Dropout From Routine Immunization Among Children 12-23 Months Of Age In Garissa Sub County, Kenya

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ABSTRACT

Objective: To assess the factors associated with dropout in routine immunization among children 12-23 months of age in Garissa Sub-County

Research Design: This study was a descriptive cross-sectional study

Location of the study: Garissa sub-county in Garissa County, Kenya.

Target Population: 7176

Sample population: 216 children aged 12- 23 months

Data Collection Instrument: primary data was collected using questionnaire

Results: The findings illustrate that there were significant dropout rates within and between the immunization antigens: Pentavalent-1 to pentavalent-3 recorded 13 percent, while pentavalent 1- to measles recorded 17 percent. Mothers had different levels of knowledge regarding the different types of vaccine; measles 91% and 34% percent in influenza. Their biggest fear was derived from possible occurrences of adverse effects. Health system factors such as readily available vaccine, trained health care workers and possession of MCH cards contributed to high drops rate and immunization coverage

Conclusion: There were significant dropout rates within and between the immunization antigens: Pentavalent-1 to pentavalent-3 recorded 13 percent, while pentavalent 1- to measles recorded 17 percent. Mothers had different levels of knowledge regarding the different types of vaccine; measles 91% and 34% percent in influenza. Their biggest fear was derived from possible occurrences of adverse effects. Health system factors such as readily available vaccine, trained health care workers and possession of MCH cards contributed to high drops rate and immunization coverage.

Key words: Garissa sub county, Dropout from routine immunization among children 12 -23 months of age

1. INTRODUCTION

According to the World Health Organization (WHO), immunization is the process whereby a person is made resistant to an infectious disease, typically by the administration of a vaccine. A vaccine is a substance used to stimulate the production of antibodies and provide immunity against one or several diseases, prepared from the causative agent of a disease, its products, or a synthetic substitute, treated to act as an antigen without inducing the disease. Vaccines stimulate the body's own immune system to protect the person against subsequent infection or disease.

Vaccination is considered important for improving child survival (Lee, 2005), and one of the most cost-effective public health interventions to date, saving millions of lives (Levine *et al.*, 2011) and protecting countless

children from illness and disability. This is because more than 10 million children in developing countries die every year because they do not access effective interventions such as immunization that could fight common and preventable childhood illnesses (Zaidi et al., 2014). Immunization remains the most important public health intervention and a cost effective strategy to reduce both the morbidity and mortality associated with infectious diseases.

Vaccination coverage is dependent on supply as well as demand for vaccines. Adequate supply can be maintained by procuring enough vaccines and ensuring vaccines are readily available at health facilities with trained staff to give the vaccines and adequate equipment to safely store and maintain them. Demand for the vaccine can be complex, and depends on factors including caregiver knowledge and attitudes for health service, diseases and vaccinations (Katz *et al*., 2004) as well as access to healthcare and vaccination facilities.

In Kenya healthcare facilities at the sub-county level serve as immunization facilities for routine immunization (Kariuki, 2012). Caregivers who bring their children to the health facilities for routine immunization are given information about the type and timing of recommended follow-up immunizations. However, some mothers do not bring their children back on schedule, exposing children at increased risk of infection. Although significant strides have been made in increasing immunization coverage in Kenya including new initiatives of reaching every child in all sub-county, the dropout rates still remain high with more than 27% of the sub-county in Kenya having >10% drop out rates (WHO, 2012). While few studies have been conducted on reasons for dropouts (Kariuki, 2012; Ndiritu *et al*., 2006), little or no evaluations of the strategies to reduce dropouts have been reported in Kenya.

Despite improvement of national estimates, many sub-counties in Kenya continue to report low vaccination coverage. These deficiencies in vaccination coverage have resulted in several wild type poliomyelitis and measles outbreaks in the country particularly Garissa where 14 cases of wild polio virus were reported in May 2013. County low levels of education, long distances to the nearest health facilities, lack of knowledge on immunization and lack of staff are among the contributing factors to low immunization coverage (Omutanyi and Mwanthi, 2005). Thus, there is an urgent need to scale up vaccination coverage in order to reverse this trend.

