

## Oral Cholera Mass Vaccination Campaign Coverage Survey in Ayod County, Jonglei State, South Sudan

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### Abstract

*In South Sudan there was cholera outbreak since 2014 affecting more than 14 counties. In response to the outbreak on June and July 2017, an oral cholera vaccination (OCV) campaign was conducted in Ayod County in four payams such as Jiech, Kandak, Karmuom and Padek. To assess the coverage of the vaccination, Post Campaign Evaluation survey was conducted in the above mentioned four payams. Cluster survey sampling methodology was used to determine sample size. From four targeted Payams in total 1,326(364 from Jiech, 350 from Kandak, 264 from Padek and 348 from Karmuom) respondents interviewed. The respondents categorized in to three age groups (1–4, 5–14, >15 years). The finding indicated different vaccination coverage in each Payams 86.1% (95% C.I 82.2%-89.9%) in Jiech, 81% (95% C.I 74.3%-87.9%) in Kandak, 88.6% (95% C.I 84.1%-93%) in Padek and 84.6% (95% C.I 79.9%-89.2%) in Karmuom. People who received two-doses of vaccination above 15 years of age were 84.3% (94% C.I 81.2%-87.5). The overall gender representativeness was marked by a big respondent of female compare to male respectively 536 and 464 with respective coverage of 53.6% (95% C.I 49.3-57.8) in female and 46.4% (95% C.I 41.8-50.9) in male. However, the complete two dose coverage was high in male 86.8 % (95% C.I 83.5-90.1) and female 84.3 (95% C.I 80.9-87.6). Kandak has the lowest coverage 81(74.3-87.9) of all payams. Based on the population structure and the target for reaching with oral cholera vaccination, the vaccination coverage is at the acceptable range to provide prevention and to interrupt transmission of infection.*

**Keywords:** Vaccination, Coverage, social mobilization, cold chain and drop out.

### Introduction

The cholera cases have reached unprecedented levels in South Sudan with continues transmission for more than four years. During this survey there were 11 counties with active transmission of vibrio cholera in South Sudan. The vibrio cholera transmission exacerbated by population movement to the area where there were shortage of water, hygiene and sanitation facilities in South Sudan. Ayod County was one of the areas affected by cholera and seasonal population movement was common practice in search of pastures for their cattle. These locations are usually cattle grazing camps and fishing hubs, with very limited or no water, hygiene and sanitation facilities.

This poor hygiene and sanitation practices have been observed amongst communities, including unsafe water consumption, open defecation especially in the cattle camps where women and children have been settled. 75% of

the populations are settled in these four locations where cholera outbreak was confirmed. In total 11,140 people reached with first dose oral cholera vaccine in 6 days' mass campaign (20<sup>th</sup> -26<sup>th</sup> June 2017) and 11,953 people reached with second doses of oral cholera vaccine in the second-round mass 6 days' mass campaign (18<sup>th</sup> -23<sup>rd</sup> July 2017).

Oral Cholera Vaccine (OCV) are increasingly used as part of preventive and reactive vaccination strategies (8–16). Before 2011, Dukoral vaccine (Crucell, Stockholm, Sweden), licensed for use in persons  $\geq 2$  years of age (2 doses given 7 days to 6 weeks apart), was the only available WHO-prequalified vaccine approved for the purpose based on safety and efficacy. In September 2011, Shanchol vaccine (Shantha Biotechnics, Hyderabad, India) was prequalified by WHO (2 doses given 14 days apart). Shanchol offered several advantages over Dukoral, including approval for use in persons  $\geq 1$  year of age, administration without buffer or water, and lower

price (US\$1.85/dose). Recent data from Kolkata, India, indicated that 5-years protective efficacy of 2 doses of Shanchol was 65% (95% CI 52%–74%) (19), and effectiveness for 6 months this had been confirmed after a vaccination campaign for outbreak control in Guinea with 86% (95% CI 56.7%–95.8%) success (17). These findings further support the use of OCV in response to epidemic and endemic cholera. Following two series of OCV mass campaign with administration of two doses of Shanchol vaccine was conducted to population in four targeted areas (Jiech Padek, Karmuom and Kandak). The Vaccination coverage in each location were 86.1% (95% C.I 82.2%-89.9%) in Jiech, 81% (95% C.I 74.3%-87.9%) in Kandak, 88.6% (95% C.I 84.1%-93%) in Padek and 84.6% (95% C.I 79.9%-89.2%) in Karmuom.

