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Factors Associated with Uptake of Yellow Fever Immunization among Mothers of Children Aged 10-24 Months in Kabarnet Division, Baringo County

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Abstract: *Yellow fever is a viral disease transmitted to people and to non-human primates especially those living and visiting tropical regions of Africa, Central and South America through the bites of infected mosquitoes. It is one of the serious public health concerns globally affecting all groups of populations both in rural and urban areas. The main objective of the study was to determine factors associated with the uptake of Yellow fever immunization among mothers of children aged 10-24months living in Kabarnet Division, Baringo County. This study was conducted in randomly selected villages in Kabarnet Division as a cross-sectional study which adopted both quantitative and qualitative data collection techniques. 384 mothers of children aged between 10 and 24 months in Kabarnet Division took part in the study. A sample size of 384 was used to achieve the desired objectives. Structured questionnaires and focus group discussion were administered concurrently. STATA 12 and NVIVO were used for analysis. The study found out that the uptake of yellow fever was 59% in the study locations used. More than 90% of the caregivers were mothers. Knowledge on existence and importance of yellow fever vaccine was found to be associated with uptake of vaccine services. Availability of the vaccines (54%), access to the vaccines (23%) and lack of awareness on the vaccines (18%) were the main hindrances to uptake. The study recommends frequent supply of the vaccines to prevent stock-outs, door to do campaigns to mop out those who are not immunized and awareness campaigns to improve level of knowledge on the vaccines*

1.0. Introduction

Yellow fever is a flavivirus infection that is transmitted to people and to non-human primates through the bites of infected mosquitoes is one of the public health concerns globally. This serious viral disease affects people living in and visiting tropical regions of Africa, Central and South America [1-4]

In rural areas next to forests, the virus typically causes sporadic cases or even small-scale epidemics (outbreaks) but, if it is introduced into urban areas, it can cause large explosive epidemics that are hard to control [6, 7]. Although many people who contract yellow fever do not develop any symptoms, some have mild flu-like symptoms, and others develop a high fever with jaundice (yellowing of the skin and eyes) or hemorrhaging (bleeding) from the mouth, nose, eyes, or stomach [8]. Half of patients who develop these severe symptoms die. Because of this wide spectrum of symptoms, which overlap with those of other tropical diseases, it is hard to diagnose yellow fever from symptoms alone. However, serological tests that detect antibodies to the virus in the blood can help in diagnosis. There is no specific antiviral treatment for yellow fever but its symptoms can be treated [9]. Eradication of yellow fever is not feasible because of the wildlife reservoir for the virus but there is a safe, affordable, and highly effective vaccine against the disease. Large-scale vaccination efforts during the 1940s, 1950s, and 1960s reduced the yellow fever burden for several decades but, after a period of low vaccination coverage, the number of cases rebounded [5 and 10]

In 2005, the Yellow Fever Initiative—a collaboration between the World Health Organization (WHO) and the United Nations Children Fund supported by the Global Alliance for Vaccines and Immunization (GAVI Alliance)—was launched to create a vaccine stockpile for use in epidemics and to implement preventive mass vaccination campaigns in the 12 most affected countries in West Africa. Campaigns have now been implemented in all these countries except Nigeria. However, without an estimate of the current yellow fever burden, it is hard to determine the impact of these campaigns [1 and 2]

In 1988 the EPI global advisory Group reviewed the situation on Yellow Fever and noted high incidence in children. The group recommended for introduction of Yellow Fever vaccine in the routine immunization schedule which was latter endorsed by joint WHO and UNICEF technical group in Africa [11, 12]. Due to the risk of adverse event

reactions the Yellow fever vaccine was not recommended to children under 6 months, the vaccine was aligned to measles Vaccination and recommended to be given at 9 months in high risk Yellow fever epidemic zones. Yellow fever epidemiology triad since 1950, hence linked to the historical resurgence of Yellow fever vaccination [13] indicates 29 countries out 34 African countries are at risk of Yellow fever epidemic due to low Yellow fever coverage of less than 80% WHO/UNICEF recommended coverage (Reach Every Child strategy. 2002).

1.2. Problem Statement

Due to the magnitude of the high morbidity and mortality of vaccine preventable diseases and population involved, governments in most developing countries are streamlining PHC activities by promoting preventive and promotive services through enhanced RED strategy activist to protect venerable population through expanded programme on immunization. Despite introduction of Yellow fever vaccine in routine immunization for Kerio valley zone specifically for Baringo County [1] to accelerate routine immunization to children under one year, Yellow fever coverage has continued to perform below 80% [2], routine immunization statistic [14] for Kabarnet district has cumulatively recorded declining coverage of (57.2%, 50%, 49%, 32.4% and 24.2%) respectively for five (5) years

This low coverage translates into reduced hard immunity for Yellow Fever vaccines among children in Baringo County (low efficacy), exposing venerable children yet to another epidemic outbreak similar to the one that occurred 1991 -1993 that resulted into 22 cases of confirmed Yellow fever outbreak with case fatality of three children who were under 5 years (14, 15).

If the Yellow Fever vaccination can be effectively addressed through routine vaccination it will avoid the mass campaign that contributes to major public health expenditure while Yellow Fever illness contributes to socio-economic problem corresponding to a rising cost of drugs, long duration of hospitalization. Increased prevalence rates will destabilize community while increase poverty in the society.