2. MATERIALS AND METHODS

2.1 STUDY SUBJECTS

This study was conducted in Garissa Sub-county. This is one of the 7 Sub Counties in Garissa County. It covers an area of 5,656 km^2 and is situated 400km north east of Nairobi city with a population of 166,880.

2.2 RESEARCH DESIGN

This study was a descriptive cross-sectional study. This design was applied on Garissa Sub-county to establish the factors influencing dropout rates in immunization among children who were 12-23 months of age.

3. RESULTS

3.1 COVERAGE AND RESPONSE RATE

A sample of 216 households with children aged 12-23 months in Garissa sub-County whose guardians consented to participate in the study were considered. These were selected from the wards in the sub county which were Galbet, Waberi, Iftin, Township and Sankuri. Out of these 216 sampled respondents, 168 returned their responses which was a 78% response rate (Table 4.1). Babbie (2011) suggested that a response rate of 60% is good for paper based questionnaire survey. The response rate for this study was adequate and good and the findings presented relate to the 168 responses received. All these received questionnaires were found to be fit for analysis.

Table 4.1: Sampling Distribution

No.	Ward	Sample	Coverage	%
1	Galbet	73	62	85
2	Waberi	35	28	80
3	Iftin	52	37	71
4	Township	38	26	68
5	Sankuri	18	15	83
Total		216	168	78

3.2 CHARACTERISTICS OF RESPONDENTS

Demographic characteristics of the 168 mothers and caregivers indicated that 57% were aged 26 – 35 years while only nine percent were aged above 45 years (Table 4.2). Eighty-eight percent of the respondents were married, while only one percent had never been married. These findings show that most of the children aged 12 – 23 months were in households where the parents were young and married.

Table 4.2: Age and Marital Status of mothers and caregivers of children 12 to 23 months of age in Garissa sub-county, Kenya, October – November 2016

Attribute	Characteristics	N	%
Age	25 and below	38	23
	26 – 45	98	57
	46 and above	15	9
	Missing	17	10
Marital Status	Never married	2	1
	Married	147	88
	Divorced / separated	12	7
	Missing	7	4
Total		168	100

The study also investigated household characteristics and the relationship between the respondent and the child. The results in Table 4.3 indicated that 58% of the respondents were mothers to the children while only the rest were other household members, These results indicated that most of the respondents were mothers and hence could be able to provide the requisite information required about the children. The study also investigated the

household size of which the child under study belonged. The results established that 56% of the children came from households which had and 4 – 6 members while 8% came from households with over 13 members.

Table 4.3: Respondents' relationship with Child and Household size

Attribute		N	%
Relationship with Child	Mother	98	58
	Others	70	42
Household size	6 and below	94	56
	Above 6	74	44
Total		168	100

Out of all the households, 42% had two children aged five years and less. Those with 3 and above children aged five years or less were 29% (Table 4.4). Households with one child aged between 12 and 23 months were 58%. Those households that had three or more children aged 12-23 months were 17%.

Table 4.4: Number of respondents by number of children aged less than five and by number aged 12 to 23 months

Attribute		N	%
Number of children aged less than five years	1	48	29
	2	71	42
	3 and above	49	29
Number of children aged 12 to 23 months	1	97	58
	2	42	25
	3 and above	29	17
Total		168	100

The results in Table 4.5 indicated that 24% of the children were first or second born while 21 were born third or later. The results further indicated that 51% of the children were male while 49% were female. Similarly, the study sought to establish where the child was delivered. Results indicated that 80% of the children were delivered in hospitals while only 20% were delivered at home. This indicated that most mothers in the area were opting for hospital delivery, noting that this had greatly outnumbered home delivery.

Table 4.5: Birth order, sex of the child and where the child was born

Attribute		N	%
Birth order	1 and 2	40	24
	3 and above	36	21
	Missing	92	55
Sex of Child	Male	86	51
	Female	82	49
Where the child was born	Home	34	20
	Hospital	134	80
Total		168	100

Socio-economic characteristics of all the household heads indicated that 46% of the had primary level of education while only one percent had tertiary level of education (Table 4.6). Findings moreover indicated that 27% of the household heads had no formal education. The education level attained by mothers was also

investigated. This was because mother's education is largely associated with immunization in various studies. The results in Table 4.5 indicated that 42% of the mothers had no formal education while only one percent had tertiary education. These results indicate that mothers and household heads in Garissa sub-county had little or no formal education.

