



## **ASSESSMENT OF MEASLES VACCINATION AND ACCESS BARRIERS IN THE RIVER NILE STATE, SUDAN**

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**Abstract:** Measles is a significant public health concern globally, causing millions of cases and hundreds of thousands of deaths annually. This cross-sectional descriptive study aimed to assess the measles vaccination coverage and identify barriers to access measles immunization in the River Nile State, Sudan, where the morbidity of measles is increasing. A total of 183 participants were recruited through a community-based cross-sectional, descriptive study using a questionnaire, and vaccination cards were reviewed to obtain information about vaccination status. The directors of Epidemiology and Immunization departments in the state were interviewed to collect data regarding measles vaccination coverage and case reports. The study found that measles vaccination coverage in children under five years old was 92% of the targeted population according to the state reports, while only 73.8% of the study group was vaccinated by the routine immunization system. The availability of measles vaccination service at the centers was 98.4%, with 78.7% of vaccination services provided by static centers. Suboptimal access to measles immunization represented barriers to vaccination, including distant health centers (19.7%), on-foot access to centers (44.3%), and vaccine rejection by mothers (7%). The study recommends increasing the number of static and sub-centers, activating health education programs to raise awareness, using simple and attractive messages to educate the public about the disease and the importance of vaccination, and encouraging mothers to vaccinate their children. The study's findings can inform strategies to improve measles vaccination coverage and reduce morbidity and mortality rates associated with measles in the River Nile State, Sudan.

**Keywords:** Measles, Vaccination, Immunization, Access Barriers, River Nile State, Sudan.

### **INTRODUCTION**

Measles is an infectious disease recognized as a major global public health problem, with nearly 45 million cases and 1 million deaths per year [1-3]. Since humans are the only host of measles, an effective and safe vaccine can be produced.

The Expanded Programme on Immunization (EPI) was launched in Sudan in 1976. The first 5-year plan for the EPI was formulated in 1985. The program has introduced the six classical EPI vaccines (BCG, polio, DTP (Diphtheria-Tetanus-Pertussis), and measles vaccines). In the history of the expanded program on immunization in Sudan measles was eliminated long time ago but it happened to come back again but with low morbidity. The measles vaccine induces long-term and probably lifelong immunity in most people. Live



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attenuated measles virus vaccines are in use. Most of them were derived from the Edmonton strain. Measles antibodies develop in about 85% of children vaccinated at 9 months of age, 95% of children vaccinated at 12 months of age, and 98% of those vaccinated at 15 months of age [4]. Sudan is one of the largest countries in Africa covering 1.882 million km<sup>2</sup> with a current estimated population of about 40 million [5]. The population is culturally and ethnically diverse with several hundred tribal groupings speaking several languages. Arabic became the official language of the state after independence in 1956 [6]. The country contains 18 states. Atbara locality is one of the localities in the River Nile state and has a population of 144.510 [7].

Health services in River Nile state are delivered through 25 hospitals, 330 health centers, and 65 health units. The Ministry of Health & Social Development in River Nile state has established the Expanded Program in 1997. There are 26 immunization centers, 11 are fixed centers, and 15 are sub-centers. In 1990, vaccination coverage of children under one year of age reached 57% for measles as a national estimate; measles immunization coverage in 2000 was estimated at 40-50% in the Darfur and Kordofan regions, compared to 70-85% in Northern, Nahr El Nil, and Khartoum [8].

In 2006 Sudan began the application of a case-based surveillance system that requires investigation of exact and detailed data collection and analysis for each case reported by taking a blood sample or oral fluid to confirm the case and the urine sample and throat swab to isolate the virus to take appropriate timely action; Case-based reporting and laboratory confirmation of every suspected case is fundamental for monitoring measles virus during the elimination phase. Regarding case-finding activity, many conditions produce rash syndromes that could be measles—for example, rubella, scarlet fever, rosella, dengue fever, and drug reactions. Although the incidences of these illnesses vary over time and by location [4].

## Objectives General objective

To assess Measles vaccination and possibly other problems leading to increasing disease cases in the River Nile state.

## Specific objectives

- To identify the availability of measles vaccination services at the centers.
- To determine the barriers of suboptimal access to measles immunization.
- To compare measles vaccine coverage with the reported surveillance cases.
- To estimate the measles vaccine coverage rate.

## MATERIALS AND METHODS

### Study design

A community-based cross-sectional, descriptive study design was conducted.