1.3. Justification of the Study

Yellow fever coverage has continued to perform below 80% [4] routine immunization statistic (KEPI, 2011-2015) for Kabarnet district has cumulatively recorded declining coverage of (57.2%, 50%, 49%, 32.4% and 24.2%) respectively for five years [9]. Yellow fever vaccination poses a serious threat to both EPI programme and the society that has high poverty index level of 46 % like Baringo County [16]

Therefore the study intends to identify the underlying factors contributing to low Yellow fever immunization coverage, subsequently align the findings together with recommendation to implement accelerated immunization coverage based on WHO set standard of increasing all antigen to >90/80 goal. This goal implies that all health facilities should thrive to vaccinate at list 90% of target children under one year within the catchment area to raise total district coverage to > 80% as recommended by WHO [3]

Consequently this study will be of importance to the Division of Vaccines and Immunizations (DVI) whose main mandate is to provide ‘’high quality’’ immunization services to protect the society against Vaccine Preventable diseases (VPD) further more if the situation is not addressed there are like hood of further decline in the coverage, hence subjecting community to YF epidemic and defeat the effort of EPI programme to provide high quality vaccination service for venerable children [17]

The study findings will be used to address the current problems affecting routine immunization programme on YF community prevailing situation. The Division of Vaccine and immunization together with the Baringo County Health Management Team (CHMT) will use this information to plan on strategies to improve Yellow fever vaccines for target children in the this high risk zone.

1.5. Objectives

1.5.1 Main Objective

To determine factors associated with the uptake of Yellow fever immunization among mothers of children aged 10-24months living in Kabarnet Division, Baringo County

1.5.2 Specific Objectives

1. To determine the coverage immunization status of yellow fever immunization among children aged 10-24 months in Kabarnet Division, Baringo County
2. To determine knowledge, attitude and practices of mothers of children aged 10-24 months on Yellow fever vaccination in Kabarnet Division, Baringo County
3. To determine factors associated with uptake of Yellow fever immunization in Kabarnet Division, Baringo County

3. Methodology

3.1 Study Site/ Area

The study was carried out in some randomly selected villages in Kabarnet Division, Baringo

County. Baringo County is located in the high risk Yellow fever zone which lies within Yellow fever epidemiology triad since 1950. The County is divided into 14 administrative wards with 65 locations and 175 sub locations.

The Baringo County has different agro-ecological zones necessitating different agricultural activities. It's situated in arid and semi-arid zone characterised by low annual rainfall However, in the highlands they receive average rainfall. The major farming activities include dairy farming and growing of maize, groundnuts, cotton and coffee. The remainder of the county is mainly rangelands with the rearing of goats, sheep, cattle and camels and bee keeping that translates into livestock activities. The district is served by all-weather roads - Eldoret - Kabarnet and Murom - Kabaranet earth roads [18].

The district is experiences hot and warm weather; this warmer and hot climate accelerates the spread of disease primarily because warmer global temperatures favours microorganisms as well as disease-carrying animals e.g. primates - monkeys, insects –mosquitoes and the germs and viruses they carry to survive (epidemiological triad). Climate-sensitive diseases are among the largest global killers. Deadly diseases are often associated with hot and warm weather e.g. Aides mosquitoes that causes Yellow fever is spread due epidemiological triad that favours environment, vectors and agent to thrive. Hence Baringo County where Kabarnet county hospital is situated has basic climatic conditions that favour the existence of Aedes mosquitoes, coupled with the presence of primates that acts as host [19]

The Tugen are indigenous community who are part of the Kalenjin community when combined with other sub tribes form seven tribes of Nilotic ethnic groups. The official spoken language is Tugen, these are nomadic community who values livestock, hence livestock plays a central role during cultural events and dowry settlements, meat and milk form part of their stable food. They worship to god known as Asis which means 'sun' currently majority have converted to Christianity [20].

3.2. Study Design

This was a cross sectional descriptive study that utilized both quantitative and qualitative techniques.

3.3. Study Population

The study population consisted of mothers of children aged 10-24 months living in the randomly selected villages in Kabarnet Division, Baringo County.

3.4. Inclusion and exclusion criteria

Mothers of children aged 10 to 24 months of age who lived in the randomly selected village and who had given consent to participate were included, whereas mothers who had children in the same group but refused to give their consent to participate were excluded [21].

3.5 Sample Size Determination

The sample size for the large population was calculated using the Fischer's exact probability test as shown below. This formula is only applicable when the population under study is over 10,000.

$n=Z^2 *pq /d^2$ [22]

Where:

n= desired sample size if sample population is above 10,000

Z= standard normal deviate at a required confidence level (in this case 95% confidence level)

p=proportion in population estimated to have particular characteristics (placed at p=0.5 since the proportion of attitudes and perceptions towards the yellow fever vaccination is unknown)

q=1-p

d=level of precision at 95% confidence level

Therefore sample size in this case

z=1.96, p=0.5 ,q=0.5, d=0.05, $n=1.96^2*0.5*0.5/0.05^2 = 384$

3.6 Sampling procedures

The study used a convenience sampling technique. A convenient sample consists of using the most readily available or most convenient group of subjects for the sample (Cohen et al., 2000). This method was chosen in order to target the respondents who were willing to participate in the study and those who were available at the time when the researcher was gathering data. Kabarnet Division was used as the venue for sampling. Multi stage purposive sampling was used to select the sites (sub counties, wards and villages) due to the vastness and hard to reach locations. Six wards were sampled from 6 Sub-counties by their status of vastness, and hard to reach areas, Kabarnet was selected due its many villages 412, vastness and hard to reach areas. Kabarnet is a highland yellow fever epidemic prone zone and the residents are the Tugen community who are nomadic pastoralists and bee keepers. The House holds for Yellow fever intervention with mothers of children aged 10-24 months was selected using a computer from the village house hold master list to generate at least 500 households with mothers with children aged 10-24 months, with assumption that some households might not have eligible children aged

