

Polio Eradication—Lessons from the Past and Future Perspective

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ABSTRACT

Background: India has recently achieved the “Polio free status” by WHO with stringent efforts of the Health Ministry to control its spread. However, we should not forget the lessons learnt from the failure of National malaria eradication Programme and National Tuberculosis control Programme which creates a need to assess the probable barriers for the various National Health Programmes. The present article presents an overview of the Polio Eradication programme in India highlighting the lessons learnt from the past. Also, it evaluates the reality behind full participation of Pulse Polio Programme.

Materials and Methods: The study results of a cross-sectional survey conducted with an aim to assess the probable reasons and barriers behind non compliance of Pulse Polio Programme among parents of children (1-5 yr of age) of Modinagar area have also been discussed. The survey instrument was a structured, 10 item, closed ended questionnaire.

Statistical analysis used: Chi-square test was used to analyze the difference between proportions of individual responses

for each question and multiple logistic regression was used to assess relation between socio demographic parameter and absence from Polio Ravivaar.

Results: The study reveals a surprising 68% attendance of Pulse Polio programme which is far behind the desired goal. Most of the parents who did not attend polio ravivaar considered that there was no need for the repetition of Polio vaccine (76.9%) followed by their fear that the vaccine might get contaminated during transportation (74.5%). A significant positive association was found between older age group of the eligible children (4-5 yr, O.R.1.52), female gender, illiterate parents, distance of more than one km from residence to vaccination and lack of source of information (O.R. 1.47).

Conclusion: Efforts should be done to investigate the probable reasons behind non compliance for various immunization programmes to analyse the current situation in detail and formulate appropriate programs for coming years so that the efforts so far don't go in vain and we secure a healthy Polio free nation for our future generations.

Keywords: Immunization, India, Non compliance, Polio eradication, Pulse polio programme, Perceived barriers

INTRODUCTION

Overview of Polio eradication Programme

Health is the most important human asset and is a distinct key issue in public policy discourse in every mature society [1]. India is undergoing an epidemiologic, demographic and health transition phase wherein many epidemic diseases have been brought under control through various organizations like National centres for diseases control, WHO and persistent Government efforts. Nevertheless, communicable diseases are still dominant and constitute major public health issues [2]. About 40% of all deaths in India are still due to infections. Presently, the burden of ill health imposed on Indian society is equivalent in lost potential to 12.5 percent of GDP (Gross domestic product) for infectious and allied complaints [3].

India's struggle against various communicable and infectious diseases like malaria, kala azar, tuberculosis, encephalitis, dengue and the much discussed poliomyelitis is well-documented. But there remain unforeseen challenges that make the path towards disease eradication an onerous dream. A glance at the past would help us appreciate the roadblocks in Public health sector making us well prepared for the confrontation with the “Future” [4].

The success story of Polio eradication in India creates a milestone in Public health sector. Much was done worldwide to combat Polio. The first polio vaccine, introduced by Dr. Jonas Salk of United States of America in 1955 contained killed poliovirus administered by injection. The second, an oral vaccine with weakened live virus,

was licensed in 1961 by Dr. Albert Sabin of Poland. Polio was crippling up to 200,000 children a year when India introduced the oral vaccine in 1978. India was declared smallpox free in April 1977. Following its footsteps; vaccination against Polio started in 1978 as part of the Expanded Program on Immunization (EPI). By 1984, it was successful in covering around 40% of all infants, giving 3 doses of OPV to each. In 1985, the Universal Immunization Program (UIP) was launched to cover all the districts of the country. This program led to a significant increase in coverage, up to 95%. However, in 1995, following the Polio Eradication Initiative of World Health Organization (1988), India launched Pulse Polio Program under the name of “Polio Ravivaar” along with the Universal Immunization Program which aimed at 100% coverage. This project dealt with the ways to fight poliomyelitis through a large scale immunization programme, co-operating with various international institutions, state governments and Non Governmental Organizations [5].

The monumental success of polio eradication in India has carved a niche for unparalleled efforts of Public health organizations. India has showed an unprecedented success story towards achieving the aim of “Polio free country” by completing three years without any case of polio on 13 January 2014, marking a landmark for the country, which in 2009 accounted for nearly half of the world's polio cases [6,7]. But, before we celebrate our triumph over Poliomyelitis, it is essential to checklist the lessons from the failure of malaria and T.B. eradication programme and realize the danger of re-emergence of the disease in the future.

