Original Article

AFP Surveillance

Evaluation of AFP Surveillance Sensitivity in AJK

1. Tariq Mahmood Mughal 2. Amjad Mahmood Khan 3. Abdul Majeed Khan 4. Ehtisham ul Haq 5. Mumtaz Khan

1. Asstt. Prof. of Pathology, 2. Asstt. Prof. of Medicine, 3. Asstt. Prof. of Radiology, MBBS Medical College, Mirpur AJK and Div; Head Quarter Teaching Hospital Mirpur, AJK. 4. S.O., DHQ Teaching Hospital Mirpur AJK. 5. DHIS Coordinator Mansehra KPK

ABSTRACT

Objective: Main objective of the study is to analyse sensitivity of the surveillance system, required to keep poliovirus circulation ceased in AJK.

Study Design: Retrospective analysis of AFP cases reported during the study period.

Place and Duration of Study: This study included all the AFP cases reported during the study period in AJK from Jan. 2011 to Dec. 2013.

Materials and Methods: Historical data is used to analyse AFP surveillance for detecting poliovirus infection in children age <15 years in the study area based on few assumptions that all the results are negative and adequate information were available to make ultimate diagnosis of each AFP case reported in the area during study period. Surveillance sensitivity analysed using AFP surveillance criteria recommended by WHO and variable used in AFP surveillance system.

Results: Surveillance sensitivity is analysed based on two indicators "non polio AFP rate" and stool adequacy. Sensitivity level analysed in AFP cases aged 6-59 months for ≥7 OPV doses including routine and SIAs revealed 6/10 districts have high sensitivity.

Conclusion: Long absence of Polio virus in the area, creeping up of boredom among health human resource, Clinician's failure to notify all AFP cases resulting in down going Surveillance sensitivity.

Key Words: AFP, Polio eradication, Surveillance sensitivity

INTRODUCTION

PEI in Pakistan is haunted by campaign quality not improving; number of AFP cases /year declining, hope of identifying Polio virus transmission is not bright shrouded by the security challenges and political unrest. Precisely Pakistan is at high risk of missing target to interrupt Polio virus transmission by the end of 2014. In this study efforts are made to critically analyse the sensitivity of AFP surveillance system in AJK, as AJK is the only geographical area in Pakistan which has reported last case of WP (wild Poliovirus) in 2000 and maintained the status of interrupted wild polio virus circulation since then.

Aetiology of the Poliomyelitis was established nearly 109 years ago when Poliovirus was discovered during an experiment[1]. Experiments started about how the virus spreads in nervous system through blood and axonal transportation**.** 50 years later two vaccines were discovered to fight this crippling disease. Today Global Polio Eradication efforts succeed in containing Polio virus from 7 Continents to 3 countries, from 1000 cases per day to 1 case and from 3 strains to 1 strain today.

The emergency committee to monitor the Global Polio Eradication efforts met on 2014-05-28, 29 this year. Ten member states with ongoing Polio virus circulation participated in the meeting. Emergency committee affirmed that 60% of Wild Polio Virus circulation in seven countries (Cameroon, Equatorial Guinea, Ethiopia, Israel, Somalia and the Syrian Arab Republics) retransmitted through endemic countries (Pakistan, Nigeria and Afghanistan)[2] and there is dire need to declare Polio Eradication as IPHE (International Public Health Emergency).

By reviewing the current progress of the global initiative it seems the Pakistan will be the last country to eradicate Polio as Somalia was the last country to eliminate Small pox. 2014 emerged as a public health emergency as endemic countries failed to interrupt poliovirus transmission a GPEI target for 2010-2012[3]. Numbers of cases reported this year are higher than any of the time in past 5 years.

220 cases of WP1 reported in 2014 as compared to 64 last year by the end of 43 weeks, 29 districts found with ongoing Polio virus transmission as compared to 19 by the end 43 week in 2013. Environmental sampling results shows 87/263 (34%) sample positive for WP1 as compared to 47/265 (18%) positive for WP1 in 2013 by the end of 20 September[4]. At the moment Pakistan is the only state among endemic countries which has significant increase in number of WP1 cases reported through both AFP surveillance system and environmental sampling[5].

