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Original Research Article

A study on knowledge, attitude and practices of cold chain handlers regarding cold chain management in district Kanpur

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ABSTRACT

Background: Immunization is one of the most cost-effective measures to prevent childhood diseases. Vaccines are sensitive biological products and their potency can diminish irreversibly when exposed to inappropriate temperatures. Cold chain handler (CCH) is the most crucial person at a cold chain point (CCP) as his/her correct knowledge and skills regarding cold chain practices, vaccine management and handling are immensely vital for the success of universal immunization programme. Thus, this study has done to assess the knowledge, attitude, and practice of CCH in public health facilities in district Kanpur.
Methods: A cross sectional study was conducted in 20 CCPs of public health facilities of district Kanpur using multistage simple random sampling technique. The data was collected by using direct personal interview method using semi-structured interview schedule based on standard Government of India (GOI) questionnaire then filled on the Microsoft excel sheet and most appropriate statistical tool applied and results were drawn accordingly.
Results: Only 25% of cold chain handlers had good knowledge and 20% had poor knowledge about cold chain handling similarly 25% were showing excellent performance (in terms of attitude and practice) 50% were showing average performance and 25% were showing poor performance.
Conclusions: There is need to improve the knowledge level of CCHs regarding cold chain maintenances and handling practices by regular training sessions and monitoring visits. Medical officers of the health facility supported by district immunization officer should be actively involved in the monitoring and supervision of the CCHs on regular basis.

Keywords: Cold chain handler, EEFO, FIFO, Cold chain equipment, Open vial policy

INTRODUCTION

Immunization is one of the most cost-effective measures to prevent childhood diseases. Vaccines are sensitive biological products and their potency can diminish irreversibly when exposed to inappropriate temperatures. Once its potency is lost it cannot be regained.[6] Hence for effective implementation of the immunization programme, cold chain and vaccine management need a great focus and attention. Cold chain handler (CCH) is the most crucial person at a cold chain point (CCP) as his/her correct knowledge and skills regarding cold chain practices, vaccine management and handling are immensely vital for the success of universal immunization programme.[12] Cold chain management, training, supervision, a higher level of education, and year of service were significant determinants of the practice of vaccine cold chain management. Besides, vaccine supply chain performance and logistics in the health facilities were suboptimal. The inefficient vaccine management systems, including poor stock management, poor quality of vaccine handling and storage, contribute to high wastage of vaccines.[14] Vaccine wastage could be expected in all programs and some level of wastage is unavoidable. Due to the increasing vaccine costs, countries are looking more closely than before at

vaccine wastage. Effective management of the vaccine cold chain system at all levels is one of the crucial factors for maintaining vaccine potency, which narrows the gap between vaccinated and immunized.[22] It saves program costs, prevents high wastage rates and stock-outs, and improves the safety of immunizations. Significant improvements can also be made in cold chain management, resulting in considerable savings in vaccine and children's life. Thus, this study has done to assess the knowledge, attitude, and practice of CCHs in public health facilities in district Kanpur.

Objectives

Objectives of the study were: to assess the knowledge and attitude of cold chain management of CCHs; and to assess the practices of CCHs.

METHODS

A cross sectional study was conducted in 20 CCPs of public health facilities of district Kanpur using multistage simple random sampling technique. Cold Chain Points were selected by using direct personal interview method using semi-structured interview schedule based on standard GOI questionnaire to fulfil the desired objectives.

Study subjects

CCHs engaged in cold chain management in public health facilities of district Kanpur were the study subjects.

Ethical approval was obtained from the ethical committee of GSVM Medical College, Kanpur. Oral informed consent was also requested from the study participants and confidentiality was maintained.

Study duration

The duration of the study was for 6 months i.e. from 15 June 2021 to 26 December 2021.

Inclusion criteria

Vaccine handlers who engaged in vaccine cold chain management and who gave their consent to participate were included in the study.

Exclusion criteria

CCHs who were not willing to give consent were excluded from the study.

Definitions and explanation of the terms used in the study

Cold chain handler

Any staff (regular/contractual), as assigned by the facility in charge, with the responsibility of vaccine and cold chain management at any level of vaccine stores is known as CCH.

Cold chain equipment

It is a set of equipment, which helps in providing recommended temperature for the vaccines to preserve their quality during storage and transportation from the site of manufacture till their administration to the target beneficiary.

Recommended temperatures

All vaccines under the national immunization programme are stored at a temperature range of +2°C to +8°C. Diluents of vaccines should also be stored at a temperature range between +2°C to +8°C at least 24 hours before use.

Regular defrosting

It is recommended that the cold chain equipment be defrosted when frost thickness on the inner wall is more than 5 mm or once in a month (whichever is earlier).