10-24 months. A list of 412 villages was typed on MS Excel workbook to make a village master list, a list of 40 villages was randomly generated using random number generator (MS Excel) as shown below [23-25 and 26]

3.7 Methods of Data Collection, Management and Analysis

Structured questionnaire was administered to mothers of children aged 10 months to 24 months. The questionnaire (Appendix 1) was to address issues such as the immunization status coverage of children in Kabarnet Division, knowledge, attitude, practices of mothers of children aged 10-24 months about Yellow fever vaccination and the factors associated with Yellow fever immunization. The questionnaire was administered in the translated version in Tugen (Appendix 2). Two focus group discussions amongst the mother of children aged between I0-12 months and 13-24 months was conducted. Each group was composed of between 8-12 mothers who were purposively selected to participate in the discussions. The discussions were conducted in a nearby primary school in consultation with the mothers (participants). The researcher moderated discussions while one field assistant will be tape recording and taking notes, as back up [29].

Data entry from the questionnaire was done using Microsoft access through using unique identifier in duplicate for validation, double entry and exported in SPSS version 12. The data was cleaned, cross-checked for entry errors and range checks. Data storage was done using a flash disk while questionnaires sheets were kept under lock and key drawers. Data was then entered and analysed using SPSS version 14. Pearson's Chi-square test was used to determine various levels of association in the variables. The results were presented in form of tables, descriptive statistics and measures of association [30]. Data from FGDs was transcribed, translated into English and typed into MS word for easy keeping (as transcripts) using flash disk. Coding on the transcripts was done using NVIVO version 10 to enable thematic analysis which was based on themes developed from objectives and responses. Its results were presented in verbatim form.

4. Findings

This chapter covers data analysis and interpretation. The data was collected using structured questionnaire and focus group discussion and organized using Epi-Info which was then analysed using STATA 12. Summary tables were used together with graphical presentations where applicable. Associations were tested using Pearson's chi-square. The study covered a total of 384 mothers/caregivers with children 10-24months living in the randomised villages in Kabarnet.

4.1. Social and Demographic Characteristics of the Study Population

Ninety-six per cent (n=373) of the respondents (parents or guardians) who took part in the study and indicated their gender were Female. Most, 219 (57%) of the children whose parents/guardians took part in the study were Female whereas 157 (41%) were male. Respondents aged between 21 and 24 years were the majority, 108 (28%), followed by 104 (27%) aged between 25 and 29 years. The mean age of the children whose guardians or parents took part in the study was 14 months (SD=4.08). Majority, 235 (61%) of the children were aged 14 years and below whereas only 63 (16%) were above than 19months old.

Table 4.1. Age and Gender Distributions in the Population

Variable	Frequency	Percentage
Sex		
Female	373	96.9
Male	11	3.1
Child Sex		
Female	219	56.9
Male	165	43.1
Respondent Age		
Under 20 years	45	11.7
21 – 24	108	28.0
25 – 29	104	27.0
30 – 34	78	20.3
35 and Above	46	12.0
Missing	3	1.0
Child Age	Mean (SD) = 14.47 (4.08)	
14 months and below	235	61.0

15-19 months	83	21.6
20-24 months	66	17.4
Total	**384**	**100.0**

Most, 238 (62%) of the respondents were married with the rest of the population either Single (28%), Divorced/Separated (6%) or Widowed (2%). Housewives, 108 (28%) and farmers, 100 (26%) were the main occupation for the respondents, highlighting their perceived socio-economic status.

Table 4.2. Socioeconomic Characteristics of the Population

Variable	Frequency	Percentage
Marital Status		
Single	106	27.5
Married	238	61.8
Divorced/Separated	23	6.0
Widow/Widower	8	2.1
Missing	9	2.6
Religion		
Christian	370	96.1
Muslim	4	1.0
Traditional	2	0.8
Missing	7	2.1
Education	Mean (SD) = 14.47 (4.08)	
None	5	1.3
Primary	103	26.8
Secondary	175	45.4
College	80	20.8
University	12	3.4
Missing	8	2.3
Occupation		
Housewife	108	28.4
Farmer	100	26.0
Teacher	49	12.7
Civil Servant	38	10.1
Business	79	20.5
Student	9	2.3
Total	**384**	**100.0**

4.2. Coverage of Uptake of Yellow Fever Vaccine

The overall yellow fever immunization coverage for the study was 59% (n=225). Table 4.3 shows the distribution of Booklet ownership (an indicator of immunization awareness by village. Of the villages that were sampled, Ochii, Pemwai, Otingo, Kimotony and Kiboei each had one household without an immunization booklet (which implied that they had not attempted to seek the immunization care). The only other village with households without a booklet was Kapropita (2 households). The differences in booklet ownership across the villages were not statistically significant (p=0.373).