Table 4.6: Reported level of education of household head and highest level of education of child's mother

Attribute		N	%
Highest level of education attained by household head	None	46	27
	Primary	77	46
	Secondary	33	20
	Tertiary	2	1
	Post tertiary	3	2
	Missing	7	4
Highest level of education attained by the mother	None	70	42
	Primary	56	33
	Secondary	29	17
	Tertiary	2	1
	Post tertiary	6	4
	Missing	5	3
Total		168	100

The occupation of the mother or caretaker was also sought with results being as indicated in Table 4.7. The results noted that there were different occupations for the mothers and caregivers. Results established that 38% of the mothers and caregivers were house servants while one percent indicated that they were artisans. Those who were unemployed were 19%.

Table 4.7: Main occupation of the mother or caregiver

	N	%
Peasant	36	21
Driver	12	7
House servant	63	38
Artisan	2	1
Business person	23	14
Unemployed	32	19
Total	**168**	**100**

The ability to read and write for the mothers or caregivers of the children was also investigated. The results indicated that 65% could read while 35% could not read. The results indicated that 60% could write while 40% could not write (Table 4.8). This indicated some inability on the part of the mothers and caregivers who could not read to respond competently to the questionnaires and also the inability to interpret the immunization cards. For those respondents who could not read, the questionnaire was administered to them by the researcher.

Table 4.8: Socio-economic characteristics of mother [or] and caretaker

Attribute		N	%

Ability to Read	Yes	109	65
	No	59	35
Ability to Write	Yes	100	60
	No	68	40
Total		168	100

3.3 DROPOUT RATE FROM SELECTED ANTIGENS

The study sought to achieve the first objective by analysing the dropout rate for selected antigens. First, the study sought the immunization of the children for the different antigens. The antigens selected were BCG, Penta 1, Penta 3 and measles. The study results are presented in Table 4.9. The reported BCG vaccination coverage was 86%, 60% for Penta 1, 53% for Penta 3 and 50% for measles. Those who were fully vaccinated were 43%.

The study also sought the dropout rate for the various antigens. Table 4.10 indicates that BCG to Penta 1 drop out rate was hence 7 percent [(86 – 80)/86]. Findings also indicated that dropout rate from Penta 1 to 3 was 13% [(80– 70)/80] while the drop out rate from Penta 1 to measles was 17% [(80 – 66)/80]. These findings indicate dropout rates that were high.

Table 4.9: Immunization dropout rate

Antigens	Point A	Point B	Dropout rate
BCG to Penta I	86%	60%	7%
Penta I to III	60%	53%	12%
Penta I to Measles	60%	50%	17%

NB: Point A refers to first mentioned antigen and B the second

Other aspects of immunization were also investigated. These included possession of MCH card, place of most vaccinations, when the first polio vaccine was received, number of times the polio vaccine was received excluding birth dose, and number of times the pentavalent vaccine has been received. Results are presented in Table 4.11. The results as indicated that 89% of the caregivers had MCH cards for the children. Results also indicated that 87% of the children had received most of their vaccinations in hospitals. Moreover, 73% of the children had received their first dose of polio vaccine at birth. Further, 24% of the children had received the polio vaccine three other times apart from the first does at birth. Similarly, 31% of the children had received the pentavalent vaccine for one time only.

Table 4.10: Other Aspects of vaccination

Attribute	Measurement	N	%
Possession of MCH card	Yes	150	89
	No	8	5
	Missing	10	6
Place of most vaccinations	Hospital	146	87
	During vaccination campaign	9	5
	Missing	13	8
When the first polio vaccine was received	At birth	123	73
	Within first 2 weeks	31	18
	Not received	1	1

	I don't know	6	4
	Missing	7	4
Times the polio vaccine was received excluding birth dose	One time	33	20
	Two times	26	15
	Three times	40	24
	Four times	28	17
	More than four times	38	22
	Missing	3	2
Number of times the pentavalent vaccine has been received	None	25	15
	One time	52	31
	Two times	38	23
	Three times	41	24
	More than three times	7	4
	Missing	5	3
Total		168	100

3.4 KNOWLEDGE ON IMMUNIZATION

Results on knowledge of the caregiver on vaccines are presented in Table 4.12.