EEFO principle

EEFO stands for-early expiry first out. vaccines, diluents, syringes should be stored in a way that the one with early expiry is used first.

Exception to EEFO principle

While following the EEFO, the VVM status of the vaccine should be given priority. It means the vaccine with VVM stage nearer to discard point should be used first.

Freeze-sensitive vaccines

Following vaccines used under national immunization schedule are freeze-sensitive vaccines: hepatitis B vaccine, pentavalent vaccine, inactivated polio vaccine (IPV), diphtheria pertussis and tetanus (DPT) vaccine and tetanus toxoid (TT). This vaccine can be damaged by temperatures below 0 ºC.

Conditioning of the ice-packs

Before placing ice packs inside a cold box or vaccine carrier, they need to be kept at room temperature to prevent damage to the freeze-sensitive vaccines. This process is called conditioning. An ice pack is correctly conditioned when the water covers its surface and the sound of water is heard on shaking it.

Shake test

This test is done to check if there is a suspicion that a vaccine vial has been exposed to freezing.

Open vial policy

This policy calls for the reuse and storage of open vaccine vials of specific types that still contain a few doses at the end of a vaccination session if certain conditions are met. It applies to multi-dose vials of the DPT, TT, hepatitis B, oral polio vaccine (OPV) and liquid pentavalent. This policy does not apply to measles, BCG, Japanese encephalitis (JE) vaccines.

For knowledge assessment there are 11 questions with options as: (A) no/some knowledge and (B) satisfactory knowledge. Scoring of each question is as follows: option A=1, and option B=2.

Grading of knowledge is as follows: poor knowledge: 0-10 (score), average knowledge: 11-16 (score), and good knowledge: 17-22 (score)

For attitude and practices assessment there are 11 questions with options as (A. yes, and B. no); option A=2 option B=0.

Scoring of each question is as follows: poor performance: 0-10, average performance: 11-16, and excellent performance: 17-22.

After all the relevant data collected on Microsoft excel sheet, master table was made accordingly. Data was entered to trial version of statistical package for the social sciences (SPSS) version 27 and then analysed. To fulfil the objectives of the present research study most appropriate statistical tools were applied to analyse the data and conclusions and results were drawn accordingly.

RESULTS

All the cold chain handlers showed the satisfactory knowledge about VVM, arrangement of vaccines in ILR, conditioning of ice packs and only 20% CCH had satisfactory knowledge about shake test, heat and freeze sensitive vaccines (65%), open vial policy (85%), AEFI (60%), correct temperature recording (55%), waste disposal of needles and syringes (70%), indent making and voucher knowledge 80% and about EEFO, FIFO in 70% of total cold chain handlers.

Among all CCPs visited 100% (20 out of 20) had dedicated space/room for cold chain and 80% (16 out of 20) had dedicated space for syringes and diluents (dry storage). Only 30% (6 out of 20) CCP had correct placement of ice-packs inside DFs moreover 75% (15 out of 20) of CCPs ice packs were filled with water up to the mark over ice packs. 70% CCP had correct arrangement vaccines in ILR, 65% CCH were maintaining the stock and vaccine distribution register on regular basis, only 25% CCH received training for cold chain management in last one year (Table 1).

Grading of knowledge

25% of cold chain handlers (5 out of 20) had good knowledge about vaccine storage, heat and freeze sensitive vaccines, arrangement of vaccines in ILR, open vial policy, indent making, how to discard used vials and syringes, defrosting, arrangement of ice packs, correct temperature recording (standard graphical manner) VVM, AEFI, shake test; 65% (13 out of 20) CCH had average knowledge; and 20% (2 out of 20) CCH had poor knowledge (Table 3).

Grading of attitude and practices (performance)

25% (5 out of 20) are showing excellent performance on CCPs in terms of arrangements and storage of vaccines, EVIN, distribution criteria of vaccines (EEFO, FIFO, VVM), maintaining of stock register, indent register, AEFI register, log book, and contingency plan; 50% (10 out of 20) were showing average performance; and 25% (5 out of 20) were showing poor performance (Table 3).

Table 1: Knowledge, attitude and practice of CCH regarding cold chain management.

S. no.	Variables (n=20)	No/some knowledge (%)	Satisfactory knowledge (%)
	Knowledge of CCH		
1	Knowledge of VVM	0	100
2	Knowledge of arrangements of vaccines in ILR	0	100
3	Knowledge of conditioning of ice packs	0	100
4	Knowledge of shake test	80	20
5	Knowledge of heat and freeze sensitive vaccines	35	65
6	Knowledge of open vial policy	15	85
7	Knowledge of AEFI	40	60
8	Knowledge of correct temperature recording	45	55
9	Knowledge of waste disposal of needles and syringes	30	70
10	Knowledge of indent making and vouchers	20	80
11	Knowledge of EEFO, FIFO, SOP, contingency plan	30	70
	Attitude and practices of CCH	**Yes**	**No**
12	Dedicated separate room for cold chain room	100	0
13	Dedicated space for dry storage	80	20

Continued.