### **Objective**

To assess Oral Cholera vaccination mass campaign coverage for ensuring adequate prevention of diseases transmission.

### **Methodology**

#### **Study population and setting**

This study is a population-based survey of Ayod County in four locations (Jiech, Kadak, Padek and Karmuom) following mass vaccination campaign. Population included in the study was one year and above in age wise and present in the house at the time of survey. Children under five years 'old and unable to express their opinion were supported by parent or care taker to capture required information. Total population figure of the area was obtained from county health department for campaign planning and assessment of the campaign coverage.

#### **Survey design and sampling**

This survey utilized a two-phase cluster sampling design. In the first phase, a fixed number of populations were grouped in clusters, considering neighborhoods and villages. In the second phase, a fixed number of households within each cluster were selected, and information gathered on one or several eligible individuals from house hold. Sample size was calculated to estimate coverage by age group (1–4, 5–14 and  $\geq 15$  years) by using the following assumptions:

- A desired precision of  $\pm 0.05$ .

- An expected 2-doses of OCV coverage of 60%,
- A nonparticipation rate of 5%,
- Design effect of 2 to account for differences within and between clusters and
- A confidence interval of 95%.

For a target population of 18550, sample size of 1,416 were calculated (363 individuals from Jiech, 347 from Padek, 347 from Kandak and 359 from Karmuom). However, due to different reason at time of survey mainly absence of parents to provide information for their children, refusal of some individuals and inaccessibility of some house hold only 1,326 individuals in four locations were interviewed

The following criteria were used for eligibility to participate in the survey

- Were  $>1$  year of age to receive vaccination and for parents/care take to participate on evaluation
- Resided in a selected household during the OCV campaign,
- Able to give oral consent ( $<18$  years of age, consent was provided by a responsible adult member of the household/care taker).

Responses for children were provided by the mother or the father if child was  $>5$  years of age. The protocol was approved by MoH and WHO. The survey was considered as program evaluation.

#### **Data Collection**

Data collectors were trained on survey data collection tools and household selection methods. The survey was conducted 2 days after the second round OCV campaign completion. Interview was initiated with the first household selected from the village. Subsequent households were selected by using the systematic method of traversing the enumeration area by moving in a clockwise manner and skipping households according to a pre-calculated sampling interval. An adult, head of household was interviewed with the use of standardized questionnaire. Information collected include general demographic characteristics, awareness of the OCV campaign, number of eligible persons in the household who were vaccinated with OCV during the campaign and the number of doses received. From each household, 1 or 2 persons were randomly chosen from each of the 3 age groups for an in-depth interview (for younger children, the mother/father or care taker provided the

information). Each interviewer collected information about the interviewee's age, sex, previous history of cholera, number of OCV doses received during the current campaign (documented by vaccination card or by recall if the card was not available). Those who had not received the first or second doses of vaccine were asked their reasons for not being vaccinated. Interviewers asked all questions without probing for answers.

### Data Analyses

STATA 13.1 software was used for data analysis. For each location targeted for the Oral

cholera vaccination of 1-and 2-doses received during the campaign post campaign coverage was calculated by age group and sex. For each location also calculated rates of dropout between receipt of first and second vaccine doses, and reasons for not receiving vaccine.

## Results

### Baseline characteristics

Of the 1416 sample size, only 1,326 (94%) individuals reached during the survey (364 in Jiech, 350 in Kandak, 264 in Padek, 348 in Karmuom).

**Table 1.** Respondents by locations

	<b>n</b>	<b>Frequency</b>	<b>(%)</b>
<b>Location</b>	<b>1326</b>		
Jiech		364	27.5
Kandak		350	26.4
Padek		264	19.9
Karmuom		348	26.2
<b>Gender</b>	<b>1326</b>		
Male		701	52.8
Female		625	47.2
<b>Age</b>	<b>1326</b>		
<5 years' old		142	10.7
5-14 years' old		361	27.3
≥15 years' old		823	62

Of 1316 participants 52.8% were male where as 47.2% were female. Majority of responders were more ≥15 years' old (62%), <5 years old (10.7%) and age range 5-14 years' old were (27.3%).

