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Original Research Article

A cross-sectional study to assess the knowledge, attitudes and practices regarding the measles immunization during an outbreak of measles in an urban slum of a metropolitan city

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ABSTRACT

Background: Measles is a highly infectious disease, and Mumbai experienced an outbreak in 2022, resulting in 600 cases and 17 deaths. Inadequate immunization coverage has been suggested as a key factor, yet the underlying reasons remain unclear.
Method: This cross-sectional descriptive study aimed to explore caregivers' knowledge, attitudes, and practices regarding measles-containing vaccines (MCV) during the outbreak in an urban slum. Caregivers of children aged 9 months to 5 years presenting with febrile rash at Baiganwadi Health Post were surveyed using a 30-item peer-validated questionnaire administered via telephone after verbal consent.
Results: Among 100 participants, 99% recognized measles, but only 10% identified all key symptoms, and 53% were unaware of potential complications. Vaccination coverage was low: 50% unvaccinated, 18% unsure, 25% partially vaccinated, and 7% fully vaccinated. Common barriers included lack of awareness, concurrent illness, and fear of side effects.
Conclusion: The findings highlight significant immunization gaps and underscore the need for targeted community-based interventions to improve MCV coverage in vulnerable populations.

Keywords: Measles, Vaccine Hesitancy, MMR Vaccine, Knowledge, Attitudes, Practices, Caregivers, Slum

INTRODUCTION

Ever since Edward Jenner discovered the vaccine against smallpox in 1796, the world has triumphantly looked towards immunization to prevent and eradicate some of the most troublesome diseases known to man.[1] According to WHO, there are 31 vaccine-preventable diseases, and approximately 2.5 million deaths are averted due to vaccines every year, mostly in developing countries.[2] Hence, it is incredibly important to ensure proper access to vaccines for all eligible children following the National Immunization Schedule for a developing country like India. Of all the vaccine-preventable diseases, Measles is a highly contagious airborne disease caused by the Measles Morbillivirus. Worldwide, it affects about 10 million people annually, causing about 100,000 - 200,000 deaths.[3] One of the main concerns about the disease is how contagious it is; some studies place the R0 in the range of 12-18.[4] After an incubation period of about 7-18 days, symptoms appear in 3 stages-prodromal, eruptive, and convalescent.[5]

Symptoms in the prodromal phase include fever, cough, coryza, and conjunctivitis. There is also the presence of small white spots called Koplik spots inside the buccal mucosa, which are pathognomonic of the disease. The eruptive phase is characterized by the appearance of a maculopapular rash over the face, which eventually

spreads to the rest of the body.[5] The Measles vaccine was developed in 1963 and subsequently combined with the vaccines against Mumps and Rubella in 1971 to produce the MMR vaccine, as the world has come to know it.[6] From the years 2000-2018, the Measles vaccination prevented an estimated 23.2 million deaths, mostly in developing countries, proving how important it is for such nations to vaccinate their population against measles.[7] It needs to be noted that missed immunization is reported as the most important factor behind outbreaks of Measles across the globe.[8,9] However, the full coverage of Measles immunization faces roadblocks in the form of a delay or even abstinence, owing to reasons ranging from "fear of side effects" to "belief in natural immunity."[10]

As India continues to recover from the COVID-19 pandemic, the country has led the highest number of Global Measles Outbreaks. A total of 32,069 suspected and confirmed measles cases were reported to the World Health Organization from the latter half of 2022, with 10,416 cases erupting within only one month (November-December 2022). The state of Maharashtra contributed to the highest number of cases, with Mumbai emerging as the focus point of the epidemic.[11,12] As per survey reports, the overall vaccination coverage for the two doses of the Measles-Rubella vaccine in Mumbai has dropped from 82% to 41% as compared to last year.[13] This is in part owing to the population density and partly due to poor coverage of immunization in slums.[14] Therefore, in the backdrop of the current Measles outbreak, it becomes imperative for researchers to assess the vaccination status of children and to study the factors responsible for missed Measles immunization, and a focused vaccination plan, strong community engagement, active advocacy, and a reliable surveillance system are needed to control the outbreaks.

