Assessment of Routine Immunization Program at Selected Urban Health Centres in Ahmedabad, Gujarat, India

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Abstract:

Introduction: Urban Health Centre is a key place for implementing Routine Immunization program and vaccine storage. The present study evaluated Cold Chain Point (CCP) and logistics related to routine immunization at selected Urban Health Centers (UHCs) in Ahmedabad. **Objective:** 1. To evaluate the cold chain infrastructure and logistics supporting routine immunization programs at UHC with a focus on assessing the quality and reliability of vaccine storage and handling practices. 2. To assess the knowledge about cold chain among the Vaccine Cold Chain Handlers (VCCHS). **Method:** In this cross-sectional study, one UHC from each of the seven zones of Ahmedabad city was randomly selected for assessment of Cold Chain management. Knowledge of VCCHs at each UHCs was assessed using semi-structured questionnaire. Analysis was done using Microsoft excel 2019. **Results:** It was observed that all UHCs were having session plans and logistics estimation. Around 28.5% UHCs were having lack of essential tools, such as Drop Out charts and maps of their catchment areas. Open vials were found without dates and times labelled in 43% of UHCs, and in one UHC, a vaccine vial was found beyond its usable Vaccine vial Monitor (VVM) stage. All the medical officers utilize various strategies to create awareness, with the majority (86%) using interpersonal communication. All Health Care Providers stated Socio-cultural beliefs and fear of side effects as reason for non-utilization of services. Only 42% of Vaccine Cold Chain Handlers (VCCHs) demonstrated complete knowledge about live vaccines. **Conclusion:** The study highlights certain issues at UHC like maintenance of drop out chart, map of catchment area, training of medical officers on module of immunization, ice-packs arrangment in Deep Freeze, no knowledge of VCCHs about shake test, which indicates lack of efficiency of VCCHs and need of their training.

Keywords: Cold Chain, Health Personnel, Routine Immunization, Vaccine Storage

Introduction:

Immunization is an investment for today and tomorrow. It is a cost effective and highly successful health intervention, which prevents needless suffering through sickness, disability and death.

Widespread immunity due to vaccination is largely responsible for the worldwide eradication of smallpox and the elimination of diseases such as polio and tetanus from much of the world.[1] Vaccines against rotavirus, rubella and polio (injectable) will

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help the country meet sustainable development goal 3 target (3.2) that include by 2030, end preventable death of newborns and children under 5 year of age, with all countries aiming to reduce neonatal mortality (NNMR) to at least as low as 12 per 1000 live births (NNMR for Ahmedabad is 18.0 per 1000 live births according to NFHS 5) and under 5 mortality rate (U5MR) to at least as low as 25 per 1000 live births. (U5MR for Ahmedabad is 29.5 per 1000 live births according to NFHS 5).[2] The Programme now consist vaccination for 12 disease, Tuberculosis, Polio, Hepatitis, Diphtheria, Pertussis, Tetanus, Hemophilus influenza B, Measles, Rubella, Pneumonia, Rotaviral gastroenteritis, Japanese encephalitis.

According to NFHS-5, 76.1% of children in India were fully immunized. The percentage of fully immunized children in India has increased with time, as percentage was 35% from 1992-1993. Percentage of fully immunization coverage in Gujarat is 64.1% and 70.3% in Ahmedabad city.[3] The success of immunization program in field depends on the availability of appropriate logistics and proper training of health workers. These have impact on not only in improving the coverage and reducing dropouts but also in improving the quality of vaccination.

It was realized that merely providing vaccine just to achieve targets without giving adequate attention to quality of immunization services doesn't guarantee a reduction in disease morbidity and mortality. Urban Health Centre (UHC) is a key place for implementing routine immunization program and storing of vaccines. The present study was conducted with an objective to evaluate the cold chain infrastructure and logistics processes supporting routine immunization programs at UHCs in Ahmedabad, with a focus on assessing the quality and reliability of vaccine storage, handling practices and knowledge assessment of VCCHs.