The impeded progress of Polio eradication in Pakistan is mainly because Polio is an enterovirus which has no extra human reservoir and infection commonly spread through oral-faecal route especially when hygiene and sanitation is poor[6]. Most of the people infected with

polio virus remain subclinical and very small proportion of infected people experience viral replication in CNS (central nervous system) which may lead to enduring neuronal damage and paralysis[7]. As we have discussed Polio case is most commonly recognized by onset of paralysis and paralysis occurs in 0.1% to 2% of Polio infected cases[8]. This elevated fraction of subclinical cases and no criteria to identify Polio by clinical signs and symptoms alone add to difficulty in eradicating Polio[9,10] and finally failure to reach to every eligible child during SIAs and routine EPI is the state specific issue for missing all the targets of Global Polio eradication in Pakistan. PEI in Pakistan is haunted by campaign quality not improving; number of AFP cases /year declining, hope of identifying Polio virus transmission is not bright shrouded by the security challenges and political unrest. Pakistan is specifically at high risk of missing target to interrupt Polio virus transmission by the end of 2014[11]. Number of cases reported in low transmission this year are very high for any of the low transmission season in last five years[12].

In this study efforts are made to critically analyse the sensitivity of AFP surveillance system in AJK, as AJK is the only geographical area in Pakistan which has reported last case of WP (wild Poliovirus) in 2000 and maintained the status of interrupted wild polio virus circulation since then.

District-Wise Area, Population, Density, Growth Rate & Household-Size in Azad Kashmir (Planning and development Department, 2012)

Districts	Area (Sq. KM)	Population Census 1998 (Million)		MICS 2007-2008	Projected Population 2013 (million)	Density in 2012 (Persons / Sq.KM
		Popu-lation	Growth rate	House-hold* Size		
Muzaffar-abad	1642	0.454	2.80%	5.8	0.695	407
Hattian	854	0.166	2.80%	5.8	0.254	286
Neelum	3621	0.126	2.80%	7.6	0.193	51
Mirpur	1010	0.333	2.09%	6.7	0.470	441
Bhimber	1516	0.302	2.60%	6.7	0.452	285
Kotli	1862	0.563	2.59%	7.3	0.841	432
Poonch	855	0.411	2.24%	6.8	0.589	655
Bagh	770	0.282	2.00%	6.8	0.393	483
Haveli	598	0.112	2.00%	6.8	0.156	246
Sudhnoti	569	0.224	1.99%	6.6	0.312	518
AJK	13297	2.973	2.41%	6.7	4.359	312

All the indicators were analysed based on WHO guidelines for successful AFP surveillance to eradicate Polio from Pakistan. WHO requires all the AFP cases age <15 years reported within 7 days of onset of paralysis, target for Pakistan is ≥2 cases / 100,000 children age <15 years. Two stool sample of each AFP cases taken 24 hours apart within 14 days of onset of paralysis, target is ≥80% adequate sample. Specimens arriving in national reference lab within ≥3 days of sent to lab in good conditions, target is ≥80%. Specimen with turnaround time ≥28days, turnaround time is time involving receipt of specimen and reporting of results, target is ≥80%. Stool specimen from which non polio enterovirus is isolated, target is ≥10% (this is the indicator of the quality of the reverse cold chain maintained during the collection and transportation of stool specimen).[13]

In the past AJK has maintained the campaigns quality and surveillance sensitivity to the level required for Polio eradication in the area. Population immunity against Polio remains the central subject for maintaining interrupted Polio virus circulation since 14 years. But risk of virus introduction has increased in the area because of decline in campaign and surveillance quality, IDPs coming to settle here from high risk areas, continuous mass movement towards and from the area of Polio virus circulation.

MATERIALS AND METHODS

Surveillance sensitivity analysed using AFP surveillance indicators for detecting poliovirus infection in children age <15 years in the study area based on few assumptions that all the results are negative and adequate information were available to make ultimate diagnosis of each AFP case reported in the area during study period.

Specificity of indicators is taken as WHO standard criteria for AFP surveillance according to which minimum rate of AFP case reporting is 2 cases/100,000 children < 15 years of age, 80% stool specimen collected within 14 days of onset of paralysis and stool testing considered to be the benchmark for excluding of poliovirus from AFP cases. Inadequate cases finally diagnosed by the ERC (Expert review committee) if residual weakness persists at 60 days follow up.

Each AFP case finally classified as Poliomyelitis if poliovirus isolated from stool sample, non polio AFP or compatible if system fails to collect stool sample within 14 days of onset of paralysis and sufficient proofs are not available to support the case as non polio AFP

Sensitivity evaluation conducted using AFP surveillance criteria recommended by WHO for AFP surveillance system. All the variables which describe surveillance arrangement and can manipulate the probability of disease or detecting the disease included in the analysis. Events that can bias the sampling methodology and size are included in the analysis. This research was recommended by the department of health AJK.

