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Assessment of Acute Flaccid Paralysis core surveillance indicators reported in Jigawa State, NigeriaYusuf, K.M. ^{1*}, Sume, G. E.², Hamisu, A. W. ², Isiaka, I. A. ², Manneh, F.², Ibrahim, I. ², Dahiru, H. ²., Chukwumuanya, I. ², Okeke, L. A.³, Simple, E. ³, Nwodo, C. ³, Shuaibu, H.F. ³, Ahmad, A.⁴ Banda, R. ², Braka, F. ², Shuaib, F.¹

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Abstract

Poliomyelitis is a highly infectious viral disease transmitted through the faeco-oral route. Standardized and accurate core Acute Flaccid Paralysis (AFP) surveillance indicators allow progress to be monitored over time. The indicator used to determine if surveillance is sufficiently sensitive to detect polio virus circulation is the annual proportion of AFP cases that are caused by other diseases or conditions apart from polio virus amongst children aged <15 years. The aim of this work was to assess and validate the high AFP surveillance core indicators reported by Jigawa state. A peer review assessment of the high stool adequacy and non-polio AFP rate was undertaken. The local government areas (LGAs) were selected by varying the two core indicators in 3 by 3 table. The peer review conducted was the first of its kind as per our search shows. Out of 103 AFP cases earlier classified as true and adequate by the state, only 71 (68%) were true AFP cases with 81 (78.6%) cases having adequate stool. Buji LGA had the highest number of not true AFP cases 10 (53%) and inadequate cases 4 (21%). True AFP cases had higher adequate stool samples than not true AFP cases. It was apparent from the result that there was over reporting of core surveillance indicators in the state. This work will be of great importance to countries such as Afghanistan, Pakistan and Nigeria which are still polio endemic to evaluate their surveillance system and act accordingly. Training of all officers involved with verification of AFP cases and stool sample collection should be undertaken so that the programme is not misrepresented.

Key words: Acute flaccid paralysis, Core surveillance indicators, Jigawa, Polio virus, Nigeria

Introduction

Poliomyelitis, is a highly infectious viral disease transmitted through the faeco-oral route. The disease could result in irreversible paralysis in 1:200 infections and has a case fatality rate of 5-10% (Saleh *et al.*, 2016). As it is targeted for eradication, highly sensitive surveillance for acute flaccid paralysis (AFP), immediate case investigation, and specimen collection are critical for the detection of wild poliovirus. AFP has been defined as acute or sudden onset of weakness or paralysis of a limb characterized as flaccid in a child < 15 year of age or in any person in whom a clinician suspect poliomyelitis (WHO, 1997).

Standardized AFP surveillance indicators allow progress to be monitored over time and be compared among countries (CDC, 2012). The indicator used to determine if surveillance is sufficiently sensitive to detect Polio virus circulation is the annual proportion of AFP cases that are caused by other diseases or conditions known as non-polio AFP (NPAFP) among children aged <15 years. Countries certified as polio-free should achieve an annual NPAFP rate of ≥ 1 case per 100,000 population aged <15 years; all endemic countries should achieve annual rates of ≥ 2 , while those in Lake Chad basin should achieve ≥ 3 (Saleh *et al.*, 2016). To ensure sufficiently complete and reliable laboratory analysis, $\geq 80\%$ of AFP cases should

have two stool specimens collected ≥ 24 hours apart, within 14 days of paralysis onset, arriving in good condition by reverse cold chain at an accredited laboratory (WHO, 2008). Most African countries had designated surveillance officers working on AFP surveillance (Nsubuga *et al.*, 2002), which enables them to exceed the target set by WHO (Odoom *et al.*, 2014). The World Health Organization (WHO) recommends four inter-related strategies for global eradication of polio. These strategies include routine immunization, Supplemental Immunization Activities (SIAs), surveillance and targeted "mop-up" campaigns (CDC, 2013). Nigeria has been implementing high quality acute flaccid paralysis (AFP) surveillance, as gauged by the reported non-polio-associated AFP rate and the percentage of AFP cases with adequate stool specimen collection (Hamisu *et al.*, 2016).