Table 4.3: Coverage of Yellow Fever Immunization by village

Village	Has your child ever received Yellow Fever immunization?			
	No	Yes	Total	
Chepkenon	3	7	10	$\chi 2 = 40.19$ df = 39 p = .373
Hospital II	4	5	9	
Kabarbarma	0	9	9	
Kabonde	0	9	9	
Kamondui	0	7	7	
Kapitai	10	0	10	
Kapkapsango	8	1	9	

Kapkelelwa	7	2	9
Kapkemel	7	2	9
Kapropita	8	2	10
Kaptarakwa	10	0	10
Kaptiony	9	0	9
Katmamuma	10	0	10
Kibemgoi	9	0	9
Kiboei	9	0	10
Kimagok	10	0	10
Kimotony	9	1	10
Kipkaech	0	10	10
Kiptim	0	10	10
Lelgut	0	10	10
Magonoi	0	10	10
Mowo	0	10	10
Ngolong	0	11	11
Ochii	9	1	10
Oinobmoi	10	0	10
Onogo	9	0	9
Otingo	9	1	10
Pemwai	9	1	10
Senjani	0	9	9
Serei	0	9	9
Sigono	0	10	10
Sikinwo	0	10	10
Tambuchwa	0	10	10
Torogok	0	10	10
Torokwone	0	9	9
Tubei	0	10	10
Tuli	0	9	9
Tumbosok	0	10	10
Tumgoi	0	16	10
Ngechepche	0	9	9
Total	**159 (41.4)**	**225 (58.6)**	**384 (100.0)**

4.3. Knowledge, attitudes and practices of respondents on Yellow fever immunization

21 (5.45%) indicated that they have never been informed on importance of completing schedule for routine immunization. However, for those who indicated having previously been informed of importance of completing the immunization schedule, 94% of them indicated health units or facilities as the source of that information.

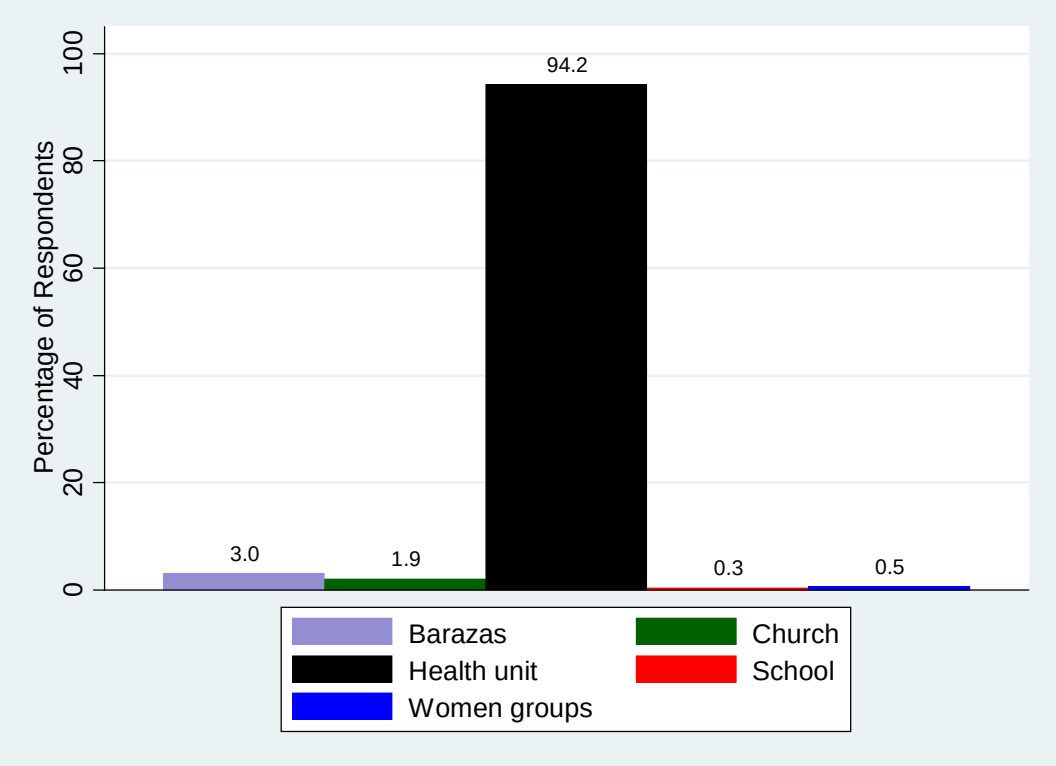

Figure 4.1. Where did you get the information on importance of completing schedule for routine immunization issues?

Only 8 (2.1%) did not have an immunization card booklet as observed in the missing information section for the completeness of immunization schedule. Most respondents, 214 (56%) indicated that vaccines were not available, whereas far distances from the hospitals and lack of awareness on existence of the services each contributed to 66% of non-immunization cases. This is consistent with the reports from the focus group discussions that the mothers are often not informed on the importance of completing routine immunization for yellow fever. For instance a sentiment from a mother in the group discussions that

"They don't care, honestly, whether you are informed or not. Their lives won't stop"

Table 4.4: Completeness of Schedule

Variables	Frequency	Percentage
Completeness of Immunization Schedule		
Partially completed (Measles given without Yellow Fever)	346	89.9
Schedule Completed	31	8.0
Missing	7	2.1
Reasons for non-immunization		
I did not know it existed	66	17.1
Health facilities are far away	66	17.1
Vaccines are very expensive	5	1.1
Vaccines are not available	214	55.6
Not Applicable	34	9.1
Which disease does Yellow Fever Protect?		
Aware	161	41.8
Not Aware	223	58.2
Total	384	100.0

Figure 4.2 shows the distribution for testing respondent knowledge on why yellow fever vaccine is administered. 72% revealed that the vaccine helps protect the children against diseases, 21% said that it helps the children to grow healthwise, whereas 7% had no idea why the

vaccine was administered. In terms of correctness of knowledge, only those who knew of the preventive role played by the vaccine on a child's health answered correctly.