METHODS

After a field visit to the Baiganwadi Health Post, Govandi, to estimate the contribution presented by a lack of immunization towards a recent Measles outbreak, there was a perceived need to assess the attitudes of caregivers towards immunization. The first step of the project was taken by ascertaining the study design. The study is a cross-sectional, qualitative study, which included children aged 9 months to 18 years who reported with symptoms suggestive of Measles within a set time period of 2 months (09 November 2022 to 09 January 2023) at the Baiganwadi Health Post, Govandi, Mumbai, Maharashtra, India.

Participants outside the age bracket and those not consenting were excluded. A formal request was sent to the Executive Health Officer, Head Office, MCGM to access the data of children reporting with Fever and Rash from 09 November 2022 to 09 January 2023. The Medical Officer of Baiganwadi Health Post was contacted and informed about the same to ensure a smooth and direct collaboration.

Once the respective permissions were granted, data collection was started. With the help of the Medical Officer at the Baiganwadi Health Post, data on the number of children reporting with Fever and Rash from 09 November 2022 to 09 January2023, along with their Parent's/Guardian's contact number was obtained. This data was then compiled and arranged at random into an Excel Sheet called the "Roster". Simultaneously, a questionnaire containing a total of 8 items on demographic details and 22 questions, which was divided into 4 sections, was drafted and content validated by 10 expert faculty members across different departments from the institution.

This questionnaire was then translated into Hindi & Marathi, two of the most commonly spoken languages in Mumbai. Further, to conduct a Face Validity of the questionnaire, 10 candidates were chosen from the Roster in serial order. The caregiver of the child was designated as the respondent for the survey. After explaining the study and taking their verbal consent, the survey questions were asked in a language comfortable to the respondent.

This served as the pilot study, which provided insight regarding the time taken per call and the ease of understanding the language of the questionnaire. The questionnaire was then finalized as per the inputs and translated accordingly. A target sample size was calculated with p=0.83 and q=0.17 considering a similar study in 2012, with l=0.08 and using a formula n=4pq/l2 it was found to be n=88. The target sample size was rounded off to 100, accounting for no response and incorrect data. Following the chalking-out of objectives, questionnaire validation and pilot study, permission was sought from the Institutional Ethics Committee, LTMGH, which was granted after due scrutiny.

The study was then started by contacting the caregiver of the child over a telephone call using the data obtained from the Baiganwadi Health Post. The caregiver was explained in plain language the purpose of the study and was asked for their due verbal consent. For respondents who answered the calls and provided their consent, the survey was performed over telephone and their answers were recorded on a Google Form. Respondents who did not answer the call were contacted for 2 to 3 more days at maximum. Respondents who denied consent were not contacted any further. The data collected from the survey was collated on the Google Form database, which was converted into an Excel Sheet. This data was further Graphically depicted.

RESULTS

The sample selected had 100 caregivers responding on behalf of their respective child. The demo graphic data of the children comprised 54 females and 46 males (Figure 1), from varying age groups between 9 to 60 months, with a median age of 24 months (Figure 2). The respondent or

the caregiver was asked questions around their socioeconomic status, which revealed 78% children belonging to upper lower class as per modified Kuppuswamy Scale-2024 (Figure 3). All respondents were residents of a cluster in Govandi, Mumbai for at least 1 year and reported their child for fever with rash to the Baiganwadi Health Post, Govandi, Mumbai.

Of the 100 caregivers surveyed, 77% reported that their child had a cough, 44% reported a runny nose, and 14% reported red or watery eyes when questioned about symptoms other than fever and rash. Some others reported more information: 1% reported only fever, rash, or heavy perspiration, whereas 5% reported only fever plus rash (Figure 4). Parents were also polled regarding the health problems of their children while suffering from measles. 82% respondents claimed their child had no significant problems. However, 1% reported seizures, 4% respondents reported diarrhoea, 3% stated ear infections, and 12% indicated respiratory issues. No one reported loss of consciousness or behavioural changes.

