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Research Article

Novel Digitization of Preparedness Assessment for Pneumococcal Conjugate Vaccine Introduction in Immunization Programme: Experience from India

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Abstract

Background: The emergence of second COVID-19 wave posed a potential threat in attaining the target of introducing Pneumococcal Conjugate Vaccine (PCV) across India by March 2022. Each field level activity necessary prior to a New Vaccine Introduction, including preparedness assessment of states and districts, training field-level health workers and supervisors, distributing training material, community mobilization became a challenge. The pandemic-related restrictions necessitated the development of an alternative digital tool in place of traditional manual technique for the very initial step in the long list of activities, i.e. preparedness assessment. In this study, the authors document the development and implementation of an innovative tool - PCV Roll Out Monitoring and Preparedness Tool (PROMPT).

Method: An updated version of WHO was approved by the Government of India as the preparedness checklist for new vaccine introduction. Consequently, the tool was further adapted and digitized by inclusion of conditional entries, character limits to form the PROMPT.

Results and Discussion: The developed PROMPT is an innovative, user-friendly online tool, broadly comprising of two components: checklists and dashboard. Both State and District versions of checklists are included in the tool, facilitating comprehensive recording of preparedness data on all key programmatic domains. The data collected through the checklists is presented through a dynamic dashboard.

PROMPT is a novel digital solution since it is the first time that an online tool was deployed for preparedness assessment for NVI. Use of PROMPT has led to increased efficiency, simpler progress tracking, automatic collation of data and generation of visual analytics.

Conclusion: The COVID-19 pandemic had put forth an unprecedented situation compelling the need for innovation and adoption of novel modalities to improve health outcomes. The PROMPT tool is one such innovation that in the future could possibly serve as a modifiable online templatized tool for preparedness assessment for NVIs.

Keywords: *Pneumococcal Conjugate Vaccine (PCV); PCV Roll Out Monitoring and Preparedness Tool (PROMPT); COVID-19*

Introduction

Roll-out of any new vaccine in the country has always been a tedious and labour-intensive task [1]. The entire process of introducing a new vaccine into the programme requires meticulous operational planning at all levels, with detailed activities and timelines. The very initial step involves top-down macroplanning at the state level, followed by bottom-up microplanning and detailing the precise logistic and financial needs for each district and sub-district [2]. In order to ensure efficient and effective planning, there is a need to assess the preparedness of the State and District for the new vaccine introduction. The Ministry of Health and Family Welfare (MoHFW), Government of India (GoI) has developed and disseminated comprehensive state and district-level preparedness assessment checklists to be used before introducing any new vaccine. These paper-based checklists were designed to help in assessing and identifying strengths, weaknesses, opportunities and threats to ensure corrective measures are taken for the effective and successful introduction of a new vaccine. The checklists include details on the existing Human Resource, Routine Immunization (RI) microplanning status along with the RI training status, recording and reporting practices. It also collects information on vaccine coverage and wastage, logistics planning and management, monitoring and supervision Adverse Events Following Immunization, Mobilization, Advocacy, Surveillance and Cold chain maintenance.

Despite being a time and labour-intensive task, paper-based preparedness assessments were undertaken in the pre-pandemic era for the successful roll out of new vaccines, namely measles-rubella (MR) vaccine and rotavirus vaccine (RVV) [3].

However, the COVID-19 pandemic posed unprecedented challenges of social distancing and travel restrictions to this elaborate yet essential exercise of preparedness assessment [4]. Such a situation created a dire need for an innovation to meet existing need for remote, digitized, automated method of data collection and collation for preparedness assessment. The COVID-19 pandemic has accelerated the pace of digital innovations with increased impetus on automated analytical tools which contribute to both access and quality of healthcare [5]. Digitized tools have been employed in various projects by partner organizations for evidence-based use and response [6]. Electronic tools have been used across the world for digitizing processes including strategizing, preparing and planning response to the COVID-19 pandemic [7]. Apart from allowing remote and real-time functioning, digital tools also ease conducting additional statistical and epidemiological analyses on real-time information which serve as a decision-making tool for public health leaders and policy makers [8].

Therefore, a digital tool was needed to fill the lacunae of paper-based preparedness assessment. The PCV Roll Out Monitoring and Preparedness Tool (PROMPT) was developed and deployed for digital preparedness assessment at all levels (National, State, District) before the roll-out of PCV. PROMPT aims to obtain filled assessment checklists in a pre-designed format from the states and districts through a digitalized approach. This automated tool has been purposively designed to eliminate the intensive documentation and reduce the strenuous workload on human resources. Further, PROMPT enhances the efficiency of preparedness assessment and offers an interactive interface for transferring the checklists and monitoring their status.