Table 4.11: Knowledge on Immunization

Attribute	Measurement	N	%
Do you know the reason why a child is vaccinated?	Yes	145	86
	No	16	10
	Missing	7	4
Why is a child vaccinated?	To prevent diseases	130	90
	So children may grow up healthy	10	7
	To cure diseases	5	3
Do you think a child can get a disease if he/she is not vaccinated?	Yes	145	86
	No	2	1
	Don't know	10	6
	Missing	11	7
Total		168	100

Results presented in Table 4.12 indicate that 86% of the respondents reported that they understood why the child is vaccinated. However, it was 90% of these who clearly understood the need for vaccination. Moreover, 86% rightfully indicated that a child could get a disease if they are not vaccinated. This indicated that most of the mothers and caretakers understood the importance of vaccines.

Further, respondents were asked to mention diseases that are immunized during childhood. This was done without prompting and results are as indicated in Table 4.13. Results in Table 4.12 indicated that without prompting the diseases immunized that the respondents were much aware of included Measles (91%), TB (85%) and Tetanus (80%). Those that the respondents were least aware of included mumps (29%), influenza (34%) and diphtheria (38%).

Table 4.12: Knowledge of Diseases Immunized (no prompting)

Disease	N	Yes (%)	No (%)	Don't know (%)
Measles	168	91	6	3

TB	168	85	11	4
Tetanus	168	80	10	10
Polio	168	75	22	3
Pneumonia	168	70	21	9
Rubella	168	58	32	10
Rotavirus	168	46	38	16
Hepatitis A	168	45	48	7
Pneumococcal disease	168	42	48	10
Haemophilia influenza type B	168	40	49	11
Pertussis (whooping cough)	168	39	57	4
Hepatitis B	168	39	54	7
Diphtheria	168	38	54	8
Influenza	168	34	55	11
Mumps	168	29	61	10

Further the diseases that are immunized during childhood were prompted to the respondents and they were required to indicate whether they were knowledgeable on their immunization during childhood. The results (Table 4.14) indicate that TB had the highest awareness at 96% followed by measles (94%), tetanus (88%) and Polio (88%). Diseases with the least awareness were influenza (41%) and mumps (56%). Without even prompting, the respondents showed a good knowledge of the diseases immunized against during childhood.

Table 4.13: Knowledge of Diseases Immunized (Prompting)

Disease	n	Yes (%)	No (%)	Don't know (%)
TB	168	96	3	1
Measles	168	94	4	2
Tetanus	168	88	9	3
Polio	168	88	8	4
Pneumonia	168	85	13	2
Rubella	168	82	15	3
Rotavirus	168	72	14	14
Haemophilia influenza type B	168	65	29	6
Diphtheria	168	65	31	4
Hepatitis A	168	65	28	7
Hepatitis B	168	63	20	17
Pertussis (whooping cough)	168	61	34	5
Pneumococcal disease	168	57	26	17
Mumps	168	56	33	11
Influenza	168	41	36	23

The study also computed the vaccine knowledge level for the respondents. The percentage was computed based on how many vaccine antigens the respondent knew as a percentage of the total antigens enquired. The classification was as follows: 0 to 20% was very poor, 21 – 40% was poor, 41 – 60% was average, 61 – 80% was good and 81-100% was very good. The knowledge of respondents for the vaccines is presented in Figure 4.1. The results indicated that 68% of the respondents had poor and very poor knowledge of vaccines.