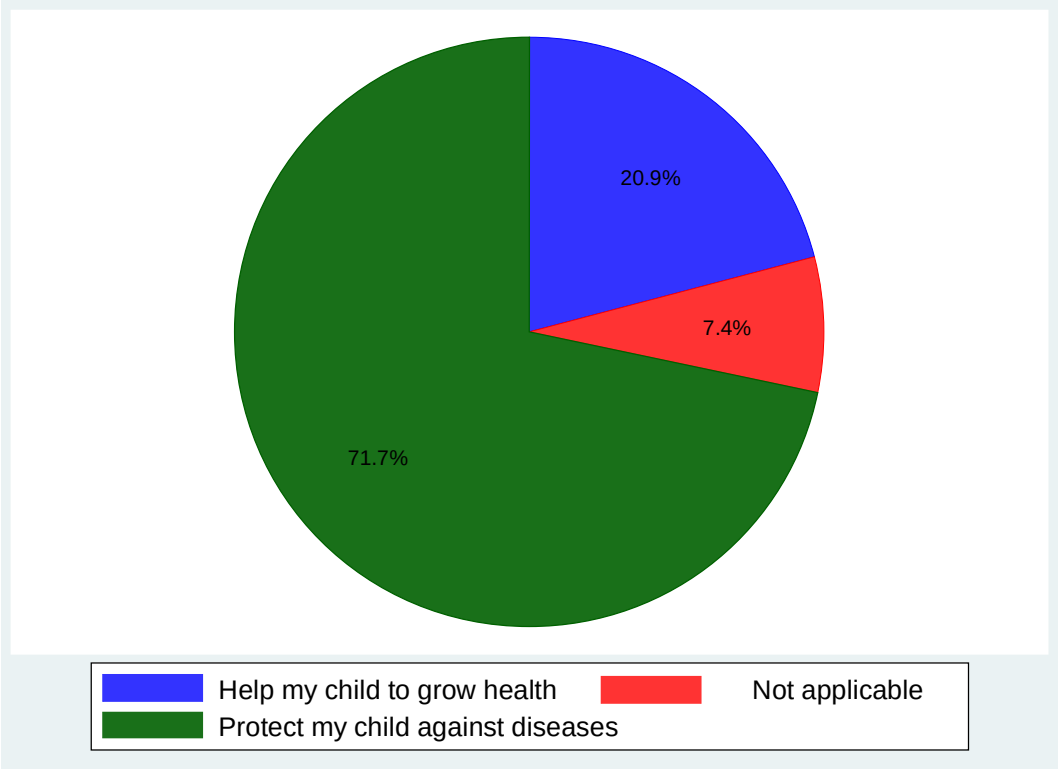

Figure 4.2. Why did you think routine immunization for Yellow Fever is important for your child?

Figure 4.3 presents the findings on the source of information on yellow fever vaccine. The vast majority (82%) sourced their information from the district hospitals, whereas the remaining 18% obtained the information from government health facilities other than district hospitals.

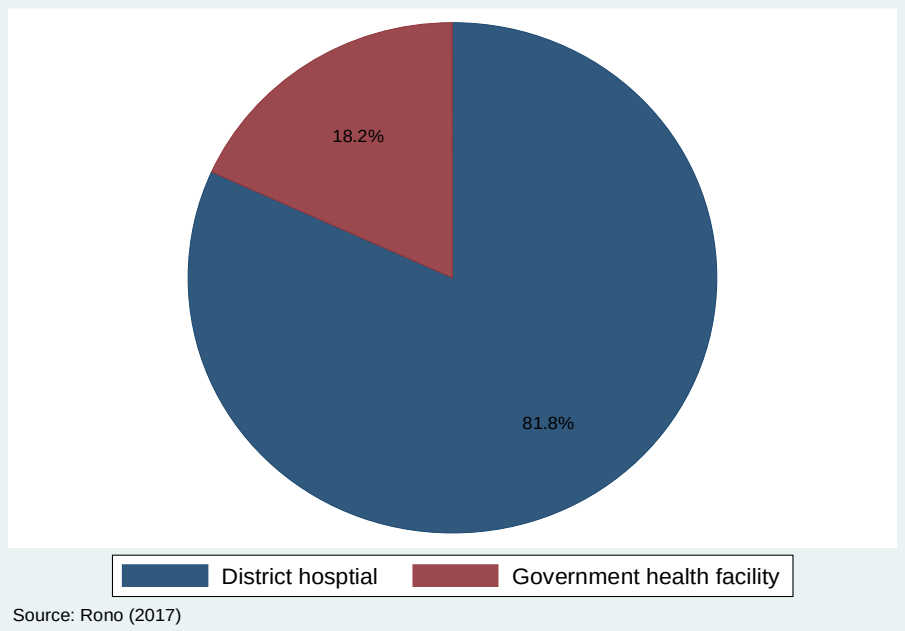

Figure 4.3. Where did your Child receive immunization?

Of the respondents who had accessed the yellow fever vaccine services, 6% were satisfied whereas 94% were not.

