

Original Research Article

Assessment of cold chain and vaccine management practices in cold chain points of Bilaspur, Chhattisgarh: a cross-sectional study

Sabhya Pritwani^{1*}, M. Jawed Quereishi²

¹District Health Society-Bilaspur, National Health Mission-Chhattisgarh, Bilaspur, Chhattisgarh, India

²Department of Health and Family Welfare, National Health Mission-Chhattisgarh, Raipur, Chhattisgarh, India

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*Correspondence:

Dr. Sabhya Pritwani,

E-mail: sabhyapritwani94@gmail.com

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ABSTRACT

Background: To maintain the immunization effectiveness, and uninterrupted availability of vaccine, functional cold chain is required. This can be achieved by continuous monitoring and supervision. The objective was to assess the functionality and monitoring of cold chain points of Bilaspur district of Chhattisgarh.

Methods: A cross-sectional study conducted in the month of January 2021 in 15 old and new cold chain points, which were selected randomly from all the five blocks of district. Block level “supportive supervision of cold chain and vaccine management” checklist was used to collect the data. The data was presented in frequency and percentages.

Results: The key findings were shortage of staff, irregular review of temperature records and irregular cold chain point monitoring. Other gaps included failure to record monitoring visits and the improper positioning of ice packs and cold chain equipment.

Conclusions: There were shortfalls in the fundamental elements of cold chain, which call for immediate action from the authorities.

Keywords: Cold chain management, Cold chain point, Cold chain system, Immunization, Supportive supervision, Vaccine management

INTRODUCTION

Immunization is an essential part of primary health care which acts as a shield for children from preventable life threatening conditions, significantly improving child morbidity and mortality.¹ In Chhattisgarh, coverage of fully immunized children and infant mortality rate has increased from 76.4% and 53 per 1000 live births in NFHS-4 to 79.7% and 44.3 per 1000 live births in NFHS-5.^{2,3}

Increasing vaccine coverage depends upon strengthening of multiple factors such as micro-planning, cold-chain and logistics management, monitoring/supportive supervision, and community mobilization. Cold chain

point and vaccine logistic management are the backbone of immunization.^{4,5} Studies have shown that poor infrastructure, poor maintenance, lack of knowledge among cold chain handlers, and inadequate monitoring leads to the vaccine ineffectiveness and cold chain failure.⁴ Literature revealed that 15 children died in a remote village of South Sudan in the year 2017 due to sepsis/toxicity. This was caused by the administration of contaminated vaccine, not following the cold chain protocols, and undertrained vaccination team.⁶

Hence, enhancing the quality and management of cold chain infrastructure is critical especially in this pandemic era where equitable access to safe and efficacious vaccines will help in preventing the spread of infectious

diseases. With this background, the present study was done to assess the vaccine management, availability of cold chain equipment (CCE), vaccine storage practices, monitoring of cold chain and knowledge regarding vaccine storage amongst the vaccine cold chain handlers (VCCH) in cold chain points (CCPs) of Bilaspur district of Chhattisgarh.

METHODS

We conducted a cross-sectional study in the month of January 2021 at Bilaspur district. The district has 4 blocks, namely, Bilha, Masturi, Kota and Takhatpur. There are 25 functional CCPs in Bilaspur district. 18 CCPs are old whereas 7 are newly setup CCPs for COVID-19 vaccination. Out of total 25 CCPs, 15 CCPs were included in the study due to time constraint and logistic feasibility. From each block, 3 CCPs were selected randomly (lottery method) to maintain uniformity and representativeness in all the blocks of district. From the urban area of Bilaspur, 3 more CCPs were selected similarly (Figure 1).

