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Research Article

Study of Causative Factors Leading to Non-Utilization of Pulse Polio Immunization

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Abstract: ***Introduction:*** Polio is one of the 6 major killer disease identified in our country. The most unfortunate part of the disease is that it less often kills but universally makes the child disabled cripple. In India over 110 million children under 5 year of age are living cripple life because of poliomyelitis which is 2 out of 3 case of polio in the world. Poliomyelitis is acute viral infection caused by RNA virus. ***Aim and Objective*****:** To identify the non-utilizers of pulse polio immunization, to study the factor leading to non-utilization of pulse polio immunization programme, ***Material and Methods*****:** Study was hospital based discriptive study based on the interview of parents of children less than 5 years. Total 200 interviews were conducted of which 100 were non utilizer group and other 100 were utilizer group. Interview was based on pre-formed proforma. In this study method adopted was a rapid assessment procedure. ***Results*****:** In this study 33% of the non-utilizers were not aware about PPI programme, about 67% of non-utilizers were aware about PPI of which 15% were due to transit during PPI, child illness (13%), parents business (9%), not aware of day (8%), not aware of need (6%), Nobody was available to take the child to PPI booth (5%), vaccinator was not available (5%). No conveyance (5%) and no knowledge about age group (1%). ***Discussion*****:** One third (33%) of the non-utilizers were not aware about PPI programme which comes out to be a major reasons for non-utilization. About 2/3 of non-utilizers were aware about PPI of which the 1st important reason which lead to non-utilization was transit during PPI (15%). Other causes were illness of child (13%), parents business (9%), not aware of days (8%), not aware of need (6%), Nobody available to take the child to PPI booth (5%), no conveyance available to reach the PPI booth (5%), Vaccinator was not available (5%) and no knowledge about age group (1%). ***Conclusion:*** To evaluate the PPI programme and find out the factor causing non utilization of PPI. The non-utilizers and utilizers both were interviewed. Study shows that there was marked unawareness prevailing among the population about vaccination, about 33% of non-utilizers were not aware about PPI. This suggests that there was lack in social mobilization and community effort.
Keywords: Pulse Polio, Immunization, Non utilizers, Utilizers etc.

INTRODUCTION

Polio is one of the 6 major killer disease identified in our country. The most unfortunate part of the disease is that it less often kills but universally makes the child disabled cripple. In India over 110 million children under 5 year of age are living cripple life because of poliomyelitis which is 2 out of 3 case of polio in the world. Poliomyelitis is acute viral infection caused by RNA virus. The word poliomyelitis is derived from the Greek word (Polios = gray, myelia - spinal cord). It infects gray matter of spinal cord and is characterised by limb paralysis. In India lameness survey in Northern state showed annual incidence rate of 2-5/1000 in rural preschool children and 1-3/1000 in urban preschool children. In south India, it suggests that prevalence of polio lameness among school children is 3.5/1000, employing an annual incidence in whole population of India is around 15/1000.

Poliomyelitis is eradicable disease because man is the only host. Vaccination plays an important role in its eradication as proved in western countries with introduction and extensive use of activated OPV and inactivated OPV. Since 1961 polio has been eliminated from most of the developed countries. India itself has experienced a 68% decline as a result of increasing coverage with 3 doses of OPV from 1988-90. Despite the large scale vaccination programme being carried out throughout the country, paralytic poliomyelitis continue to be a health problem. Drawing inspiration from the success of smallpox initiative in 1988 World Health Assembly passed committed WHO to global eradication of poliomyelitis by year 2000. By 1994 about 145 countries had recorded zero incidence of poliomyelitis. Although India still continues to have relatively large number of cases of poliomyelitis, 9440 case were officially reported. Union ministry of health and family welfare in India decided to launch PPI on a

national level in December, 9, 1995 immunizing more than 87.81 million less than 3 years of age with OPV and 2nd phase 6 weeks later on 20th January 1996. 93.58 million Children were immunized with OPV.

To arrive specially at the goal of polio eradication, government has started intensified PPI in India conducting 4 nationwide PPI round between October, 99 and January 2000. In addition eight priority states (UP, MP, West Bengal, Bihar, Rajasthan, Assam, Gujrat and Orissa) had organise 2 supplementary PPI round between February and April 2000.