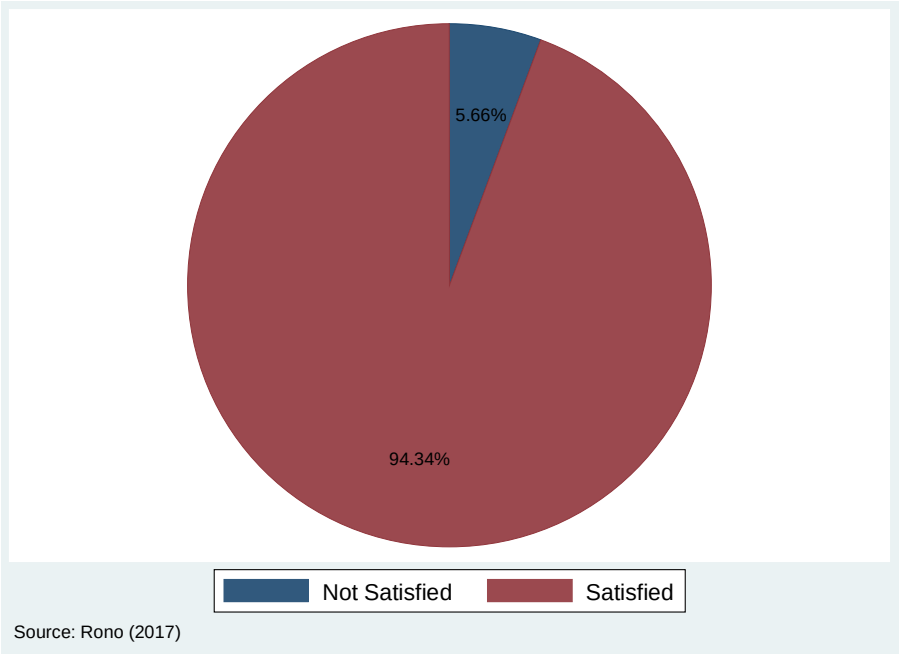

Figure 4.4. Were you satisfied with the services?

Of the respondents who indicated their dissatisfaction, the outstanding reason for not being satisfied with the services was unavailability of the services (71%). Fear of vaccine reaction and long walking distance were each cited by 14% of the respondents.

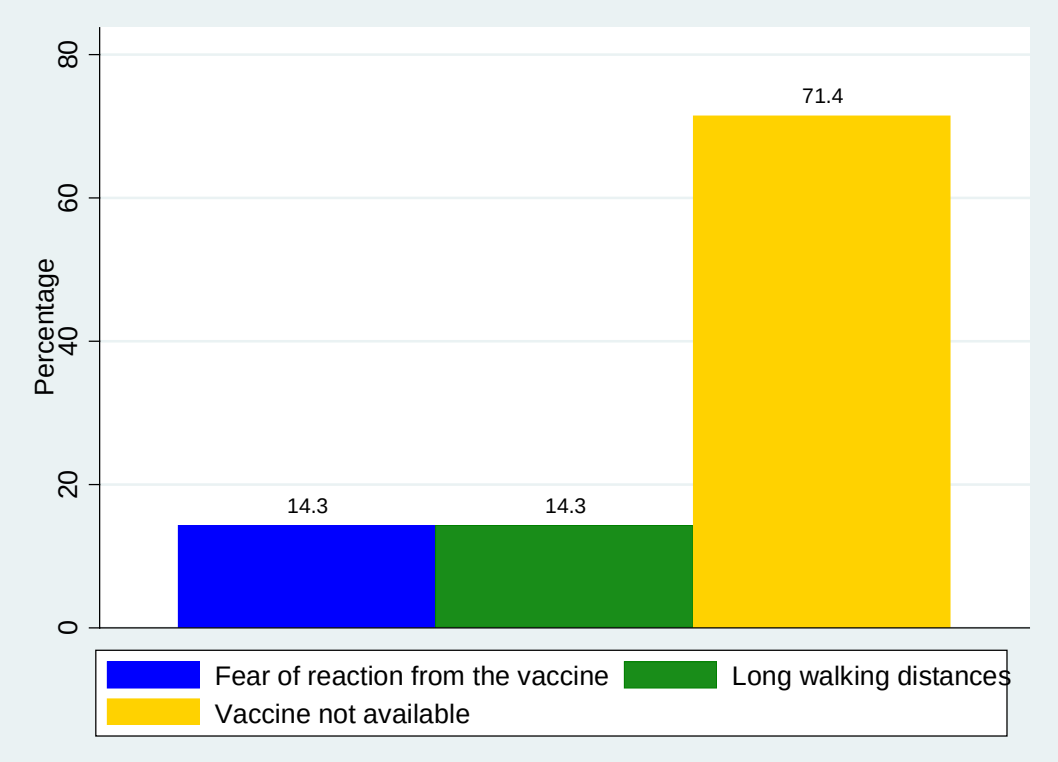

Figure 4.5. Why were you not satisfied?

Of the 74 participants who responded to the question on awareness of yellow fever vaccine side effects, only 3 (4%) of them were confidently aware of the side effects. The rest were either totally not aware (64%) or indicated that yellow fever vaccine had no side effects (31%).

