

Factors Associated with Full Immunization Coverage among Children up to 12 Months, Kakuma Mission Hospital, Turkana County, Kenya

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Abstract

The 2014 Kenya Demographic Health Survey showed that only 56.7% of children in Turkana County had received all recommended vaccines by 12 months of age, which is 12% below national and 24% below World Health Organization global coverage rates. This study aimed to identify factors that influence full immunization coverage (FIC) by 12 months of age in Kakuma Mission Hospital, Turkana County, in 2015. Kakuma is the site of a UNHCR refugee camp, established in 1969. Administration of vitamin A by 6 months of age and administration of measles-containing vaccine by 9 months of age were predictive of FIC.

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Introduction

Immunization of children against vaccine-preventable diseases is crucial to reducing infant and child mortality. According to the World Health Organization (WHO), by 2016 the global fully immunized child (FIC) rate stood at 86% [1], compared to 67.2% of infants in Kenya and only 61.8% in Turkana County [2]. Turkana County is located in northwestern Kenya, is vast, sparsely populated by approximately one million people, and many of its residents are rural pastoralists and refugee populations from South Sudan, Ethiopia, Democratic Republic of Congo, Burundi, Eritrea, and Somalia [3]. The town of Kakuma has very few health facilities (HFs). Pregnancies, child births, and overall health services are not documented and recorded consistently, which leads to informational gaps and poor health monitoring capabilities.

Kakuma Town and the refugee camp located there are near the border nexus of Kenya, South Sudan, and Ethiopia (**Figure 1**). The refugee camp began in 1969 but grew exponentially in 1991 in response to the ongoing war in what was then southern Sudan [4]. That event started the encampment strategy in Kenya and

the handover of the refugee screening process to international non-governmental organizations entities [5]. Whether as a local Kenyan or an immigrant, the health care options in the area are limited to Kakuma Mission Hospital (KMH) and its 4 satellite HFs (**Table 1**). There are no HFs available across the border into South Sudan or Ethiopia, nor are there "nearby" satellite HFs between Lodwar and Kakuma.

Although governmental and non-governmental outreach efforts are helping to improve access to health care in Turkana County, there is still considerable need for maternal care, outreach and education [6]. According to recent data, up to 79.5% of all births take place without the assistance of skilled birth attendant, up to 20.4% of all births occur in public health facilities, and only 2.7% of births occur in private health facilities [7,8].

KMH is the only referral health facility in the sub-county and services the local population of approximately 180,000 people [9] and acts as the referral hospital for the 4 satellite clinics that provide primary care services and community outreach services

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Figure 1 Location of Kakuma Mission Hospital and Kakuma Refugee Camp, Turkana County, Kenya (Map courtesy of the Department of Anthropology, University of Notre Dame, 2011.)

Table 1 Satellite clinics associated with Kakuma Missionary Hospital (KMH), Turkana County, Kenya

Facility	Ward	Entity in charge	Distance from KMH (km)	Distance from camp (km)
Komdei Dispensary	Kakuma	Ministry of Health	7	1
Nakoyo Dispensary	Lopur	Africa Inland Church Ministries	10	3
Lochoredome Dispensary	Lopur	Ministry of Health	12	7
Kalobeyei Health Center	Kalobeyei	Turkana County Health Department	24	20

Table 2 Recommended infant immunization schedule, Kenya Ministry of Health, current as of 22 September 2017 (<http://www.motherhood101.co.ke/immunizations-kenya/>)

Antigen	Time(s) of administration
BCG	At birth
OPV	At birth, 6 weeks, 10 weeks, and 14 weeks
Pentavalent	6 weeks, 10 weeks, 14 weeks
PCV 10	6 weeks, 10 weeks, 14 weeks
Measles	9 months
Yellow Fever	9 months
Vitamin A	6 months, 12 months

BCG= Bacille Calmette-Guerin; OPV=oral polio vaccine; pentavalent contains tetanus, diphtheria, Hib, Hepatitis B, pertussis antigens; PCV10=pneumococcal conjugate 10 valent

Table 3 Characteristics of mother and children and results of bivariate analysis in Turkana County, Kenya, between April and December 2015