There are many hinderances in the implementation of PPI especially in a vast country like India resulting in its failure in various dimensions. Thus it is important to study all aspect of this programme.

Aim of the study to identify the non-utilizers of pulse polio immunization, to study the factor leading to non-utilization of pulse polio immunization programme, to study the socio-economic condition and demographic profile in non-utilizers of pulse polio immunization and to compare the different aspects of non-utilizers vs utilizers of pulse polio immunization.

MATERIAL AND METHODS

The present study was hospital based discriptive study based on the interview of parents of children less than 5 years. Total 200 interviews were conducted of which 100 were non utilizer group and other 100 were utilizer group. Interview was based on pre-formed proforma. In this study method adopted was a rapid assessment procedure. In the last 10 years this method was widely used and accepted approach in the evaluation of National programme of health (Taylor Commission, WHO, 1995).

This method gives us a quick and systematic data gathering to guide out policy based on the opinion of knowledge and practice of the person who have participated in National PPI programme. The study population was obtained from stratified and purposive sampling of parents of under 5 year.

The study population has been divided into two broad groups.

1. Group I non utilizers - Parents / Guardians of children under 5 years of age who did not receive any of the dose ot NID as well as those who received only the of 1st dose.
2. Group II utilizers - Parents I Gardians of children under 5 year of age who received all doses of NID respective of their age

The questionare based on pre structured proforma for both groups includes.

a. Awareness and knowledge about PPI programme,
b. Awareness about routine immunization,
c. Reasons of non-utilization of PPI programme (only group I),
d. Socio-economic condition and demographic profile,
e. Various channels for receiving information of PPI programme,
f. Distance of polio centre from residence,
g. Consent from family member for PPI
h. Time availability for PPI

RESULTS

In this study 33% of the non-utilizers were not aware about PPI programme, about 67% of non-utilizers were aware about PPI of which 15% were due to transit during PPI, child illness (13%), parents business (9%), not aware of day (8%), not aware of need (6%), Nobody was available to take the child to PPI booth (5%), vaccinator was not available (5%). No conveyance (5%) and no knowledge about age group (1%).

Hindu and Muslim had equal incidence of awareness (66.2%) and Christians were 100% aware. Graduate parents showed 100% awareness while awareness among secondary passed was 83.3% and illiterate parents showed maximum percentage of unawareness i.e. (42.2%).

Similar trend was shown by fathers literacy level maximum (94.1%) number of graduate father showed awareness i.e. 90% of secondary passed father showed awareness while maximum incidence of unawareness was showed by illiterate father i.e. 51%.

Mothers occupation showed very significant effect on awareness 100% service class mothers were aware while 84.2% of housewife mothers were aware. Maximum incidence of unawareness belongs to labourer class mothers i.e. (46.6%). Similarly 94.7% service class fathers were aware while awareness among business class fathers was 64.2% and unawareness was maximum among labourer fathers i.e. (42.2%).

100% urban parents were aware while awareness among urban slums area were 92% and maximum number of unaware i.e. 52.6% was showed by rural area parents.

100% awareness was among HSEC, 69.5% MSEC parents were aware while maximum number of unawareness was prevailed among LSES parents.

93.7% fully vaccinated child parents showed awareness while it was 77.6% among partially vaccinated and maximum number of unawareness belongs to unvaccinated group i.e. 73.1%.

Joint family showed 90.6% of awareness while 50.9% of unawareness was showed by nuclear family.

Table-1: Showing Age Distribution of Children

Age	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
< 1 year	34	34	17	17
1 - 2 year	16	16	26	26
2 - 3 year	11	11	22	22
3 - 4 year	17	17	16	16
4 - 5 year	22	22	19	19

Above table shows that about 34%, highest incidence among the non-utilizers was in below 1 year of age group and lowest 17% incidence among the utilizers was also in this age group. Low incidence was seen in 1-2 year and 2-3 year of age, 16% and 11% respectively among non-utilizers while highest incidence of utilizers was seen in this age group, 26% and 22% respectively, p value = < 0.02 which is significant.