Rationale

The PCV Introduction in the country started in 2017 and by 2020, 5 high burden states were covered under the UIP. In February 2021, GoI announced for the pan-India expansion of PCV, to be completed by March 2022. Considering the short time line for such a labour and time intensive task, it was imperative to resort to a digital solution which would allow remote working due to social restrictions along with robust monitoring of preparedness status across geographically diverse regions of India overcoming the prevailing Covid 19 restrictions. Thus, the PROMPT Tool was developed to overcome existing challenges and facilitate preparedness assessment.

Objectives of the Study

1. To document the development of a digital tool for preparedness assessment for PCV introduction and its implementation in the field.

2. To document how this digital tool for preparedness assessment facilitated the entire process and can be leveraged for other health interventions.

Materials and Methods

The Ministry approved state and district preparedness assessment checklists were taken as baseline data collection tools for the development of the PROMPT. Only the routine immunization points or questions were redrafted or updated with respect to PCV. PCV specific questions, like the cold chain space and dry space required to store the PCV vaccine vials and the AD syringes and the required versus available space for the same, were incorporated into the tool. Also, modifications in the checklists needed for local use were also incorporated. The final checklists with all the changes and additions were again submitted to the MoHFW for approval. Only after getting all required nods and approvals, an external software development agency was hired to develop this into an online real-time digital tool. Detailed discussions with the hired agency were conducted to ensure that all parties were on the same page regarding the development, regular updating and maintenance of the online tool.

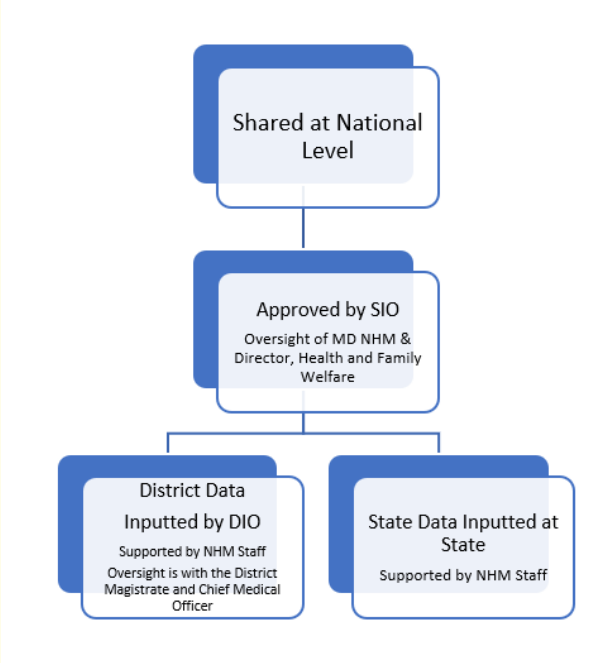

Figure 1: *Data flow for PROMPT Tool at District and State Level.*

The State and District checklists used as the basis of data collection covered questions under the following themes: State/District Human Resources, Demographic profile, RI Microplanning status, IMI specific information, RI Training status, RI Recording and reporting practices, Vaccine coverage and wastage, Vaccine and logistics management, Waste management and injection safety, Monitoring and supervision, Adverse events following immunization, Mobilization, Advocacy and communications, Surveillance, Cold chain maintenance and general impressions. Each of the thematic area had a comments section at the end for the evaluator to record and specific or interesting findings. All the questions from the checklists were modified into multiple-choice questions or open-ended questions. Data related questions, where the answers were supposed to be numbers or percentage, were primarily open-ended questions.

Components of the PROMPT tool

The PROMPT broadly comprises 2 components: the checklists and the dashboards.

The checklists - both state and district - are online, customized survey forms to record preparedness data covering relevant domains. The responsibility of assisting in the completion of the State level checklist was with the State Immunization Officer with support from the State NHM team. The oversight of the entire state level data and information being shared through the checklists was done by the MD NHM and the Director Health and Family Welfare. Similarly, the responsibility of assisting the evaluators in completing the district level checklist lies with the District Immunization Officer with support from the District NHM team. The district oversight remained with the District Magistrate and Chief Medical Officer.

