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Cold Chain Monitoring Practices In Public Health Care Facilities Of Satna District, Madhya Pradesh.- A Cross Sectional Study.

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Abstract:
Background:*One of the major factor contributing to the success of the immunization program is the proper handling of cold chain and vaccine logistics. Improper cold chain practices can affectthe efficacy of vaccines and enhance wastage. Madhya Pradeshis one of the high-priority states for maternal and child health programs in India*
Aim and objective*: To assess the condition of cold chain equipment, cold chain maintenance related practices, and the knowledge of the cold chain handlersin public health facilities in Satna district.****Methodology:****A cross-sectional study was conducted fromJanuary to March2019 in the public health facilities of the district which were having cold chain points.Anenumeration all two Civil Hospitals, nine Community Health Centres and 12 randomly selectedPrimary Health Centres was carried out. Standard cold-chain monitoring checklist and interviewer-administered questionnaires wereused for data collection.****Statistical Analysis:*** *Descriptive and analytical analyses were carried out in SPSS15.****Results:****In 19/23facilities, the ILRs and DFs were kept as per the guidelines as well as monitoring visitswere made by the higher authorities. In 20/23 facilities the vaccines were stored properly, and the vaccine handlers were able to correctly demonstrate it. Daily twice recording of temperature was reported in 18 facilities. In 6/23facilities the diluents were placed in cold chain 24 hours before the immunization sessions.* ***Conclusion****: Knowledge of cold chain handlers, as well as the equipment management, was as per the guidelines, but the vaccine handling practices were not satisfactory. There is a need for regular maintenance of the cold chain logistics serving to such a large population. The gap between knowledge and practices adopted by the cold chain handlers should be noticed.*
Key Words*: Monitoring, Cold chain Practices, Vaccine, Primary health centers.*

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I. Introduction

Immunization is a cost-effective and commonly used asan intervention to prevent illnesses. India has one of the world's largest Universal Immunization Program (UIP) with USD 500 million invested in vaccine-preventable disease protection for children(1). GAVI, a non-profit organization, reported that the country raises approximately 27 million kids every year. GAVI also argues that India has the largest proportion of unimmunized children. Increased immunization coverage with effective and quality medicine is the reaction to reduced child mortality rates worldwide:(1,2,3) Immunization programs erroneously contribute to vaccine wastage.(4,5) The World Health Organization (WHO) estimates that 50% of all drugs worldwide are wasted.(6) No particular quantity of vaccine wastage can be considered commonly acceptable as it relies primarily on the program and local situation. Theoretically, in the context of the prevailing local situation, it would primarily be the type of waste that would determine whether a certain quantity of waste is appropriate.(6)

According to the National Health and Family Survey (NFHS-4, 201)report, The infant mortality rate of Madhya Pradesh (51 deaths before the age of one year per 1000 live births) is high as compared to the whole country. (7) Even though this number has reduced when compared to the NFHS3 reports, where it was 70 but still there is a major need to take initiatives which can help in the reduction of the Infant mortality rate. (7) Also, an increase in the immunization coverage was noticed when compared to previous NFHS reports. (7) In Satna district, the immunization coverage of all basic vaccines was recorded as 51% according to the NFHS 4 report. (7)

According to the standards of the Government of India, 2012 was chosen as the year to cover children from all low coverage areas including Madhya Pradesh, and so it was called as the year of Routine Immunization and Immunization Week was also organized, the process continued in 2013 as well.(8)

Maintaining vaccine temperature at any moment is essential as the vaccine may be useless owing to the cold chain system inability. The most prominent constraints recognized assessments of cold chain vaccine logistics were, as follows, non-uniform coverage, deficient micro-plan, bad program execution, bad tracking and oversight, elevated dropout rate, over-reporting, injection security, insufficient cold chain substitution schedule, vacancy of field employees, logistical vaccine problems and bad maintenance of vaccines.(9)