Table-2: Sex Distribution of Children

Sex	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Male	52	52	59	59
Female	48	48	41	41

Above table shows that sex distribution of children among non-utilizers is approximately equal in both sex (male 52: female 48%) while there is male predominance i.e. 59% in utilizers group and 41% were female. Male and female ratio is 1.4: 1 in utilizers group, p > 0.10 which is not significant.

Table-3: Religion

Religion	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Hindu	74	74	60	60
Muslim	24	24	30	30
Christian	2	2	10	10

Above table shows that high incidence of non-utilizer and utilizer belongs to hindu religion (74:60) and lowest incidence of non-utilizers belongs to Christian (2%) as compared to utilizer Christian (10%) and muslim religion showed approximately equal percentage in both groups. Chi square=7.46268, df=2, p value=2.396053E-02 which is highly significant. p<0.05 therefore this data is statistically significant.

Table-4: Residence

Residence	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Urban	16	16	61	61
Urban slum	25	25	17	17
Rural	59	59	22	22

Above table showing 59% of non-utilizers belongs to rural area while 61% of utilizers belongs to urban area. Lowest incidence (16%) of non-utilizers belongs to urban area while 22% of utilizers belongs to rural area. p<0.001 which is highly significant.

Table-5: Distribution of Children by Mother Literacy

Literacy Status	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Illiterate	77	77	11	11
Primary	5	5	19	19
Middle	4	4	22	22
Secondary	6	6	25	25
Graduate & Above	8	8	23	23

Above table shows (77%) of the non-utilizers mother were illiterate and 8% were graduate or highly educated while lowest percentage of utilizer mothers were illiterate (11%) and highest percentage had secondary education (25%) and higher education (23%). p<0.001 which is highly significant.

Table-6: Distribution of Children by Father Literacy

Literacy Status	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Illiterate	49	49	7	7
Primary	13	13	2	2
Middle	11	11	9	9
Secondary	10	10	43	43 ,
Graduate & Above	17	17	39	39

Above table shows that 49% of non-utilizer fathers were illiterate and 17% were graduate and lowest (10%) had secondary education while lowest percentage of utilizers were illiterate (7%) and primary education (2%) and highest percentage of utilizer father belonged to secondary education (43%) and graduate and above (39%). Chi square=68.95669, df=4, p=<10(-6) which is highly significant.

Table-7: Distribution of Children According to Both Parents Literacy

Literacy Status	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Both Illiterate	49	49	7	7
Both literate	23	23	89	89
One illiterate	28	28	4	4

Above table shows that high percentage of non-utilizers were seen when both parents were illiterate (49%) as compared to utilizers (7%) and lowest percentage of non-utilizers when both parent were literate as compared to 89% utilizers. p<0.001, which is highly significant.

Table-8: Occupation of Mother

Occupation	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
House wife	38	38	74	74
Labourer	58	58	9	9
Service	4	4	17	17

Above table shows that in relation to occupation of mother percentage of non-utilizers is significantly higher among labourer group mother (58%) and lowest among service class group (4%) and house wife 38%. While in utilizers highest percentage was among house wife mother (74%) and lowest in labourer group (9%). p<0.001, which is highly statistically significant.

In this study 64% of non-utilizers fatter belong to labourer group while 49% belongs to service class of utilizer father and lowest (15%) belongs to labourer group of utilizers. This data is statist cally significant p<0 001. 66% of non-utilizers come under low socio-economic group while 67% of utilizers belong to middle (36%) and higher SEC group (31%). Lowest (11%, belongs to high SEC among non-utilizers p<0.001, which is highly significant.

Table-9: Routine Immunization

Vaccination	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Unvaccinated	26	26	14	14
Partial vaccinated	58	58	12	12
Fully vaccinated	16	16	74	74

Above table shows highest percentage of non-utilizers partially vaccinated (58%) and lowest were fully vaccinated. While 74% of utilizers group were completely vaccinated and lowest were partial vaccinated (12%). $p< 0.001$, which is highly significant.

Table-10: Knowledge about PPI Programme.

