

## EVALUATION OF COLD CHAIN SYSTEM IN RURAL AREAS OF HARYANA

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### ABSTRACT

*Evaluation of cold chain system was done in a time bound study during August and September months of 1992 in two districts of Haryana as there were frequent breakdowns of icelined refrigerators during the previous year. The study revealed that defective stabilizers and electricity plugs and sockets were the reason of breakdown in many cases. Temperature maintenance and functioning of deep freezers was satisfactory. Retrospective analysis showed that the polio vaccine samples picked up during 1990-92 were found to be satisfactory by CRI, Kasauli. Use of two ice-pick carrier and thermos flasks was associated with poor temperature maintenance. Seven vaccine carriers out of 25 examined had cracked wall lining. Lids of carriers were also not kept tight during vaccination sessions. Response lag of the health workers and medical officers in case of breakdowns was delayed. A one day refresher course exclusively on cold chain maintenance at community health centre level is recommended.*

Key words: *Vaccine Carrier, Ice lined refrigerator, Vaccine potency.*

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After having attained a reasonably good immunization coverage all over India(1,2) the need to give quality vaccine has become a priority. Maintaining vaccines at the recommended temperatures of +2 to 8°C is one of the most important limiting factors in this regard, particularly in countries with a tropical warm climate. For this, constant vigil and monitoring of cold chain is vital(3).

With more than 80% immunization coverage achieved in Haryana(2,3), it is imperative that such high coverage should be maintained and simultaneously emphasis put on improving cold chain. This study evaluated the functioning of cold chain system in two districts of Haryana as part of a sponsored study by Central Technical Committee (Integrated Child Development Services), New Delhi. The study was mainly designed to assess reporting system of immunization achievements in these selected districts.

### Material and Methods

This was a time-bound one month study conducted from August 6 to September 2, 1992 and three immunization days were covered in one district and two areas of another district were studied. Pre-set proforma were used on which details on duration of the immunization sessions, record of temperature at the beginning and end of the sessions, condition of vaccine carrier and the manner in which the carrier and the vaccines were kept during the session were recorded. Dial thermometers were used for recording the temperatures. Deep freezers/icelined refrigerators (DF/ILR) were examined in the primary health centre/ community health centre (PHC/CHC) for functioning and for maintenance of temperature chart. District level data on repairs

and replacement of DF/ILR and reports of vaccine potency tests were also acquired from the District Immunization Officer.

### Results

Four CHC, 3 PHC and 2 hospitals, were visited, and 7 immunization sessions were attended during the survey. There was only 1 trained technician stationed at district headquarters to cater to complaints relating to DF/ILR of the district. Data from the district revealed that during 1991-92, 19 DF and 19 ILRs were in commission in the PHC/CHC/hospitals; Of these, 6 ILRs had developed defects during the year. Three defective ILR were sent back after repairs and 3 had to be condemned. There were 20 reported complains from the district during 1991-92. These included faults in the stabilizer (8 cases) and compressor (3 cases), faults in the thermostat, gas leakage and power socket faults.

Of the 6 DF examined during the survey, all except 1, which was kept under observation for faltering temperature, were in good condition and functioning normally. Storage of vaccine and packing was proper in all. However, at one CHC, the DF was kept at a place in a room which received direct sunlight.

Two of the 7 ILRs had been sent to the district headquarter for repairs. Of the remaining 5, the temperature was within the prescribed range (+4 to 8°C) in 4. Thus, of 13 DF/ILR examined 4 had some defect (cold chain sickness rate 31% for August 1992). The ILRs were overpacked due to oversupply of vaccines. All the functioning ILRs had reports of breakdowns 2-3 times since installation. Although temperature charts were being maintained in all centres, reporting of breakdowns, repairs and power cut was not noted and the charts were not upto date in 3 centres.

All stabilizers were working at the time of survey. However, these had been replaced 2-3 times since installation. At all the places the power sockets and plugs were of inferior quality with reports of frequent burning of electricity points.

The female health workers used thermos flasks instead of vaccine carriers, for carrying vaccines. In 7/25 (28%) vaccine carriers, wall linings were cracked. In all except 1 PHC, where carriers were kept clean and dry, the carriers were dirty, wet and foul smelling.

Of the 7 vaccination sessions that we attended, improper vaccine handling practices were noted in 2. These included carrying vaccines in flasks or in small vaccine carriers and exposing the vaccines to atmospheric temperatures. At the other sessions, the temperatures recorded at the end of the sessions were within acceptable limits.