Jigawa state covers a total land area of about 22,410sq Km. It is bordered on the West by Kano State, on the East by Bauchi and Yobe States and on the North by Katsina and Yobe States and the Republic of Niger. The state is mainly populated by the Hausa, Fulani and other minority tribes. The topography of the state is generally flat with the northern, central, and eastern parts covered with undulating sand dunes running in the Southwest to Northeast direction. The state is bisected by the Hadejia River and traverses the state from the west to the east through Hadejia-Nguru wetlands and empties into Lake Chad. The state lies between latitudes 11°N and 13°N and longitudes 8°E and 10°35'E with a tropical climate while the temperature varies at different times. High temperatures are normally recorded

between the months of April and September. The daily minimum and maximum temperatures are 15 degrees and 35 degrees Celsius. The rainy season lasts from May to September with average rainfall of between 600 millimetres to 1000 millimetres (Jigawa, 2017).

This paper aims to validate the high AFP surveillance core indicators reported by the state and describes the results as well as identifying aspects that require improvement. To ensure that what the state was reporting was actually what obtains in the field, we embarked on a validation mission to Jigawa state.

Materials and Methods

The aim of this study was to validate the reported core surveillance indicators. Therefore, a peer review assessment of the high stool adequacy and non-polio AFP rate in state was carried out with the following objective to estimate the level of concordance for both surveillance core indicators.

To reduce recall difficulty amongst the caregivers, only cases which were reported by the state within the last 90 days from onset of paralysis and were verified to be true and adequate were validated. This enabled us to review one hundred and three (103) AFP cases from 12 LGAs which were in categories 1 to 3, as shown in tables 1 and 2.

Ethical considerations

Approval for the study was given by the National Primary Health Care Development Agency. We protected the confidentiality of patients by not disclosing their names.

Table 1. Parameters used to categorize the LGAs using 3 by 3 table

LGA selection categorization		Non-AFP Rate		
		49-36	35-20	
Stool Adequacy		Category 1	Category 2	Category 3
	98-95	Category 4	Category 5	Category 6
	94-90	Category 7	Category 8	Category 9

Table 2. Names of the LGAs visited in categories 1 through 3.

LGA selection categorization		Non-Polio AFP Rate		
		≥50	49-36	35-20
Stool Adequacy	≥99	Roni, Buji, Dutse, Taura	Kaugama, Gagarawa, Birnin Kudu, Yan Kwashi, Gwaram, Auyo	Garki, Kiyawa, Babura, Ringim, Miga, Gwiwa, Sule Tankarkar, Jahun, Hadejia, Guri, Malam-Madori
	98-95	Category 4	Category 5	Category 6
	94-90	Category 7	Category 8	Category 9

All the cases verified were under 15 years of age. The peer review was conducted using standard AFP guideline for case definition and investigation which was "Any case of sudden flaccid weakness or paralysis in an under 15-year-old child or when a clinician thinks of poliomyelitis". The field work was conducted from 14th to 17th Aug, 2017. Figure 1 shows how the LGAs were situated in the state.

