

# Missed opportunities for immunization among children attending a Paediatric Outpatient Clinic at Juba Teaching Hospital

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**Background:** Immunization prevents child morbidity and mortality through the universal access to routinely recommended childhood vaccines.

**Objectives:** To determine the prevalence and factors associated with missed opportunities for immunization (MOI).

**Method:** An out-patient paediatric clinic-based study conducted in May - June 2012 using the standard World Health Organization (WHO), Expanded Programme on Immunization (EPI) protocol for assessing MOI. The study involved client exit interviews with caregivers of children aged less than 2 years, reviews of immunization cards and parental recall of immunization history, and interviews with health workers.

**Results:** Data were collected on 448 children aged 0-23 months and from 18 health workers. The prevalence of MOI was most common among children older than 12 months. As the age of administration of the vaccine increased so did the number of MOI. MOI were more common for DTP3 (22.1%) OPV3 (24.4%), and measles (31.2%) compared to other vaccines. Factors associated with MOI included home births, inadequate antenatal care, lack of information, and, among health workers, poor knowledge of immunization schedules and contraindications.

**Conclusion:** The high prevalence of MOI could be reduced by defaulter tracing, encouraging antenatal visits and hospital deliveries, and education of caregivers and health workers.

**Keywords:** Immunization, missed opportunities, young children, South Sudan.

## INTRODUCTION

The Expanded Programme on Immunization (EPI) was established by the World Health Organization (WHO) in 1974 to ensure universal access to routinely recommended childhood vaccines. Six diseases were targeted: tuberculosis, poliomyelitis, diphtheria, tetanus, pertussis, and measles <sup>[1]</sup>. In 1974, fewer than 5% of the world's infants were fully immunized <sup>[1]</sup>. By 2005 global coverage with the third dose of diphtheria-tetanus-pertussis vaccine (DTP3) was 79%, but many children, especially those living in poorer countries, still were not being reached. In 1974, WHO and the United Nations Children's Fund (UNICEF) developed the Global Immunization Vision and Strategy which aimed to decrease vaccine preventable diseases related morbidity and mortality <sup>[2]</sup>.

EPI was launched in Sudan in 1976 but coverage in South Sudan remained very low. The 2006 Sudan Household Health Survey (Southern Sudan Report 2006 <sup>[3]</sup>) showed percent coverages, by the age of 12 months, were:

- BCG 43%.
- DTP1 37%, DTP2 26% and DTP3 20%.

- OPV1 46% and OPV3 24%.
- Measles 28%.
- All recommended vaccinations 32%

Of children aged 12-23 months 43% had not received any of the recommended vaccinations <sup>[3]</sup>. By the end of 2004, DTP3 coverage of children less than one year of age in South Sudan was 10% <sup>[4]</sup>. After the comprehensive peace agreement in 2005, the Ministry of Health-Republic of South Sudan (MOH/RSS) together with its partners worked to re-establish the immunization programme in all parts of the country and this was launched in 2009. The immunization coverage for DTP3 had risen to 43% by 2009 <sup>[4]</sup>.

The immunization schedule includes BCG, three doses of DTP, four doses of OPV and measles vaccine.

According to Sudan Household Health Survey II, 2010 Southern Sector, only 4.3% children aged 12-23 months had immunization cards but, if caregivers' recall was included, the coverage was: BCG 34.4%, DTP3 15%, OPV3 14.8% and measles 26.3%. Only 6.3% of children aged 12 and 23 months were fully immunized <sup>[5]</sup>.

WHO recommends that each health facility has a health information system for monitoring and evaluating immunization programmes. Assessing the immunization status of children exiting health facilities is recommended to identify the gaps in the programmes and factors associated with MOI. The immunization status of each child should be updated at every contact with the health care system. Immunisation services are free of charge in South Sudan but the coverage remains low. Information on the prevalence of MOI is lacking. This study, therefore, aimed to determine the prevalence and factors associated with missed opportunities for immunization in South Sudan.

## METHOD

A hospital-based cross-sectional study was conducted between May and June 2012 at Juba Teaching Hospital Paediatric Outpatient clinic. A sample of 448 children was obtained using the Fisher's formula and consecutive sampling.

All children aged up to 24 months were accepted with caregiver's consent except where the caregiver could not provide a history of vaccination, or the child had contraindications or was admitted.