### Study area

The study was conducted in Atbara locality which lies between latitudes 17.32-17.42 east and linear Length 32.23 - 34.17 W It has an area of 3510 km<sup>2</sup>

### Study population

All children aged under five years old who were covered by measles immunization in 2019.



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## Inclusion criteria

All children aged under five years old living in the Atbara locality for at least 12 months before the date of data collection.

### ● Exclusion criteria

All children aged under five years old who are not original citizens of the Atbara locality.

## Sampling

The sample size required was determined based on single proportion population formula as

Sample size  $n' = Z^2 P q_2$  (1)

$n$

$d$

Where:

$n'$  = sample size with finite population correction,

$Z$  =  $Z$  statistic for a level of confidence (1.96 for 95% confidence level),  $P$

= expected proportion.  $q = 1 - p$  and,

$D$  = precision (the precision is 5%, then  $d = 0.05$ ).

There is a total of sample 183 from the study population (35.873). Data were therefore collected through Questionnaire filling.

## Data collection techniques

Populations under the study were subdivided into clusters by administration unit. 1.

A cumulative list of the population under the study had been done.

**Table 1.** Sample size distribution among districts

Area	Census	Sample size
North Atbara	17259	88
Middle Atbara	8665	44
South Atbara	3731	19
Sola	6218	32
Total	35873	183

The sample size in each administration unit was distributed using a simple random method.

## Data collection tools

Data was collected using the following tools:

### ● Questionnaire

A pre-prepared and pretested questionnaire was directed to the mothers to collect data regarding sociodemographic and vaccination status.



- Reviewing cards

Vaccination cards were reviewed to obtain data information about vaccination status and doses number regarding the children's age and gender.

- Interview

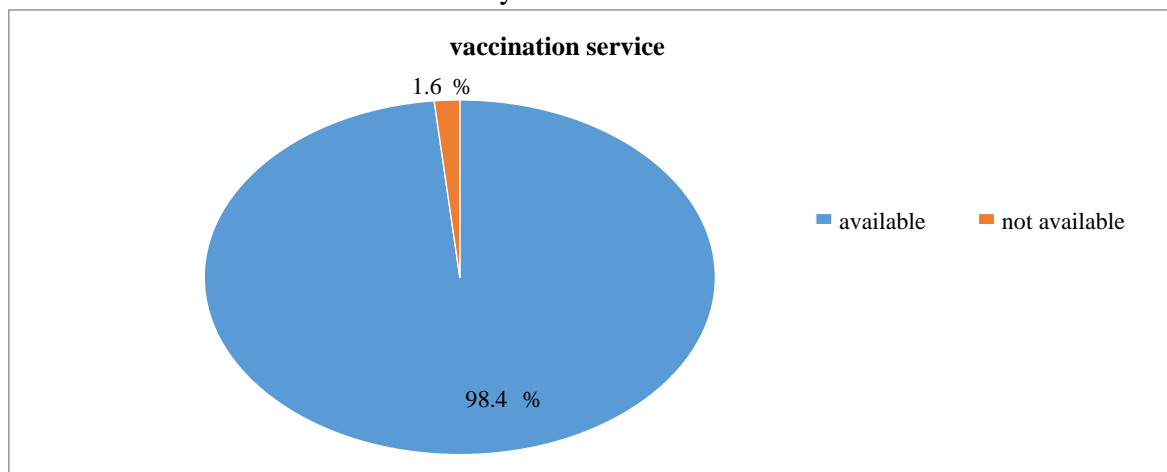
Interview with Directors of Epidemiology and Immunization Departments -Ministry of Health - River Nile State, was conducted to collect data regarding the measles vaccination coverage and case reports.