On asking, 99 of the 100 respondents said that they were aware about the disease called "Measles", although colloquial names (like Chhoti Maata, Govar) were more commonly used. When asked about the symptoms of Measles according to them, only 3 respondents said that they were unsure and the others mentioned the various symptoms of Measles in different combinations. 10% caregivers were able to list all 5 symptoms (fever, rash, red/watery eyes, runny nose, cough). Among the 5 classic symptoms of measles most respondents were able to mention fever (97%), rash (92%), cough (75%) whereas only 42% parents picked runny nose and 13% of parents mentioned red/watery eyes (Figure 5). The caregivers were also probed on their knowledge of complications post-Measles, where it was found that 52% respondents were unaware or unsure about the complications (Figure 6). Apart from this, 99% caregivers said that they were aware about the Measles outbreak back then and were also aware of the Measles vaccination campaign in response to the outbreak. When asked about the sources of their knowledge on these topics, the caregivers named Healthcare professionals, ASHA workers, CHVs, Community, and social media in varying proportions (Figure 7).

From the data collected, it was revealed that 50% of the children were completely unvaccinated against measles at the time of reporting, while the parents of 18% were unsure of their vaccination status. Only 26% children had received their age-appropriate vaccines, where 7% had received both doses, and 19% had received just one dose. Thus, 6% children who were eligible for their second MMR dose had not received their due shot (Figure 8). These numbers showed a marked deficit in the vaccine coverage. Out of the 93% of respondents who either did not have their children vaccinated, had partially vaccinated or were unsure of the vaccination status; 84% eventually got their child the appropriate dose by the time of survey, but 9% did not.

Out of the 74% of respondents who either did not have their children vaccinated, or were unsure of the vaccination status; the most common reason reported was that they were not aware of the vaccine dosage - cited by 39% respondents, while 10% said that they were unaware about the vaccine immunisation schedule completely; this resulted in a total of 49% parents displaying a lack of knowledge and awareness as their main reason behind lack of vaccine compliance (Figure 9). 27% respondents said the child was suffering from a concurrent illness at the time of vaccination, whereas 17% respondents acknowledged their fear of side effects as the one of their reasons to defer the vaccination. Loss of documents or immunization cards was reported by 9% parents, and 9% mentioned traveling or migration, while the COVID-19 pandemic lockdown was implicated by 10% parents for the lapse in vaccinating their child. Thus, 28% parents cited certain logistical barriers to immunization.

Belief in alternative medicine and rumours about the vaccination were also cited by 3% and 4% parents, respectively. Only 1% of parents said they are entirely against vaccinations.

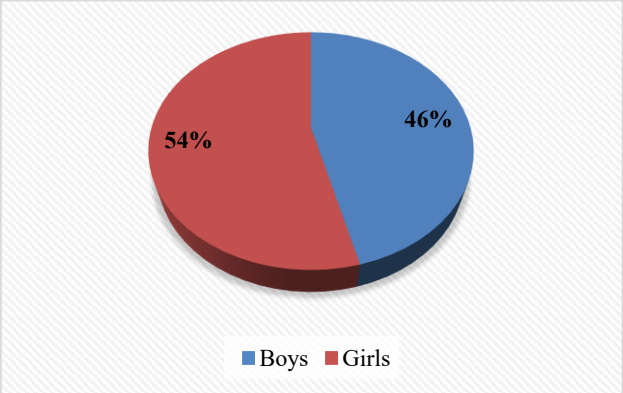

Figure 1: Gender demographics of the children.

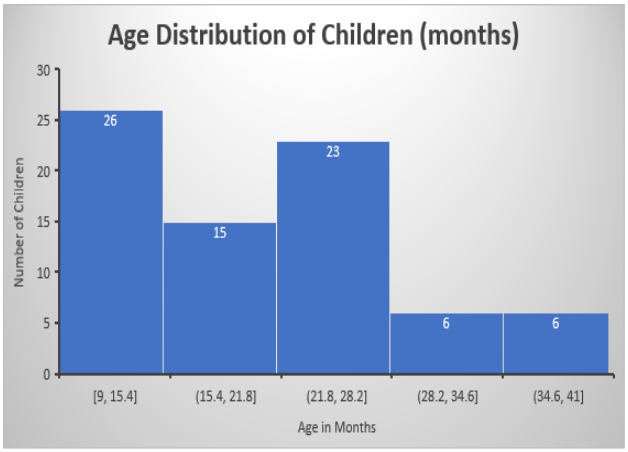

Figure 2: Histogram depicting age of the children.

