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CASE STUDY - PUBLIC HEALTH

USAGE OF ALTERNATE VACCINE CARRIER: BATTERY OPERATED PORTABLE ACTIVE VACCINE CARRIER IN SELECTED 6 DISTRICTS OF TAMIL NADU

Vinay Kumar Krishnamurthy [(1)], Vidhya Viswanathan [(1)], Pradeep Manokaran [(1)], Shikha Srivastava [(2)], Mohini Vijay [(2)], Niranjan Joshi [(2)], Taslimarif Saiyed [(2)], Selvavinayagam T S [(1)]

(1) Directorate of Public Health and Preventive Medicine, Chennai.

(2) Centre for Cellular and Molecular Platforms (C-CAMP)

Abstract

ABSTRACT : As a part of our Universal Immunization Programme (UIP), we implemented a trial on usage of battery-operated active vaccine carrier in maintaining the vaccines in the recommended temperature for longer duration in outreach sessions and to understand its operational feasibilities and benefits in six districts selected with the aim to cover rural, urban and tribal areas. Active vaccine carriers were found to have the benefit of maintaining vaccines in recommended temperature range for longer durations and the ease of knowing the temperature in the display panel made the HCWs more confident in ensuring the maintenance of recommended temperature at outreach sessions. Issues arising due to improper conditioning of icepacks in the traditional vaccine carriers are eliminated with the usage of active vaccine carriers and this may help to reduce vaccine wastage. These vaccine carriers were found to be best suited for outreach sessions in areas with difficult terrain, hard to reach or inaccessible areas.

KEYWORDS : Mega camps, Mass vaccination, Innovation in Public Health.

INTRODUCTION

One of the essential activities in Public Health is the vaccination of mothers and children through the Immunization programme implemented in India since 1978. In Tamil Nadu, outreach sessions for immunization are being conducted for more than four decades by field staff – Village Health Nurses (VHNs) under the Directorate of Public Health and Preventive Medicine. Proper storage and transportation of vaccines at recommended temperatures from the point of manufacture to the point of use is crucial for successfully implementing the immunization programme. Maintaining the potency of the vaccines, by ensuring they are carried to the session sites in the recommended temperature range is necessary.[1] Utmost importance is given to ensure safe and potent vaccine delivery. Health care workers are adequately trained on the procedures and protocols to be followed while carrying the vaccines from the Cold Chain Points (CCPs) to the outreach session sites. Vaccine carriers play an important part in the successful conduct of outreach immunization sessions by facilitating the transport of vaccines from the Cold Chain Point (CCP) to the outreach session sites. The COVID-19 pandemic has also created a need for mass vaccination and the conduct of frequent, longer outreach camps to improve coverage of beneficiaries.

Passive vaccine carriers with four icepacks, which are currently being used, can hold the vaccines at the recommended temperature range for 36 hours (holdover time), when unopened.[2] But for usage in an outreach session, it is necessary to open the vaccine carrier frequently as per the requirements. Hence the holdover time of vaccine carriers in actual field usage for outreach sessions is reduced to less than 12 hours. Many instances of discarding vaccines due to freezing have been reported worldwide, and preventing vaccine freezing remains one of the biggest barriers in vaccine management.[3] There is currently no vial-level indicator of freeze exposure for vaccines, so health workers worldwide have only the shake test to verify whether vaccines have frozen.[4–6] Unlike heat exposure, where the effect on potency takes from 2 to 30 days at 37 °C, freezing can happen in an instant for freeze-sensitive vaccines.[1]

Active vaccine carriers have notable advantages over traditional vaccine carriers. As the active vaccine carriers have an active cooling system, there is no necessity for icepacks and thereby effects due to improper conditioning

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Corresponding Author : Vidhya Viswanathan
email : vidhyaviswanathan5210@gmail.com

of icepacks like freezing of vaccines, condensation of water around icepacks leading to seepage into open vials are eliminated.