Knowledge	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Not known	33	33	1	1
Partially knowledge	48	48	52	52
Exact knowledge	19	19	47	47

Above table shows that maximum number of both utilizers (52%) and non-utilizers (48%) had partial knowledge about PPI programme 33% of non-utilizers did not know about PPI and only 1% of utilizers were unaware about PPI and 47% of utilizers and 19% of non-utilizers had exact knowledge about PPI programme $P<0.001$, which is highly significant.

Table-11: Knowledge about Disease Polio

Knowledge	Non utilizers (n=100)		Utilizers (n=100)	
	No. of Cases	Percentage	No. of Cases	Percentage
Yes	89	89	98	98
No	11	11	2	2

Above table reveals that 89% of non utilizer and 98% of utilizers knew about the disease of polio while 11% of non utilizers and only 2% of utilizers did not know about disease of polio. $p<0.05$, which is highly significant.

DISCUSSION

A study of causation factor leading to non-utilisation of PPI was carried out in the Department of Paediatrics. Total 200 interviews were conducted out of which 100 were non-utilizers and rest 100 was utilizers (control group). The study population was obtained from stratified purposive sampling of children attending OPD ward. The method adopted was rapid assessment procedure.

Reason of non utilisation

One third (33%) of the non-utilizers were not aware about PPI programme which comes out to be a major reasons for non-utilization. About 2/3 of non-utilizers were aware about PPI of which the 1st important reason which lead to non-utilization was transit during PPI (15%). Other causes were illness of child (13%), parents business (9%), not aware of days (8%), not aware of need (6%), Nobody available to take the child to PPI booth (5%), no conveyance available to reach the PPI booth (5%), Vaccinator was not available (5%) and no knowledge about age group (1%).

The above data shows that 1/3 of non-utilizers have never heard about PPI which reflects the failure in part of the information displayed inspite of heavy expenditure spent on publicity of PPI programme. Among the aware non-utilizers (67%), non-utilization was because of transit during PPI and child illness (28%), unaware about need (6%), unaware of NID (8%) and no knowledge about age group. This reflected the lack of proper information given to community about PPI. 10% of non-utilizers consented of lack of conveyance to reach PPI booth and unavailability of vaccinator at PPI booth. This shows improper facilities given to community for PPI. 14% non-utilizers were because of parents business and no one available at home to bring the child to PPI booth. These findings support the need to continue to place major emphasis on activities which increase public awareness before each

compaign. According to study done by Bir Singh *et al.* [1] on PPI in Delhi IIP 1996 observed non-utilization of PPI.

The present study reported approximately similar result as given by Bandhoupadhyay *et al.* [2]. The present study evaluated incidence for not known about PPI 33% as compared to 43% child illness 13% as compared to 10% parents business 9% as compared to 27%. This elicits that in present study busy parent constitutes less percentage. Vacanator not present as compared 3% child illness 13% Vs 10%. Evaluation of PPI 1996-97 by ministry of health and family welfare the reason for non utilizers.

Awareness was more among Hindu (74.6%) and christian (14.9%) while among unaware non utilizers Hindu religion was pre dominent (75.7%) and there was no incidence of unawareness among christian religion. Muslim had approximately equal proportion between utilizers and non-utilizers. Literacy of mother shows significant impact on awareness about PPI. Result shows that 93.9% (31) of unaware mothers were illiterate as compared to 68.6% (46) of aware group non utilizer mothers. Highly educated graduate aware mother also show significant number of non-utilizers 11.9% (8) while no incidence was seen in unaware group. Literacy of father has also some impact on awareness. 75.7% (25) of unaware non utilizers father were illiterate as compared to aware group (35-8%).

Low socio economic condition comprise 66% of non-utilizers of which 40% come under aware group and 26% were unaware group which is 59% of aware non utilizers and (78.7%) of unaware group of non-utilizers. High SEC showed no incidence of unawareness and Muslims were approximately equal incidence in both groups. Nuclear family showed high incidence 87.8% (29) among unaware group of non-utilizers while joint family showed low incidence (12.2%) of unawareness and more awareness i.e (73%).