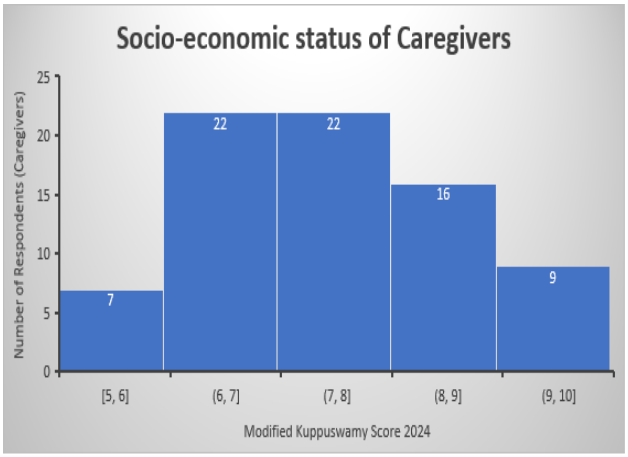

Figure 3: Histogram depicting Modified Kuppuswamy Score 2024 for caregivers of children

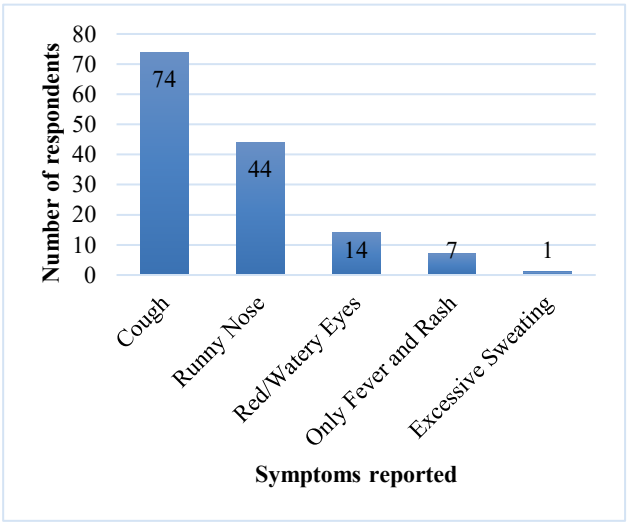

Figure 4: Vertical bar chart depicting symptoms, other than fever and rash, reported by the caregiver on presenting to the health post.

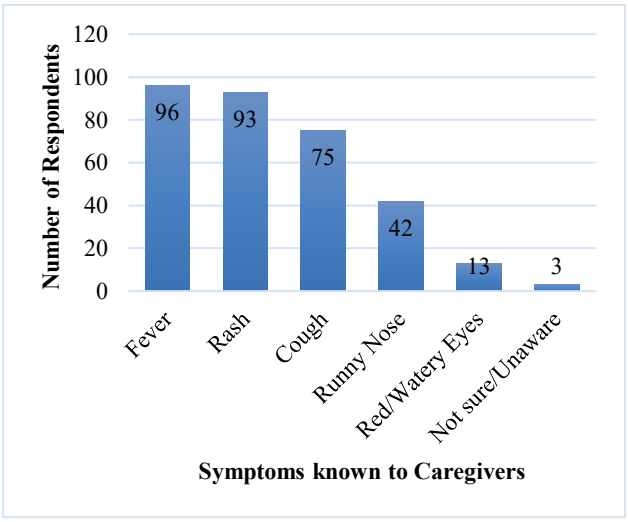

Figure 5: Vertical bar chart depicting knowledge of measles symptoms as per caregivers.