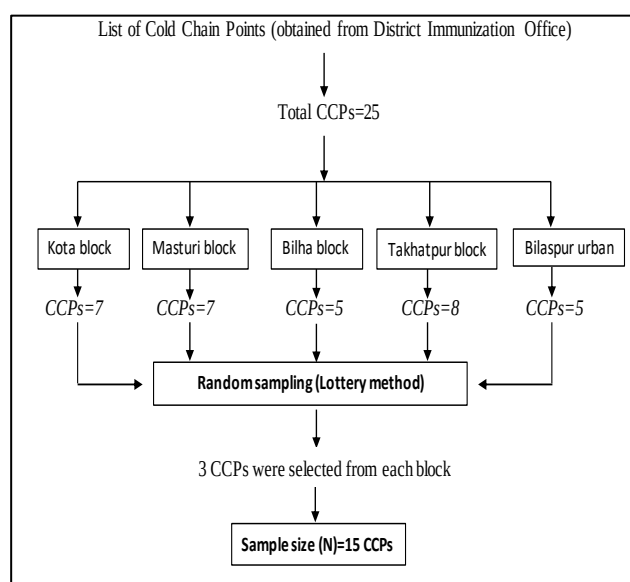


Figure 1: The selection strategy of cold chain points from all the blocks.

A pre-tested predesigned structured block level checklist named “supportive supervision of cold chain and vaccine management” prescribed by Government of India was used to collect the data. Out of 98 questions in the checklist those questions which were of relevance to study objectives were included in the study. Data was collected on the six components: background information of the cold chain point, information on human resource, cold chain equipment and its maintenance, temperature monitoring, vaccine management, and monitoring and supervision information. All the parameters were assessed

by the single researcher from one-to-one interview with the vaccine cold chain handlers along with the inspection of CCPs and records reviewing. The verbal consent was taken before interviewing vaccine cold chain handlers. The collected data was entered, cleaned, and analysed in MS Excel. The data was presented in frequency and percentages. The ethics approval was not sought however, data was collected after obtaining permission from Chief Medical and Health Officer (CMHO). The anonymity and confidentiality of the VCCHs and CCPs data were maintained throughout the study. All the COVID-19 protocols were followed during the data collection.

RESULTS

Old cold chain points

All the CCPs had trained medical officer, working ice-lined refrigerator (ILR), deep freezer (DF), voltage stabilizer and cold box whereas, working vaccine carriers were present in three-fourth 8 (73%) of CCPs. In the six CCPs, cold chain technician visited after the complaint and resolved the problem in the mean of 70 days (1, 365). All the CCPs had dedicated functional thermometer for each of the CCE along with its logbooks. Monthly review of temperature records was documented only in 5 (45%) of CCPs (Table 1).

More than half, 6 (60%) of the CCPs placed icepacks correctly in DF. All the CCPs had standard vaccine and stock/issue register out of which almost three-fourth 8 (73%) CCPs had up to date registers and stored vaccine vial correctly in ILR. None of the CCPs had vaccine vial beyond vaccine vial monitor (VVM) and expiry date, any frozen vaccine and unreadable vials in the ILR. In all the CCPs, VCCH correctly demonstrated ice pack conditioning (Table 1).

New cold chain points

Four new cold chain points were included in the study which were created for the COVID-19 vaccination a week before the data collection. Hence, the present checklist was not appropriate for those CCPs at that time point. All the cold chain points were installed with the ILR and DF which were in working condition but were not placed as per the guidelines. One trained vaccine cold chain handler was posted in each CCP, and they all were able to demonstrate temperatures correctly however, correct demonstration of ice pack conditioning was done by only two VCCH. Since these were the newly formed CCPs, none of the VCCH were aware of the routine immunization techniques. Due to the lack of training, VCCH were not confident in performing their duties independently. A rural medical assistant (RMA) proposed that the new VCCHs visit the older CCPs to observe all of the procedures that must be carried out in a CCP.

Table 1: Characteristics of cold chain points.