The estimated number of patient attendances was 560 per week hence during a four weeks' study 2,240 patients were anticipated. A consecutive sampling technique was employed for collecting data up to 424 patients.

The standard World Health Organization, Expanded Programme on Immunization (WHO EPI) protocol for assessing MOI was adapted and used to conduct this study<sup>[6]</sup>. Exit interviews were carried out with a review of immunization cards and caregivers recall of immunization history. Eighteen health workers, out of a total of 30 (12 of whom were not willing to participate), from different paediatric wards and the EPI department were interviewed using a questionnaire administered by the principle investigator.

After checking for accuracy and completeness, data were transferred into a Microsoft Access data base, checked for input errors and analyzed using IBM-SPSS software version. The chi-square test and Mann Whitney U test were applied to determine factors that related to children and caregivers. Odd's ratio and test of significance were used to determine factors associated with MOI. Logistic regression analysis was done to determine factors independently associated with MOI.

Responses to the open ended questions to health workers were summarized and emerging themes were identified.

## RESULTS

The median age (IQR) of the 448 children was 8

**Table 1. Children's characteristics**

Variable	n (%)
<b>Age Group</b>	
<=12months	328(73.3)
>12months	120(26.7)
<b>Sex</b>	
Male	59 (57.8)
Female	189 (42.2)
<b>Mother's antenatal care</b>	
Yes	427 (95.3)
No	21 (4.7)
<b>Place of birth</b>	
Health facility	294 (65.7)
Home	154 (34.3)

**Table 2. Socio- demographic characteristic of the caregivers**

Variable	n (%)
<b>Sex of the caregiver</b>	
Male	9 (2.0)
Female	439 (98.0)
<b>Relationship with child</b>	
Mother	435 (97.1)
Other relative	13 (2.9)
<b>Marital status</b>	
Married	431 (96.2)
Single/Widowed/Separated/divorced	17 (3.8)
<b>Occupation</b>	
Employed	74 (16.5)
Unemployed	374 (83.5)
<b>Education</b>	
No education	134 (29.9)
Primary education	190 (42.4)
Secondary	92 (20.5)
College / University	32 (7.1)
<b>Religion</b>	
Christianity	435 (97.1)
Muslim	13 (2.9)

**Table 3. Missed opportunity for immunization per vaccine**

Vaccine	Missed opportunity	95% CI of %
BCG (n=448)	34 (7.6)	5.4 - 10.0
DTP1 (n=399)	14 (4.5)	1.8 - 5.4
OPV1 (n=399)	20 (5.0)	3.0 - 7.1
DTP2 (n=375)	38 (10.1)	7.0 - 13.3
OPV2 (n=375)	39 (10.4)	7.2 - 13.5
DTP3 (n=357)	79 (22.1)	17.5 - 26.4
OPV3 (n=357)	87 (24.4)	20.0 - 29.0
Measles (n=218)	68 (31.2)	25.2 - 37.6

months (5-13 months); 57.8% were males and 42.2% were females. Most (95.3%) mothers attended antenatal clinics and 65.7% delivered in a health facility (Table 1). Of the 448 caregivers 435 (97.1%) were mothers of whom 431 (99%) were married, 374 (83.5%) were unemployed, 134 (29.9%) had no formal education and 435 (97.1%) were Christians (Table 2).

The prevalence of MOI was 56.5% (95% CI 51.8-60.9%). There was an increased prevalence of MOI as the age for administration of the vaccine increased. Table 3 shows that MOI was highest for DPT3 (22.1%), OPV3 (24.4%) and measles vaccines (31.2%).

MOI was associated with children’s and caretakers’ socio-demographic characteristics. Children who had missed most immunizations were older than 12 months (OR 1.5, 95%CI 1.0-2.4). Children whose mothers attended antenatal care were statistically less likely to

have missed immunization (OR 0.1; 95% CI 0.0-0.5). Children born at home were more likely to have missed immunization (OR 2.2, 95% CI 1.4-3.3) compared to those who were born in hospital. Lack of formal education was associated with an increased MOI (OR 1.8, 95%CI 1.4-3.3) (Table 4).

