

## Evaluation of Vaccine Cold Chain in Urban Health Centers (UHCs) of Jamnagar Municipal Corporation (JMC), Gujarat

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### Abstract:

**Introduction:** Immunization is a well-known and effective method of preventing childhood diseases. With the implementation of Universal Immunization Programme (UIP), significant achievements have been made in preventing/ controlling the Vaccine Preventable Diseases (VPDs). An important element in immunization perceived as backbone of the program is cold chain and vaccine logistic management. **Objective:** To assess the status of various cold chain elements e.g. cold chain equipment and its maintenance, temperature maintenance, vaccines arrangement etc. at Urban Health Centers (UHCs) of Jamnagar Municipal Corporation (JMC). **Method:** It was cross sectional observational study, done at sites where vaccines are stored and at outreach sessions where immunization services are provided. Out of 11 UHCs under JMC, only 6 are having cold chain points and all of them are included in present study. Pretested fully structured specially designed checklist was used to collect the data. **Results:** Responsibility of cold chain handling is given to trained personnel at 50% UHCs. Proper maintenance of cold chain equipment was observed at 66% UHCs. Proper arrangement of vaccines was maintained at 60-70% of UHCs. Temperature record books were available at all 6 UHCs but its maintenance was up to date at only 4 centers. External and internal monitoring were observed at 50% and 66% of UHCs respectively. **Conclusion:** Overall maintenance of cold chain equipment, arrangement of vaccines, monitoring of cold chain at UHCs in JMC was satisfactory except at few points like lake of training of cold chain handlers, lake of regular up to date of temperature record books & lake of monitoring by concerned medical officers at all urban health centres (UHCs).

**Key words:** Cold Chain, Urban Health Centres (UHCs), Vaccine

### Introduction:

Immunization is one of the best efforts that India is putting forward currently to fight against various vaccine preventable diseases (VPDs).<sup>[1]</sup> The country spends a lot of resources every year on immunization.<sup>[1]</sup> The success of this program depends highly on the level of cold chain maintenance of the vaccines right from the site of manufacturing up to its administration.<sup>[1]</sup> Urban Health Centers (UHCs), set up under various Municipal Corporations, have been the backbone for delivering services related to immunization in urban areas in India. It is thereby important that cold chain system be adequately maintained at these centers. It

is repeatedly found that cold chain is not maintained properly in India.<sup>[2-4]</sup> Here, we attempted to evaluate the loop holes in the maintenance of cold chain of vaccines and assessed the training and practices adopted by the cold chain handler for the same at UHCs in Jamnagar city.

### Method:

The present study was a cross sectional observational study, done during July 2014 at UHCs where vaccines are stored. There are 12 UHCs under Jamnagar Municipal Corporation (JMC) and out of which only 6 are having cold chain point and the same have been included in present study. Pretested fully

structured specially designed checklist was used to collect the data. Ethical approval was taken before the commencement of the study from the ethical committee of the concerned institution.

Detailed information regarding various elements of cold chain like equipment, maintenance, power supply, storage/ supply of vaccine, record keeping etc. were collected by using pretested structured proforma. Selected UHCs were personally visited and equipment Deep Freezers (DFs) Ice Lined Refrigerators (ILRs) Vaccine carriers, cold boxes, etc) and records were examined. Responsible person looking after vaccine supply, storage and cold chain maintenance and the Medical Officer (MO) of UHCs were interviewed to collect the relevant information.

The data entry was done using Microsoft Office Excel 2010 and data analysis was done using EPI INFO and in Microsoft Office Excel 2010.

### Results:

Jamnagar Municipal Corporation (JMC) is divided into total 19 wards with 12 UHCs, but only 6 of them have cold chain point. All 6 of them are covered in present study. Responsibility of cold chain

handling is assigned to single individual in all UHCs. Among them only half of them have gone through cold chain training.

Table 1 shows the maintenance of the cold chain equipment at studied UHCs. Do and don't stickers were fixed on body of all ILR and DFs while only 50% of these equipments were locked at the time of visit. Working digital thermometer were present in only 33.33% of them. Proper defrosting status and crisscross icepacks arrangement were maintained in 4 (66.7%) Deep freezers (Dfs).