S. no.	Variables (n=20)	No/some knowledge (%)	Satisfactory knowledge (%)
14	Correct arrangement of ice packs in deep freezer	30	70
15	Correct arrangement of vaccines in ILR	70	30
16	Regular maintenance of stock register and vaccine distribution register	65	45
17	Training of CCH in last one year	25	75
18	Defrosting of ILR and DF	85	15
19	Logbook maintenance	60	40
20	Physical counting of vaccines at regular intervals	35	65
21	Open vial vaccines in different container in ILR	85	15
22	Availability of sharp disposal pit	100	0

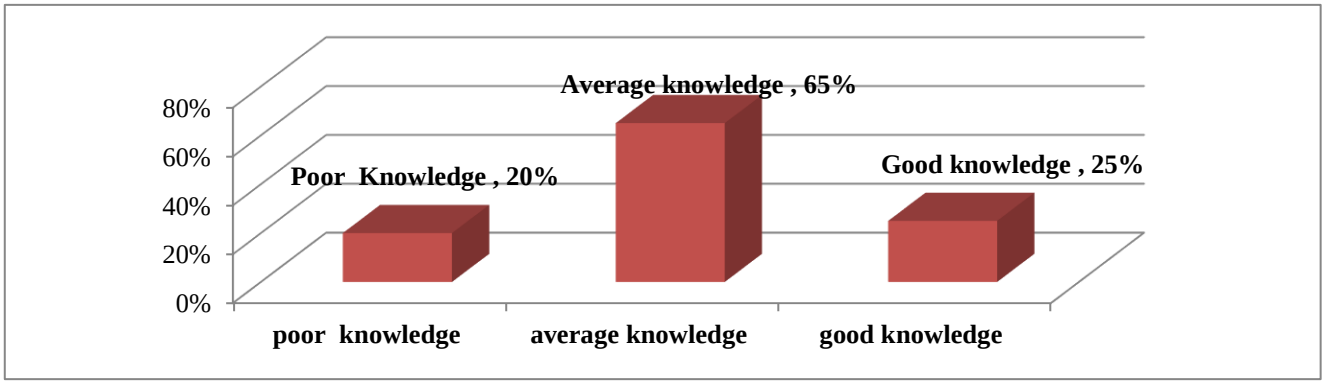

Figure 1: Knowledge chart.

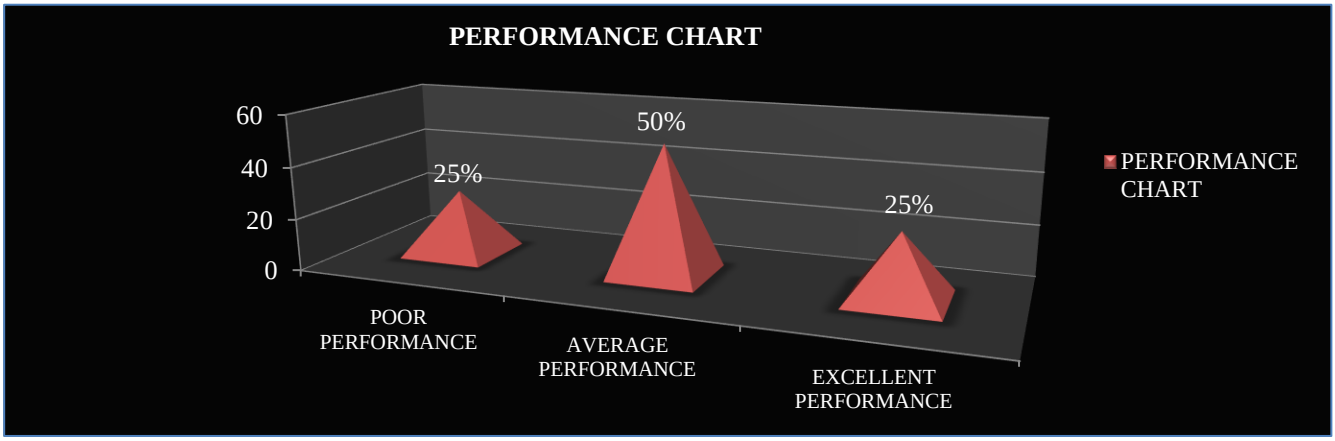

Figure 2: Performance chart.

Table 2: Score gained of cold chain handlers of different cold chain points.