Data analysis plan

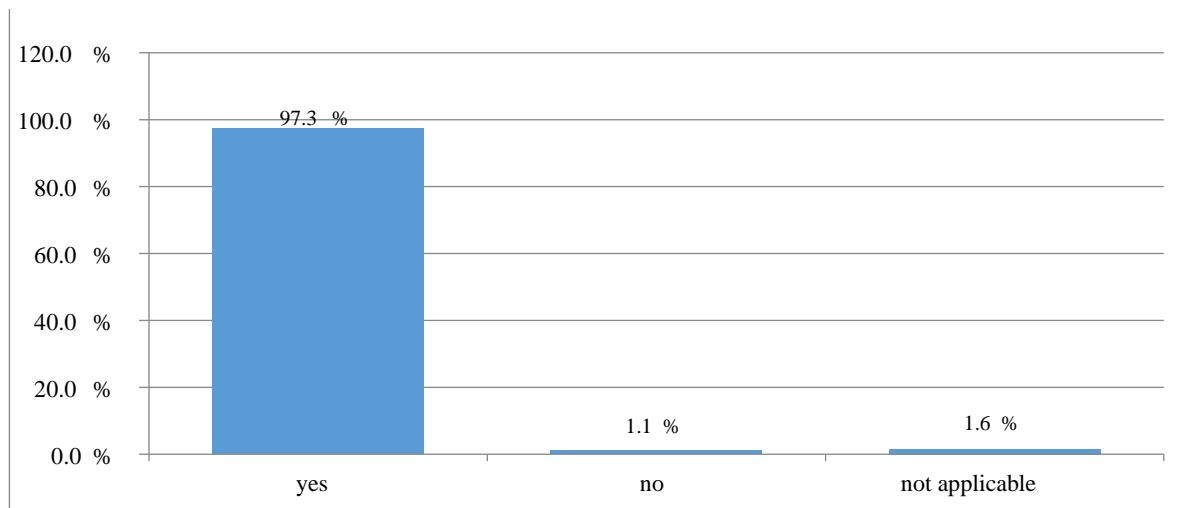
Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20 and the association between the different variables were checked using a Chi-square test at a significant level equal to 95%.

Ethical considerations

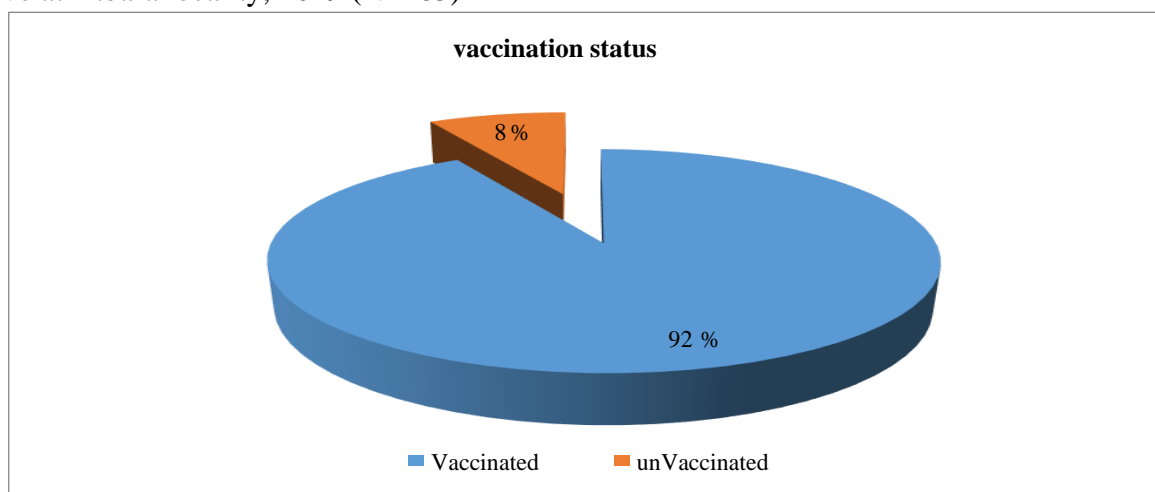
- IRB ethical clearance of the university of Bahri.
- IRB ethical clearance of Ministry of Health RNS.



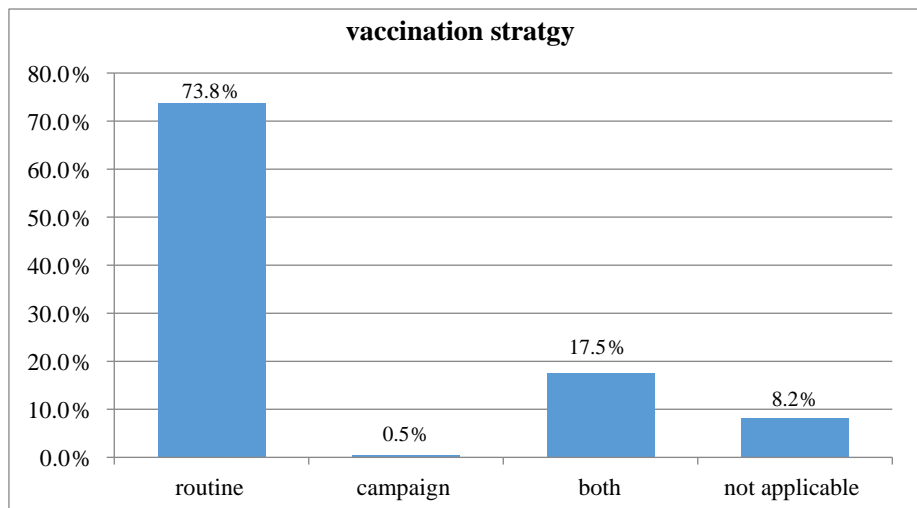
**Figure 1.** Distribution of the participants according to the availability of vaccination services in children under five in Atbara locality, 2019 (N=183)



