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Thinking Out-of-Box in Addressing Communication and Service Delivery Challenges: Use of a Traditional Communication Method for Improving Immunization Coverage in Remote Rural Hard-to-Reach Areas of India

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Abstract

Sirmaur district in the state of Himachal Pradesh in India is a hard-to-reach area situated in the western Himalayas having an extreme landscape with snow-laden mountains and extensive river systems that makes the delivery of immunization services extremely challenging. Vaccinators needed a long walk through the hilly terrain to reach outreach sites. Community mobilizers were unable to go house to house to inform the caregivers to bring children to the site for vaccination. Caregivers were unaware when the vaccinators arrive at the site. As a result, many children missed vaccination or were not vaccinated timely. Age-appropriate vaccination coverage (according to national immunization schedule) in the Sirmaur district was the lowest in the state. Thinking out-of-box to address the communication barriers with the caregivers, the traditional drum beating was used, for the first time in India, in two blocks of the Sirmaur district (Rajpura and Shillai). The initiative was planned and implemented by the district health system with the support of the local community leaders. An exit interview was conducted to know the reach of the drum beating to caregivers, and a baseline and end line household survey was conducted to know the outcome of the initiative on age-appropriate vaccination coverage. Analysis of exit interviews data indicated a very high reach of a drum beating to the caregivers; more than 97% of caregivers in Rajpura and 100% in Shillai heard drum beating, and almost 95% of caregivers in Rajpura and 98% in Shillai knew the purpose of drum

beating. Analysis of immunization data from baseline and end line surveys showed improvement in age-appropriate vaccination coverage for all vaccines in Rajpura (by 2.2% for BCG, 15.3% for Pentavalent 1, 14.9% for Pentavalent 2, 14.1% for Pentavalent 3, and 6.5% for Measles/MR). In Shillai, age-appropriate vaccination coverage improved for Pentavalent 1 (by 3.4%), Pentavalent 2 (by 5%) and Measles/MR (by 1.7%). In addition, dropout rates were reduced in both the blocks, particularly in Rajpura Pentavalent 1 to Measles dropout rate was reduced by 13.5%. Both health workers and community leaders had positive perceptions of the drum beating initiative. However, another important lesson learned from the initiative was that both the access and demand-side barriers need to be addressed for the desired improvement of age-appropriate immunization coverage. In Shillai, there was lower coverage improvement and a reduction in dropout rates attributed to vacant positions of vaccinators that caused an issue with access to immunization services to people.

Keywords

Immunization, Hard-to-Reach Area, Communication, Age-Appropriate Vaccination Coverage

1. Introduction

India has an immunization target to achieve more than 90 percent full immunization coverage (FIC) by the year 2025 [1]. Over the past few years, the Universal Immunization Programme (UIP) of the Ministry of Health and Family Welfare, scaled up the outreach vaccination services and engaged a cadre of community mobilizers known as Accredited Social Health Activists (ASHAs) throughout the country. The National Family Health Survey (NFHS-5, 2019-21) found a 14.6 percentage points improvement of the national FIC (increased from 62 percent to 76.6 percent) for the basic vaccines—one dose of Bacilli Calmette-Guerin (BCG), three doses of Oral Polio Vaccine (OPV), three doses Pentavalent Vaccine, and one dose of Measles/Measles Rubella (MR) vaccine [2]. However, considerable inequities in vaccination coverage were found between the states and within the state [3]. There were demand and supply-side factors causing low immunization coverage, particularly in the remote rural and hard-to-reach areas [4] [5] [6] [7] [8]. In addition, age-appropriate vaccination coverage has been consistently low in India [4] [5] [6]. Himachal Pradesh (HP) is a northern state of India situated in the western Himalayas and Sirmaur is the southernmost district of HP (**Figure 1**).

Sirmaur is a largely mountainous, remote rural district, with 90% of its population living in the villages. The FIC in Sirmaur district was 70.6%, which was 18.4 percentage points lower than the overall state immunization coverage [9]. Age-appropriate vaccination coverage in Sirmaur district was also one of the lowest in the state. Providing immunization services and communication with caregivers has been challenging in Sirmaur district due to topographic barriers.