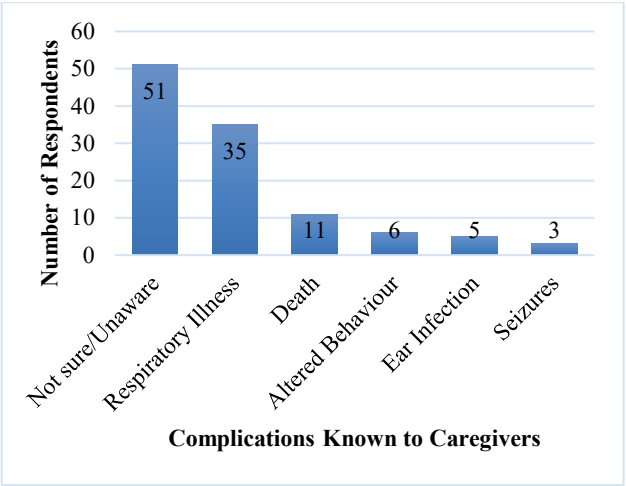

Figure 6: Vertical Bar Chart depicting knowledge of post-Measles complications as per caregivers.

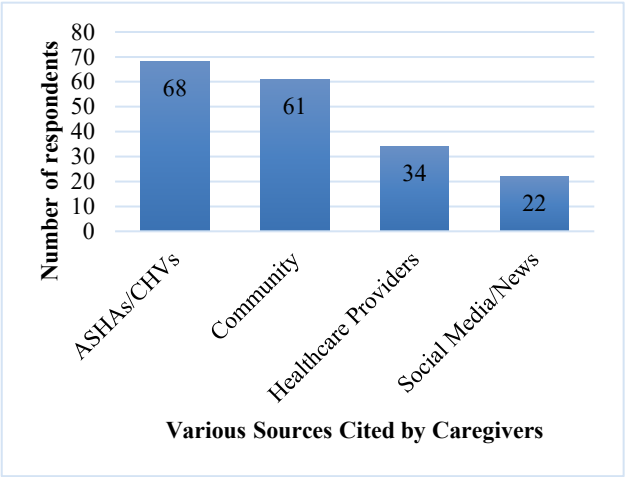

Figure 7: Vertical bar chart depicting sources cited by the respondents, for information on the measles outbreak and immunization campaign.

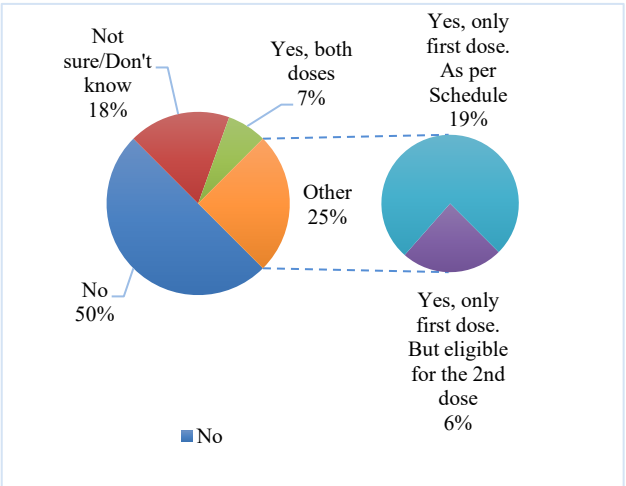

Figure 8: Pie chart depicting the child's vaccination status against measles while reporting to the concerned health post for fever and rash.

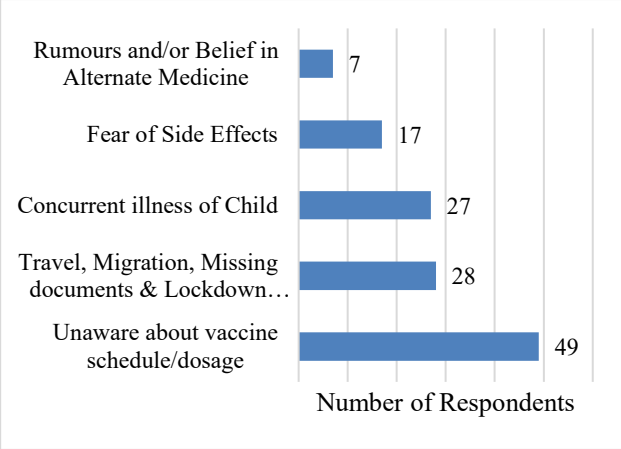

Figure 9: Horizontal bar chart depicting reasons cited by caregivers for missing the due dose of MCV for their child.