Age wise distribution

The maximum percentage of non-utilizers were among under 1 year of age group (34%) of which 21% belongs to less than 6 month of age. Under 1 year of age which is very vulnerable to risk of polio myelitis? It is very essential that this age group needs to be targetted more intensively for coverage with routine immunisation as well as PPI programme. The incidence of non-utilizers were 16%, 11%, 17% and 22% in age group of 1-2 year, 2-3 year, 3-4 year and 4-5 year respectively. Lowest incidence of non-utilizers was seen in age group of 1-2 year and 2-3 years, while the significant coverage of PPI was seen in 1-2 vear then 2-3 year of age group and least coverage of PPI was under 1 year of age (17%). Which justified the highest incidence of non-utilizers was among under 1 year of age group. The incidence of utilizers were 16% and 19% in 3-4 year and 4-5 year age group respectively. Bir Singh et al. 1996 reported that the coverage for PPI was lowest in the age group 0-6 months and highest coverage was in the age 9roup 13-18 month. Same result was reflected in the present study also.

This present study is against the study done by Bir Singh et al. 1996 showed that non acceptance was significantly higher in Muslim as compared to Hindu religion. Bir Singh *et al*. 1996 [1] reported religion wise distribution of acceptors and non-acceptors of PPI doses. Non-utilizers labourer father had highest incidence (64%) followed by service class, business 19 14% respectively and 3% children have their father (expired). Among utilizers highest incidence was in service class group (49%) followed by business class (36%) and labourers (15%). Predominant sources of information about PPI were found to be Television (30.7%) followed by information from health worker (27%) and friends (12.5%).

Bandhoupadhyay *et al*. [2], reported that TV reached largest percentage of immunized children (6.4%). The effect of TV was marked in the children who did not visited during enumeration. Of the 361 children not reached by enumeration visit 76% were immunized and 24% were not immunized of those "non enumerated" children 67% learned of PPI through TV compared to 33% of those who had not been immunized (Odd ration 4.2 $p< 0.0000$).

CONCLUSION

The strategy is to Provide two additional dose of OPV to all children less than 5 years of age on two single days in a year. The PPI are organised during the low transmission season of polio viruses, at an interval of 6-8 weeks. Now we have completed 4 rounds of PPI session and one intensified round.

This year study was conducted to evaluate the PPI programme and find out the factor causing non utilization of PPI. The non-utilizers and utilizers both were interviewed. Study shows that there was marked unawareness prevailing among the population about vaccination, about 33% of non-utilizers were not aware about PPI. This suggests that there was lack in social mobilization and community effort. 67% of non-utilizers were aware of days inspite of that they do not go for PPI. This could be due to dis-enhancement with the programme and reduction in community participation and can be overcome by increase in the educational nature of material provided to the community. The sufficient staff with updated technical information should be made available to make this possible. Because of repeated PPI cycle community fatigue was observed which important negative aspect of PPI programme is.

Obviously literacy has a definite role in promoting acceptance of PPI doses. Under 6 months of age group children is very vulnerable to risk of

poliomyelitis so this age group need to be targetted more intensively for coverage with routine immunization as well as PPI

The important mass media like TV and interperson communication played a significant role in generating of awareness therefore this media should be judiciously used to enhance the awareness and education about PPI.

Apart from continuing with the methods used till now to create awareness about PPI more and more innovative approach for the same need to be utilized so that every single parent in the community is made aware of PPI days in the times to come.

There is a below optimal relationship between health worker and community which results in the less coverage of PPI especially in the rural area.

RECOMMENDATIONS

1. Communication messages especially to unreached families should adress the information of fixed day/ fixed place for PPI.
2. Special efforts should be made to inform about PPI to the homeless and those in transit.
3. The political commitment, social mobilization and management of PPI days is exemplary and need to be sustained until eradication of polio from India.
4. Inter personal communication is still the main demand generating option for remote and rural / tribal population. Efforts to mobilise health workers, anganwadi workers, teachers, panchayat and other NGOs working individual for each area need to be strengthened.
5. Cold chain maintenance - polio vaccine is a labile vaccine, proper storage and transportation facilities should be improved to maintain the potency of vaccine on NID and at PHC level.
6. Many families do not know the reason for extra dose of polio drops hence the level of awareness in general population should be improved.
7. Number of polio booth should be increased to reduce the distance from the residence in the rural community.