A GLANCE AT THE PAST

Malaria eradication Programme

Malaria is one of the major communicable diseases affecting mankind, caused by *Plasmodium* parasite, transmitted by the bite of infective female Anopheles mosquito. Recent estimates indicate that there are approximately 300-500 million clinical cases and between 1.5 – 2.7 million deaths occurring every year due to malaria worldwide. *Plasmodium vivax* is the commonest (60-70%) cause, followed by *Plasmodium falciparum* (30-45%), *P. malariae* species is rarely found and *P. ovale* is not found in India. *P. falciparum* is a malignant variety of malaria as 0.5% to 2% may develop complicated malaria, of which up to 50% are fatal, if timely treatment is not commenced [8].

Malaria is a major public health problem in India and one which contributes significantly to the overall malaria burden in Southeast Asia. Historically, the highest incidence of malaria in India occurred in the 1950's, with an estimated 75 million cases and 0.8 million deaths per year (World Health Organization, Country Office for India) [9].

This led to the introduction of National malaria control programme in India in April 1953. It was based on indoor residual spraying of DDT twice a year in endemic area where spleen rates were over 10%. The NMCP continued for about 5yr and the results were highly successful at an estimated reduction of 80%. Encouraged by these results Govt. of India changed the strategy to National Malaria eradication programme in 1958. In 1956, the WHO Expert Committee on Malaria was called to design the eradication campaign. However, during 1960s, some areas saw resurgences of malaria after relatively long periods of interruption of transmission. Some resurgence was surprisingly serious epidemics that required the re-establishment of spraying operations. In 1969, 14 yr after the launch of the GMEP, the 22nd World Health Assembly had to recognize that there were countries where eradication was not feasible in the short term, and that a strategy of control was an appropriate step towards future eradication in those areas [10]. Thus, the global malaria eradication campaign, begun in 1955, was abandoned in 1965, when goals shrank to "malaria control" [10,11]. This shows that overzealous attempts might face challenges from the ground reality.

National Tuberculosis control programme-

Tuberculosis, or TB, is an infectious bacterial disease caused by *Mycobacterium tuberculosis*, which most commonly affects the

lungs. TB is a major Public health, social and economic problem in our country. TB is a leading health concern all over the world particularly in India because 1/3rd TB patients belong to India globally. National TB Control Programme (NTCP) was initiated in 1962 as a decentralized programme in India on a 50:50 sharing basis between Centre and State. The objectives of the Programme were to reduce the morbidity and mortality; to reduce disease transmission and to diagnose as many cases of tuberculosis as possible and to provide free treatment. However, it could not make much of an impact on this dreaded disease [12].

In 1992, the Government of India, together with the World Health Organization (WHO) and Swedish International Development Agency (SIDA), reviewed the national programme and concluded that it suffered from managerial weakness, inadequate funding, over-reliance on X-ray, non-standard treatment regimens, low rates of treatment completion, and lack of systematic information on treatment outcomes. As a result, a Revised National Tuberculosis Control Programme (RNTCP) was designed. In the year 1993, WHO declared TB as a global emergency. Based on the findings and recommendations of the Review Committee, the Government evolved the revised strategy called as RNTCP with the objective of curing at least 85% of the smear positive patients and detecting at least 70% of them. The emphasis on case-detection would be subsequent to achieving the desired cure rate. This strategy was pilot tested initially in 1993-94 on a population of 2.35 million and thereafter, was expanded for assessing technical and operational feasibility in a population of 13.85 million. The aggregate cure rates in these projects areas is around 80% [12,13]. This highlights the need for a more realistic Public Health approach to combat epidemic diseases.

Polio Eradication- Challenges for the future

Polio incidence has dropped more than 99% since the launch of global polio eradication efforts in 1988. According to global polio surveillance data from May 14, 2014, 77 polio cases have been reported to date in 2014 from Afghanistan, Cameroon, Equatorial Guinea, Ethiopia, Iraq, Nigeria, Pakistan, and Syria. In 2013, a total of 416 polio cases were reported from the following countries: Afghanistan, Cameroon, Ethiopia, Kenya, Nigeria, Pakistan, Somalia, and Syrian Arab Republic [14].