Districts: AJK government is responsible for providing curative and preventive health services in all districts through health department. Data analysed keeping in view the health services delivery structure in all the districts and surveillance sensitivity was analyzed at the districts level.

Age: Age was integrated to target the age specific categories of AFP cases, because the infection probability decreases with increase of age and vice versa apart from immunization status. But infection in >15 years age also depends on the severity of infection.

Population immunity; This risk category was integrated in the analysis as population immunity against Polio. OPV (oral polio vaccine) is the vaccine of choice used in both routine EPI (Expanded Program on Immunization) and SIAs (special Immunization activities).

In endemic countries most of the cases of poliomyelitis occurs in age <5 years (14)(8) and children play important role in the transmission of poliovirus infection. Population immunity is assessed by calculating OPV3 doses received by reported AFP cases through routine EPI aged 12-23 months and total OPV doses received through Routine EPI and SIAs doses aged 6-59 months.

RESULTS

Population immunity against Polio: District wise sensitivity level of Population immunity against polio and AFP Surveillance system to detect poliovirus if enter in the study area using surveillance data between 2001-2013. Data analysis revealed high sensitivity in all districts for routine EPI doses of OPV except moderate sensitivity in district Sudhnoti, Poonch and Neelum and district Neelum shows low sensitivity for routine EPI.

Sensitivity level analysed in AFP cases aged 6-59 months for ≥7 opv doses including routine and SIAs revealed 6/10 districts have high sensitivity. While districts 2/10 districts including Bhimber and Bagh fall in moderate and 2/10 districts including Poonch and Haveli falls in category of low sensitivity.

Surveillance sensitivity is analysed based on two indicators "non polio AFP rate" and stool adequacy. 5/10 districts have been placed in high sensitivity level for NPAFPR (non polio afp rate) while 3/10 districts in moderate sensitivity and 2/10 districts found having low sensitivity.

Sensitivity level for stool adequacy remains high 9/10 districts placed in high sensitivity level and only 1/10 district Haveli could only be placed in low sensitivity level.

Table No.1: Shows criteria for immunity & surveillance sensitivity analysis

Characteristics	high	Moderate	low
OPV3 dose age 12-24	≥95 %	80%-90%	<80%
≥7 SIAs OPV dose in age 6-59 m	≥90%	80%–90%	<80%
0 doses	<5%	5%–10%	>10%
Non-Polio AFP rate	≥2	1.5-2	<1.5
AFP cases with adequate specimen	≥80%	75%-80%	≤75%

Table No.2: Shows district wise sensitivity level of immunity and surveillance in AJK.

Districts	Sensitivity level of Immunity indicators			Sensitivity level of Surveillance indicators		Other risk levels	
	OPV3 Doses aged 12-24 m NPAFP	≥7D in age 6-59 m. NPAFP	0 OPV doses in NPAFP	Non-Polio AFP rate	AFP cases with adequate specimen	Endemic Borders districts or Environmental sample +	Insecurity
Bhimber	High	Moderate	High	High	High	Yes	No
Bagh	High	Moderate	High	High	High	No	No
Kotli	High	High	High	Moderate	High	Yes	No
Sudnuti	Moderate	High	High	Moderate	High	Yes	No
Poonch	Moderate	Low	High	Moderate	High	Yes	No
Muzaffarabad	High	High	High	High	High	Yes	No
Hatyian	High	High	High	Low	High	No	No
Neelum	Moderate	High	High	High	High	No	No
Haveli	Low	Low	Low	Low	Low	No	No
Mirpur	High	High	High	High	High	Yes	No

DISCUSSION

Interruption of disease transmission is the decisive target of program now than ever because eradication is not possible without achieving this objective, mainly because high fraction of subclinical cases of Polio infection. Data analysis revealed that surveillance sensitivity in AJK vary from district to district and creeping down. Even if quality surveillance and population immunity against polio build accumulated surveillance sensitivity but several studies show several years without detection of case cannot assume low risk of reintroduction of poliovirus in the area.[15]

Persistent surveillance sensitivity is required to prevent poliovirus reintroduction in the area particularly when neighbouring areas are endemic and mass movement from and to the endemic areas exist on daily basis. Our study suggests that ≥95% confidence to keep the

poliovirus transmission interrupted in AJK at the prevalence of 10^{-5} need sustained sensitive AFP surveillance in the area. Achieving case notification 2 case/100,000 and stool adequacy ≥80% supported by the ≥95% coverage during SIAs and routine EPI is essential for eradicating Poliovirus.