Parameters	N=11 (%)
Is there an updated microplan available in the CCP for the current financial year	8 (72.7)
Does the CCP have adequate space for dry storage?	9 (82)
Number of VCCH present in the cold chain point	
1	9 (82)
Are the VCCHs trained on the latest VCCH module?	
One	9 (82)
Both	2 (18)
Does the VCCH carry out the daily and weekly PPM as per the checklist?	8 (73)
All the ILR/DF are placed as per specified guidelines	6 (55)
Are contingency plans for vaccine storage displayed appropriately?	8 (73)
Are the latest standard job aids displayed in the centre?	8 (73)
Is there documented evidence of physical stock verification in the last 3 months? (%)	7 (64)
Does the CCP have documented minimum and maximum stock levels for all antigens?	2 (18.1)
Are the vaccines correctly stored in the ILR?	8 (73)
Is there any open vaccine vial stored in the ILR without date and time mentioned on it?	
Opened vial found with date and time	6 (55)
Opened vial found without date and time	5 (45)
Have the opened vaccine vials (to be discarded) of the last session day, been kept in cold chain with clear labelling of “not to be used”?	
Kept as per guidelines	6 (55)
Guidelines not followed	3 (27)
Such type of vaccine vials not available	2 (18)
Is there adequate space available for conditioning of ice packs?	5 (45.4)
How the immunization waste is disposed off?	
Through outsourcing	4 (36)
At the session sites	7 (64)
Is there any monitoring visit by district level authorities in the last 3 months?	
No visits	2 (18)
Visit was done and documentation available	3 (27)
Visit was done, but no documentation available at the facility	6 (55)
Is the vaccine store and its premises including the store keeper’s office clean?	
Poor	1 (9)
Average	4 (36)
Satisfactory	6 (55)

DISCUSSION

In the present study, the VCCHs knew updating microplan to plan the frequency and strategy of immunization sessions and marking daily and weekly PPM as per the checklist to keep a track on breakdown of equipment. This was evident in the findings observed in 8 (73%) CCPs. The study conducted in 60 CCPs of Bilaspur and Rajnandgaon districts had updated microplan in 90% of CCPs and carried PPM in 80% of CCPs.⁷

In the present study, the VCCHs knew whom to contact for the maintenance of equipment and hence, 8 (80%) CCPs were visited by the PPM service provider in the last 4 months, which was higher than the study conducted in Durg (60%).⁴

Only half of the CCPs (55%) placed ILR and DF as per the guidelines, which could be due to the lack of periodic

training, overburdened staff, and lack of regular monitoring by the officials. The present finding was lower than the study conducted in Jashpur and Sarguja (100%).⁸ In the present study, 6 (60%) CCPs correctly stored ice packs for freezing in deep freezer, which was almost similar to the other study conducted in 3 CHCs at Damoh (67%).⁹ This was mainly because VCCHs of old CCPs were properly trained and followed the job aids present in the CCPs.

The functional thermometers for each cold chain equipment were present in 10 (91%) of CCPs, which was lower than the study conducted in Jashpur and Sarguja, where all the CCPs had functional thermometers in all the equipments.⁸ The documentation of monthly review of temperature records were maintained by only 5 (45%) CCPs which was much lower than the other study conducted in Jashpur and Sarguja (67%).⁸ This could be because most of the VCCHs were working singlehandedly most of the time without any support

staff. Another reason could be the lack of safety for the staff, especially in resource-poor settings and distant locations, resulting in their absence at health centres and interruption in routine work.

In 8 (73%) of the CCPs, the vaccine stock and issue registers were fully updated. The registers were out of date in the remaining CCPs, which may have been caused by lack of staff or by the same individual doing multiple tasks. The present finding was lower than that reported in Surat (85%) and Jashpur and Sarguja (94%).^{8,10} In the present study, 8 (73%) CCPs stored vaccines correctly in the ILR, which was lower than the studies conducted in Bilaspur and Rajnandgaon (93%).⁷ This may be attributable to the job aids displayed in the cold chain facilities that VCCHs adhere to and their extensive experience with CCPs for many years.

In the present study, less than half of the CCPs 5 (45%) had adequate space for ice pack conditioning. This was due to the poor infrastructure observed during the data collection. In many CCPs, ANC services, immunization, and cold chain point were provided in the same room. The present study finding was in concordance with the findings observed in Durg (45%) and lower than the findings observed in Bilaspur and Rajnandgaon (97%).^{4,7} Only 3 (27%) CCPs in the present study were visited by district officials in past three months and the VCCHs documented it. This could be due to the disruption of routine health-related services because of COVID-19. The findings were slightly lower than the study conducted in Bilaspur and Rajnandgaon, where visits were made to 40% of CCPs in the last three months.⁷

CONCLUSION

The main findings were lack of staff, inadequate training for newly established CCPs, incorrect positioning of ice packs and cold chain equipment, and inconsistent monthly temperature reviews. Infrastructure was lacking, and there was infrequent monitoring as well. Findings of the study indicate inadequacies in the essential elements of cold chain, which call for immediate action from the authorities.

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