Emvolio is a battery-operated active vaccine carrier developed by Centre for Cellular and Molecular Platforms (C-CAMP) and manufactured by Blackfrog Technologies through the funding support of Hitachi Energy India Limited. The battery-operated active vaccine carrier designed with the WHO specifications and conforming to International Electrochemical Commission (IEC) standards was manufactured with the dimensions of 30cm length, 20cm breadth and 41cm height, 1.8 litres payload capacity and 6.7 Kg weight. It has 311Wh Li-ion battery and requires 4 hours of charging time. The initial cooldown time is 20 minutes. It can maintain vaccines strictly between 2 °C to 8 ° C for more than 12 hours in the field with an accuracy of ±0.5° C in an operating ambient temperature of -20° C to 65° C. The device life claimed is 10 years. The temperature inside the active vaccine carriers can be monitored with the help of a display panel outside, it can be ensured the vaccines are maintained in the recommended temperature range.[6]

As a part of our immunization programme, we implemented a trial from April 2022 to March 2023 on usage of battery-operated active vaccine carrier (Emvolio) in maintaining the vaccines in the recommended temperature for longer duration in outreach sessions and its operational feasibilities and benefits in six districts namely Chennai, Salem, Nilgiris, Tiruchirapalli, Dindigul and Madurai selected with the aim to cover rural, urban and tribal areas. 45 active vaccine carriers were deployed in Primary Health Centres (PHCs) in the six districts. We provided Hands-on training to the Trainer of Trainers (ToT) from the six districts. Site deployment was done followed by training of the respective Health Care Workers (HCW) by the ToT. We have documented our experiences on the daily usage of active vaccine carriers in outreach sessions.

FINDINGS

Totally, 8,674 vaccine vials were carried to the outreach sessions using the active vaccine carriers and 10,550 children and mothers were vaccinated. Around 3,240 vaccine vials were returned to the CCP post immunization session with Vaccine Vial Monitor (VVM) indicating they are in usable state. The daily average usage of active vaccine carrier for nine months from April 2022 to March 2023 in the six districts are shown in Figure 1. The daily usage of active vaccine carriers ranged from 1.51 to 14.26 hours. The maximum average daily usage of active vaccine carrier was recorded in Salem for about 9.28 hours.

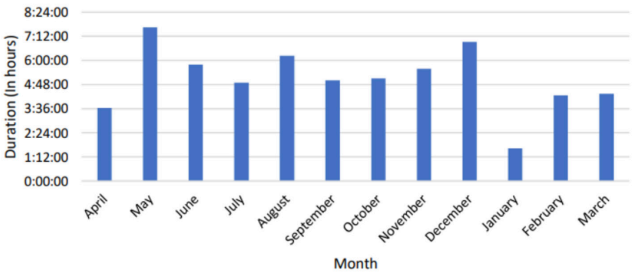

Figure 1 : Month wise Daily average usage of active vaccine carrier for 9 months, Apr,2022-Mar, 2023 in the selected 6 districts, Tamil Nadu

There is no necessity for icepacks and thereby effects due to improper conditioning of icepacks like freezing of vaccines, condensation of water around icepacks leading to seepage into open vials were eliminated. As the temperature inside the active vaccine carriers can be monitored with the help of a display panel outside, HCW found it easier to ensure that the vaccines are maintained in the recommended temperature range. HCWs reported that more vaccine vials were returned efficient to the CCPs after the immunization session than before when using the passive vaccine carriers with four ice packs. With the benefit of maintaining the recommended temperature for longer durations, active vaccine carriers were used in outreach sessions in areas with difficult terrain, hard to reach or inaccessible areas and also areas with extreme high or low temperature ranges. HCWs reported the active vaccine carriers were heavier than the traditional vaccine carriers.

CONCLUSION

Battery operated active vaccine carriers were helpful in maintaining the recommended temperature of the vaccines for conducting longer sessions. The ease of knowing the temperature in the display panel made the HCWs more confident in ensuring the maintenance of recommended temperature at outreach sessions. Issues arising due to improper conditioning of icepacks in the traditional vaccine carriers – like freezing of vaccines, seepage of condensed water in to opened vaccine vials are eliminated with the usage of active vaccine carriers. This may help to reduce the vaccine wastage. These vaccine carriers may be best suited for outreach sessions in areas with difficult terrain, hard to reach or inaccessible areas.

Quantitative studies should be done to compare the maintenance of temperature and vaccine potency between traditional passive vaccine carriers and active vaccine carriers

measuring the parameters like reduction in vaccine wastage, loss of Vaccine Vial Monitor (VVM) and to understand long-term benefits of usage of devices in the field before deploying in larger scale.

CONFLICT OF INTREST

The authors Shikha Srivastava, Mohini Vijay, Manager, Niranjan Joshi, Taslimarif Saiyed are part of the Centre for Cellular and Molecular Platforms (C-CAMP) involved in development of the active vaccine carrier Emvolio.

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