Original Article

Surveillance of Cold Chain System During Intensified Pulse Polio Programme - 2006 in Chandigarh

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ABSTRACT

Objective. To evaluate the maintenance of cold chain system in the Intensive Pulse Polio Immunization (IPPI) campaign in the Union Territory, Chandigarh.

Methods. A cross sectional study was conducted in 18 designated vaccine sub-depots, where OPV vials were stored prior to IPPI and 25 IPPI booths out of the designated 406 IPPI booths in U.T, Chandigarh. The booths were selected by stratified random sampling technique. 25 Vaccine vials, one from each booth were selected and sent for potency testing at Central Research Institute (CRI)- Kasauli.

Results. All the randomly selected vaccine samples were reported portent, as per the reports provided by CRI – Kasauli .Cold chain maintenance and temperature charting was found satisfactory.

Conclusion. There are some avoidable errors which leaves room for improvement, which can be in the form of provision of adequate number of exhaust fan, voltage stabilizers, etc. Uninterrupted power supply should be ensured. Lastly, more emphasis is to be given on maintenance of cold chain system in reorientation training program of all health functionaries. **[Indian J Pediatr 2007; 74 (8) : 751-753]** *E-mail : goelnaveen2003@yahoo.co.in*

Key words : *Cold chain sickness rate; Deep freezer (DF); Ice lined refrigerator (ILR); Vaccine carrier; Vaccine potency*

Cold chain *i.e.* the system of transporting, storing and distributing vaccine in a potent state at recommended temperature till it is administered to an individual is the vital link between the child and immunity in immunization against Vaccine Preventable Diseases (VPDs).[1,2,3,4] Each exposure of the vaccine to an ambient temperature has a cumulative effect on reducing its potency and this is of prime concern in view of the fairly frequent reports of occurrence of VPDs in populations thought to have been immunized well.

To maintain potency of a heat sensitive vaccine like OPV (for which the recommended temperature for storage is between 2-8° C)[4] is a challenge in a tropical/ developing country like India, where power shortage and load shedding are common problems. Thus, in spite of guidelines for cold chain maintenance, a stringent system of refrigeration, temperature monitoring and record keeping, compliance in actual practice remains less than optimal.[1,2,4,5] But in past few years, there has also been a lot of advancement in safe storage and transport facilities for vaccines, yet there are avoidable human errors which if otherwise controlled can improve cold chain maintenance greatly. These avoidable errors include-lack of regular monitoring of temperature, refrigerator not being used exclusively for vaccines, high temperature during transport and storage, repeated exposures to very low temperature and repeated thawing.[1, 4]

"Vaccines do not save lives but vaccination does"[5]. With more than 90% immunization coverage achieved in Chandigarh[6], it is important that this level be maintained and all components of cold chain system be monitored strictly as per the guidelines, as it is the fundamental link for success of vaccination.

Keeping this in mind, the present study was conducted to evaluate the cold chain system in Chandigarh during IPPI programme 2006.

MATERIAL AND METHODS

This cross-sectional study was conducted at different levels of cold chain maintenance, starting from the point

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from where vaccine vials were supplied at sub depots to the place where it was administered at designated booths on immunization day and during house to house activity as well. Information from sub-depots was collected one week before National immunisation day. This survey was conducted in two rounds, in month of April (round 1) and May (round 2) 2006. The information was collected from all *i.e.* 18 (Eighteen) designated vaccine sub-depots, where OPV vials were stored prior to IPPI rounds. Out of the 406 IPPI booths in UT Chandigarh, 25 booths were selected by systematic random sampling technique and 25 vials collected and sent for potency testing at Central Research Institute, Kasauli. In both the rounds, teams involved in house to house activity were also monitored. A checklist as recommended by the experts of cold chain system[4,5] was used for recording the details.

Table 1. Status of Cold Chain Equipments during Intensified Pulse Polio-2006.

Cold Chain equipment	Commissioned Number	
	Round 1 (April, 2006)	**Round 2 (May, 2006)**
DF Capacity		
300 lt.	06	05
140 lt.	15	17
Total	21	22
ILR Capacity		
300 lt.	02	01
140 lt.	16	18
Total	18	19
Total DF + ILR	39	41
Total that could be examined	33	41

RESULTS

During both the rounds, 18 vaccine sub-depots were designated. There was not even a single Walk-in Freezer (WIF) or a Walk-in Cooler (WIC) for the U.T. A total of 940 vaccine carriers, 4668 icepacks (of which 840 were reserve/extra) were commissioned for each round as per the information provided by the District Immunization Officer. A total of 80 ILR and DF were deployed during the Pulse Polio Immunization Programme 2006. 21 Deep-freezers and 18 ice-lined refrigerators were commissioned for round -1 and 22 deep freezers and 19 Ice-lined refrigerators were commissioned for round-2 (Table 1). Out of these 18 designated vaccine sub depots, three sub depots were locked at the time of visit; hence 6 (DF's + ILR's) could not be examined during Round - 1. All these equipments were properly leveled, fixed permanently to socket, kept in a cool room away from direct sunlight and atleast 10 cms away from wall 24.24% and 43% old chain equipments were locked in round 1 and round 2 respectively. All the equipments were being defrosted periodically except 4.8% (Table 2). The vaccines were stacked neatly in all the ILR's except one during both rounds. There was no overstocking of vaccine vials in ILR and deep freezers. The first - in and first - out principle was followed and none of the vaccine was frozen, expired or overstocked. But 6.07% and 4.88% of the equipments were used for keeping food or drink in Round 1 and 2 respectively. All except two (4.8%) of ILR/DF were connected with a voltage stabilizer. Temperature charting was being done routinely but 6% (round 1) and 4.7% (round 2) of the temperature charts were not signed by the supervisor/Medical Officer (Table 3). During both the rounds it was observed that 4 DFs and 1 ILR were out of order. So the cold chain sickness rate for year 2006 was 6%. All these cold chain equipment which were found out of order were repaired within the recommended response time of one week. It was observed that the exhaust was either not used or non-functioning in 5 (33.33%) and 9(50%) sub depots during Round 1 and Round 2 respectively.