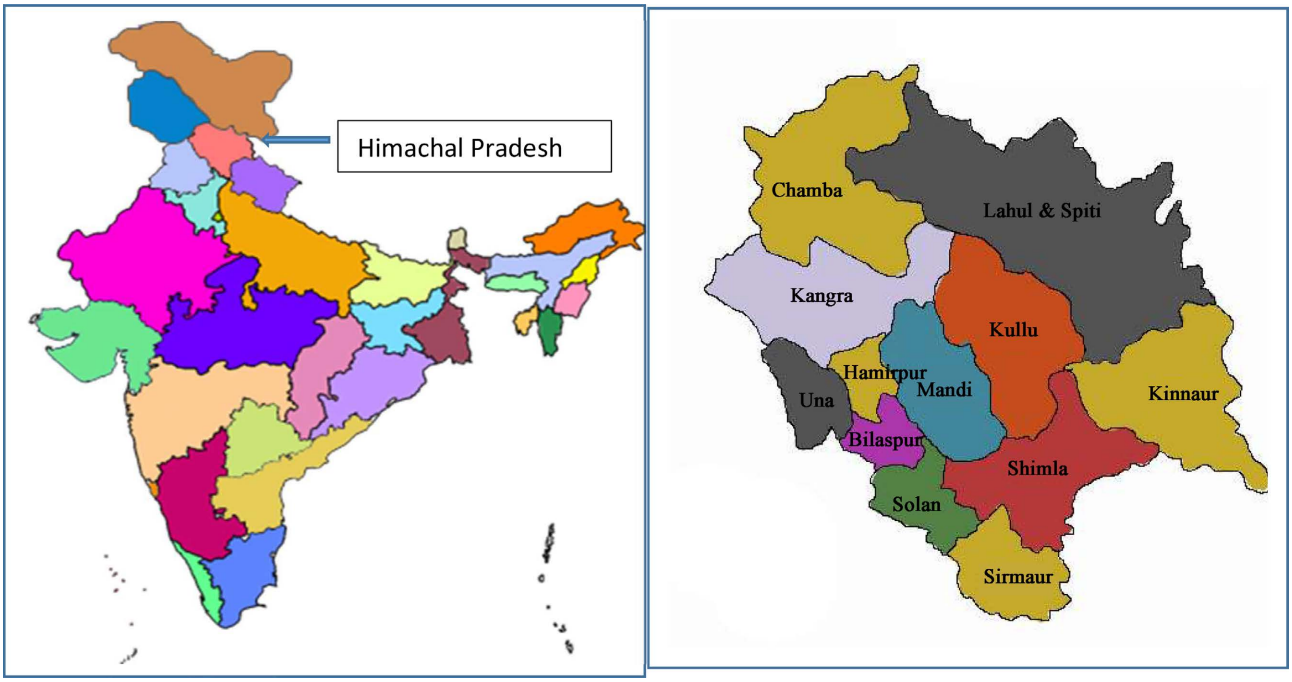

Figure 1. India Map showing location of Himachal Pradesh (HP) and location of Sirmaur district in HP (Source: Google Map).

In the hilly terrains of the district, the vaccinators had difficulty reaching the outreach vaccination sites and the community mobilizers (ASHA workers) had challenges going house-to-house to inform the caregivers to bring children for vaccination. As a result, children often missed the vaccination sessions and/or were not vaccinated timely as per the UIP recommended vaccination schedule. A coordinated service delivery approach along with an alternative communication method to reach the caregivers was necessary for improving immunization coverage.

2. Materials and Methods

2.1. Program Description

In consultation with the district health administration, a framework was designed and tailored to address barriers to immunization services, and implemented with support of the local community leaders in two blocks of the Sirmaur district (Rajpura and Shillai). As illustrated in **Figure 2**, the framework included the various stakeholders (Vaccinators, Community Mobilizers, Caregivers, and Children) and their respective challenges/barriers in providing, communicating, and receiving immunization services; the inputs for providers for updating the micro-plans, use of drum beating as an alternative communication method to inform caregivers, and caregivers are aware and bring children to session site; and as a result, children get vaccination shots timely and protected from vaccine-preventable diseases.