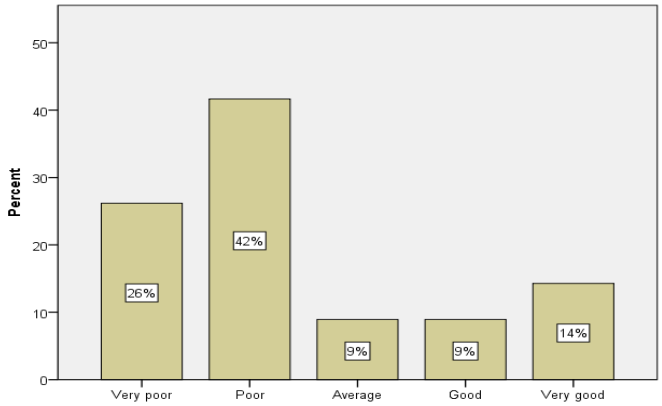

Figure 4.11: Vaccines Knowledge Level

Table 4.14: Attitude and Social Cultural Factors

Factors	N	Not at all	Low extent	Moderate extent	High extent	Extremely High extent	Mean
Opinion from religious leaders	155	29%	8%	21%	27%	15%	2.91
Decision by father not to vaccinate	157	30%	8%	24%	21%	17%	2.87
Rumours about the vaccine	147	28%	20%	24%	16%	12%	2.58
Use of traditional healers instead	149	31%	26%	11%	19%	13%	2.55
Fear of side effects	129	32%	23%	23%	8%	14%	2.49
Concerns about the safety of vaccines	125	32%	17%	12%	21%	18%	3.20
Our customs are against immunization	129	45%	19%	7%	18%	11%	2.29

The association between attitude of caregivers and dropout rate was assessed. The results in Table 4.18 indicate that there was a significant association between fear of vaccines and dropout from BCG to Penta 1 (χ^2 = 11.268; $p < 0.05$) and between fear of vaccines and dropout from Penta 1 to Measles (χ^2 = 9.820; $p < 0.05$). However, findings indicated that there was no significant association between fear of side effects and dropout rate from Penta 1 to Penta 3 (χ^2 = 6.277; $p > 0.05$).

Table 4.15: Association between fear of vaccine side effects and drop out rate

Fear of side effects	Dropout rate					
	BCG to Penta 1		Penta 1 to Penta 3		Penta 1 to Measles	
	No	Yes	No	Yes	No	Yes
Not at all	78.0%	22.0%	87.8%	12.2%	90.2%	9.8%
Low extent	100.0%	0.0%	90.0%	10.0%	86.7%	13.3%
Moderate extent	93.3%	6.7%	73.3%	26.7%	66.7%	33.3%
High extent	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Extremely high extent	88.1%	11.9%	88.9%	11.1%	83.3%	16.7%
χ^2	11.268		6.277		9.820	
df	4		4		4	
P-value	0.024		0.179		0.044	

The association between concerns about safety of vaccines and dropout rate was also examined. The results in Table 4.20 indicated that concerns about safety of vaccines was not significantly associated with BCG to Penta 1 dropout rate (χ^2 = 3.669; $p > 0.05$). However concerns about safety was significantly associated with Penta 1

to Penta 3 dropout (χ^2 = 14.074; p < 0.05) and Penta 1 to Measles (χ^2 = 17.093; p < 0.01). This indicates that concerns about safety of vaccines were a factor which significantly determined immunization coverage.

Table 4.16: Association between concerns about safety of vaccines and dropout rate

Concerns about safety of vaccines	Dropout rate					
	BCG to Penta 1		Penta 1 to Penta 3		Penta 1 to Measles	
	No	Yes	No	Yes	No	Yes
Not at all	87.5%	12.5%	77.5%	22.5%	75.0%	25.0%
Low extent	95.2%	4.8%	100.0%	0.0%	100.0%	0.0%
Moderate extent	93.3%	6.7%	80.0%	20.0%	66.7%	33.3%
High extent	92.3%	7.7%	96.2%	3.8%	92.3%	7.7%
Extremely high extent	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
χ^2	3.669		14.074		17.093	
df	4		4		4	
P-value	0.598		0.012		0.003	

3.5 SOCIAL-CULTURAL, HEALTH SYSTEM AND OTHER FACTORS INFLUENCING DROP OUT RATE FROM ROUTINE IMMUNIZATION

Social economic factors

One of the social economic factors assessed was the means of transport when attending vaccination sessions at the MCH. The results in Table 4.21 indicate that 73% of the respondents indicated that the they travelled on foot with 10% indicating that they travel by bus. Seventeen percent indicated that they travel by private car.