Method:

A cross-sectional observational study was conducted at seven Urban Health Centers (UHCs) in Ahmedabad City between 2021-2022 to assess the cold chain management practices and staff knowledge and skills. The study focused on evaluating temperature control and monitoring, vaccine storage and handling practices, cold chain equipment maintenance and functionality, and the knowledge and skills of vaccine cold chain handlers. Ahmedabad Municipal Corporation consists of seven zones with total 81 Urban Health Centres (UHCs) which are distributed across all the zones. The study population comprised a convenience sample of 49 healthcare providers, including: 7 Medical Officers (MOs), one representing each of the 7 Urban Health Centres (UHCs), 7 Vaccine Cold Chain Handlers (VCCHs), one from each UHCs and 35 additional healthcare staff, consisting of nurses and Accredited Social Health Activists (ASHAs), who were present at the UHCs on the day of data collection. This study received ethical approval from the institutional ethic committee. Prior to data collection, informed verbal consent was obtained from each healthcare provider. Data collection was conducted utilizing a pre-designed, semi-structured questionnaire.

Table 1: Findings of Routine Immunization Programme management at Urban Health Centres (N=7)

Programme Management Aspects	Yes (%)	No (%)
Availability of map of catchment area	5 (71.42)	2 (28.57)
Availability of session plan	7 (100)	0
Estimation of logistics	7 (100)	0
Availability of drop out chart	5 (71.42)	2 (28.57)
Joint review meeting conducted in last calendar month	7 (100)	0
Training of medical officer on recent module of Immunization	5 (71.42)	2 (28.57)

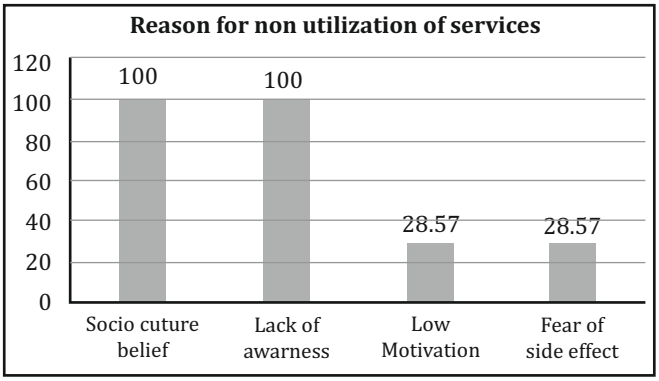
Additionally, interviews were conducted with healthcare providers, comprising Medical Officers, VCCHs, and Vaccinators. The questionnaire encompassed various components, including planning, cold chain management, logistics, and knowledge assessment. Statistical analysis was performed using Microsoft Excel 2019.

Programme management aspects at Urban Health Centre are depicted in Table 1. It was observed that all UHCs were having session plans and logistics estimation. Medical officer also conducts joint review meeting on weekly basis. Out of all the UHCs, two centers (28.57%) were having lack of essential tools, such as Drop Out charts and maps of their catchment areas. Two medical officers have not received training on the recent immunization module.

Various awareness activity were undertaken to promote UIP. Medical Officers utilize various strategies to create awareness, with the majority (86%) using interpersonal communication. Additionally, other approaches, including mother meetings (43%), health camps (28%), and other IEC (Information, Education, and Communication) activities (14%) were also utilized.

Reasons for non utilization of services are depicted in Figure 1. All Health Care Providers stated socio-cultural beliefs and fear of side effects as primary reason for non-utilization of services. While lack of awarness about programme services and low level of motivation was stated by 29% of Health Care Providers.