Hence, there remains no room for complacency to avoid recurrence of the Poliomyelitis from the neighboring countries. If mass vaccinations are discontinued and the government drops its guard, the disease could return with a vengeance. For this, it is necessary

Q No.	Question	Those who did not attend Polio Ravivaar		Those who attended Polio Ravivaar		p-value (chi-square test)
		Response Yes n (%)	Response No n (%)	Response Yes n (%)	Response No n (%)	
1.	Do you think that Polio Vaccine is of no use and might be harmful for the health of the baby	84 (20.2%)	332 (79.8%)	172 (19.46%)	712 (80.54%)	0.8
2.	Do you think that vaccine given in the Polio Ravivaar programme might be contaminated during the transportation	310 (74.5%)	106 (25.5%)	510 (57.7%)	374 (42.3%)	<0.0001
3.	Do you think that Polio vaccine is given by untrained workers?	295 (70.92%)	121 (29.08%)	410 (46.38%)	474 (53.62)	<0.0001
4.	Do you think that there is no need for repetition of Oral Polio Vaccine?	32 (76.9)	96 (23.1)	282 (31.9)	602 (68.1)	<0.0001
5.	Do you feel that Timings of Polio Ravivaar interferes with your job/work timings?	302 (72.6)	114 (27.4)	324 (36.65)	560 (63.35)	<0.0001
6.	Do you prefer immunization at Private clinics/hospitals rather than Govt. aided "Polio Ravivaar"?	229 (55.04)	187 (44.96)	270 (30.54)	614 (69.46)	<0.0001
7.	Do you think that attending Polio Ravivaar is not necessary as Door to Door immunization service is also provided thereafter?	90 (21.63)	326 (78.37)	184 (20.81)	700 (79.19)	0.79
8.	Were you not aware of the dates and venue for Polio Ravivaar?	79 (19)	337 (81)	206 (23.3)	678 (76.7)	0.04
9.	Do you think that Polio has already been eradicated from our country?	95 (22.8)	321 (77.2)	160 (18.1)	724 (81.9)	0.056
10.	Do you think that Polio Ravivaar is nothing but a political propaganda?	105 (25.24)	311 (74.76)	194 (21.94)	690 (78.05)	0.2

[Table/Fig-1]: The primer sequences are shown

S. No.	Socio-demographic parameter	Those who did not attend Polio Ravivaar n(%) 416(100%)	Those who attended Polio Ravivaar n(%) 884(100%)	OR	p-value
1	Age			1.52	0.03
	0-1	23(5.5)	264(29.9%)		
	1-2	57(13.7)	236(26.7%)		
	2-3	102(24.5)	185(20.9%)		
	3-4	109(26.2)	127(14.4%)		
	4-5	125(30.1)	72(8.2%)		
2	Gender			1.14	0.5
	Male	193(46.4)	430(48.6)		
	(female)	223(53.6)	454(51.4)		
3.	Education			2.24	0.00
	Illiterate parents	140(33.6)	185(20.9)		
	Primary education	129(31)	290(32.8)		
	Higher School	87(20.9)	267(30.2)		
	Intermediate	60(14.4)	97(11)		
	Graduate and above	0(0)	45(5.1)		
4	Occupation			1.25	0.13
	Working mother	111(26.7)	255(30.2)		
	Working Father	362(87)	772(87.3)		
	Non working mother	305(73.3)	629(69.8)		
	Non working Father	54(13)	255(12.7)		
5	Distance of Pulse polio venue for residence (>1 km.)	112(26.9)	202(22.9)	1.79	0.00
6	Source of Information			1.47	0.6
	None	198(47.6)	54(6.1)		
	Health Worker	129(25.24)	230(26)		
	Doctor	87(20.9)	287(32.5)		
	Family / Relatives	2(0.5)	313(35.4)		
7	Family Type			1.12	0.47
	Joint Family	348(83.65)	707(79.98)		
	Nuclear Family	68(16.35)	177(20.02)		

[Table/Fig-2]: Relationship between socio-demographic parameters with absence from pulse polio programme

to ensure full participation in Pulse polio programme such that none of the child below 5yr of age should skip Polio Ravivaar Programme. Furthermore; for any non compliance, it is necessary to know the probable reasons behind it.

Full participation in Pulse polio programme-Myth or Reality?

Many previous studies regarding the fallacy of immunization coverage indicates coverage of 85.9% for BCG, 80.8% for DPT and 81.0% for OPV. Misconceptions among mothers of partially immunized children and lack of information specially in rural areas were main reasons of non-immunization. (U Manjunath et al., Naeem M et al., Mhatre SL, Corsi DJ) [15-18]. Other cited reasons for 'missed' vaccination were prior reminder not given; mother's forgetfulness and unavailability of vaccine. (Patel TA, Niraj B) [19]. This highlights the existent gap between the desired and achieved goal regarding the compliance for Pulse Polio Programme. There is no comprehensive literature explaining the reasons behind non compliance of Polio Ravivaar. Hence, a cross-sectional study was conducted with an aim to assess the probable reasons and barriers behind non compliance of Pulse polio programme among parents of children (1-5yr of age) of Modinagar area, Ghaziabad, Uttar Pradesh, India to suggest appropriate recommendations for continued success of Polio eradication.

