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Evaluation of the Acute Flaccid Paralysis (AFP) Surveillance System in Punjab, Pakistan-2019

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Abstract

Background:

Pakistan is one of two countries where polio is still endemic in spite of enormous efforts. Pakistan started AFP surveillance system in 1995 and in 2000 additional technical support was provided to the system at all levels by WHO. Despite heavy circulation of polio virus in provinces KPK, Sindh and Baluchistan, Punjab has only 12 cases reported in 2019. Hence this system was evaluated in Punjab to identify any gaps.

Methods:

Descriptive study was carried out in Punjab during February-2020. Literature and records were reviewed. In depth interviews of stakeholders were conducted using a semi-structured questionnaire. Updated CDC guidelines for evaluating public health surveillance system 2001 were used for evaluating the surveillance system.

Results:

Case definition was simple and system collects all necessary information. System had flexibility to collect information on other diseases like measles and Neonatal tetanus (NNT).

Data quality was good and timeliness of all the performance indicators was excellent. Sensitivity was 100% as the system has picked up all the cases. Positive predictive value was 0.16%. System had the good acceptability in donor agency and the persons who are in the system. System was present in all districts, less involvement in private sector and representativeness was average. System operates without interruption showing good stability.

Conclusion:

AFP surveillance system in Punjab is well developed. There is less involvement of private health sector. No full-time designated DSC is present in districts of Punjab. Routine immunization has no significant improvement. Environmental samples are still positive. It is recommended that there should be designated DSC in all districts of Punjab. Active surveillance sites should be increased in private sectors. Routine immunization should be improved. Actions taken for positive environmental samples need to be documented and communicated to higher level.

Keywords: AFP, Surveillance, Punjab, Evaluation

Introduction

Polio is a paralyzing disease and has affected the mankind in diverse ways. It causes not only permanent disability but also causes mental agony. The emotional and financial sufferings caused by this disease to a family and a society are immeasurable [1].

Polio is not a new disease; it has caused sufferings since time immemorial. The available history dates back to the Egyptian period and the carvings might be seen having crippled pictorials. The first known outbreak in history has its roots in the USA in the early 19th century. This disease has turned in to an epidemic from an endemic situation in the early 20th century and has therefore got in to limelight. Now, the world has started seriously thinking about the control measures of the disease as it has started leaving demoralizing effects on the family lives [2, 3].

1950's and 1960's have given a new lease of life to those who have lost hopes with the invention of vaccines against this infectious disease. The use of Injectable Polio Vaccine was started in the USA in 1955 after being licensed in the same year while the use of Oral Polio Vaccine was started in 1961 [4]. Cuba has successfully launched mass vaccination campaigns in 1960's and were able to eradicate the disease in the same decade, followed by other countries in the American region. Due to its gravity, WHO Assembly in 1988, unanimously approved a resolution to eradicate polio by year 2000 [5, 6]. Poliomyelitis is a highly infectious disease caused by polio virus. There are 3 types of polio virus; type 1, 2, 3. It mainly affects children under

five years of age and may even cause permanent paralysis. At most of the time, the infection is asymptomatic and the paralytic disease is in <1% of the infections. In these cases the most common and frequently occurring sign and symptoms are fever, headache, neck stiffness, severe muscle pain and acute flaccid paralysis.

This disease spreads through fecal-oral route from person to person as human is the only reservoir.

In less than 1% of the unfortunate victims, the disease causes paralysis leading to permanent disability. In some cases, depending upon the nature of severity, it may lead to death^[7].

The Table 1 given below is showing the situation of the disease burden in the Pakistan Country province wise.

Table 1: Situation of the disease burden in the Pakistan Country province wise

National Update for Polio Cases							
Province	Total Cases 2013	Total Cases 2014	Total Cases 2015	Total cases 2016	Total cases 2017	Total cases 2018	Total cases 2019
Punjab	7	5	2	0	1	0	12
Sindh	10	30	12	8	2	1	30
KPK	76	247	33	10	1	8	93
Balochistan	0	25	7	2	3	3	12
Gilgit Baltistan	0	0	0	0	1	0	0
Total Global Cases	93	307	54	20	8	12	147

Source: WHO

Poliovirus is continuing to cripple children in Pakistan because of the failure to reach all children with sufficient doses of vaccine. The most important reason for this includes access problems due to security particularly in the Khyber Pakhtunkhwa Tribal Districts (KPTD), operational and planning challenges, and the failure to identify and include all high risk underserved population groups.