Cold chain points	Knowledge score		Attitude and practice score	
	Score gained	Percentage of total score (%)	Score gained	Percentage of total score
Cold chain point (1)	12	55.4	12	54.5
Cold chain point (2)	15	68.2	12	54.5
Cold chain point (3)	19	86.4	20	90.9
Cold chain point (4)	09	40.1	10	45.5
Cold chain point (5)	15	68.2	14	63.6
Cold chain point (6)	12	55.4	04	18.2
Cold chain point (7)	20	90.1	18	81.8
Cold chain point (8)	14	63.6	18	81.8
Cold chain point (9)	14	63.6	12	54.5

Continued.

Cold chain points	Knowledge score		Attitude and practice score	
	Score gained	Percentage of total score (%)	Score gained	Percentage of total score
Cold chain point (10)	17	77.3	18	81.8
Cold chain point (11)	12	55.4	12	54.5
Cold chain point (12)	14	63.6	10	45.5
Cold chain point (13)	18	81.8	18	81.8
Cold chain point (14)	10	45.5	08	36.4
Cold chain point (15)	12	55.4	14	63.6
Cold chain point (16)	16	72.7	12	54.5
Cold chain point (17)	18	81.8	16	72.7
Cold chain point (18)	12	55.4	19	86.4
Cold chain point (19)	14	63.6	10	45.5
Cold chain point (20)	16	72.7	14	63.6

Table 3: Grading of knowledge, attitude and practice of cold chain handlers of different CCPs on the basis of gained score.

S. no.	Parameters	Number of CCP	Percentage
	Grading knowledge of CCH		
1	Poor knowledge	02	20
2	Average knowledge	13	65
3	Good knowledge	05	25
	Grading of attitude and practices of CCH		
1	Poor performance	05	25
2	Average performance	10	50
3	Excellent performance	05	25

DISCUSSION

In our study it was seen that all the CCPs have separate room for cold chain and 80% CCP had separate dedicated room for diluents and syringes. Only 25% of vaccinators and vaccine handlers received cold chain management-related training while just 27.6% got supervised on cold chain management. The present study revealed that all CCHs had knowledge about VVM, open vial Policy, freeze sensitive vaccines, correct temperature range and diluents which is a quite commendable finding. It was found in the present study that knowledge of "shake test" was present in only 20% of CCHs which is very less than as observed by Sinha et al in Durg (52.63%), Naik et al in Surat (66.7%) and Gupta et al in Madhya Pradesh (66.7%) but similar finding was reported by national EVM assessment (19%) and Uttar Pradesh comprehensive EVM assessment (22%) and Rao et al in South India (22.4%).[5,11,17,18] Our finding that all CCHs knew about conditioning of ice-packs but only 55% actually carried it out stresses on the fact that implementation is important than mere knowledge.

Similar results were reported by Sharma et al in Kheda.[15] It was found in our study that complete temperature record in the log book was found in 60% of CCPs which is lower than 70.1% and 76% reported by national EVM assessment and Uttar Pradesh comprehensive EVM assessment respectively.[12,18] Even Choudhury et al and Sinha et al reported it as 83% and 95%.[2,17] All vaccine arrivals and dispatches were updated in the stock inventory within one working day of transaction at 75% CCPs as revealed by the present study which is higher as reported by Sinha et al (61.1%) and Naik et al (85%).[11,17]

In the present study, evidence of regular defrosting of the equipment was found at 61.6% of the CCPs whereas Sinha et al reported it at only 25% but Choudhury et al reported it at 91.6% of CCPs.[2,17] We found out that all ILR/DF were kept at wooden or plastic blocks at 95% CCPs. However, Choudhury et al found that 83% CCPs had all ILR/DF kept at wooden or plastic blocks.[2] In our study, correct order of placing vaccines in an ILR was found out at 70% of CCPs. This was reported as 85%, 66.7%, 84.8%, 93.2%, 90% and 67% by Sinha et al, Mallik et al, Patel et al, Sharma et al and Naik et al respectively.[10-12,15,17]

CONCLUSION

There is need to improve the knowledge level of CCHs regarding cold chain maintenances and handling practices by regular training sessions and monitoring visits. Vaccines worth crores of rupees and most importantly health of millions of infants and children are in the hands of CCHs. Hence, they need regular training to keep their knowledge and skills updated. CCHs need reinforcement in skills like correct way of reading thermometer, conducting shake test, conditioning of ice-packs and executing contingency plan. Medical officers of the health facility supported by district immunization officer should be actively involved in the monitoring and supervision of the CCHs on regular basis.

Recommendations

Strong monitoring and close supervision of vaccine and logistics management in CCPs. I also recommend continuous training and supportive supervision of CCHs to address remarkable findings of this study. Periodic onsite supervision by medical officer in-charge/district immunization officer about correct cold chain practices would be helpful to ensure quality of immunization services in the study area.

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