II. Methodology

Study Type and duration: A cross-sectional study was carried out to assess the vaccine cold chain related practices in the public health facilities of Satna district, Madhya Pradesh from Jan 2019 –March 2019. **Sample Size calculation:**The public health facilities from all eight blocks of Satna district were included in the study. The two Civil hospitals, nine randomly selected Community health centers and 12 Primary health centers were included in this study. Out of 29 cold chain points existing in the district, 23 points were covered in this study.**Ethical Approval**: Ethical clearance for the study was obtained from Kasturba Medical College & Kasturba Hospital institution ethics committee, the IEC no. obtained is 742/2018 and also written informed consents were taken from the participants during the study.Prior permission from the Chief Medical and Health Officerwas also taken.

The designated cold chain handler's in 22 cold chain points, and a laboratory technician in-charge of cold chain handling were interviewed.The visitswere not pre-informed to the cold chain handlers, to prevent bias during data collection**. Data Collection tool**:The standard checklist to monitor cold chain, being used by the Health Department, was used to collect the data. Regarding equipment, monitoring was done by using an observatory standard checklist by the principal investigator and for assessing the knowledge of the cold chain handlers the standard questionnaire was used, interviews were conducted by the investigator which took almost 15 minutes per interview. **Data Collection method**:The cold chain equipment was observed on the day of the visit by the principal investigator.And the interviews of the cold chain handlers were also conducted by the investigator.Informed written consents were obtained from the participants**. Analysis**: The descriptive data analysis was conducted in SPSS15.Tests for the association of cold chain monitoring practices between PHC and other health facilities is carried out. Name of the variables was found to be statistically different in Fisher's chi-square test.

III. Results

The background information of all the 23 CCPs visited is tabulated according to the type of the organization. [Refer table1] In most of the Public health facilities i.e.18/23, the latest contingency models for proper storage of vaccines in the ILR was displayed properly. Availability of updated micro plan for the current financial year was seen in 18/23 facilities. Adequate available space for ice pack conditioning was found to be in 11/23 facilities. Civil Hospitals were found to be performing better as compared to other health facilities when compared under certain variables used in table no. 1.[Refer table2] District level authorities made monitoring visits to 21 of the 23 facilities within past 6 months. One of the PHC and a Civil hospital reported the monitoring visit by the higher level authorities, but had no documentation. In one PHC and a CHC vaccines were found to be kept in the deep freezer. In 20/23 places vaccines were kept in the basket in the ILR. The cold chain handlers in most of the health facilities i.e. 16/23 reported that the diluents were always used to keep in the cold chain, and only in 6 facilities the diluents were placed in the cold chain 24 hours before the immunization sessions.[Refer table 3]The twice daily recording of the temperature was seen to be followed in 18/23 public health facilities. The training of the cold chain handlers based on the latest model was given to the cold chain handers in 22/23 health facilities, in December 2018. In 20/23 health facilities, it was noticed that the vaccine cold chain handlers were able to correctly demonstrate the method of ice pack conditioning.

IV. Discussion

The findings from the present studyshow that in most of the public health facilities in Satna district has the required cold chain point features, the cold chain handlers have had sufficient knowledge, but the cold chain and vaccine-related handling practices seems to be poor.

It was found that in 82.6% public health facilities, the ILRs, and Deep freezers were kept properly as per the guidelines. The study conducted byMendhe et al, in the neighboring state Chattisgarh,the upkeep of ILRs and Deep freezers were low at 58.3%(10).One of the reasonsfor good maintenance of equipment could the frequent monitoring visits made by the authorities, and the effect of supervisory visits were reported in the study by Naik et al, in Surat where all the equipment was kept properly as per the guidelines(11).In the present study, 95.7% of the public health facilities, the ice packs were not placed correctly for freezing in the deep freezers. Similar results were reported by Mendhe et al in Chattisgarh (75%)and by Nail et alin Surat (65%) wherethe ice packs were not kept properly. Thisindicates that there is a difference between knowledge of cold chain handler's and their handling practices.Similar to other studies, 69.6% ofthe places covered in this study havefunctional

thermometers for each functional cold chain equipment (12). Recording and reporting of the temperatures twice a day was 78.3% found in this study, which was higher than the study by S Mallik et al in Kolkatta (60%) (10)and lesser than that in Chattisgarh (91.6%) (11).In the present study,the vaccines were properly stored in the ILR in 86% of the facilities.