Pakistan is still a polio-endemic country. Jointly with Afghanistan it constitutes only main epidemiological block of polio virus transmission, based on the epidemiological and genetic sequencing data.³³ districts/towns with the persistent transmission or recurrent infection have been identified and comprehensive plans have been developed to address the remaining issues in these areas^[8].

Punjab is the most populous province of Pakistan constituting about 55% of the total population and has boundaries with Sindh, Baluchistan and Khyber Pakhtunkhwa and people travel from these provinces through Punjab on daily basis and thus also providing a source of polio virus transmission.

Of all the so far reported AFP cases in the year 2019, 12 cases are confirmed as Poliomyelitis cases in Punjab province with the isolation of WPV-1 in all of these cases. 7 polio cases were detected in 2013, 5 polio cases in 2014, 2 polio cases in 2015, no case was detected in 2016, one polio case has been detected in 2017 and no polio case in 2018 in Punjab province.

Methodology

Place of study: The place of study was Punjab, Director General Health, Director EPI, MO-WHO office.

Duration of the study: The study was conducted during February-2020.

Tools of study:

- The updated CDC guidelines for evaluating public health surveillance system 2001 were followed.
- Available literature and material on AFP surveillance was reviewed.
- Stakeholders were identified.
- In depth interviews of the following stakeholders were conducted using a semi-structured questionnaire under the CDC guidelines.

The AFP surveillance system attributes were evaluated qualitatively as well as quantitatively according to the CDC guidelines. The results will be analyzed accordingly and will provide a base to comprehensive report writing, which will be shared with concerned stakeholders.

Identification and engagement of Stakeholders:

The stakeholders identified at provincial and district level were

1. Provincial Health Manger of DHIS
2. Provincial Focal person of WHO
3. Area coordinator of WHO
4. Epidemiologist
5. Chief Executive Officer-District Health Authority
6. Focal person for polio of different districts
7. Pediatrics Consultants
8. Divisional Surveillance Officer-WHO
9. District Surveillance Officer-WHO
10. PEO-WHO
11. Patients & Private Labs
12. Traditional healers

Meetings and in-depth interviews were conducted with the key personnel of existing surveillance system to collect the information and required data with the help of semi structured questionnaire.

The data collected from interviews and discussion was then organized and analyzed and recommendations were then shared with stakeholders to make the further improvement in the existing surveillance system.

Ethical Issues:

Formal consent and permission were taken from concerned authority to conduct study. Verbal consent was taken from respondents. Privacy and confidentiality were maintained.

Results

Our study showed that various attributes like Simplicity, Flexibility, Data Quality, Acceptability and Sensitivity of the AFP Surveillance system of Punjab can be graded as "Good to Excellent" according to the CDC Guidelines while Predictive Value Positive (PVP) has been "Poor."

Following the CDC guidelines for evaluating surveillance systems, the AFP surveillance system was evaluated.

1. Simplicity: (Good)

- The case definition and the reporting forms that are used by the AFP surveillance system for detection of case collect all information regarding demography, exposure, contacts and treatment of that particular case.
- PEO-WHO, Area coordinator and DSC are working on the AFP surveillance in a district.
- The staffs which are working in the surveillance system have training regarding surveillance data entry, data managements, data analysis and stool collection.

2. Flexibility: (Excellent)

- This surveillance system provides response to new health related events such as measles & other diseases like neonatal tetanus (NNT) [12].
- The staff working on the AFP surveillance system is skilled and can put up changes in case definition or technology without demanding additional logistic support.
- AFP surveillance system in the Pakistan has the flexibility for the other communicable diseases.

3. Data Quality: (Good)

- AFP surveillance system accurately detects the polio, data quality was found to be good but some of the case files observed were found to be incomplete and with some missing information.
- AFP surveillance System has a mechanism for monitoring and controlling any type of errors. The data was filled by trained PEO, DSC & transferred in Clear hardcopy and electronic form, and was sent to the provincial and national level.
- Percentage of zero reporting forms completion was 80%. Some errors were also found in the filled zero report forms.

4. Acceptability: (Good)

- The compliance of persons in the donor agency that operates the system and persons who are reporting the data to use the system both are good; this specifies that AFP surveillance has good acceptability.
- AFP surveillance system provides exact, consistent, complete, and timely data.

5. Sensitivity: (236%)

- The currently AFP surveillance system has the higher sensitivity of detecting polio cases and polio virus transmission.
- This higher sensitivity is also helpful in assessing the routine immunization, polio vaccination status of that AFP child and of that community also to which that child belongs.
- The expected AFP cases of the Punjab during year 2019 were 3092 [14] and the reported AFP cases were 7311.
- Sensitivity: $7311/3092 \times 100 = 236\%$
- This means that system is detecting 14.16 AFP cases per 100,000 children of age less than 15 years.