To adjust for confounding variables, the data were analysed using logistic-regression modelling. The following were independently associated with missed opportunity for immunization; antenatal care (p=0.018) and place of birth (p=0.007). However caretakers’ education and children’s age (p=0.074) were not associated with MOI (p=0.115) (Table 5).

Responses from the 18 health workers showed that:

1. There was poor knowledge of the vaccination schedule especially for the BCG vaccine. None knew the appropriate time to give BCG. The measles vaccination schedule was more commonly known than the DTP3 and polio vaccination schedules.
2. The majority were not aware of the contraindications for BCG and polio vaccines. None was aware of any contra-indication for DTP and measles vaccines.

**DISCUSSION**

The high prevalence of MOI in this study is similar to one from Kenya where it was attributed to inadequate knowledge of health workers [7]. A study in a health centre in Sudan found that prevalence of children missing at least one vaccination was 58% and missing all vaccinations was 29% [8]. Similarly in Uganda the prevalence of MOI was 59.6% [9].

**Table 4. Factors associated with missed opportunity for immunization**

Variable	Missed opportunity		OR (95 % CI)	P value
	Yes	No		
<b>Child’s age group</b>				
<=12 months	176(69.6)	152(77.9)	1.0	
>12 months	77(30.4)	43(22.1)	1.5(1.0-2.4)	0.047
<b>Mother’s antenatal care</b>				
Yes	233 (92.1)	194 (99.5)	0.1 (0.0-0.5)	
No	20 (7.9)	1 (0.5)	1.0	<0.001
<b>Place of birth</b>				
Health facility	147 (58.1)	147 (75.4)	1.0	
Home	108 (41.9)	48 (24.6)	2.2 (1.4-3.3)	<0.001
<b>Caretaker’s education</b>				
No formal education	89 (35.2)	45 (23.1)	1.8 (1.2-2.8)	
Formal education	164 (64.8)	150 (76.9)	1.0	0.006

Our study shows the highest prevalence of MOI was for OPV3, DPT3 and measles; the results among the three vaccines was not statistically different. A higher prevalence of MOI for measles compared to DPT3 is attributed to the long interval between DPT3 and measles vaccine - a finding similar to that in Nigeria <sup>[10]</sup>.

The high prevalence of MOI in our study can also be attributed to civil war, bad road networks, inadequate technical staff, low accessibility to health facilities, frequent vaccine stock outs and breakdowns of the cold chain. That 5.6% of children had never been immunized was attributed to the lack of information and ineffective out-reach programmes especially in remote areas.

There have been frequent immunisation campaigns against poliomyelitis and measles and this was reflected in the knowledge of caregivers.

Children of mothers who did not attend antenatal clinics and/or who delivered at home have an increased chance of not being immunized. It is likely that interaction with health workers in antenatal clinics and during hospital delivery enhances the uptake of immunisation.

Lack of information was cited as one of the commonest causes of incomplete immunization as either caretakers did not know the child needed to be immunized or were unaware of the need for return visits. Inadequate knowledge of health workers on dosing, schedule and contra-indication on immunization is a similar finding in a study which had been done in Kenyatta National Hospital in 1996 <sup>[7]</sup>.

MOI can be reduced by creating awareness among health workers and caregivers, and by attaching immunization data detail to out-patient forms.

### CONCLUSION

Home delivery and failure to attend antenatal clinic were independently associated with MOI. Lack of information was the most common reason given by the caretakers for incomplete immunization.

### RECOMMENDATIONS

The South Sudan EPI should have a clear policy that every child coming in contact with a health facility should have her/his immunization status updated. Strategies should be put in place to ensure that all unvaccinated children in the community or in contact with health facilities are identified. Health workers should be given continuing training on immunization practices. The media can be used to promote caretakers' awareness on the importance of immunization and immunization schedules.

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**Table 5. Multivariate logistic regression analysis**

Variable	OR (%95 CI)	P value
<b>Child's age group</b>		
<=12 months	1.0	
>12 months	1.5(1.0-2.3)	0.074
<b>Mother's antenatal care</b>		
Yes	0.1 (0.0-0.8)	
No	1.0	0.018
<b>Place of birth</b>		
Health facility	0.6 (0.4-0.9)	
Home	1.0	0.007
<b>Caretaker's education</b>		
No formal education	1.4 (0.9-2.2)	
Formal education	1.0	0.115

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