Variable	N (%)	OR	95% CI	P-value
Age of mother at birth [years] (n=432)				
≤23	196 (45)	0.7794	0.466-1.304	0.08
>23	236 (55)			
Residence (n=605)				
Urban	453 (75)	0.8728	0.5193-1.467	0.07
Rural	152 (25)			
Place of delivery (n=612)*				
Home	447 (73)	0.5591	0.3457-0.9042	0.01
Hospital	167 (27)			
Sex of child (n=608)				
Female	274 (45)	0.9302	0.586-1.477	0.07
Male	334 (55)			
Birth Order (n=405)				
≤3	242 (60)	1.097	0.5872-2.049	0.09
>3	163 (40)			

MCH=maternal and child health; KMH=Kakuma Mission Hospital; OR=odds ratio; CI=confidence interval.

*level of significance $p < 0.05$.

Denominators differ for each variable, as we could count only those cases where the information for the specific variable was included in the MCH register.

throughout the Kakuma region, including the refugee camps. All of the data from these HFs are centralized at the KMH for entry into the District Health Information System (DHIS).

Globally, uptake of immunization services depends on factors related to maternal knowledge, geographical accessibility and many other socio-demographic characteristics [10]. This study aimed to assess factors associated with being FIC by 12 months of age in children up to 59 months of age at KMH and to generate data that could be used for better planning and strengthening of immunization service delivery in remote areas (**Table 2**).

Methods

Study Design

This was a cross-sectional study of data obtained from maternity, antenatal care (ANC), and maternal and child health (MCH) registries at KMH for women who visited those clinics between April and December 2015. FIC was defined as an entry in the permanent registers of any child and his/her mother who received 3 doses of oral polio vaccine (OPV), 3 doses of pentavalent, and 1 dose each of Bacille Calmette-Guerin (BCG), vitamin A and measles-containing vaccine before age 12 months at KMH between April 2015 and December 2015 and correctly recorded in the immunization register.

The data were collected via retrospective review of individual medical records and MCH, maternity, and immunization registers, which are the standard Ministry of Health (MoH) registration books that each health facility must use to record patient information. Data were categorized as “Yes” if the child was FIC by 12 months and “No” otherwise. We did not access adherence to strict order of delivery of the vaccines nor did we

document which vaccines were missing to rule the child “not FIC.” That was outside the scope of this study. Demographic and other variables collected are outlined in **Table 3**.

Inclusion criteria

Children <12 months of age and women between 15 and 49 years attending the clinics (**Table 1**) and/or receiving any of the reproductive maternal newborn and child health services at KMH for the period between April 2015 and December 2015 were eligible.

Bivariate analysis

This was performed between the independent variables and outcome variable using 2 by 2 tables. A 95% Confidence Interval (CI) and P-value for the outcome of interest (FIC status) for each variable collected were calculated.

Logistic regression

The outcome variable was the likelihood of a child ≤12 months being FIC. The independent variables were the individual characteristics of both the child and his/her mother outlined in **Table 3**.

Ethical approval

All the MoH registers where data were collected remained confidential because the data collection exercise was at the KMH MCH clinic. There were no face-to-face interviews with the mothers. Approval for the study was obtained from the Kenya Field Epidemiology and Laboratory Training Program faculty and the permission to access the registers and DHIS was obtained from Turkana County Health Department.

Table 4 Logistic regression findings for mothers and children <12 months of age attending MCH at KMH, Turkana County, Kenya, between April and December 2015

Variable	R-Square	p-value
Age at birth of mothers	0.0003	0.908218
Residence	0.0004	0.607990
Place of delivery	0.0090	0.016699
Sex of child	0.0001	0.759355
Birth order	0.0002	0.726912
Vitamin A by 6 months of age	0.7123	<0.00001
1 dose of measles-containing vaccine by 9 months of age	0.9001	<0.00001

MCH=maternal and child health clinic; KMH=Kakuma Mission Hospital

Results

Descriptive analysis

A total of 615 children were included in the study, with 55% (338) male, and 75% (461) from urban areas (**Table 3**). The mean age of mothers attending the clinics was 23.6±4.5 years (range). A small proportion (27% [167]) were delivered at the hospital, of which 19% (31) were FIC compared to 73% (447) of mothers who delivered at home, of which only 12% (54) of their children were FIC. Only 14% (86) of children recruited were fully immunized as evidenced by a completed “Yes” entry on the FIC column of the MCH clinic permanent register.