6. Predictive Value Positive: (0.16%):

- The total confirms cases of polio by Laboratory were 12 and the total reported AFP cases were 7311. So, the predictive value positive (PVP) is $12/7311 \times 100 = 0.16\%$
- This high sensitivity and low predictive value positive might be due to the reason as polio is disease marked for eradication so to detect any polio virus transmission, we have a loose definition of AFP so that we might not miss any polio case.

7. Representativeness: (Average)

- AFP surveillance system is present and functioning in every district of Punjab and is utilized by all stakeholders' especially government and public hospitals.
- System has limited link with private health facilities, laboratory and physicians & have ability to describe the

occurrence of a polio cases over time and its distribution in the population by place and person.

8. Timeliness: (Excellent)

- The timeliness of all the indicators like notification of AFP case within 7 days, case investigation within 48 hours, stool samples sent to laboratory within 3 days of investigation and 60 days follow-up was more than 88%.

9. Stability: (Good)

- The system responds within 24 hours after the case report.
- The system manages the data efficiently.
- The system sends reports and data within the time frame to the next level.
- The system is reliable and available when needed, showing that the stability of the system is good enough.

Summary of the results of the system attributes shown in below Table 2:

Table 2: Results of the system attributes

S. No	System Attributes	Results
1	Simplicity	Good
2	Flexibility	Excellent
3	Data quality	Good
4	Acceptability	Good
5	Sensitivity	236%
6	Predictive Value Positive	0.16%
7	Representativeness	Average
8	Timeliness	Excellent
9	Stability	Good

Discussion

AFP surveillance is one of the four cornerstone strategies of the Polio Eradication Initiative. Although the main objective of AFP surveillance is to detect the presence of circulating wild-type poliovirus, information obtained through surveillance has other essential uses. AFP surveillance data are the final measure of a country's progress towards polio eradication. It allows programme managers to plan effective strategies for national immunization campaigns and supplemental activities which require knowledge of the populations, locations, and times where the virus is circulating. Genetic sequencing information from poliovirus isolates is used to refine the understanding of the "micro-epidemiology" of the circulating virus. This detailed information facilitates focused vaccination strategies, thereby leading to the interruption of wild poliovirus transmission.

The information gathered through AFP surveillance in Pakistan continues to guide programmatic decisions for conducting SIAs and ensuring rapid response to outbreaks, as seen in 2007 and 2008.

International reviews confirmed that Pakistan has a well-functioning, well conventional and responsive AFP surveillance system at national, provincial and district levels. The AFP surveillance system has achieved and maintained all indicators above the internationally approved standards for certification since 2001 [8].

Public health surveillance system and vital registration evaluation in Pakistan carried out with support from the World Bank and it accomplished that the AFP surveillance

system in Pakistan could be considered as gold standard [9]. Punjab has a well-functioning and responsive AFP surveillance system in all the districts that are sending AFP cases files in time, weekly active surveillance and zero reports at provincial office in time. Provincial WHO office is monitoring and analyzing the AFP surveillance activities in all over the province and is also responsible for conducting the SIAs in the province and evaluation of polio campaigns by third party evaluation, market survey, LQAS (lot quality assurance sampling) under the guidance of Provincial Emergency Operation Centre (P-EOC) and National -EOC.

Data analysts are also available at the provincial level who maintain the records of all the reported AFP cases and polio confirmed cases.

The Provincial Polio Eradication Officer (PPEO), Provincial Surveillance Officer who are assigned to look after the districts in the province, are part of the WHO Provincial Office. District Surveillance Officer is also present in few high districts of the Punjab while Divisional Surveillance Officer is available in every division of the Punjab. The District Surveillance Officer along with Divisional Surveillance Officer and PEO-WHO compiles the AFP surveillance data, including updating of line list for the entire district. The provincial staff ensures the timely submission of the provincial data for weekly and monthly transmission to the National Surveillance Cell (NSC). Compiled and updated district line listings from the districts are received at the provincial office weekly (every Monday). PEI-WHO office compiles and updates all these line listings on every Wednesday and submits to the National Cell (NSC) on every Thursday. The Provincial Expert Review Committee (ERC), consisting of the Deputy Director-EPI, a pediatric Professor/ senior pediatrician, a senior neurologist and a microbiologist/ virologist familiar with poliomyelitis, is functional in the province. This committee meets monthly or need based to classify AFP cases having inadequate stool

samples with residual paralysis after 60 days. Such cases are classified within 90 days of notification.