A double-sided drum locally known as *Dhol* is an integral part of Indian culture-used during religious rituals, local festivals, marriage, and other important

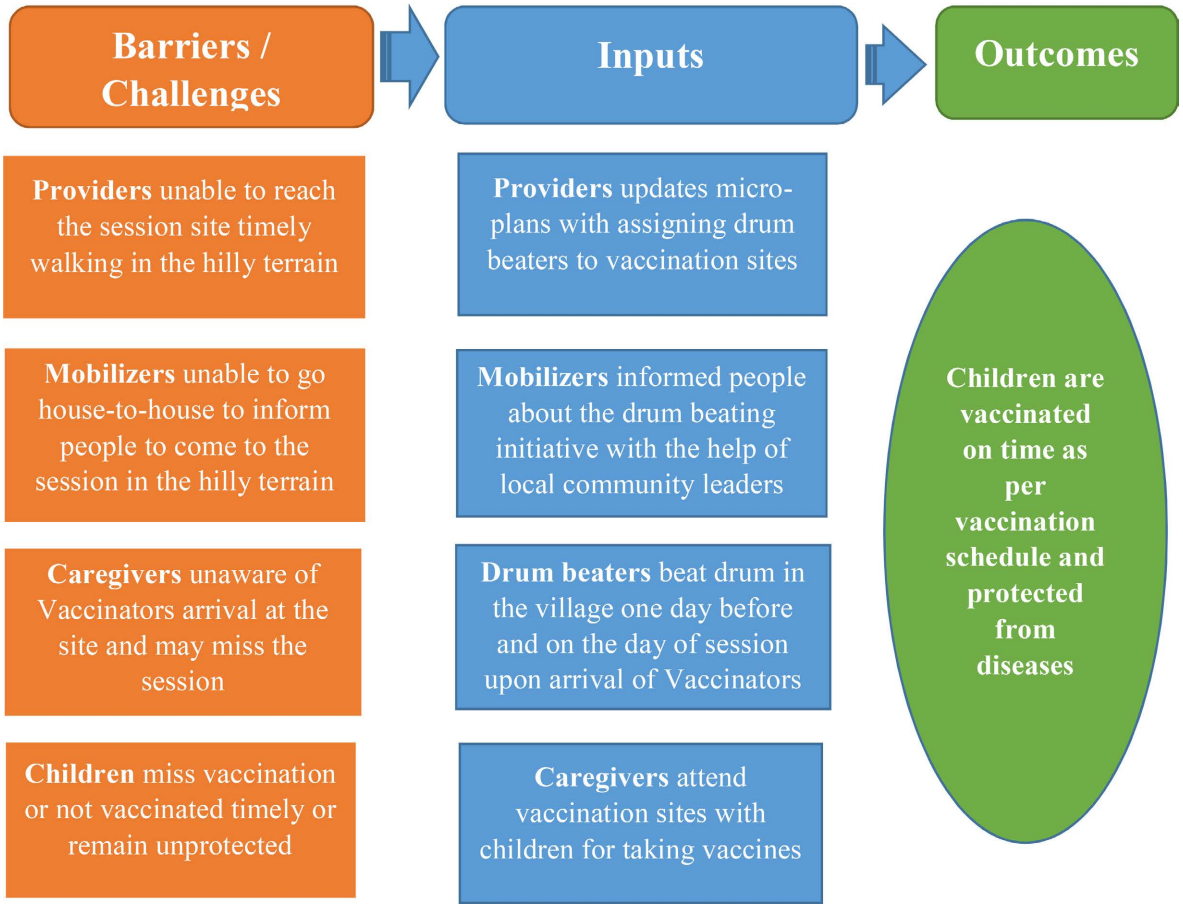

Figure 2. Conceptual framework of the drum beating initiative.

community events. In the hilly areas, the sound of *Dhol* travels a long distance to all the scattered houses across the village.

The intervention areas (Rajpura and Shillai block) were similar topographically—hard-to-reach having hilly terrains and with low age-appropriate vaccination coverage. However, the Rajpura block was better off than the Shillai block in terms of the availability of Auxiliary Nurse Midwives (the vaccinators).

The initiative for improving immunization services was well-coordinated with the defined roles of all stakeholders responsible for the children's vaccination. The activities needed to be coordinated as the action of one actor led to or helped the action of another actor. For example, the health workers needed to update the routine immunization micro-plans and tag drum beaters with each of the vaccination sites, therefore, the drum beaters knew where to go and when for drum beating. The community mobilizers (ASHA workers) needed to reach the local community leaders to inform the people about the drum beating as a new method of informing people about the vaccination session. The local community leaders supported in selecting the drum beaters (9 drumbeaters in Rajpura and 6 drumbeaters in Shillai). The drumbeaters needed to beat the drum in the catchment areas of the vaccination sites one day before the session day, and on the day of vaccination session to alert the caregivers on arrival of the vaccination

team at the site. The caregivers needed to come to the session sites when they heard drum beating with children for vaccination.