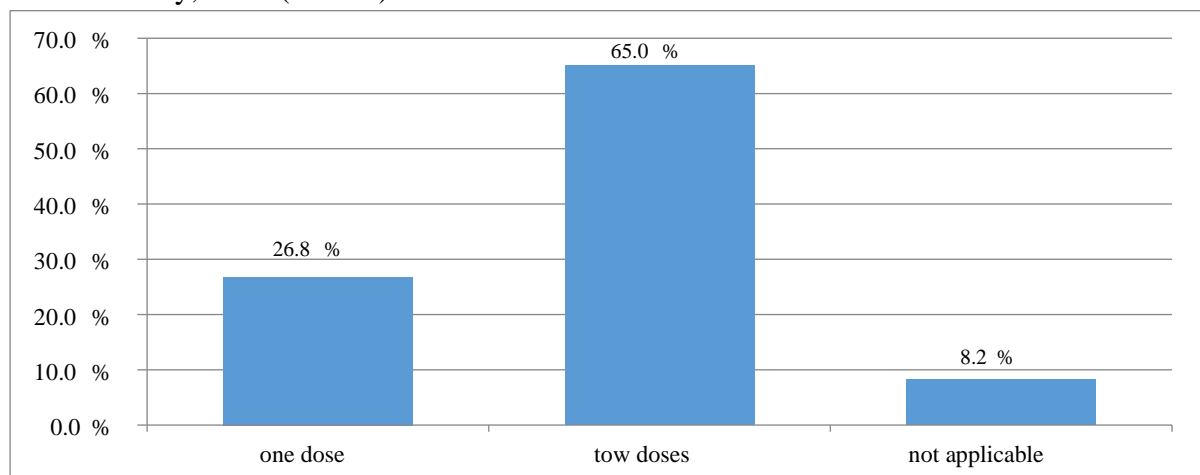
**Figure 2.** Distribution of the participants according to availability of vaccine on time dose in children under five at Atbara locality, 2019 (N=183)



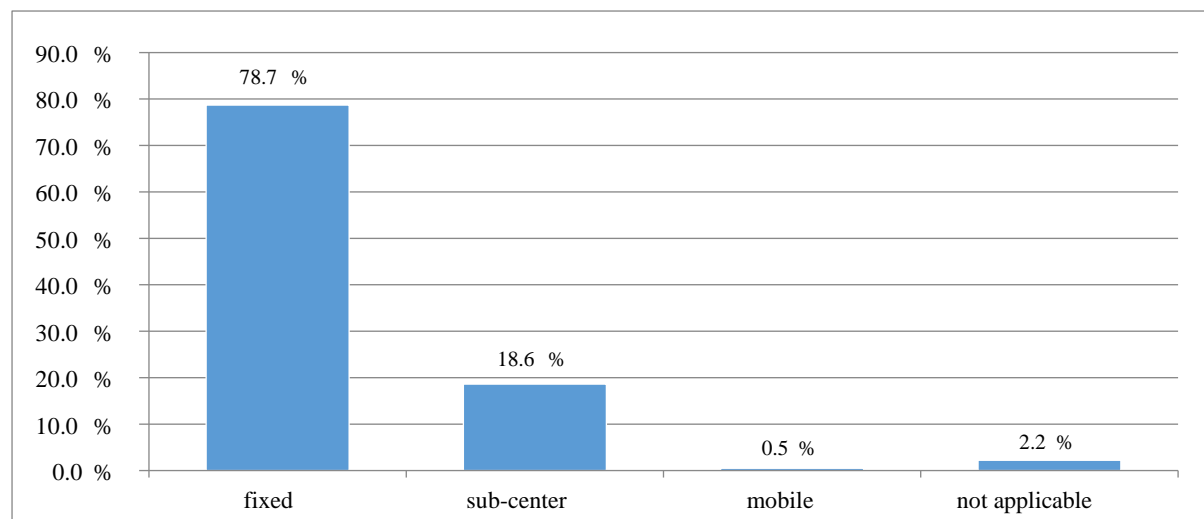
**Figure 3.** Distribution of the participants according to vaccination status in children under five at Atbara locality, 2019 (N=183)