Table 4.17: What transport do you use when going to the MCH clinic

	Frequency	Percent
On foot	119	73
By bus	17	10
Private car	27	17
Total	**163**	**100**

Amount of time spent from home to the clinic was also sought. The results established that 5% of the respondents took less than 30 minutes from home to the clinic through the various means of transport they used. Those who spent more than one hour from home to MCH were 22%.

The study also sough to establish the social economic factors that prevented the respondents from presenting their children for routine immunization. Rating was on a five scale as follows (1 – Not at all; 2 - Low extent; 3 - Moderate extent; 4 - High extent; 5 - Extremely High extent). Means and standard deviations were used to analyse the responses and results are as presented in Table 4.22. The results indicated that payments for immunization prevented immunization to a low extent (mean = 2.05). Further results indicated that long distance to immunization centre (mean = 3.01), lack of knowledge on importance of vaccines (mean = 2.75) and lack of money to take child for immunization (mean = 2.67) all affected immunization to a moderate effect.

Table 4.18: Social Economic Factors Preventing Immunization

Factors	N	Not at all	Low extent	Moderate extent	High extent	Extremely High extent	Mean
Long distance to immunization centre	151	23%	19%	14%	26%	19%	3.01
Unaware of importance of vaccines	150	30%	10%	30%	15%	15%	2.75
Lack of money to take child for immunization	126	30%	20%	20%	14%	16%	2.67
Payments of immunization	138	53%	22%	7%	4%	14%	2.05

Moreover, the study also investigated other social economic factors such as type of housing and other valuables that the family owned. First, respondents were asked whether they owned the house they occupied. Results are as presented in Table 4.23. The results established that 71% of the respondents owned the houses they lived in with 21% not owning the houses they lived in. Those who did not own the house were asked whether they paid rent. The results indicated that 77% of the respondents paid rent while 23% did not pay rent.

Table 4.19: Owning a house or Paying Rent

Attribute	Measurement	N	%
Owning a house	Yes	120	71
	No	35	21
	Missing	13	8
Paying Rent	Yes	27	77
	No	8	23

Further, type of fuel mainly used in the household was investigated. Results presented in Table 4.26 established that most of the households used charcoal (61%) while only five percent used gas. These results indicate that the households were from a lower social economic class which is expected in the rural wards of Garissa Sub County.

Table 4.20: Type of fuel the household mainly uses for cooking

	Frequency	Percent
Electricity	25	15
Bottled gas	8	5
Paraffin/kerosene	10	6
Charcoal	103	61
Firewood	22	13
Total	168	100

The type of floor of the house occupied by the household was also sought. Results indicated that 41% of the households had cemented floors while only three percent each had carpeted and tiled floors.

Table 4.21: Type of Floor

	Frequency	Percent
Earth, sand	60	37
Wood	25	15
Cement	67	41
Carpet	5	3
Tiles	5	3

Total	162	100

The study investigated the health system factors that prevented the respondents from taking their children for routine immunization. Various statements were listed and respondents were required to indicate how the listed factors affected routine immunization. Rating was on a five scale as follows (1 – Not at all; 2 - Low extent; 3 - Moderate extent; 4 - High extent; 5 - Extremely High extent). Means and standard deviations were used to analyse the responses and results are as presented in Table 4.28. The results indicated that insecurity in the area (mean = 2.13) and displacement from area where immunization was available (mean = 1.67) prevented immunization to a low extent. Results further revealed that attitude of health care workers (mean = 3.05), lack of staff in health centre (mean = 2.95), lack of vaccines in health care centre (mean = 2.95) and date of return not indicated by health care staff (mean = 3.14) prevented immunization to a moderate extent.