Unused vaccine vials were stored in the private refrigerators at the end of session, in many cases. Partially used vials were discarded (some health workers however, felt that those could be used again). In one DF/ILR, partially used vials were actually seen. At two places, visits to the centres on the day following the vaccination session, unopened and partially used vials were found in the vaccine carriers, the temperature inside which were more than 30° C. The unused vaccines which were returned to DF/ILR were not marked by any rubber band, though Health Workers were aware of the correct practice. Some of the Health Workers collected vaccine supply one day in advance, particularly if their subcentre areas were far away.

In addition to the above, we observed the cold chain maintenance at a Tehsil level hospital in one of the districts. Incidentally,

a breakdown had occurred in the cold chain due to fault in the voltage stabilizer and the plug-point because of which both DF/ILR went- out of order. It took 9 days (down time) to repair the defect. For first 4 days, the vaccines were left in the DF/ILR which were non-functional with temperature ranging from 18-25°C. The senior medical officer was not informed till the 3rd day of the breakdown. The district based technician was informed on the next day. With intervening holidays ultimately the repairs were done on the 9th day.

Reports on the vaccine potency tests conducted by Central Research Institute, Kasauli during 1990-92, on randomly picked polio vaccine samples from the field, revealed that all the vaccine samples were potent.

### Discussion

Cold chain maintenance is of vital importance for ensuring effective protection of beneficiaries against vaccine preventable diseases. The present study revealed that though temperature maintenance was reasonably good, there was still a scope of further improvement in the cold chain at peripheral levels. Frequent breakdown in icelined refrigerators as compared to deep freezers indicate some inherent problems with ELR which should be specifically investigated. Similarly, reports of frequent replacements of voltage stabilizers also calls for using good quality equipments. Plugs, sockets and wiring should also be products manufactured by standard establishments, since use of cheaper quality material resulted in frequent burning of electricity points as revealed in our study. Sokhey *et al.*(2) had also indicated some technical problem with ILR (internal leak due to corrosion) and with some voltage

stabilizers. Sokhey(4) had also earlier warned that task of refrigerator personnel would become more difficult during the coming years as equipment will age and more breakdowns will occur.

Thermos flasks and two-pack vaccine carriers should be withdrawn from the peripheral health services since their use exposes vaccines to higher temperature as revealed in our study. It was our observation that for sake of convenience, health workers preferred to use flask or 2 ice-pack carriers even when they had 4 ice-pack carriers. Health workers should also be told to keep the lid of the vaccine carrier tightly closed during the session as it also helps in maintaining a lower temperature. Vaccine carriers with cracked lining should be replaced. They should also be asked to keep the carriers dry by putting these upside down with lids removed after the session. It should also be ensured that plugs/sockets of fridges are not used for room heaters by health workers. Disposal of partially used vials should also be emphasized.

Regular maintenance of temperature chart is an effective way of monitoring the functioning of refrigerators. This helps in initiation of timely action in case of a breakdown by indicating time and duration of temperature faltering. In our study we found that though temperature was noted on the chart, the duration and time during which there was some breakdown was not indicated thus defeating the basic purpose of temperature chart. Even the feedback from the lowermost level health worker to higher level medical officer and consequent follow up action was missing. To rectify this, regular signing of such charts by the medical officer should be ensured and the person incharge of DF/ILR should be made

answerable for delayed reporting of breakdown.

Instructions should be issued that ILR and DF should not be placed in areas which receive direct sunlight. Indenting of vaccines should be on demand basis so that these are not unnecessarily accumulated leading to overpacking of fridges. The existing refrigeration technician services should be utilized so that the repairs of DF/ILR could be tackled earlier by the district based technician. This will ensure a minimal "downtime" and avert higher cold chain sickness rate and also enhance the "response time" for restoring normalcy. All minor repairs are to be attended to within 48 to 72 hours and at the maximum within 7 days and during the ILR/DF sickness period vaccines should be stored at +2 to +8°C in cold boxes.

It is recommended that one day training courses on maintenance of cold-chain equipments be conducted at block level for health workers and medical officers. It should also be emphasized during the course that any failure of DF/ILR meant that all vaccines distributed from there would be of doubtful quality. This is in contrast with poor cold chain maintenance at individual health worker (at immunization session) level which though said to be the weakest point in cold chain(5) will affect only the children immunized during that session.

Despite some minor problems with cold chain observed in our study, the retrospective analysis of the potency tests of the random vaccine samples reflected satisfactory

functioning of the cold chain in the study area. Sokhey(5) had also reported steady improvement in cold chain in late 1980's as reflected by results of vaccine potency tests. Such tests are useful for strengthening the cold chain system and plugging any loopholes identified(4). An evaluation by international experts (which included survey in two Haryana districts) also revealed that in general, cold chain maintenance was satisfactory with need of closer supervision in some cases(2).

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