The block supervisors supported the planning process and monitored the drum beating to make sure that it was done according to the micro-plans. Each drummer received 700 Rupees (8.5 dollars) for each day of drum beating work.

2.2. Data Collection

Exit interviews were conducted with caregivers at the vaccination sites (sample size: 633 and 397 in Rajpura and Shillai block respectively) to know the reach of the drum beating. Household surveys were conducted before (baseline) and after (end line) the implementation of the drum beating in both Rajpura and Shillai blocks to measure the outcomes of the drum beating initiative. A stratified multistage sampling technique was used for sample selection. Sample size in Rajpura was 606 at baseline and 368 at end line, and in Shillai 274 in baseline and 286 in end line. At the households, children 0 - 23 months old having a vaccination card was included in the sample. In addition, qualitative data was collected at the end line to assess the perceptions of stakeholders on the drum beating initiative. Six focus group discussions (FGDs) were conducted with the caregivers (three in each block) and four FGDs were conducted with community mobilizers (two in each block). In addition, six in-depth interviews (IDIs) were conducted with the vaccinators (three in each block) and two IDIs were conducted with the local community leaders (one each block). Data collectors were from a local non-government organization (NGO) who were trained and supervised by the supervisors. Data collection protocol and tools were reviewed and received prior approval from the Institutional Review Board (IRB).

2.3. Data Analysis

Quantitative immunization data collected through household survey was analyzed using SPSS for the following indicators:

- % of infants received vaccines (1 dose of BCG, 3 doses of Pentavalent vaccine, and 1 dose Measles/MR vaccine) on time according to UIP vaccination schedule
- % of infants dropped out between successive Pentavalent doses, as well as dropout from Penta-1 to Measles/MR vaccine

Graphs and table on age-specific vaccination coverage by antigen and dropout rates respectively were generated and compared between the findings of the baseline and end line surveys for both blocks to discern the outcome of drum beating initiative.

Exit interview data with the caregivers at the immunization session site was tabulated and analyzed using MS Excel. Graphs were created on the reach of drum beating and understanding the purpose of drum beating by the caregivers.

The end line qualitative data were transcribed manually and analyzed based on emergent themes on perception of health workers, community mobilizers

and community leaders on drum beating as an alternative method of communication to reach the caregivers.

3. Results

3.1. Reach of Drum Beating to Caregivers

During exit interview three questions asked to the caregivers—whether they have heard the drum beating, what time have they heard drum beating, and what do they know about the purpose of drum beating. The analysis of exit interview data indicated that drum beating reached widely in both the blocks. 97.2% caregivers in Rajpura and 100% in Shillai block heard the drums beating before coming at the vaccination sites, and 94.7% of caregivers in Rajpura and 98% in Shillai knew the purpose of drum beating (Figure 3).

3.2. Improvements in Age-Appropriate Vaccination Coverage (Among Card Holders)

Analysis of vaccination data collected from the home-based records of children 0 - 23 months at baseline and end line indicated that age-appropriate vaccination coverage increased with the drum beating initiative. In Rajpura, age-appropriate vaccination coverage improved by 2.2 percentage points for BCG, 15.3 percentage