Figure 1: Reason for Non-utilization of immunization services according to Health Care Providers (N=49)*



(*Multiple responses)

Table 2: Findings related to Cold Chain system at UHC (N=7)

Cold chain aspects	Yes (%)	No (%)
Thickness layer of ice inside the equipment >5 mm	2 (28.5)	5 (71.42)
Cold chain room have facility for handwashing with water and soap	2 (28.57)	5 (71.42)
Any open vial stored in Ice Lined Refrigerator (ILR)without date and time mention on it	3 (42.85)	4 (57.14)
Ice pack arranged in criss-cross manner	4 (57.14)	3 (42.85)
Cold Chain Point have adequate space for dry storage	4 (57.14)	3 (42.85)
Deep freeze (DF) temperature (-15 to -25°C)	5 (71.42)	2 (28.5)
Any vaccine vial beyond usable VVM in the ILR	1 (14.28)	6 (85.71)
ILR and DF placed on wooden blocks & 10 cm away from wall	7 (100)	0
ILR/DF connected through functional voltage stabilizer	7 (100)	0
Functional thermometer inside ILR & DF	7 (100)	0
Twice daily recording of temperature log book	7 (100)	0
Record of defrosting	7 (100)	0
Signature of Medical officer in temperature log book	7 (100)	0
Vaccine vials correctly arranged inside ILR	7 (100)	0
Vaccine vial placed inside labelled cartons	7 (100)	0
ILR temperature (+2 to +8 ^{0}C)	7 (100)	0
Presence of things Other than vaccine inside ILR	0	7 (100)
Diluent placed inside ILR at least 24 hrs before distribution	7 (100)	0
VCCH clean all vaccine carrier with warm water and detergent after return	7 (100)	0

Table 2 shows findings related to Cold chain system at Urban Health Centre Several cold chain rooms were found to have inadequate facilities. Specifically, lack of handwashing facilities found in 71% of cold chain rooms and insufficient space for dry storage were found in 43% of cold chain rooms. Furthermore, issues with vaccine storage and handling were observed. Open vials were found without dates and times labelled in 43% of UHCs, and in one UHC, a vaccine vial was found beyond its usable VVM stage. Additionally, ice packs were not arranged in a crisscross manner in 42.85% of the DF (Deep Freezers), and in 28.5% of UHCs, the ice layer inside the DF was excessively thick (>5mm).

Knowledge assesement of VCCH was found that all of them possessed complete knowledge about freeze sensitive vaccine, VVM, Early Expiry First Out (EEFO), First In, First Out (FIFO), conditioning of ice pack and storage temeperature of ILR and DF. However, only 42% of VCCHs demonstrated complete knowledge about live vaccines, and a significant 14.28% lacked knowledge about the shake test.

Discussion:

Planning is a continuous process of analysing data, evaluating progress and constraints and making decisions about reaching program objectives. It was observed in the present study that session plan and estimation of logistic was prepared at all UHCs but other important matters which were helpful for better planning of immunization services like map of catchment area, drop out chart were not prepared in many UHCs. NIHFW study in various states of India in 2009 observed poor results regarding planning as compared to present study i.e., map of catchment area was not available in 61% of UHCs as compared to 28.57% in present study and Estimation of number of beneficiaries were not done in 39% of UHCs as compared to 100% done in the present study.[4] Better results in this study has been observed because of the timely preparation of list of beneficiaries by the ANM/Female health worker (FHW), as Gujarat uses E- Mamta developed by National infromatics centre. It is the duty of the ANM/FHW to prepare the list of the beneficiaries due for vaccination on the given day. The state of Gujarat uses the mother and Child Tracking Software named E-Mamta (developed by National Informatics Canter, New Delhi, India). This software gives a list of due beneficiaries for various services including immunization. Such due list of beneficiaries was available at all 14 (100%) sites. Whereas in a study conducted by Parmar et al.,[5] the due list of beneficiaries was available at only 1 site out of 13 sites visited by them in the rural areas of Vadodara. Joint review meeting was conducted in the all UHCs in present study which was not conducted in half of the UHC in a study done by Mithun Sanghvi et al[6] in Jamnagar district.

In present study the communication channels used for motivating parents to about utilization of UIP services was interpersonal communication. Same result was found in the evaluation of UIP in different state of India under INCLEN study in 2005.[7] In present study reason for non utilization of services according to HCPs were socio cultural belief and lack of awareness. Similar reasons found in study conducted by Nath L et al.2015,[8] who conducted similar study at Haridwar.