Analysis of the historical data of the study area suggests long nonappearance of the poliovirus, stoppage of the clinicians to correlate non polio AFP cases with AFP surveillance system and presence of exact diagnosis resulting in decreased number of AFP cases in the area. Clinical decision making process of GPs (general practitioners) and child specialists further hampered the surveillance system. Environmental sampling can be proved as additional surveillance approach in AJK.

CONCLUSION

Long absence of Polio virus in the area, creep up of boredom among health human resource, Clinicians failure to notify all AFP cases resulting in downwards going Surveillance sensitivity. Findings of the study emphasize the AFP surveillance indicators up to required level of WHO to help eradicate Polio initiative globally and maintain poliovirus circulation interrupted in the study area. Beside Surveillance indicators up to the WHO standard needed for certification as a Polio free country.

REFERENCES

1. Recanielo VR. One Hundered year of Polio Virus pathogenesis. ELSEVIER 2006; (9-16): 2006.
2. http://www.polioeradication.org. [Online]. [cited 2014 September 30]. Available from: [Cited 2014 Sep 9] http://www.polioeradication.org/dataand monitoring/poliothisweek.aspx
3. WHO.GPEI.Annual report 2012: [Internet][cited 2014 August 23]WHO Genava Switzerland. Report No. WHO/POLIO/13.03.Available from Annual Report/AR2012/GPEI_AR2012_A4_EN.pdf
4. http://www.who.int. [Online]. [cited 2014 September 17. Available from: [Cited 2014 Sep 1] HYPERLINK http://www.who.int/mediacentre/ news/statements/2014/polio-20140505/en/ .
5. WR D. The biologic principles of poliovirus eradication. The J of Infect Dis 1997;175 (Suppl 1): 286–292.
6. http://www.polioeradication.org. [Online]. [cited 2014 September 30. Available from; [Cited 2014 Sep 11] Availble from:http://www.polioeradi-cation. org/dataandmonitoring/poliothisweek.aspx.
7. Shibuya K. The global epidemiology of infectious diseases Vol. 4. In Poliomyelitis: World Health Organization; 2004. p. 111–149.Availble from: http://www.biomedcentral.com/content/pdf/1471-2334-9-162.pdf
8. Arita I. Is polio eradication realistic?. Science 12 May 2006; Vol 312 No. 5775: pp. 852-854.
9. WHO. Independent Monitoring Board of the Global Polio Eradication Initiative Ninth Report.[online]; May 2014. Availble from: http://www.polioeradication.org/portals/0/documen t/aboutus/governance /imb/10imbmeeting /10imb_ report_en.pd
10. WHO. Polio Eradication & Endgame Strategic Plan 2013-2018[Online] Availble from: http://www.polioeradication.org/Portals/0/Docume nt/Resources/StrategyWork/GPEI_Plan_FactFile_ EN.pdf
11. WHO.Morbidity and Mortality Weekly Report Weekly [internet]. Vol. 63 No. 16:1: 2014 April 25. Available from: http://www.cdc.gov/ mmwr/ pdf/wk/mm6337.pdf.
12. WHO.Summary report on Technical Advisory Group Meeting on Polio Eradication for Pakistan.Islamabad Pakistan.June 2014 [Internet]. Report No. WHO-EM/POL/411/E.Availble from: http://www.polioeradication.org/Portals/0/Docume nt/Aboutus/Governance/IMB/11IMBMeeting/5.3_ 11IMB.pdf
13. Planning and development department . AJK at glance.2013 [cited 2014 Sep 11] Availble from : http:// www. pndajk.gov.pk/.../AJK at a glance 2013 final.pdf
14. Singh J. Epidemiological considerations on age distribution of paralytic poliomyelitis. J of Tropical Pediatrics 1996;42(4):237–241.
15. Debanne SM. Statistical certification of eradication of poliomyelitis in the America: Mathematical Biosciences 1998;150(1):83–103.

Address for Corresponding Author:
Dr. Ehtisham ul haq,
Divisional Headquarter Hospital Mirpur,
AJK. Pakistan
Phone numbers: +92-300-5119890
E-mail - drehtisham@gmail.com