V. Conclusion

In all the public health care facilities covered in this study in Satna district, the Cold chain equipment management was found to be good, Cold-chain handlers were trained and found to have adequate knowledge, but observed a gap between the knowledge and the handling practices of the cold chain handlers.

VI. Recommendations:

Temperature monitoring records should be updated regularly as per the recommendations. On-site supportive supervision may be required to ensure that the knowledge imparted in the training is translated into improved handling practices. Regular maintenance of the cold chain logistics serving to such a large population needs to be ensured.

Limitation: Could cover only 23 of the 29 cold chain points in the district due to logistic constraints.
Authors Contribution:SG:Conceived the idea, collected data, reviewed literature, analyzed the data and written the first draft. PN: supported in the analysis, and reviewed the manuscript. AR: Overall guidance to the study, and reviewed the manuscript. SS: Reviewed the manuscript.

Table1: Background Information on Cold Chain Points:

Features of Cold chain points		**Type of organization**		
		CHC	**PHC**	**CH**
Contingency plans for vaccine storage displayed appropriately	**Yes**	8	8	2
	No	1	4	0
An updated micro plan available in the Cold Chain Point for the current financial year	**Yes**	8	8	2
	No	1	4	0
Adequate space available for ice pack conditioning	**Yes**	6	4	1
	No	3	8	1
Cleanliness of vaccine store and its premises including the storekeeper's office	Poor	0	2	0
	Average	7	9	1
	Satisfactory	2	1	1
Total		**9**	**12**	**2**

Table2: Knowledge and Practice of VCCH:

Vaccine cod chain handler's knowledge and practices		**Type of organization**		
		CHC	**PHC**	**CH**
All the Ice Lined Refrigerator /Deep Freezer are placed as per specified guidelines	**Yes**	7	10	2
	No	2	2	0
Vaccines kept in the basket in the Ice Lined Refridgerator (ILR)	**Yes**	7	12	1
	No	2	0	1
Diluents kept in the cold chain at least 24 hours before issuing to the session sites	**Yes**	3	3	0
	No	0	1	0
	Always	6	8	2
Is there any vaccine vial beyond usable Vaccine Vial Monitor in the ILR	Yes	4	6	0
	No	5	6	2
Vaccines kept in the deep freezer	Yes	1	1	0
	No	8	11	2
Ice packs correctly placed for freezing in the Deep Freezer	**Yes**	0	1	0
	No	9	11	2
Vaccines correctly stored in the ILR	**Yes**	5	3	0
	No	4	9	2
Monitoring visit by district level authorities in the past 6months	No visit	0	2	0
	The visit was done and documented	9	9	1
	The visit was done but no documentation	0	1	1
Total		**9**	**12**	**2**

Table3: Vaccine Storage and Handling practices of CCP:

Handling and storage practices		Type of organization		
		CHC	PHC	CH
The Vaccine Cold Chain Handlers were trained on the latest VCCH model	**Yes**	9	11	2
	No	0	1	0
The twice-daily recordings(holidays) complete and up to date for the last three months	**Yes**	7	10	1
	No	2	2	1
Vaccines correctly stored in the ILR	**Yes**	5	3	0
	No	4	9	2
Vaccine Cold Chain Handlerswere able to correctly demonstrate the ice pack conditioning	**Yes**	8	10	2
	No	1	2	0
Total		**9**	**12**	**2**

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