**Table 2.** Respondent's age

Location				
Age group	Jiech, n=364	Kandak, n=350	Padek, n=264	Karmuom, n=348
<b>Age</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>
<5 years' old	38 (10.44)	50 (14.29)	34 (12.88)	20 (5.75)
4-14 years' old	123 (33.79)	97 (27.7)	76 (28.8)	65 (18.7)
≥15 years' old	203 (55.7)	203 (58)	154 (58,3)	263(75.6)

**Table 3.** OCV coverage per location considering 2<sup>nd</sup> dose completion

Location	doses of OCV (95% C.I)		
	Total, n=1000	one doses	Two doses
Jiech	n=360	n=50	n=310
	36 (31.04-40.9)	32.4(19.4-45.4)	86.1(82.2-89.9)
Kandak	n=159	n=30	n=129
	15.6(9.9-21.2)	18.8(4.8-32.8)	81.1(74.3-87.8)
Padek	n=220	n=25	n=195
	22(16.5-27.4)	11.3(-1.08-23.8)	88.6(84.1-93.09)
Karmuom	n=261	n=40	n=221
	26(20.6-31.3)	15.3(4.1-26.4)	84.6(79.9-89.4)
Overall average		n=145	n=855
		14.5(8.7-20.3)	88.5(86.4-90.6)

Of 1326 people (364 in Jiech, 359 in Kandak, 264 in Padek, 348 in Karmuom) who were received vaccination administratively, only 1000 had a vaccination card of which 885 completed the vaccination with the second dose and only 145 received one dose. Overall, 88.5% (95% C.I 83.1%-87.9%) received second dose and documented with vaccination card. This varies

per location: 86.1% (95% C.I 82.2%-89.9%) in Jiech, 81% (95% C.I 74.3%-87.9%) in Kandak, 88.6% (95% C.I 84.1%-93%) in Padek and 84.6% (95% C.I 79.9%-89.2%) in Karmuom. The dropout rate between the first and second dose was 14.5% (95% C.I 8.7%-20.2%) and was high in Kandak 18.8% (95% C.I 4.8%-32.8%).

**Table 4.** Coverage of vaccination with vaccination card

No of doses received	Area 95% CI	Jiech	Kandak	Padek	Karmuom
	Total, n=1000		n=360	n=159	n=220
<b>Total</b>					
<b>Age 1-4 years</b>	<b>n=105</b>	<b>n=36</b>	<b>n=26</b>	<b>n=26</b>	<b>n=17</b>
Two doses	89.5(83.3-95.7)	94.4(86.7-102.1)	88.4(75.4-101.5)	84.6(69.5-99.6)	88.2(71.9-104.5)
On dose	10.5(7.6-28.5) *	5.5(-26.2-37.3)	11.5(-24.6-47.6)	15.4(-20-50.7)	11.7(-32.9-56.4)
<b>Age 5-14 years</b>	<b>n=288</b>	<b>n=122</b>	<b>n=47</b>	<b>n=64</b>	<b>n=55</b>
Two doses	86.4(82.2-90.7)	91.8(86.7-96.8)	78.7(65.5-91.9)	86.1(77.1-95.2)	80(68.1-91.8)
On dose	13.5(2.8-24.2)	8.1(-8.8-25.2)	21.2(-4.09-46.6)	12.3(10.5-35.0)	20(-3.6-43.6)
<b>Age ≥15 years</b>	<b>n=607</b>	<b>n=202</b>	<b>n=86</b>	<b>n=130</b>	<b>n=189</b>
Two doses	84.3(81.2-87.5)	81.1(75.2-87.1)	80.2(70.8-89.6)	90(84.5-95.4)	85.7(80.3-91.1)
On dose	15.6(8.3-22.9)	18.8(6.3-31.2)	19.7(0.83-38.7)	10(-6.3-26.3)	14.2(1.08-27.4)

The second dose is considered as full dose for coverage, thus the overall coverage in age group varies in age group 89.5% (95% C.I 83.3%-95.7%) in children under 5 years, 86.4% (95% C.I 82.2%-90.7%) in age group 5-14 years old and

84.3% (94% C.I 81.2%-87.5%) in respondents ≥15 years old. The dropout rate is significantly high among respondent ≥15 years of age (15.6%, 95% C.I 8.3%-22.9%) than among children <5 years of age 10.5% (p-value 0.05).