Further, the dashboard has two segments- the completion dashboard and the analytics dashboard. The completion dashboard offers numerous advantages allowing ease of remote monitoring and follow-up on filled, completed, and submitted checklists. It also ensures rapid data collection from the respective States and UT's. On the other hand, the analytical dashboard is a ready reckoner automated data visualization hub that provides charts and maps delineating the status of the states in terms of preparedness. It encompasses a multitude of themes such as informative profiles of States/UTs, description of previously introduced vaccines coverage and drop-outs (Penta/DPT/MR), detailed information on the availability of Cold chain handlers, space, and logistics. Additionally, the tool allows programmatic Supervision (STFIs/DTFIs/Review Meetings & AEFI Meetings) and surveillance of disease severity. For the data analytics dashboard, numerous rounds of brainstorming were done to finalize data visualizations for each of the indicators reflected in the dashboard, to ensure that these are easily understood and interpreted correctly by the policy makers and programme managers.

Results

The key features of the online tool which differentiate it from the traditional paper-based assessment include increased efficiency in the preparedness assessment as there is limited paper-work required. This restricts number of scanned copies of required data, hard copies of the checklists, hand-written findings and responses by the evaluator. There is also a feature of real-time tracking of the completeness of the tool state and district-wise. The completion dashboard, which is visible only to the admin, shows the percentage completion of the tool in each district and state individually. If some state/district has not completed the checklist, it was highlighted in the dashboard, which could be used to intimate the respective evaluators so that they complete the checklists and then resubmit the same. These features assisted in easy and timely follow-ups with each of the evaluators which was difficult in the traditional method, as the only time the completeness or correctness of the checklists was after the submission.

Also, the tool offers an interactive interface to the user for transferring the preparedness assessment checklist to an online platform. Another exceptional feature in the tool that allows automated collation of data and visualization of KPIs on the analytical dashboard has added to the value of this innovative tool. This collated and analysed data could be easily exported to excel sheets and also the visualizations can be exported to other platforms for easy sharing with the concerned stakeholders.

The most important and effective component or feature of the PROMPT was the completion dashboard. Real-time progress of the preparedness assessment was reviewed through the completion dashboard where details of each and every interaction with the tool were available to the supervisors and dedicated admins. Month and state wise number of views of the tool, number of interactions, dates of completion of a checklist, date of final submission and number of submissions is one of the key indicators which are shown in the completion dashboard. Also, the number of draft and completed checklists was also shown in one of the donut graphs. For states, all districts completion status was also available and a state's status was shown as completed only after all the districts had successfully submitted their checklists.

