslim background and believed that polio drops were used as a tool for causing sterility in the children and had been shunned by community leaders. This led to a substantial rise in Polio cases in that area. Similar beliefs exist in the Pakistan where several religious and tribal leaders express their concern about polio campaign being Western conspiracy to control Muslim population [52].

The Health Worker Related Factors Influencing Utilization of Immunization Services among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda

Results of the present study showed that Rudeness of health workers; No versus Yes (aOR 3.50, 95%CI 1.73 – 7.06, P<0.001), Being informed about subsequent immunization schedules; No versus Yes (aOR 0.38, 95%CI 0.20 – 0.70, P=0.002) were the health worker related factors that were found to positively influence the utilization of immunization services among the study participants. Rudeness of health workers: Attitudes and behavior of health staff treating mothers in an unfriendly, disrespectful, or even abusive manner are frequently cited as discouraging children's vaccination. Health staff reportedly screamed at mothers who forgot the child's card, missed a scheduled vaccination appointment, or had a dirty, poorly dressed, or malnourished child. Mothers felt humiliated and discouraged from returning (e.g. in Ethiopia, Zimbabwe, Niger, Kenya, Bangladesh, West Africa, Uganda, Benin, Nigeria and Syria) [53, 54]. This factor was not prominent in all settings. In Uganda only 13% of over 1000 women interviewed complained about being treated rudely [55]. Being informed by health workers about subsequent schedules: In one study, community members pointed to a lack of information about particular vaccines, vaccination scheduling and times of services as one of the most common constraints to having a child vaccinated [56]. This finding is in agreement with the finding of the present study. Even where extreme behavior is not normal, health workers commonly communicate little and poorly with mothers, so that some mothers leave not knowing when to return and what to do about side effects (e.g., in Liberia, Niger, Burkina Faso, Somalia, Guinea, Malawi and Benin) [57]. In Mozambique, three quarters of health workers said they always wrote the return dates on the child's card, but only one quarter of the cards examined actually had the date written [58]. Better communication was reported in programs In Uganda, Bangladesh and Armenia.

The Health System Factors Influencing the Utilization of Immunization Services among Children Under 5 Years in Lira Municipality, Lira District, Northern Uganda

When a multivariate logistic regression was run, the health system factors that were found to independently utilization of immunization services among children under five years of age were; Having a child Immunization card; No versus yes (aOR 0.34, 95%CI 0.19 – 0.63, P=0.001), and understaffing at the health facility; No Versus Yes (aOR 2.87, 95%CI 1.43 – 5.78, P=0.003). Having child immunization card; when a mother goes home with an immunization card, she is more likely to remember the next immunization schedule and therefore the child will fully utilize the immunization services. The finding of the present study is in line with the finding of a study carried out by [59] which investigated factors associated with immunization status among children aged 12 to 23 months in Nouna Health District, Burkina Faso. Findings indicated that complete immunization is significantly associated with availability of vaccination card [59]. Understaffing at the health facility; When staff within the facility are few then most probably the immunization services are not delivered efficiently in addition to existence of certain bottle necks such as mothers having to wait for longer hours to be served by the available few health workers, more side effects of the vaccines may also be experienced by the immunized children as a result of being immunized by health workers who are exhausted. As such, some mothers may dodge taking their children for immunization thereby leading to incomplete utilization of immunization services [60, 38].

CONCLUSION

Findings from the study shows that the percentage of children who utilized immunization services was below the global immunization goal and strategy (GIVS) recommended target of ≥90% national

immunization coverage set by WHO and UNICEF. The study further indicates that Mothers' education level, Religion, Rudeness of health workers, being informed about subsequent immunization schedules, having a child Immunization card and understaffing at the health facility were the independently influenced utilization of immunization services among children under 5 years of age in Lira Municipality, Northern Uganda.

Recommendations

Ugandan Government should improve on Supplemental immunization activities such as National Immunization Days (NIDs) and Catch-up campaigns that are already in place. Ugandan ministry of health should conduct immunization campaign frequently. Such a campaign should be specific communication focused on all the required vaccines. In addition, government should work with religious leaders so as to improve the uptake of vaccine. Ugandan Ministry of health should make an effort to sensitize parents about the importance of completing the immunization schedule especially the Muslim parents. Education programs that can target poor and uneducated people should be put in place so that they are able to make informed decisions regarding immunization of their children. Free health facilities should be made available to every mother so that poor mothers can easily access them. The government should work on the problem of understaffing by recruiting and deploying more health workers so as to improve on the immunization services. Administration of various health facilities should encourage the health workers under their jurisdiction not to be rude to mothers who have taken their children for immunization. Ministry of health should embark on printing plenty of immunizations cards so that all mothers are given immunization cards when they take their children for immunization.

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