**Table 5.** OCV coverage per sex, consider 2nd dose as complete

	doses of OCV % (95% C.I)
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Gender	Total, n=1000	one doses	Two doses
Female	n=536	n=84	n=452
	53.6(49.3-57.8)	15.6(7.8-23.4)	84.3(80.9-87.6)
Male	n=464	n=61	n=403
	46.4(41.8- 50.9)	13.1(4.6-21.6)	86.8(83.5-90.1)

The overall sex representativeness was marked by a big respondent of female compare to male respectively 536 and 464 with respective coverage of 53.6% (95% C.I 49.3-57.8) in female and 46.4% (95% C.I 41.8-50.9) in male.

However, the complete two dose coverage was high in male than female respectively with 86.8 % (95% C.I 83.5-90.1) and 84.3 (95% C.I 80.9-87.6).

**Table 6.** Reasons for non-vaccination for first and second dose

N=135	Not vaccinated at all for both round	
		Frequency in %
	2	1.48
<b>unaware of the campaign</b>	<b>36</b>	<b>26.67</b>
unaware of the need for OCV	6	4.44
Place and time of campaign unknown	7	5.19
Fear of side effects	5	3.7
Head of family did not authorize OCV for the family	3	2.22
Lack of confidence in vaccination	1	0.74
Bad experience with previous vaccine	2	1.48
<b>Vaccination too far away</b>	<b>24</b>	<b>17.78</b>
vaccinators absent when the person wen	6	4.44
Person was ill during campaign period	9	6.67
Person did not know if eligible for vaccination	9	6.67
Heard that vaccine was unpleasant	6	4.44
Rumors about OCV being harmful	8	5.93
Vaccine not available at vaccination point	5	3.7
Care taker not available to bring child	2	1.48
Others reasons	6	2.96

The weight of withdrawal was high among respondent who mentioned their unawareness of vaccination campaign 26% of 132 respondents followed by the distance of vaccination point with leaving area (vaccination point too far away) 17.8% of 132 respondents. Those are the main

reasons which need further consideration for future OCV campaign or any other vaccination campaign which need close monitoring to address the drop out for the second dose and or subsequent doses.

**Table 7.** Reason for not being vaccinated with second dose

Reason for not being vaccinated with second dose	n=188	Frequency (%)
Unaware of the need for two doses of OCV	48	<b>25.4</b>
Place and time of vaccination unknown	11	5.82
Fear of side effects	12	6.35
Bad taste or smell	31	16.4
Vaccination post too far away	29	<b>15.34</b>
Person was ill during campaign period	7	3.7
Hours of vaccination inconvenient	9	4.76
Vaccine not available at vaccine post	2	1.06
Care taker not available to bring the vaccination point	10	5.29
Long waiting time at vaccination site	4	2.12
Vaccinators rejected person for vaccination	3	1.59
Bad experience for first dose	9	4.76
Other reasons	14	6.88

The two main reasons among respondents were not aware of vaccination campaign and distance from the vaccination point and residential area. 25.5% of total respondents' claims that they were not aware of vaccination campaign and 15.4% of respondents were complain about vaccination point being far from their residential area.

## Discussion

Oral Cholera Vaccine (OCV) are increasingly used as part of preventive and reactive vaccination strategies (8–16). Before 2011, Dukoral vaccine (Crucell, Stockholm, Sweden), licensed for use in persons  $\geq 2$  years of age (2 doses given 7 days to 6 weeks apart), was the only available WHO-prequalified vaccine approved for the purpose based on safety and efficacy. In September 2011, Shanchol vaccine (Shantha Biotechnics, Hyderabad, India) was prequalified by WHO (2 doses given 14 days apart). Shanchol offered several advantages over Dukoral, including approval for use in persons  $\geq 1$  year of age, administration without buffer or water, and lower price (US\$1.85/dose). Recent data from Kolkata, India, indicated that 5-years protective efficacy of 2 doses of Shanchol was 65% (95% CI 52%–74%) (19), and effectiveness for 6 months this had been confirmed after a vaccination campaign for outbreak control in Guinea with 86% (95% CI 56.7%–95.8%) success (17).

The current mass campaign coverage of the oral cholera mass vaccination in Ayod County is acceptable considering the population structure and population movement pattern in the country. In the campaign population age group below one

year of age was excluded as per the recommendation for vaccination intake. The overall coverage was more than 80% and able to halt community transmission of vibrio cholera.

## Recommendations

Future campaign should consider proper planning, social mobilization and mobile vaccination point to reach more population with vaccination.

## Limitation of the survey

The main limitation of the study was accessing to some of the village's due population movement with their cattle looking for pastures.

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