Table 4.5. Awareness on side effects of Yellow fever

Variable	Values	Frequency	Percentage
Are there any side effects associated with yellow fever vaccine	No	23	31.1
	Not Aware	48	64.9
	Yes	3	4.0
	Total	74	100.0

A cross tabulation of between the mothers'/caregiver's level of education and awareness of the importance of completing routine immunization schedule for the child under 1yr for all antigens shows a significant relationship (Pearson $chi^2(3) = 11.485$ $p = 0.009$). This awareness increases with the level of education.

Table 4.6. Awareness on importance of Immunization schedule by Education Level

	Aware of the importance of completing immunization schedule for 10-24months			
Education level	Yes (%)	No(%)	Total (n)	
None	20%	80%	5	$\chi 2=11.485(3)$ p=.009
Primary	38.9	62.1	103	
Secondary	72.0	28.0	175	
College	87.5	12.5	80	
University	91.7	8.3	12	
Total (n)	73.1	26.9	375	

4.5. Factors contributing to low yellow fever immunization uptake

Most (n=224) respondents lived within 5km of the health facilities. Forty-four per cent (n=166) of the respondents walked their way to the hospitals, whereas 32% (n=120) used motor bikes. Only 4% used bicycles. This shows that the socio-economic status of the residents was low-middle income. Since majority had to walk to access the yellow fever vaccine, distance could be a hindrance to their ability to obtain the services.

Table 4.7. Distance to the Health facility against Means of accessing health facility

Means to the health facility	Distance to Health facility, n (%)			
	Less than 5 km	5-10 km	More than 10 km	Total
Bicycle	2 (0.9)	2 (1.4)	0 (0.0)	4 (1.2)
Motor bike	67 (29.9)	53 (38.1)	0 (0.0)	120 (32.2)
Public Vehicle	19 (8.5)	54(38.9)	10 (100.0)	83 (22.3)
Walk	136 (60.7)	30 (21.6)	0 (0.0)	166 (44.5)
Total	224 (100.0)	139 (100.0)	10 (100.0)	373 (100.0)

Table 4.8 shows distribution of various factors that measure availability. Seventy-seven per cent (n=296) indicated that they have never received health education on importance of completing routine immunization

Table 4.8. Availability of vaccines and health education services

Variable Values	Frequency	Percentage
Have you ever attended or received health education on importance of completing routine immunization schedule including receiving Yellow Fever?		
Yes	87	22.6
No	296	76.9
Missing	2	0.5
Have you ever brought your child to the health facility and given measles and told that Yellow Fever vaccine is not available?		
Yes	378	98.2
No	7	1.8
Frequency of Drug Unavailability		

Once	111	28.8
2-3 times	195	50.6
More than 4 times	51	13.3
Not sure	21	5.5
Missing	7	1.8
Did you pay for Routine vaccination service?		
Yes	0	0.0
No	375	97.4

No service (0%) was listed by the respondents as having been paid for.

4.6. Recommendations based on challenges in YFV uptake

Figure 4.6 shows results on the challenges that if acted on can improve YFV uptake. Availability of the vaccines (54%), access to the vaccines (23%) and lack of awareness on the vaccines (18%) were the main hindrances to uptake. When asked of their opinions on how to improve the immunization process for yellow fever, the respondents suggested improvement on making the vaccines available and sufficient in the facilities. They also proposed campaigns to ensure better intrusion of the services such as door to door immunizations to follow up children who missed their vaccinations and awareness campaigns to improve their knowledge on yellow fever.