On the day of immunization, 25 randomly selected booths were visited and level of cold chain maintenance was assessed. It was observed that all health workers

Table 3. Temperature Chart

Points to be monitored	Round 1	Round 2
Separate for each ILR & DF	100%	100%
Up to date	100%	97.56%
Signed by supervisor/MO	93.93%	95.36%
If the temperature exceeded prescribed limits in period*	3.03%	7.31%

*Evaluation period for round 1 is the past one year (2005-2006). The evaluation period for Round 2 is the period between Round 1 and Round 2.

Table 2. Status of Monitoring of Ice Lined Refrigerator and Deep Freezer

Points to be monitored	ROUND - 1			ROUND - 2		
	ILR (n=15)	**DF (n=38)**	**Total (n=33)**	**ILR (n=19)**	**DF (n=22)**	**Total (n=41)**
Correct level of installation	100%	100%	100%	100%	100%	100%
Cold chain equipment (locked)	26.6%	22.2%	24.24%	47.36%	40.9%	43.9%
Away from sunlight	100%	100%	100%	100%	100%	100%
Keep adequately (10cm from wall)	100%	100%	100%	100%	100%	100%
Plugged to socket permanently	100%	100%	100%	100%	100%	100%
Defrosted periodically	100%	100%	100%	94.73%	95.4%	95.12%
Not used for keeping food /drink	93.3%	94.4%	93.93%	94.73%	95.4%	95.12%
Installed with a voltage stabilizer	100%	100%	100%	100%	90.9%	95.12%

were using vaccine carriers for carrying vaccines and all these carriers were in good condition. No day carrier was being used. Ice packs being used were fully frozen and all the workers were checking vaccine vial monitor before administering vaccine except one (1.3%). 5% of them did not secure lid tightly but all the vaccine carriers were kept in shade during immunization session. Only one vial was being taken out at a time. In round -1 at one of the booths, one vaccine vial was found to be in stage 3 of Vaccine Vial Monitor (VVM). This vial was collected for potency testing. All the vaccines vials collected from randomly selected booths, in both the rounds, were reported potent by CRI - Kasauli. The vial, which was found in stage 3, was also found to be potent.

During house to house campaign only 5 teams could be met. All of them were carrying vaccine carriers no day carriers were being used. Four fully frozen icepacks were being used in carriers and only one vial was taken out at a time for vaccination.

DISCUSSION

The oral polio vaccine is the life saving vaccine we have in our hands for materializing our dream to eradicate poliomyelitis. To maintain its efficacy it requires strict maintenance of cold chain as it is the most heat sensitive vaccine. Thus, success of our war against polio depends upon the extent of efforts put to maintain a high quality of cold chain. The present study has shown that temperature maintenance was quiet good but there is still some room for improvement. Similar concerns have been raised by studies conducted by other authors[6-11]. The gaps in the cold chain system observed during IPPI-2006 as highlighted by the present study are:

- Out of the 25 sample vials taken during Round 1 - one OPV vial was in stage 3 VVM and it was being used to administer the vaccine to children.
- No WIC or WIF for the UT, Chandigarh.
- Defrosting was not done in two of the DF / ILR regularly.
- Power failures were frequently (2-4 hr/day) reported at all the vaccine sub depots.
- 6.07% and 4.88% equipments were used for keeping fod or drink in Round 1 and 2 respectively, which is not permitted for the maintenance of cold chain equipment.
- 4.88% DF/ILR's in round 2 were not installed with voltage stabilizers which maintain uninterrupted power supply in spite of low voltage.[8]
- Exhaust fans were either non-functioning or not in use in 50% of sub depots which is essential to maintain adequate ventilation for the storerooms.
- The temperature chart was maintained separately for each ILR & DF. Though the temperature recording was done twice a day on working days, no record was maintained for gazetted Holiday's & Sunday's. The temperature records were not countersigned either by a supervisor / MO in 6% (round 1) and 4.7% (round 2) sub depots, emphasizing the need for effective supervision and for proper maintenance of records even on holidays.

Hence, it is recommended that there should be a provision for walk-in-cooler and walk in freezer. There should be provision of adequate number of exhaust fans and voltage stabilizers. Defrosting should be done regularly. Uninterrupted and steady electrical supply should be ensured and in case of power failure for prolonged period *i.e.* 24 hours, alternative storage arrangements have to be made in advance. Temperature charting should be done even on holidays/Sundays. The rigorous re-orientation of health personnel regarding the importance of cold chain before every IPPI should be conducted. Effective monitoring is the most important factor in cold chain maintenance. Our study also points that all the avoidable errors identified here can be removed up to great extent by continuous and regular supervision.

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