DISCUSSION

This study explored what caregivers in Govandi, Mumbai knew, felt, and did regarding measles and its vaccination during a recent outbreak of Measles. Most parents (99%) were aware of measles-often using local names like Chhoti Maata or Govar-and could recognize some symptoms. However, only a few (10%) could identify all the classic signs, and over half (52%) were unsure about the complications measles can cause. This suggests that while general awareness exists, a detailed understanding is still lacking.

Despite most (99%) of respondents knowing about the outbreak and the vaccination campaign, vaccine coverage among children was very low. As per Plans-Rubio et al the vaccination rates must be 96-99% in order to preserve herd immunity.[15] But when the parents were asked if the child was vaccinated against Measles at the time of reporting to the Baiganwadi Health Post, only around a quarter of the children (26%) had received age-appropriate MCV dose as per the National Immunization Schedule, while half (50%) of them had not received any dose. A significant number (18%) of parents also weren't sure of their child's vaccination status. The low vaccination rates seen in Mumbai in 2022 are similar to that of a 2012 cluster survey done in Jharkhand done by Scobie et al.[16] A recent study on the same outbreak by Yadav RM, Gomare et al suggests that the Vaccine Effectiveness being only 64% (95% CI: 23-73%, p value <0.01) could also have contributed to the recent outbreak.[18]

The main reasons behind missing their child's due vaccine included confusion about vaccine schedules (49%), the child being sick at the time (27%) and fear of side effects (17%). This indicates a lack of thorough understanding about the timing, adverse effects and contraindications of the Measles Containing Vaccines (MCV) which could be mitigated by public health education. Travel, migration, restrictions due to COVID-19 lockdown and missing documents were collectively cited by more than 1 in 4 parents (28%), implying room for logistical improvement by immunization campaigns. Incorporating the use of the UIDAI/Aadhar number to register parents in a national-level immunization database and to send them electronic reminders and schedule virtual consultation could solve the aforementioned logistical barriers to vaccine compliance. Of these, sending electronic reminders has been proven to improve compliance significantly as per the roadmap to eliminate Measles, the Government of India issued a press release in 2022 outlining their plan to eliminate Measles by 2023.[17,20] At present, the coverage rate for 2 doses of MCV stands at 92% as per the HMIS data and the Government of India has taken an initiative to eliminate measles and rubella by 2026.[19]

CONCLUSION

Out of the 100 caregivers who agreed to answer the questionnaire, most (99%) were aware about the Measles outbreak and the immunization campaign in response to it. Most parents (68%) credited this knowledge to ASHA workers & Community Health Visitors, an indication that the system's grassroot level approach is reaping benefits. That being said, there was still a significant gap in knowledge regarding symptomatology and complications of Measles. Over half of the respondents (52%) did not know a single post-Measles complication, which is reflective about the lack of depth regarding crucial public health education. When they reported at Baiganwadi Healthpost, only 26% children were vaccinated as per schedule, remaining 74% had not received their due dose of MCV.

However, we also noticed in the database, that after the meeting with a healthcare provider at this healthpost the age-appropriate vaccination rate went from 26% to 91%. This may imply that there is a positive conversion effect at the interface between healthcare providers and beneficiaries, which needs to be studied with a narrow focus.

Among the 74% who were behind the schedule, the most popular reasons were lack of awareness about the immunization schedule or dose (49%) and concurrent illness of the child (27%). 28% parents responded in either "Travel" or "Missing Documents" or "COVID-19 Lockdown", in various combinations, highlighting the logistical hurdles in immunization.

Given these findings, there is a scope for bridging the knowledge gap by increased recruitment of ASHA workers & CHVs, who have been the spine of public health education at the ground level. Improved quality of information regarding Measles symptomatology, complications, its vaccine indications and contraindications may help in reducing misinformation, thereby increasing adherence. In addition to this, creating

a robust centralised Aadhar/UIDAI based SMS alert system for upcoming or missed vaccination, similar to the model used during COVID-19 pandemic, could potentially help in increasing the 2-dose MCV vaccination rates.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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