Table 2 shows the vaccine status and arrangement in ice lined refrigerators at UHCs. At one of the UHC, other than vaccines such as anti-sera, food or water, HIV kit were not put in the ILRs, at remaining 5 UHCs ILR was utilized exclusively for UIP vaccine storage. Placement of 'T' series vaccines at all UHCs was as per the guidelines except at 1 where Hepatitis B vaccine was not put at top most level. At 4 UHCs, OPV vaccine were put at the bottom of the ILRs.

Figure 1 shows temperature maintenance of cold chain equipment at studied UHCs. Temperature record book was available at all UHCs, but was put

**Table 1: Maintenance of electric cold chain Equipment at urban health centers (N = 6)**

Variable	Frequency (%)
Equipment(DF/ILR) locked at the time of visit	3(50)
DO and DON'T sticker fixed on ILR & DF	6 (100)
Working Digital thermometer present in DF & ILR	2 (33.3)
Proper defrosting status of DF	4(66.7)
Crisscross icepacks arrangement in DF	4(66.7)

**Table 2: Vaccine status and arrangement in Ice Lined Refrigerator at UHCs (N = 6)**

Variable	Frequency (%)
Anti-sera, HIV kit or other than vaccines	0 (0)
Hepatitis B at top most level	1(50)*
Placement of T series vaccine properly	5(83.3)
Placement of OPV properly	4(66.7)

\*Hepatitis B vaccine was available only at 2 UHCs

**Table 3: External and internal monitoring of cold chain at UHCs (N=6)**

Variable	Frequency (%)
External cross checking & record available	2(40%)*
Cross checked by Medical Officer (MO)	5(83.3)
Frequency of cross checking of temperature record by MO 4 times or more in month	4(66.7)

\*out of 6 UHCs, 1 was established recently, so there was no availability of last one year records

near DFs/ ILR in 83.3% of total UHCs. Temperature record books were maintained up to date in 4 (66.7%) UHCs. Morning temperatures were noted in all UHCs except 1 UHC. Availability of temperature record book for last 1 year was available at 5 UHCs. Record of power failure was noted in temperature record book at 5(83.3%)UHCs.

**Figure 1: Temperature maintenance in electric cold chain equipment at UHCs (N = 6)**

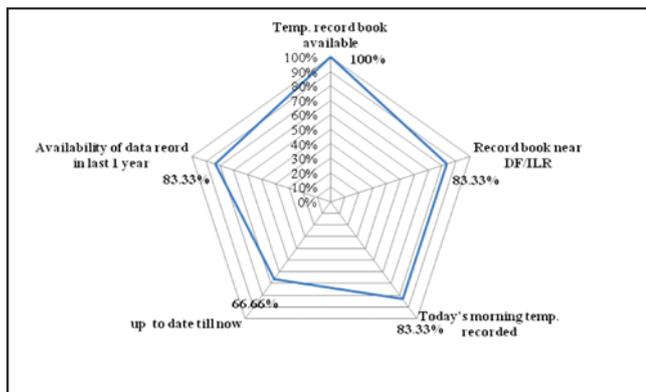


Table 3 shows the external and internal monitoring of cold chain at UHCs. External cross checking by RCHO(Reproductive & Child Health Officer), SMO(Surveillance Medical Officer)was recorded in only 50% of UHCs. Cross checking by Medical Officer of concerned UHC was recorded in 5(83.33%), but 4 or more times in a month in 4 (66.66%)UHCs.

**Discussion:**

According to census 2011, population of the Jamnagar district is 21, 59,130 which includes 5,29,308 urban population under Jamnagar Municipal Corporation being served by 12 UHCs.<sup>[5]</sup>

JMC is divided into 19 wards, and all these wards are covered under 12 UHCs, however, the availability of cold chain point was restricted to only 6 UHCs, remaining 6 UHCs are provided vaccines for outreach sessions from nearby cold chain point. Cold chain responsibility has been assigned to single individual at all UHCs, but only half of them have undergone its training. Only half of the electric cold chain equipments were locked at the time of the visit. We found all the equipment at various health facilities having do and don't instruction sticker on lid or body. In present study, working digital thermometer were present in only one third of total ILRs and DFs. When compared it was slightly different in Kapil et al <sup>[6]</sup> where 29 (63%) DF and 27(65.83%) ILR in selected UHCs had digital thermometer in working condition.