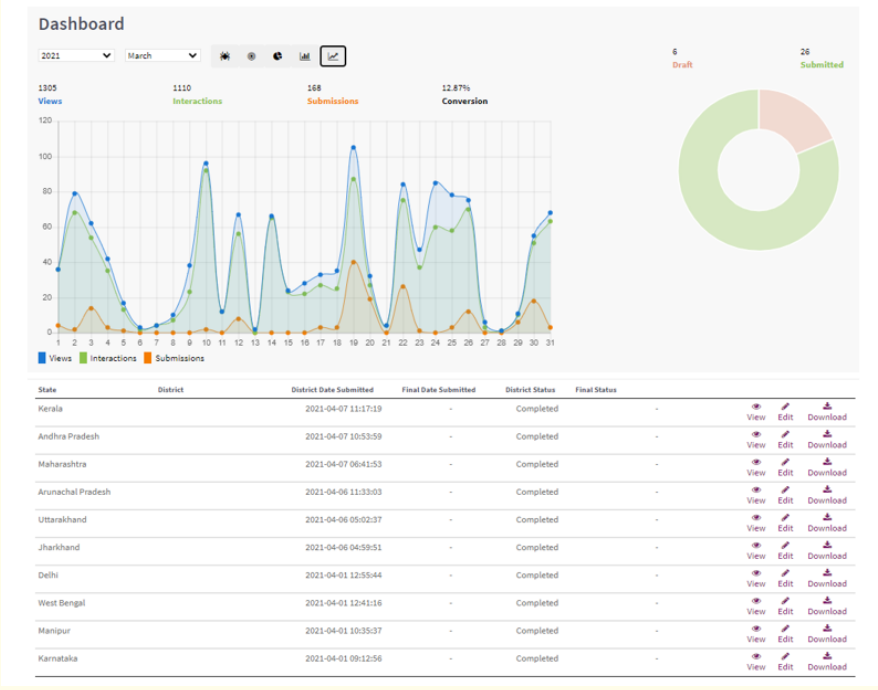

Figure 2: *Screenshot showcasing the completion dashboard of the PROMPT tool.*

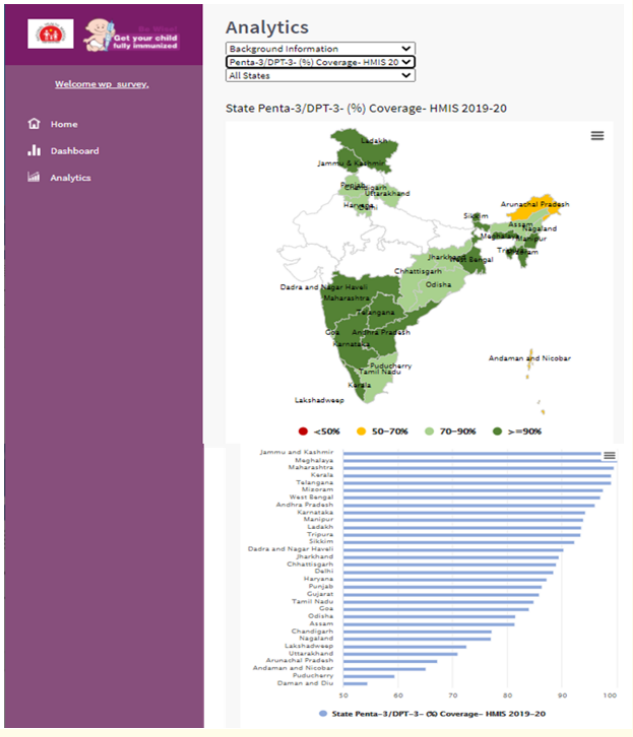

Figure 3: *Screenshot showcasing the analytics dashboard of the PROMPT tool.*

As for the analytics dashboard, maps, graphs and charts showing the HMIS data analyses for FIC and co-administered vaccines' coverage, district wise HR status, microplanning status and other key indicators with standard color-coded legends were part of the visualizations.

All analytical reports, charts, maps and graphs had the option to be exported and downloaded to other platforms so that these can be shared with the respective states and districts in different formats and any corrections or changes could be planned accordingly with respect to the requirements of the new vaccine to be introduced.

Discussion

The aim of the present study is to document the development of a digital tool for preparedness assessment for PCV introduction and its implementation in the field. As elicited through the study, PROMPT emerges as an efficient digital tool developed and implemented to conduct preparedness assessment for PCV introduction. It has an interactive, user-friendly interface to transfer State and District checklists to online platform, States and districts were able to fill data as per convenience without any data loss. It allows esay monitoring of checklist completion status and automatic collation of data and visualization of KPIs on the analytics dashboard to take programmatic corrections. Additionally, preparedness assessment was conducted in all the states timely to match with the aggressive timeline for PCV expansion.

As with any novel approach, PROMPT was associated with some challenges including requirement of a huge amount of server space and technical bandwidth to house and maintain the online tool. This was resolved by ensuring a large server space for assuring encrypted backup of collected data and by onboarding a dedicated agency for the development and maintenance of the PROMPT Tool. Further, the online tool restricted the respondents to raising queries and obtaining immediate resolutions. Also, poor network connectivity in some geographies and the limited technical expertise of the respondents led to new challenges in disseminating the tool across diverse States/UT's of the country. Prompt solutions to these issues were made via setting up a dedicated email address for responding to all queries and concerns at the earliest followed by constant monitoring to ensure the smooth utility of the tool. Besides, strategically positioning the STOs in states to ensure constant touch with state officials eased the process of data collection. The tool also suffered ooccasional loss of data from the submitted responses owing to technical glitches and inaccessibility to the tool at times due to server crash at the Microsoft backend which proved to be a major hindrance to data collection and storage in the PROMPT tool. In order to overcome this challenge, a daily backup of the entire data at multiple levels was done to ensure no data loss. Also, a provision was made to save data for each individual field duly filled in the checklist to avoid data loss due to connectivity loss.

Considering the success of the tool, PROMPT paves its way for multiple utilities going forward. While it undoubtedly can serve as an advocacy tool for promoting the plugging of existing gaps in the health infrastructure, it can also aid in the analysis of collected data to assess factors responsible for affecting the preparedness of a state for launch. PROMPT could also serve as a modifiable online templatized tool for the assessment of state/district level preparedness for the introduction of any health technology. The analytical dashboard of the tool could also continue to serve as a ready reckoner information repository for the entire country. The tool allows easy flow of granular information from National to State and from State to District levels with just a few clicks truly heralding in a digital revolution for preparedness assessment for New Vaccine Introduction.

Conclusion

The COVID-19 pandemic had put forth an unprecedented situation compelling the need for innovation and adoption of novel modalities to improve health outcomes. The PROMPT tool is one such innovation that in the future could possibly serve as a modifiable online templatized tool for preparedness assessment for NVIs.

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