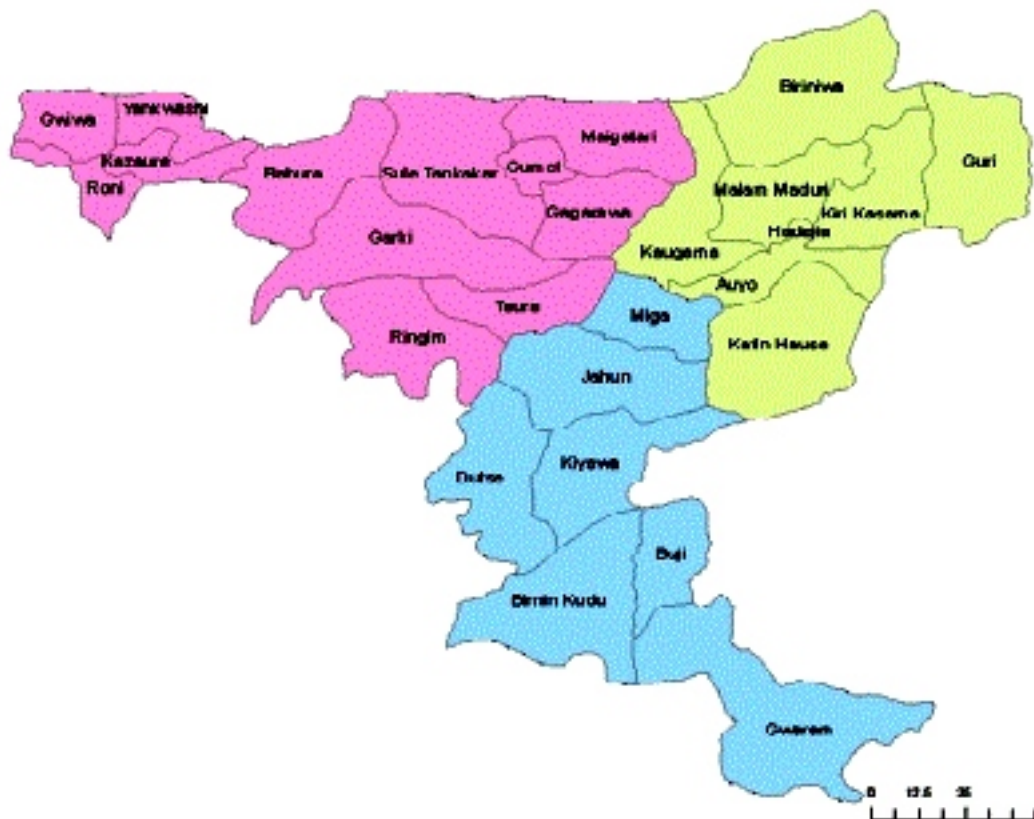


Figure : Local Government Areas Visited During the Surveillance Review.

A review checklist was applied to every AFP case. The aim was to confirm/refute an AFP case as 'adequate' and 'true'. An electronic copy of the checklist and the analysis tool were developed and data entered into the checklist by LGA resulted in automatic analysis of concordance of 'adequate' and 'true' AFP cases by LGA.

Peer reviewers prior to field work were identified and trained. A peer reviewer was any person with strong surveillance knowledge, background and skill, working in Nigeria with the government or partner agencies and involved

in surveillance. Six teams of 2 reviewers visited an LGA.

Results

Out of the 103 AFP cases earlier verified as true and adequate by the state, the independent reviewers found only 71 (68%) to be true AFPs with 81 (78.6%) cases having their stools adequate as shown in Table 3. In the process 56 wards were visited cutting across 12 LGAs which reported high surveillance core indicators in the state.

Table 3. Summary of all the verified AFP cases in the visited LGAs in the State

Parameters	Results	Percentage
No. of LGAs visited	12	44.4%
No. of wards visited	56	19.4%
No. of AFP cases reviewed	103	100%
No. of AFP cases physically seen	90	93%
No. of AFP cases not seen	10	10%
Reasons for cases not seen	Died 9 (8.7%), Travelled 1 (0.9%)	
Total AFP concordance	71	68.9%
Total stool adequacy concordance	81	78.6%

Table 4, shows the level of variance between the number of AFP cases reported by the state and what the reviewers were able to establish as true AFP cases and extent of stool adequacy. Buji LGA had the highest number of not true AFP cases 10 (53%) and inadequate cases 4 (21%). All the cases in Guri, Gumel and Miga LGAs were true AFPs, but no inadequate case was found in Birniwa, Guri and Garki LGAs.

Table 4. Proportion of Not-True AFPs & stool discordance by LGA

S/N	LGA	No. of AFP cases	No. of not true AFP cases	% of discordance (not-true) AFP cases	No. of discordance (inadequate) for stool adequacy	% of discordance stool adequacy
1	Dutse	21	5	24	2	10
2	Gwaram	8	3	37.5	2	25
3	Buji	19	10	53	4	21
4	Birnin Kudu	22	7	32	3	14
5	Birniwa	3	1	33	0	0
6	Guri	2	0	0	0	0
7	Gumel	2	0	0	1	50
8	Auyo	4	1	25	2	50
9	Garki	2	2	100	0	0
10	Babura	12	2	17	2	17
11	Gagarawa	5	1	20	3	60
12	Miga	3	0	0	3	100

The status of AFP cases in respect of stool samples collected is shown in Figure 2. Over fifty percent of the reviewed cases were true AFP cases and had adequate stool. Some as expected true AFP cases higher adequate stool samples than not true AFP cases.