The temperature in the ILR/freezer can rise if there is a thick layer of ice around the freezer or along the walls and bottom of ILRs.<sup>[1]</sup> It is therefore necessary to defrost them periodically. This should be done if the ice in the freezer is >5 mm thick.<sup>[1]</sup> The present study showed that thickness of ice on the side walls was >5 mm in the one third of deep freezers of the health centers. It suggests regular defrosting of deep freezer by the cold chain handlers at every UHCs. Ice packs should be stacked on the floor of the deep freezer horizontally (not flat) on its edge by keeping 1-2 mm space from each other for air circulation, in a crisscross manner.<sup>[1]</sup> Yet, in our study, we found this in only two-third of the UHCs.

It is mandatory, not to keep other drugs and vaccines not used in UIP, in ILR.<sup>[1]</sup> In our study, At none of the UHCs except one, other items or antisera or HIV kit or blood samples were kept in ILRs/DFs. This was

much less than what Sachdeva, et al. observed in their study (53.12%).<sup>[7]</sup> Vaccines lose their potency due to exposure to excessive heat or cold. OPV and measles vaccines can be kept at bottom of the basket while BCG, DPT, DT and TT vaccines should be kept in upper part of the baskets.<sup>[1]</sup> In present study, Hepatitis B vaccines were available at 2 UHCs, but it at the top most level at one UHC. Sachdeva, et al. stated in their study that heat-sensitive vaccines were stored correctly in all, while, freeze-sensitive vaccines were stored correctly in 62.5% health facilities only.<sup>[7]</sup> The ILR and deep freezers each should have a separate thermometer and temperature record book.<sup>[1]</sup> It was heartening to find that in our study, temperature was being recorded twice a day for both deep freezer and ILR in all the health centers in separate temperature record books. Temperature record book was available at all the UHCs, but was maintained up to date in 3/4 of UHCs. In study by Ateudjieu J et al<sup>[8]</sup> the temperature monitoring chart was pasted on 27 (96.4%) out of total 28 the cold chain equipment. On 16 (59.3%) of these charts, the temperature was recorded twice daily as recommended. Availability of temperature record book of last one year and record of power failure were noted in temperature record book in most of the UHCs except at one UHC. In study by Ateudjieu J et al<sup>[8]</sup>, the temperature monitoring chart was pasted on 27 (96.4%) out of total 28 the cold chain equipment. Regular recording of temperature twice a day is important for proper maintenance of cold chain and recording of power failure has also equal importance for maintaining the efficacy of the vaccines. Monitoring is always required to know the achievements of objectives and for overview of processing. For these reasons external and internal monitoring of cold chain have equal importance. External monitoring observed in present study at half of total UHCs, while Adequate monitoring (4 times or more/month) by Medical Officer of concerned UHC was observed at two third of total UHCs. Kapil et al<sup>[6]</sup> showed almost similar findings where (89.3%) UHCs were having temperature record books cross checked by Medical Officer) with slightly different results were found for external

cross checking (75%).

### Conclusion:

Availability of cold chain points in JMC are less as compared to demand. Overall cold chain management, vaccines arrangement, temperature maintenance and monitoring of cold chain were satisfactory at UHCs of JMC except few points like lack of trained cold chain handlers, non-working digital thermometer, no up to date records of temperature record book, inadequate monitoring of cold chain by concerned Medical Officer.

### Recommendations:

The present study contemplates for induction training to all cold chain handlers and periodic refresher training as capacity building measure for cold chain maintenance. Medical Officers should be actively involved in the monitoring and supervision of the cold chain system.

### Declaration:

**Funding: Nil**

### Conflict of Interest: Nil

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