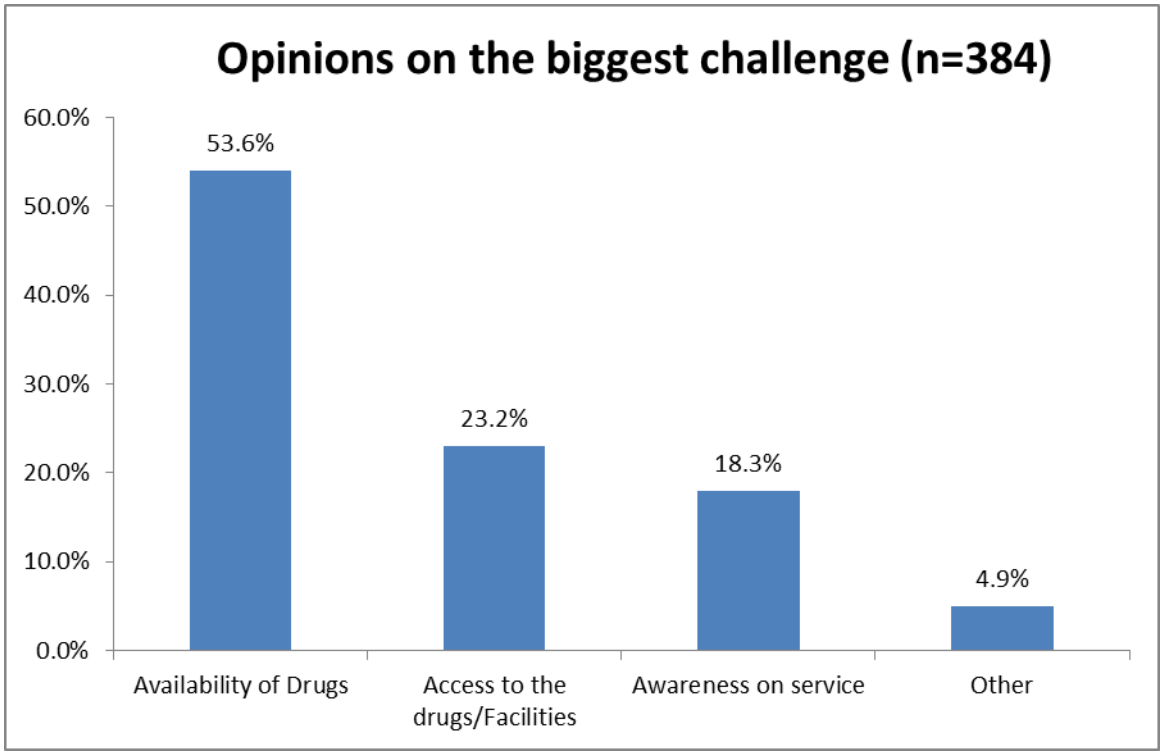

Figure 4.6: Areas for Improvement to ensure better uptake

5. Discussions, conclusions and recommendations

5.0 Discussions

Chapter four presented the results of the analysis of factors associated with uptake of Yellow fever immunization for mothers with children 10-24months in Kabarnet County. Descriptive statistics, chi square tests were used to establish the factors affecting Yellow fever routine immunization. Yellow fever vaccination coverage in Baringo County stands at 42.5% which is lower than (WHO- UNICEF 2002) recommended coverage. Differentials in Yellow fever vaccine uptake by education are evident, for instance, college educated mothers/caregivers are more likely to take their child for Yellow fever vaccination compared to their counterparts with lower education [2-4]. The study population recognized the importance of Yellow Fever vaccination. Parents interviewed expressed the pleasure that they always took their children for vaccination from birth up to one year. However, they don't always get updated on the importance of

their children for receiving yellow fever vaccine. They further explained that health workers don't inform them when the yellow fever vaccines are available in the health centres so that they should take back their children to be immunized.

On side effect – two parents shared their experience on how they have been managing their children to address pain, but majority appreciated that pain end within 2-4 days. With regards to traditional healer – only three mothers appreciated the presence of traditional healers but went further and explained that they don't offer immunization but they give herbs to protect their children from sickness that can be caused by bad eye. 10 out of 15 respondent were not satisfied with yellow fever vaccination due to scheduled immunization days that is offered on Fridays only and it's not automatic since it depends on vaccine availability, 9 client had missed the yellow fever vaccine for 3 consecutive months, but the time of the discussion their children had only been vaccinated for measles since yellow fever was out of stock. When asked to suggest ways of improving yellow fever vaccination, the respondents proposed that the hospital staff should give all the vaccine on daily basis, according to them they don't know why they told to come on Fridays and yellow fever vaccines. This request was consistent with ways of ensuring quality health services suggested by the WHO [6, 21, and 28] and [34].

They went further and explained that sometimes they also miss other subsequent antigens and requested the research team to ensure that the hospital stocks all the vaccines As for the demand for vaccines, based on the focus group discussion findings, the mothers disclosed that there is high demand for Yellow Fever, hence they decided to schedule the immunization days to reduce wastages and meet satisfy the their clients [1, 13 and 23].

Mothers also prefer door to door administration of the vaccine, which represents an aspect of dependency mind-set among the resident care givers. The finding that there is no focal person for Yellow Fever surveillance to inform the mothers on when the vaccines is available at the county is a huge problem. This is a real weakness on the part of the remote health systems especially given that vaccine administration is one of the measures of performance for health service quality. Vaccines information availability and dissemination is also a bare minimum for most health sectors yet is not the case in Kabarnet Division [16, 3 and 8].

5.2. Conclusions

The study focused its attention on Yellow fever uptake due to its low coverage in Baringo County despite the reported outbreaks a few years back (1991-1993) and suspected outbreak (2011). The single most important predictor of Yellow fever vaccine coverage at Kabarnet County is vaccine stock out. The risk of low Yellow fever uptake is highest among those with lowest education while the rates are lowest among the highly educated. Yellow Fever vaccine coverage among children stand at 59% which is less than 80% threshold recommended for perfect herd immunity

5.3. Recommendations

Following the discussed findings, the study recommends that:

1. Yellow fever vaccines in health facilities should be consistently stocked so as to prevent the frequent stock-outs in the vaccines in the study area.
2. Yellow fever campaign should be conducted in Kabarnet Division at least once after every 2 years so that any child who has missed routine immunization is able to be served as well as new migrants in the community.
3. The County health management team should ensure the vaccine is ordered based on target population of the County to avoid stock outs.
4. The EPI programs should restructure vaccine delivery to channel vaccines directly to the County rather than passing through the depot.
5. Vaccination package on Yellow fever communication should be designed and disseminated to Kabarnet district catchment areas in view of increasing awareness of the yellow fever disease burden and its relationship to hard immunity.
6. Further studies need to be conducted to test the magnitude of effect of individual factors on uptake of yellow fever vaccine.

Abbreviations and Acronyms

CHMT County Health Management Team
EPI Expanded Programme of Immunization
ERC Ethics Review Committee
GAVI Global Alliance for vaccines and immunization
ITROMID Institute of Tropical Medicine and Infectious Diseases
JKUAT Jomo Kenyatta University of Agriculture and Techno
KEMRI Kenya Medical Research Institute
KEPI Kenya Expanded Programme on Immunization
KNH Kenyatta National Hospital
MCH Maternal and Child Health Clinic
RED Reach Every Child
UON University of Nairobi
UNICEF United Nations Children fund
VPD Vaccine Preventable diseases

WHO	World Health Organization
YF	Yellow Fever

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