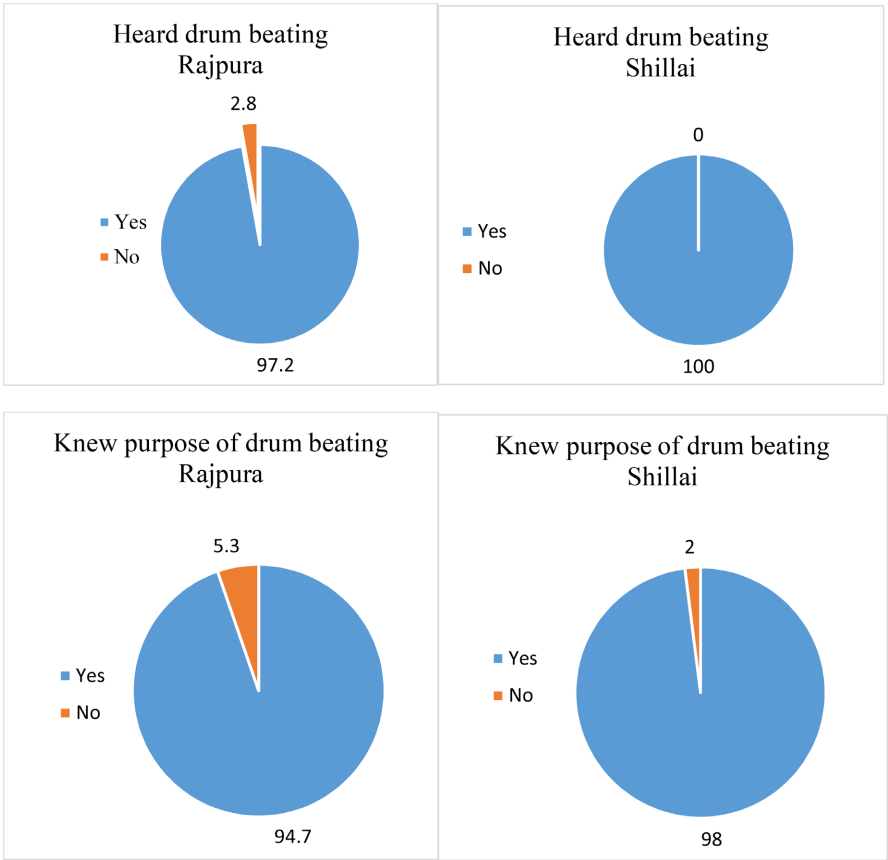

Figure 3. Percentage of caregivers heard drum beating before coming to vaccination site, and percentage of caregivers knew the purpose of drum beating in Rajpura and Shillai.

points for Pentavalent 1, 14.9 percentage points for Pentavalent 2, 14.1 percentage points for Pentavalent 3, and 6.5 percentage points for Measles/MR vaccine (Figure 4). In Shillai, age-appropriate vaccination coverage improved by 3.4 percentage points for Pentavalent 1, 5.0 percentage points for Pentavalent 2, and 1.7 percentage points for Measles/MR vaccine, and slight decline of BCG and Pentavalent 3 coverage was found. The improvement in age-appropriate vaccination coverage in Shillai was lower compared with Rajpura, which could be attributed to limited access to immunization services due to vacant positions of ANMs in Shillai block.

3.3. Reduction in Dropout Rates

In Rajpura, all dropout rates decreased, particularly there was marked decrease of Penta 1 to Measles dropout rate (by 13.5 percentage points; from 17.3% to 3.8%). In Shillai, dropout rates decreased by 0.3 percentage points for Pentavalent 1 to Pentavalent 2 and 1.6 percentage points for Pentavalent 2 to Pentavalent 3. There was slight increase of Pentavalent 1 to Measles dropout rate (from −0.6% to 2.8%) (Table 1).