Bivariate analysis

Home delivery (OR 0.5, CI 0.3-0.9) was the only variable significantly ($p < 0.05$) associated with FIC (**Table 3**). Age (OR 0.8, CI 0.5-1.3), residence (OR 0.9, CI 0.5-1.5), sex (OR 0.9, CI 0.6-1.5) and birth order (OR 1.1, CI 0.6-2.0) were not significantly associated with FIC status.

Regression analysis

Logistic regression results are outlined in **Table 4**. We included the R^2 to show the proportion of explained variance we noticed in the regression results. Infants who received measles-containing vaccine by 9 months of age explained 90% ($R^2=0.90013$) of the variation in the outcome. Administration of vitamin A supplements by 6 months of age explained 71% ($R^2=0.712322$). Age of mother, sex of the infant, residence, birth order, and place of delivery were not significant predictors of FIC when subjected to regression analyses.

Discussion

A well organized and implemented vaccination program should obtain high and equitable coverage rates for children, irrespective of their socio-demographic circumstances and challenges. Overall, the immunization coverage at KMH was extremely low. Most mothers attending MCH were young, with a mean age of 23.6±4.5 years, which is lower compared to the national mean of 27.7±6.1 years [2]. KMH had a low FIC rate of 14%, a coverage which much lower even when compared to similar population groups just across the border in Ethiopia, which has documented an FIC of 36.6% [11,12].

Place of delivery explained only 1% of variation in FIC status in KMH from the logistic regression analysis results, this determinant’s finding was similar to a finding in a rural Nigerian population where hospital delivery also influenced the likelihood of a child being fully immunized [13]. As much as

place of delivery explained only 1% of FIC status in KMH, this finding was however contrary to a 2010 national study by Antai which demonstrated birth order explained more variation in FIC status, than place of delivery, 14.5% vs 9%, respectively [14]. This study showed that home delivery had a positive association (OR=2.36, 95% CI 1.75-3.19) with the likelihood of children being fully immunized. Van Malderen et al. in a 2013 study demonstrated that living in a community with low proportion of mothers with hospital delivery was associated with lower likelihood of FIC [15] and the general WHO recommendations of at least four ANC visits and hospital delivery to improve on full immunization coverage [7]. However, the KMH context may be explained by the fact that most health services are offered to the majority population, rural pastoralists, and others through integrated outreach activities.

Limitations

The results of the study were limited by the poor quality of data as indicated by the routine data quality assessment results obtained at KMH [16]. The incompleteness of data in the MoH registers at KMH and its clinics, might have affected the impact of our independent variables on the dependent variable (Table 4). Since this study was a retrospective review of medical records, it was not possible to conduct follow-up for the missing data of all the children recruited in the study such as missing FIC status. These children may have become FIC in other health facilities or not at all, a finding that this study could not conclude on. The lack of documentation and focus on spacing needs to be addressed as if the spacing was incorrect or incomplete for vaccines that have multiple doses the child would not be truly FIC.

Furthermore, the findings here are limited to one context of KMH and not Turkana County and its respective sub-counties as a whole. Therefore, it cannot be generalized to other parts of the county. However, our findings can be instructive to other similarly situated health facilities and their catchment areas.

Conclusions

In conclusion, place of delivery, receipt of vitamin A by 6 months of age, and administration of measles vaccine by 9 months of age were the strongest factors influencing vaccination coverage and adherence to the schedule. Most children who were not FIC had poor documentation in their records. Improved documentation in records could help create a clearer picture of the FIC status in Turkana. Because none of the demographic variables were significantly predictive of the outcome, we attributed this to an overall system failure to reach and vaccinate infants living

in Kakuma. Future research should seek to establish the organizational determinants of low immunization coverage throughout the Kakuma health system, but particularly in KMH, as well as the reasons why the quality of data is poor. Overall, our findings have significant policy implications for the child health interventions in Kenya in regard to supervision and monitoring, workforce development; and outreach, education, and health services delivery to marginalized and far-flung populations. Increasing levels of utilization of data at the facility level may help reduce the data quality gaps noted in this study. The health care workers ought to take lead in the ownership of this data for effective monitoring of the health services they are providing.

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