OVERVIEW OF THE STUDY

Materials and Methods

A cross-sectional survey was carried out in the Modinagar area of District Ghaziabad, Uttar Pradesh during the time period of November 2013 to December 2013 following the Polio Ravivaar on 24th November 2013. A door to door survey was conducted over a period of one month in a total of 25 villages selected randomly to find out the reasons for not attending Polio Ravivaar. A total of 1300 children under 5yr of age whose parents/guardian agreed to respond to the questionnaire were included in the study. All the children whose parents/guardian refused to give consent for the study were excluded. Prior to the survey, the study design was reviewed and approved by the Institutional Ethical Committee. Written informed consent was obtained from the parents after explaining them the purpose and methodology of the study.

The survey instrument was a structured, closed ended questionnaire containing probable reasons and myths regarding non-compliance of Polio Ravivaar which was finalised after pretesting in pilot study [Table/Fig-1]. The 10 item questionnaire was translated in the local language-Hindi and was validated and checked for internal consistency by test-retest method (Cronbach's alpha value=0.87). Information about the type of family (nuclear/joint), parent's education and occupation, number of siblings with their age and gender and distance of the residence from the Polio Ravivaar center was also obtained. All the responses collected were entered in the Microsoft Word Excel Sheet 2007 and processed using the SPSS 16 Version. The proportions (% of responses-Yes or No) were calculated for each Question. Chi-square test was used to analyse the difference between the proportions between individual responses for each question. Furthermore, the relation between socio demographic parameter and absence from Polio Ravivaar was assessed with Multiple Logistic Regression.

RESULTS

A total of 1300 children were included for the study out of which 884 (430 females and 454 males) children (68 %) attended Polio Ravivaar and 416 children (223 females and 193 males) did not attend the Polio Ravivaar. The mean age of the children was 2.60 ±2.25 yr.

Out of the various factors assessed through questionnaire; most of the parents who did not attend Polio Ravivaar considered that there was no need for the repetition of Polio vaccine (76.9%) as compared to only 31.9% of those parents who attended Polio Ravivaar. This was followed by their fear that the vaccine might get contaminated during transportation (74.5%). This perceived fear was also quite prevalent amongst those who attended the Vaccination Programme (57.7%). Significant response difference was also observed regarding the fear of vaccination being provided by untrained workers. 72.6% of those who did not attend the pulse polio programme considered that as the vaccination was provided on a Sunday, they could not attend it due to their other work commitments as it is the only holiday which most working parents have.

[Table/Fig-2] depicts the association of different socio-demographic factors with absence from Polio Ravivaar. Female gender of the child, parent's illiteracy and a distance of more than 1km from the pulse polio vaccine were associated with 'missed' vaccination.

A significant positive association was found between an older age group of the eligible children (4-5 yr, O.R.1.52), female gender (O.R. 1.14), illiterate parents (O.R. 2.24), distance of more than 1km from the residence to the vaccination venue (O.R. 1.79) and lack of source of information (O.R. 1.47).

DISCUSSION

The study results showed the vaccination coverage for Pulse Polio Programme among the children of the selected villages to be 68 % (884 children attended the Pulse polio programme out of 1300 total eligible children) which is far less than the desired 100% coverage [20]. This indicated that in spite of stringent Government efforts, there still lies lacunae either at the administrative level or at the consumer level which has led to the existent loophole in the functioning efficiency of the Pulse Polio Programme. Similar coverage rate has been reported by the study done by Angadi MM et al., [21]. This also emphasizes the fact that that the achieved success of Polio Eradication is mainly contributed to the laborious efforts of the Government by providing door to door vaccination ,bridging the gap. However, this is practically impossible for every communicable disease, the Government is fighting with.

On assessing the responses to individual questions, the most frequent reason cited by the parents who failed to attend the Polio Ravivaar was the perceived belief that there is no need for repetition of OPV and that only single polio vaccination is sufficient for lifetime coverage prevalent especially amongst the illiterate parents. Thus, there is a lack of information and awareness pose a major problem for the Public Health Sector.

A strong association was also observed with the lack of timely information about Pulse polio programme amongst those parents who did not attend Pulse Polio Ravivaar. Similar findings were reported by Manjunath U, [15] and Angadi MM et al.,[21]. This indicates that there is a requirement of participation from all sectors of the society including Mass Media to raise the level of awareness among masses.