**Figure 4.** Distribution of the participants according to intake of vaccination service in children under five at Atbara locality, 2019 (N=183)



**Figure 5.** Distribution of the participants according to dose number taken in children under five at Atbara locality, 2019 (N=183)



**Figure 6.** Distribution of the participants according to the center type provided service in children under five at Atbara locality, 2019 (N=183)

**Table 2.** Distribution of the participants according to the distance of the center in children under five at Atbara locality, 2019 (N=183)

distance of center	Frequency	Percent
less than 5km	70	38.3%
5km	74	40.4%
more than 5km	36	19.7%
not applicable	3	1.6%
Total	183	100%

The study population showed that 46% were female and 54 % male, this result is similar to that stated by [9] who found that females (44.4%) and males (55.6%) participated in the vaccination coverage survey. 61.2% of the family size under study is between 3-6 people, and this result is similar to that stated by [10] who found that (59.5%) of the family size of children is  $\geq 5$  people. 4.9% of mothers were illiterate, and this result is lower than that stated by [11] who found that (37%) of mother participants were illiterate. 14.8% of mothers were at a basic education level, and this result is lower than that stated by [10] who found that (27.6%) of mother participants were at a primary education level. (21.3%, 59%) of mothers were secondary, university, and more education level. This result is higher than that stated by [10] who found that (11.8%) of the mother participants were secondary and more education level. 64.5% of mothers' occupations were housekeepers, and this result is higher than that stated by (Ismail et.al, in Kabridahar District, Somali Regional State, Ethiopia) was found that (40.9%) of housewives, 23% of mothers' occupation were employees. This result is higher than that stated by [10] who found that (4%) were government employees, and 1.1% of mother's occupation were farmers, and this result is lower than that stated by [10] who found that (53.4%) were farmers. 92% were measles vaccinated,



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and this result is higher than that stated by (Muscat, 2009-2011) who found it (61.7%) Were vaccinated against the disease. The study clarified that 73.8% of children are vaccinated routinely, and this result is higher than that stated by [10] where (55.6%) of children are vaccinated in a health institution. 78.7% provided service from the static center, 18% sub-center, and 5% mobile team.

The study revealed that there was an insignificant relationship between vaccination status and family size,  $P$ -value = (0.099). The result agrees with that of [9] who found an insignificant association between vaccination coverage and the child's position in the family  $P$ -value = (0.04), type of family  $P$ -value = (0.08). There was an insignificant relationship between vaccination coverage and the education level of the mother,  $P$ -value = (0.076). This result disagrees with that of [9] who found a significant association between vaccination coverage and education of the caregiver for the long-standing program (trend test,  $P$  = 0.006). There was a significant relationship between vaccination status and (occupations of mothers, availability of vaccination service, availability of time dose, strategy of vaccination service, distance of center from home, access to center, rejection from mother),  $P$ -value = (0.022, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000).

## CONCLUSION

- The study clarified that measles vaccination coverage in children under five years old is 92% of the population target. 73.8% of vaccinated children take vaccination services by routine immunization strategy.
- 98.4% of the availability of measles vaccination services at the static centers.
- 78.7% of service is provided by the static centers.
- The barriers of suboptimal access to measles immunization are represented in the (distance of centers 19.7% more than 5 km, access to centers 44.3% on foot, and 7% of rejection from mothers).

## Recommendations

Based on the findings, the study recommends the following:

- Increase the number of immunization static and sub-centers.
- Activating the health education programs to raise awareness by conducting a simple, attractive message to educate the public about the disease, and the importance of vaccination.
- Strengthen social mobilization and partnerships with civil society organizations to increase routine immunization services.

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**CONFLICT OF INTEREST :** None

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**ETHICS STATEMENT :** IRB ethical clearance of the university of Bahri. IRB ethical clearance of Ministry of Health River Nile State.

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