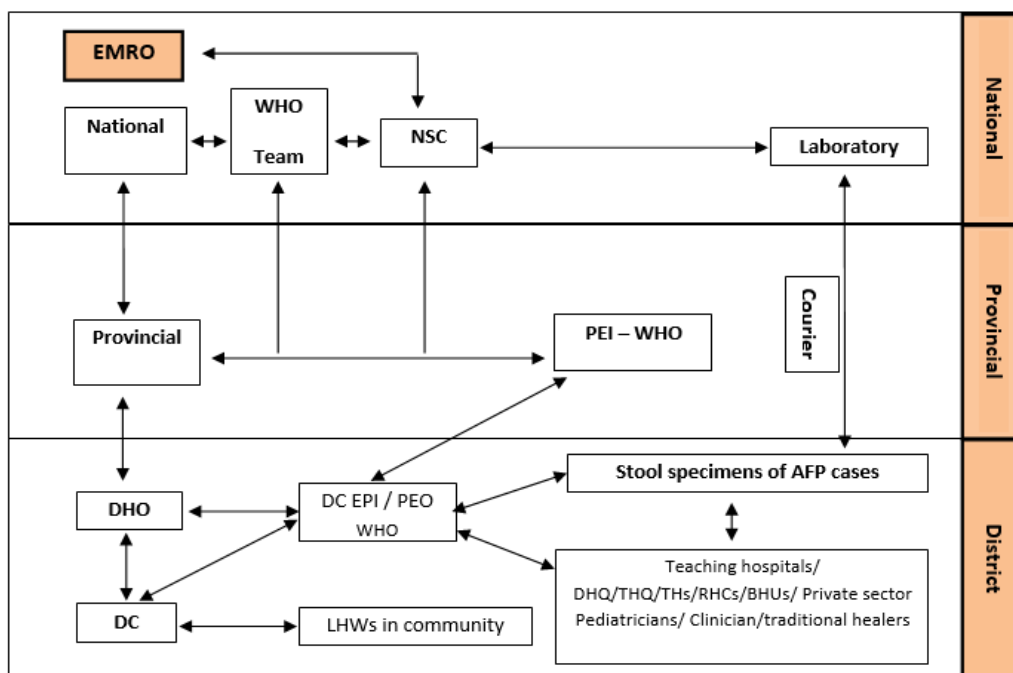
District Surveillance Coordinator (DSC), designated in each district by the District Health Officer (DHO) is primarily responsible for AFP surveillance. He works under the direct supervision of the DHO. The DSC with the technical assistance of WHO-PEO ensures the quality of data being reported to the provincial and national levels. The PEO in consultation with DSC ensures an appropriate system of regular (weekly and monthly) monitoring of AFP surveillance at the District Health Offices.

Our study showed that AFP Surveillance system of Punjab is simple, flexible and acceptable to the people of Punjab in contrast to the AFP Surveillance system of Zimbabwe which is though acceptable but more complicated and costly and less sensitive. The AFP surveillance system of Punjab is well organized and its Timeliness is good. Pakistan along-with Afghanistan is among the two remaining countries which are still endemic for polio.

The AFP Surveillance system of Punjab has also included Measles, Neonatal Tetanus in weekly reporting which makes this system a comprehensive one.

Conclusion

There is well-developed and established AFP surveillance system in Punjab and this system is very much able enough to detect polio virus transmission. This system also helps in assessing the immunization status of the area. Environmental samples are still persistently positive in some polio free districts like Multan, Faisal Abad, Lahore, DG Khan and Rawalpindi. Routine immunization status of the reported cases has no significant improvement. Stool adequacy and notification within 7 days have no significant improvement. There is less involvement of private health sectors. There is no full-time designated DSC in Punjab and the person working as DSC has other additional responsibilities as well.



Key: DSC-District Coordinator, DHO-District Health Officer, EPI-Expanded Program of Immunization, PEO-Polio Eradication Officer, WHO- World Health Organization, LHW-Lady Health Worker, NSC-National Surveillance Cell, EMRO- Eastern Mediterranean Regional Officer.

Fig 1: Organogram of AFP Surveillance System, Pakistan

Data Availability

There will be open access to the data to all the readers who will see the data supporting the conclusion.

Conflict of Interest

There is no conflict of interest and submitting authors are responsible for co-authors declaring their interests.

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