Also, the fear of vaccination being contaminated and being given by untrained workers accounts for fallacy in the participation of Polio Ravivaar. Personnel who had no training regarding EPI and the cold chain system invariably work in health centers. The reason may be the intense workload at health centers as reported by Widsanugo O et al., [22]. Study by Rao M, [23] also indicated that in India there is a shortage of high caliber senior staff in primary care to act as trainers and role models. Thus, developing the required cadre of primary care doctors, nurses, and other staff will therefore need the strong support of hospital clinicians [22]. Hence, strong policy reforms are required to empower the manpower infrastructure of Health sector. Also there is a need for comprehensive training programmes for the volunteers for Pulse Polio Ravivaar with appropriate intimation to the masses to gain their confidence [24].

Significant number of Parents preferred immunization at private medical set ups in contrast to Pulse Polio Programme, again indicating lack of trust amongst the mass regarding the credibility of the Government aided programme.

Surprisingly, many parents who did not attend the vaccination programme complained that the vaccination programme kept on Sundays interfere with their work schedule. This may be probably due to the fact that the study setting comprised of rural areas where people mostly don't have fixed working days or timings. More of the children of working mothers skipped the Polio Ravivaar, again indicating that parents might be reluctant to go for vaccination due to their work commitments or might be confident of door to door vaccination afterwards which is in contrast with the findings of Willibald J, [25]. This creates a need to implement a more flexible vaccination schedule to increase the coverage of Pulse Polio Programme.

Regarding the availability of information about the dates and venue of Polio Ravivaar, a significant number of parents (47.6%) who did not attend the Pulse Polio Programme informed that there was no

prior information of the vaccination dates. In contrast to the parents who attended vaccination, majority of them were informed by Family members/relatives or doctors again stressing on the accessibility as well as awareness barrier. Another study by Bholanath et al.,[26] also showed that major source of information were ANMs and midwives for those who attended vaccination. As the study was carried out in rural areas, where illiteracy might act as information barrier, stress should be given to spread information through other aids like use of mass media.

Female gender of the infants had significant association with missing of Pulse polio programme signifying the prevalence of gender inequality in our country. Similar results were reported by Corsi DJ [18]. In India, inequities in girls' access to health services have persisted in recent years. Researches in the past have examined this disparity through a study of gender inequities in child immunization coverage. Young girls are especially vulnerable to these gaps in coverage, but efforts need to be made to increase overall immunization coverage for both girls and boys.

Finally, children of illiterate parents usually had more dropout rate from pulse polio programme, again signifying the role of lack of knowledge in poor coverage rate. Similar results have been reported by Shurtleff et al., [24] and Mhatre SL, [17]. Hence efforts should be done to improve the access to the information regarding Pulse polio Programme through active participation of mass media.

It was also noticed that more children of joint families skipped Polio Ravivaar, though the difference was statistically non significant similar to the results reported by Patel TA, [19]. This can again be contributed to the village backdrop of the study where nuclear families are rare and parents often share the responsibilities of joint family. Even few parents were reluctant to go to Polio Ravivaar as they were confident of the vaccination service being provided at their door steps according to their previous experience. Hence, efforts to bring a change in attitude of parents are required so that they fulfill their responsibility timely. The study results might be limited due to the fact that study setting comprised only of rural population which represents socially, culturally and economically different population from urban areas.

CONCLUSION

The conducted study and experiences from the past reveals that continuous efforts are still required to maintain the status of "Polio free country" which has been achieved after a long struggle. Though the attitude of most of the parents is positive regarding the polio vaccination, but lack of appropriate knowledge concerning the significance of timely and repeated immunization remains the major factor behind non compliance of pulse polio programme. Efforts should be done to disseminate timely information much before the Pulse polio programme dates, so that full participation of all the eligible children could be expected. The policy makers should assess the probable barriers behind the absence from the vaccination programme and should join hands with the expert team and auxiliary health workers to help maintain the polio free status of our country and prevent the recurrence of infection from neighboring countries.

The lessons learnt from the failure of Malaria eradication Programme and National TB Control Programme should highlight the roadblocks in the path of achieving the goal of Disease eradication. Large scale Government aided longitudinal studies including the various geographical areas of our country investigating the probable reasons behind non compliance for various immunization programmes are recommended to analyse the current situation in detail and formulate appropriate programs for the coming years so that the efforts so far don't go in vain and we secure a healthy Polio free nation for our future generations.

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