4.22: Health System Factors Preventing Immunization

Factors	N	1 (%)	2(%)	3 (%)	4 (%)	5 (%)	Mean
Attitude of health care workers	132	31	12	11	13	33	3.05
Lack of staff in health centre	146	27	13	24	18	18	2.95
Lack of vaccines in health care centre	151	23	14	25	23	15	2.95
Date of return not indicated by health care staff	154	27	12	20	11	31	3.14
Child has adverse reactions with vaccines	150	35	15	19	14	17	2.63
Insecurity in the area	143	53	19	7	4	17	2.13
Displacement from area where immunization was available	135	62	23	7	4	4	1.67

The study sought to establish the socio-cultural, health system factors and other factors influencing dropout rate in routine immunization among children 12-23 months of age in Garissa sub- County. This was achieved through test of associations using chi square. The study established that possession of MCH card had significant association with BCG to Penta 1 dropout rate ($\chi^2 = 74.285$; $p < 0.01$) and also with Penta 1 to Measles ($\chi^2 = 17.093$; $p < 0.01$). However, findings indicated that possession of MCH card did not have a significant association with Penta 1 to Penta 3 dropout ($\chi^2 = 17.093$; $p < 0.01$).

Table 4.23: Possession of MCH Card and dropout rate

Possession of MCH Card	Dropout rate					
	BCG to Penta 1		Penta 1 to Penta 3		Penta 1 to Measles	
	No	Yes	No	Yes	No	Yes
Yes	94.6%	5.4%	88.6%	11.4%	75.0%	25.0%
No	0.0%	100.0%	75.0%	25.0%	100.0%	0.0%
χ^2	74.285		1.318		17.093	
df	1		1		4	
P-value	0.000		0.251		0.003	

The study also sought to assess the association between various demographic factors and dropout rate. The demographic factors considered included age of mother, marital status, relationship with child, and household size. The findings in Table 4.30 indicate that age of the mother, marital status and relationship of the respondent with the child were not associated with any vaccination dropout (p values > 0.05). However, results indicated

that household size was associated with only the Penta 1 to Penta 3 dropout ($\chi^2 = 4.859$; $p < 0.05$) but not significantly associated with other dropouts.

4. DISCUSSION

There was poor satisfaction and operational problems with the immunization services at Garissa Sub- County. The study results indicated that BCG to pentavalent 1 drop-out rate was 7%, Pentavalent-1 to -3 was 13% while the drop-out rate from pentavalent-1 to measles was 17%.

The findings on pentavalent-1 to measles dropout rate was considered by Sahoo et al., 2012, as a better measure of overall program effectiveness, whereas penta-1 to pentavalent-3 was considered to be a better measure of delivery effectiveness. Saroja et al., 2011 argued that a drop-out rate of 10% or more for penta-1 to penta-3 was an indicator of perceived satisfaction and operational problems that suggested a problem with the immunization services.

The finding relate to the findings by Owino et al., (2009) in Mathare slums in Nairobi that utilization of immunization services was suboptimal as indicated by the low fully immunized child (FIC) percentage of 69.2%. In this study, full immunization was very poor at 43% despite 90% of the caregivers clearly understanding the need for vaccination.

The study results indicated that 68% of the respondents had poor to very poor knowledge of vaccines. Those that the respondents were least aware of included influenza (41%).mumps (56%), This was similar to a study carried out in Ethiopia by Mohammed and Atomsa (2013) where 168 (24.2%) were not immunized at all, 367 (52.9%) were partially immunized and 159 (22.9%) were completely immunized.

5. CONCLUSION

There were significant dropout rates within and between the immunization antigens: Pentavalent-1 to pentavalent-3 recorded 13 percent, while pentavalent 1- to measles recorded 17 percent. Mothers had different levels of knowledge regarding the different types of vaccine; measles 91% and 34% percent in influenza.

Their biggest fear was derived from possible occurrences of adverse effects. Health system factors such as readily available vaccine, trained health care workers and possession of MCH cards contributed to high drops rate and immunization coverage.

6. RECOMMENDATIONS

- To increase mothers' general knowledge on immunization, health care workers need to carry out extensive social mobilization

- Health care workers to carry out health education for the mothers before and after delivery on how to differentiate between normal effects of immunization from their adverse effects in order to allay unnecessary fears.
- The county government of Garissa needs to enhance immunization outreach services to ensure that eligible children living in far places are immunized
- The health managers should ensure the continued availability of stocks for all antigens to prevent stock outs leading to missed opportunities for immunization

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