REFERENCES

1. Shigh B, Suresh K, Kumar S, Singh P. Pulse polio immunization in Delhi—1995–96: a survey. The Indian Journal of Pediatrics. 1997 Jan 1;64(1):57-64.
2. Jain A, Gaud RS, Thaker A, Shende P. In-vivo evaluation of buccoadhesive tablets using starch-polymer combinations. Pharmacology online. 2009;3:283-97.
3. Shibani Eandyopadhyaya, Knushik Banerjee, Dutta KK, Stephen J. Al/.-ood, Langmere CM: fJICD, Evaluation of mass pulse immunization with oral polio vaccine in Delhi Indian Journal of PAediatrics.1996; 63: 133-137
4. Naveen Thakre, Niranjan Shenduriker Polio eradication based on operational manual topic Recent advances in Paediatrics. Chap 17 No 8 Suraj Gupte. 1998: 279-305.
5. Arddrus Renew of infectious disease. Polio eroc:cation in WHO Co-'.h East Asian Region. 1997; 89-95
6. John TJ. Samuel BU, Christuraj S. Method to increase the sensitivity of polio virus isolation Lancet. 1992; 340-375.
7. Mittal S K Pulse polio programme. A National perspective - Department of Paediatrics - Maulana Azad Medical College, New Delhi Indian Journal of Paediatrics.1996; 3: 1-8
8. John K Andrus. Kaushik Banerjee Polio eradication in world health organisation South East Asia Region by the year 2000 - Midway assessment of progress Journal of infectious disease. 1997; 175 (1) : 90-93.
9. Jotna Sokhey. Polio eradication in India - Polio Immunization - Indian Paediatrics. 1996; 33: 253-255.
10. Sokhey J. Stephen Atwood. A process of evaluation of pulse polio immunization - Indian Paediatrics. 1996; 33: 259-260.
11. Bir Singh, K. Suresh, Sanjeev Kumar and Padam Singh: Pulse Polio Immunization in Delhi - 1995-96 : A survey : Indian J. of Paediatrics. 1996; 64: 57-64.
12. Swami HM, Bhatia V, Bhatia SPS. Evaluation of pulse polio Immunization in Chandigarh, India: Indian J. of Paediatrics. 1998; 65: 435-439.
13. A report on impact of expanded programme on immunization and the polio eradication initiative on health system in the Americas: Final report on the "TAYLOR COMMISSION" WHO: 1995.
14. Thacker Naveen, Shendoreker Neeranjan Polio eradication operational manual: Indian Academy of Paediatrics; 1996.
15. Editorial: Indian Polio Eradication Efforts of Cross Road : Indian PAediatrics. 1998; 35: 307-310.
16. Evaluation of Pulse Polio: Ministry of Health and Family Welfare: 1997.
17. Recent trends in Paediatrics Vol. 1: Pulsepolio immunization - National perseption: 161-176.
18. Pulse polio immunization in India. Revised operational guide for intensification in 1999-2000.
19. Polio Eradication Bulletin of the WHO -2000.
20. Harry F, Fall Micholas, Award, Barbara P. Hull, Julie: Paralytic poliomyelitis - seasonal strategies of disappearing disease. The Caneet. 1984; 343: 1331.
21. Jacob John. Can we eradicate polio: Frontier of Paediatrics H.P.S. Sachdeva. 1996: 76-84.
22. John JJ. Immunization against polymyelitis in develop countries. 1993; 3: 149-150.
23. Assaud and Liungarss K, Stives E. World overview of poliomyelitis. Regional pattern and trend review of infectious disease. 1984;6(2): 539-592.
24. Hoirstman DM. Control of poliomyelitis: A continuing paradox. World Health Forum.1983; 4: 264-270.

25. Alshely D, Bemal R. World Health Forum.1985; 6:3: 265-267.
26. Krishan R, Jadhav M, John TJ. Efficacy of inactivated polio vaccine in India. WHO Bulletin.1983; 61(4): 689-692.
27. Keller R. Intestinal IgA neutralizing antibodies in new born infants following polio virus immunization. Paediatric. 1969; 43: 330-338.
28. Botfiger M, Litwine VS, Assaad F, Limberk, Heer L. Beausofai EC. Poliomyelitis and meas.es immunization in Ghana. 1976, 59(5): 729-736.