Cold chain component was assessed at UHC level in the present study. Temperature of ILR was between +2 to +8^{0}C at all visited UHCs. Study conducted by Patel et al,[9] in Anand district, Gujarat during the year 2008 observed that 90.9% of UHCs had appropriate ILR temperature which was slightly lower than present study. In present study arrangement of vaccine in ILR was found to be adequate at all the UHCs. Diluent were placed inside ILR before 24 hours of distribution. Contrary to this finding, vaccines were not placed properly inside ILR and diluents were not placed inside ILR before 24 hours of distribution in a study conducted by Sanghavi M et al,[6] in Jamanagar district. In their study 85.71% UHCs had proper storage of vaccines

inside the ILR. In a study conducted by Patel et al[9] storage of vaccines in ILR was adequate in 93.2% of centers.

In the present study, it was observed that 28.57% of Urban Health Centres (UHCs) had deep freezer (DF) temperatures outside the recommended range of -15°C to -25°C, which was associated with frost thickness exceeding 5 mm and improper placement of ice packs. Notably, all UHCs had functional Ice Line Refrigerators (ILRs) and DFs, thermometers inside ILRs and DFs, and appropriate placement of ILRs and DFs. These findings are consistent with a study by Sanghavi M et al. (2019).[6] In contrast, a 2009 study by the National Institute of Health and Family Welfare (NIHFW) across various Indian states reported lower proportions of functional equipment in Primary Health Centres (PHCs): 80% had functional DFs, 78% had ILRs, 91% had thermometers, and 82% had voltage stabilizers[4] In present study, at all UHCs, ILR/DF were placed on wooden blocks, connected with functional voltage stabilizere and proper maintenance of twice daily temeperature record in log book with signature of medical officer along with record of defrosting. While the study conducted by Sanghavi M et al.,[6] in Jamnagar district 2013 they were found some issues like ILR/DF not placing on the wooden blocks, not connected with functional voltage stabilizer, temperature log book was also not properly maintained were observed in 14.29% PHCs and record of defrosting was not available in 42.86% of PHCs. NIHFW study in various states of India in 2009 observed that 36% of PHCs were not correctly maintained their temperature log books.[4] Overall cold chain maintance was satisfactory.

The success of cold chain management depends very much on the knowledge of cold chain handlers and awareness regarding cold chain practices, management, and handling. Regarding the knowledge of cold chain handlers is concerned, in the present study 86% of respondents have adequate knowledge about shake test. These finding were higher than study conducted by bishnu ram das who conducted study on effect of mobile-based supportive supervision on cold chain point management and routine immunization service delivery, Assam, India (40%).[10]

Limitation of the study:

The sampling frame was restricted to seven Urban Health Centres (UHCs) within Ahmedabad city, which limits the external validity and generalizability of the findings to other geographic locations.

Conclusion:

The present study highlights various issues related component of routine immunization program at UHC level. Issues regarding planning like maintenance of drop out chart, map of catchment area, training of medical officer on recent module of immunization were found at two centers. All sessions were according to micro plan and conducted timely at all the centers.

There were no issues found in maintenence of ILR temperature, maintenance of temperature log book, record of defrosting, vaccine arrengment in ILR but issues found in maintenance of DF temperature, ice packs arrangment in DF, in some UHCs open vial found in ILR without date and time of opening, VCCH having poor knowledge about shake test, which indicates lack of efficiency of cold chain handler and need of their training. In three facilities had inadequate space for dry storage, while five lacked access to hand washing facilities within the Cold Chain Point (CCP) room.

Recommendation:

There is a need for training of Medical Officer who hasn't received training on Immunization at two UHCs. Vaccine cold chain handlers (VCCH) and vaccinators play a vital role in UIP, necessitating timely training, particularly for newly recruited candidates. This training is essential, as some UHCs have been found to lack knowledge of essential procedures like defrosting ILR and conducting shake

tests. Accurate mapping of the catchment area should be prepared in order to monitor UIP. The dropout chart should be prepared at all the centers which help to increase vaccination coverage by identifying children who have not completed their vaccination schedule.

Declaration:

Funding: Nil

Conflicts of interest: Nil

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