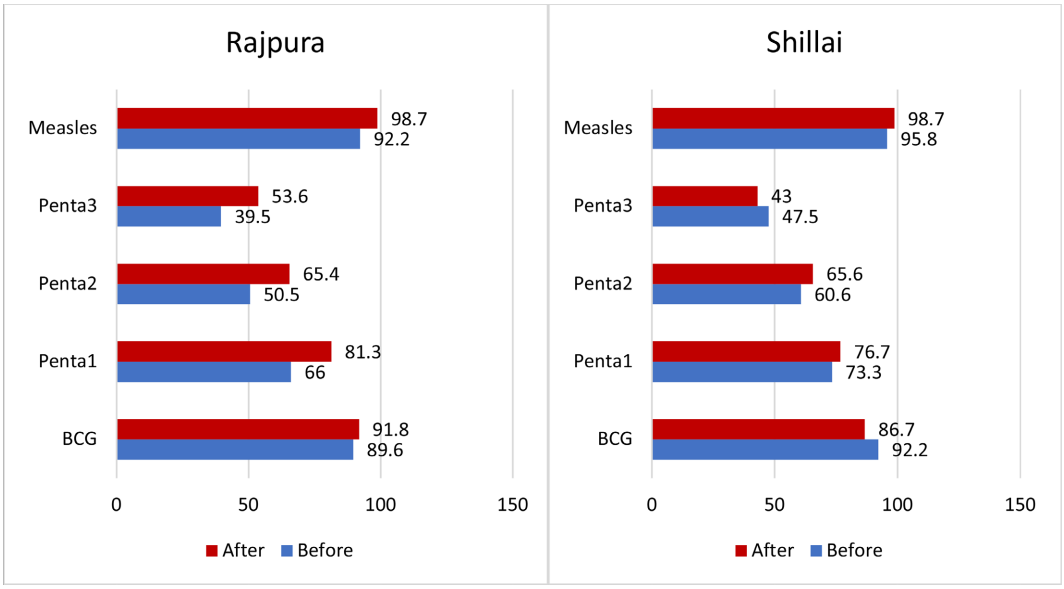

Figure 4. Percentage of children with card received BCG, Pentavalent vaccine 1, 2, 3 dose, and Measles/MR vaccine on time as per UIP schedule found in baseline and end line assessment in Rajpura and Shillai.

Table 1. Dropout rate (Penta to Penta 2, Penta 2 to Penta 3, and Penta 1 to Measles) before and after the drum beating initiative in Rajpura and Shillai.

Dropout rate (%)	Rajpura		Shillai	
	Before	After	Before	After
Penta 1 to Penta 2	0.6	0.5	03	0.6
Penta 2 to Penta 3	4.2	0.5	2.7	1.1
Penta 1 to Measles	17.3	3.8	−0.6	2.8

3.4. Perception of Stakeholders on the Drum Beating Initiative

Analysis of qualitative data from the FGDs and IDIs showed overwhelmingly positive perception of the stakeholders on the drum beating initiative.

3.4.1. Perception of Caregivers

Caregivers appreciated the drum beating initiative as a way of reminding them to come to the vaccination sites, and they insisted on continuation of the drum-beating initiative.

"I didn't have any idea before when the vaccination session started and now with drum beating I know for sure when to go to the vaccination site to take vaccines for my children"—a caregiver in Shillai block.

3.4.2. Perception of Community Leaders

The village community leaders reported positively about the drumbeating initiative.

"We saw the crowd of mothers going to the vaccination sites with the sound of drum beating that we did not see before" a community leader of Rajpura block.

3.4.3. Perception of Community Mobilizers (ASHA Workers)

ASHA workers expressed that drum beating was very helpful to inform caregivers living in the remote hilly terrain whom they usually could not reach before.

"Caregivers often forget the due dates of vaccination for children as they are busy with household work. However, now with the drum beating they know that they need to go to the vaccination site to take vaccines for children"—a social mobilizer (ASHA worker) in Shillai block.

3.4.4. Perception of ANMs (Vaccinators)

ANMs underlined that drumbeating helped to inform caregivers to bring children in the vaccination sites. Repetitive drum beating for the past almost a year resulted in significant awareness among caregivers that helped in timely vaccination of children.

"People became so conscious about vaccination with the drum beating that some caregivers call me on the session day to check if their children are due for vaccination"—an ANM in Rajpura block

4. Discussion

4.1. Drum Beating—A Useful Alternative Communication Method to Reach the Caregivers

Drum beating was found as a useful alternative communication method to inform the caregivers residing in the remote hilly terrain, where the community mobilizers had challenges with in-person visits to send the caregivers to vaccination sites for vaccinating children. It was a perfect solution to overcome the barriers to reaching the caregivers through the usual house-to-house visits. It was locally available, culturally acceptable, easily implementable, and a highly effective communication method to reach the caregiver in hard-to-reach areas. It was

affordable and the district was able to sustain using the method with their own resources and planned to scale it up in other blocks of Sirmaur district. It contributed to increasing age-appropriate vaccination coverage and reducing dropout rates. The use of a high-tech method of communication such as a mobile phone could be challenging in Sirmaur district due to connectivity, logistical, and financial issues.

Drum beating was used for the first time as a method of communication for routine immunization programs in India. However, the effectiveness of drum beating to reach caregivers with its positive outcomes in improving age-appropriate vaccination coverage would serve as evidence for its future use for immunization and other public health programs in hard-to-reach areas. The HP state government also used drum beating for reaching the caregivers during the periodic routine immunization intensification campaign known as Mission Indradhanush. Consistent with the drum beating initiative, Idris *et al.* reported that in the fragile and conflict settings prior notification to the community before conducting the outreach immunization helped in the on-time vaccination of children [10]. Abdur, *et al.* suggested the use of public announcements using loudspeakers to make uneducated caregivers aware of the timely vaccination of children in the hard-to-reach areas [11]. Francis *et al.* found that parental awareness of the need, place and time of immunization was necessary to improve the uptake of immunization [7].