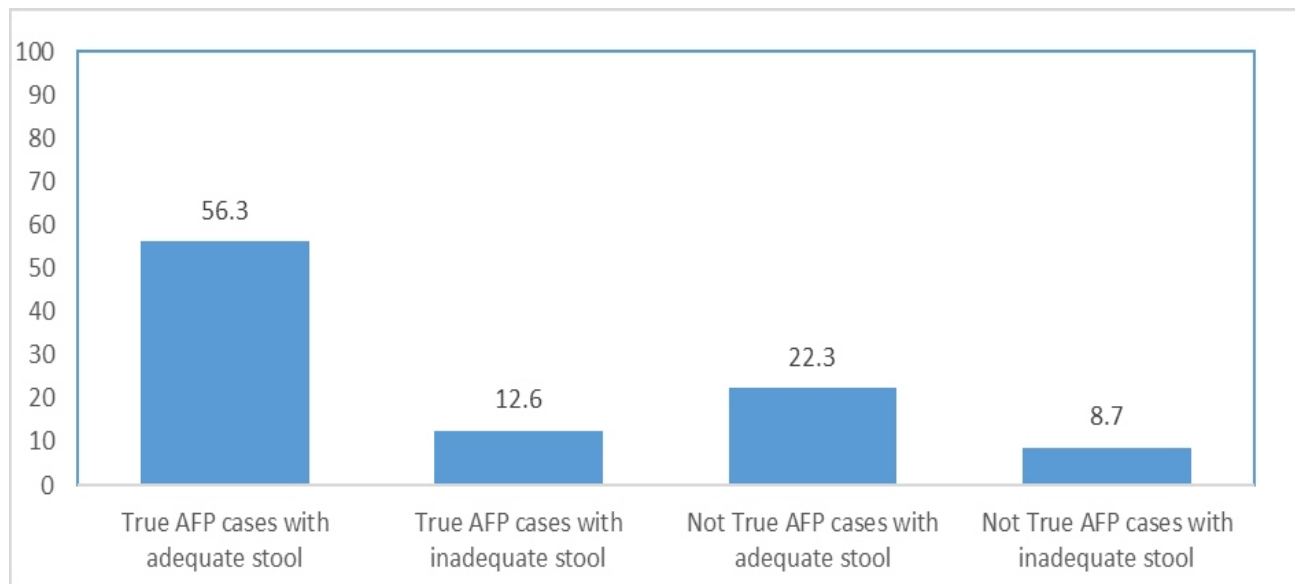


Figure 2. AFP and Stool Adequacy Status

Discussion

The study revealed that 32 cases were wrongly classified as true AFP by the state, giving a total of about 31% discordance. This finding depicts some level of knowledge gap amongst the personnel involved in the AFP surveillance network. The ministry has been encouraging surveillance staff to seek second opinion from neurologists or pediatricians when in doubt. Some states in the country have been reporting high number of AFP cases over the years as previously reported ([Bassey et al., 2011](#)). What was found in this study, greatly differs with the findings of previous authors ([Odoom et al., 2014](#); [Momen and Shakurnia, 2016](#)). The good thing about the findings in this study is that 56% of the cases (Fig. 2) which were true AFP had adequate stool. This goes to show that, the state had a good and functional surveillance network ([Odoom et al., 2014](#)).

About 14 cases (13.6%) had stool stools samples collected < 24 hours apart, which could render the sample less liable to yield polio virus. Studies have shown that only if the second stool sample was collected at least 24 hours apart will it have

the tendency of raising the probability of polio virus detection ([Cardemil et al., 2014](#)). To this end, staff were encouraged to adhere strictly to the protocol on sample collection.

Almost 15 cases (14.6%) were observed to have their stool samples collected > 14 days from the onset of paralysis. Which could lead to non-detection of the virus, because it has passed the 14-day period after onset of paralysis which is the interval with the highest probability of detecting wild poliovirus in paralyzed children ([Alexander et al., 1997](#)). This finding necessitates the need to emphasize to Disease Surveillance and Notification Officers (DSNOs)/ Assistant Disease Surveillance and Notification Officers (ADSNOs)/Surveillance Focal Persons (SFPs) and caregivers the importance of time interval between 1st and 2nd stool collection. It was observed in the course of the assessment that only one stool sample was collected from some cases 4(3.9%). Another challenge observed also was the inability of mothers and caregivers to recall events especially date of onset of paralysis.

This work will be of great importance to countries such as Afghanistan, Pakistan and Nigeria which are still polio endemic to evaluate their surveillance system and act accordingly.

Conclusion

The peer review assessment revealed over reporting of the AFP core surveillance indicators in Jigawa State. We recommend the training of surveillance officers involved in AFP case verification and stool sample collection.

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Competing interests

We hereby declare that there is nothing to be disclosed concerning this study.

Author contributions

Yusuf, K.M. and Okeke, L. A. initiated the article. Yusuf, K.M., Isiaka, I.A. and Manneh, F. drafted the manuscript. Okeke, L. A., Hamisu, A. W. and Sume, G. E., Banda, R., Braka, F. critically revised the manuscript for important intellectual content. Ibrahim, I., Dahiru, H., Chukwumuanya, I., Simple, E., Nwodo, C., Shuaibu, H.F., Ahmad, A. and Shuaib, F. conceived the article design. All authors gave final approval for the version to be published, had full access to the entire text and content and take responsibility for the integrity of the data and interpretation.

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