4.2. Need to Address both Service and Demand-Side Barriers to Achieve High Age-Appropriate Vaccination Coverage in the Hard-to-Reach Areas

The drum beating initiative contributed to improving the age-appropriate vaccination coverage and reducing dropout rates in Rajpura block. However, outcomes of drum beating in Shillai for improving coverage and reducing dropout rate was not as good as Rajpura due to the limited access to immunization services with the vacant positions of vaccinator (ANM). In Shillai, vacant positions of the ANM needed to be filled to improve access to immunization services. In fact, creating demand without improving the access to services could create negative perceptions of the community about the immunization program.

In Shillai block, with limited access to immunization services, there was a large number of Zero-dose children (children who did not get at least the first dose of Pentavalent vaccine). Ghosh *et al.* reported the availability of ANM and ASHA workers in the village is a critical factor for children to get at least one dose of the Pentavalent vaccine [8]. Francis *et al.* documented issues related to access of immunization services (such as place of immunization too far) as a cause of non-vaccination of children [7]. Abdur *et al.* reported a requirement of outreach or mobile immunization strategies for the households located away from the immunization sites such as hilly areas [11]. Favin *et al.* found in a meta-analysis of grey literature that deficiencies in access and reliable immunization services along with inadequate parental knowledge and attitude were the

main reasons for under-vaccination of children [12]. Immunization Agenda 2030 (IA2030), a global strategy to leave no one behind, in its strategic priority area 3 (Coverage and Equity) emphasized to identify barriers to uptake of vaccination services and use of an evidence-based approach to overcoming the barriers to achieve high and equitable immunization coverage [13]. Gavi, The Vaccine Alliance, in its phase 5 strategy (Gavi 5.0) focused on vaccination of missed communities and zero dose children [14].

4.3. Importance of Age-Appropriate Vaccination Coverage

Achieving high immunization coverage in a population does not imply the highest protection against vaccine preventable diseases. Age-appropriate vaccination is important epidemiologically to reduce the potential exposure of children to vaccine-preventable diseases. Lack of timely vaccination likely contributed to the significant burden of morbidity and mortality related to vaccine-preventable diseases in children [4] [5] [15] [16]. In India, periodic immunization campaigns, like the Mission Indradhanush, have been conducted in the districts with low immunization coverage across the country to improve full immunization coverage. However, campaigns are unlikely to improve the age-appropriate vaccination coverage as many children had already exceeded the age limit for timely vaccination, and campaigns do not reach children born in the days following the campaign. The immunization system should be strengthened by addressing both supply and demand-side factors to achieve high age-appropriate vaccination coverage, particularly in the hard to reach areas. Minh *et al.* reported that timely vaccination was less common among children of poor families, ethnic minorities, rural areas, and less educated people [17]. Mekonnen *et al.* suggested that the immunization program should include the timely completion of vaccination as a quality indicator [18]. Hu *et al.* suggested that policy makers should pay more attention to the determinants of age-appropriate vaccination for planning its improvement [19]. Mekonnen *et al.* suggested the design and implementation of tailored strategies to address the individual and contextual factors of untimely vaccination. [18]

5. Conclusion

A coordinated approach to immunization services delivery coupled with drum beating to inform caregivers was found promising to improve age-appropriate immunization coverage in a remote rural hard-to-reach district. Drum beating was found very effective, as an alternative communication method, for reaching people living in hard-to-reach hilly terrain. It was an appropriate initiative in the local context, and having its connection with local culture and tradition, was acceptable for both the community and the health system. The cost involved in its implementation was very low, therefore, was affordable for the district to sustain it. However, another important learning of the initiative was that both access and demand-side barriers need to be addressed to achieve the desired age-appropriate vaccination coverage in the hard-to-reach areas.

6. Limitation

The age-appropriate vaccination coverage based on home-based records was not the actual picture of immunization coverage of the Rajpura and Shillai block. The recommended method to estimate the immunization coverage is based on home-based records plus a history of vaccination, as vaccination cards are not always available. The actual immunization coverage in Rajpura and Shillai blocks could be higher or lower than the age-appropriate vaccination coverage. However, as the main objective of our initiative was to improve age-appropriate vaccination coverage, we did not collect immunization data based on the history of vaccination from the caregivers. For the same reason, we did not analyze and present the full immunization coverage (FIC) in this paper.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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