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Did this pandemic trigger a spike in mothers’ hesitancy over their children’s routine immunizations? -A cross sectional study

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**ABSTRACT**

**Background:** The COVID-19 pandemic has created a lot of disruptions for delivery of health care services like routine immunization. Delayed immunization can lead to outbreak of many vaccine preventable diseases. The current pandemic created confusions and fear among mothers to vaccinate their children. This study was an initiative to understand the struggles faced by them during the pandemic.

**Objective:** To estimate the prevalence of hesitancy for routine immunization among urban mothers during COVID-19 pandemic and to determine the factors responsible for their hesitancy.

**Methodology:** It was a community based cross-sectional study which was done for three months, data were collected from 246 mothers (sample size calculated by assuming 20% as prevalence based on pilot study) having children whose age was less than 6 years by administering a pre-tested semi structured questionnaire.

**Result:** It was found that 38% of mothers were having vaccine hesitancy during the pandemic mainly due to the factors like fear of exposure to COVID-19 and due to lockdown. Out of 6 variables 5 variables (except religion) was found to be statistically significant. On the multivariate analysis only prior to pandemic hesitancy retained statistical significance.

**Conclusion:** From our study we infer that the pandemic has increased hesitancy among mothers, hampering routine immunization. Thus, this domain deserves more consideration by health care officials and policy makers, to prevent disruption of the immunization programme.

1. Introduction

The world has been engulfed with COVID-19 since its first reporting in December 2019 in Wuhan city, China,1 giving a long pause for all the routine activities globally. The first case in India was reported on January 30, 2020 in Kerala. Nationwide lockdown began in march 2020.2 The World Health Organization (WHO) declared COVID-19 as pandemic on march 11 2020,3 making the health care sector shift their focus towards COVID-19 management and its prevention. It led to a halt to several programmes and activities. One of the most important programmes affected was the routine immunization.2

Vaccination is one of the key elements in public health care and an undeniable right of every child. Vaccines are not only critical for preventing infectious diseases and controlling their outbreak but also play a vital tool in the battle against antimicrobial resistance.4 The Government of India under the Ministry of health and Family Welfare (MohFW) launched Mission Indra Dhanush (MI) on December 25, 2014 as a special initiative to vaccinate all unvaccinated and partially vaccinated children. The programme protects against infectious diseases like diphtheria, whooping cough, tetanus, polio, tuberculosis, measles and hepatitis B in entire country and in addition vaccinate against H.influenza type b and Japanese encephalitis in selected states and districts. While the first two phases of MI resulted in a 6.7% increase in full immunization coverage in a year, a recent survey carried out in 190 districts covered in the 5th phase of MI/Intensified Mission Indra Dhanush (IMI) shows 18.5% points increase in full immunization coverage as compared to NFHS-4 survey carried out in 2015-16.5 As of now a total of six phases of Mission Indra Dhanush (MI) have been completed covering 554 districts. Nearly 33.9 million children are vaccinated every year across the country through IMI.6 India has been declared “Polio free” in 2014.4 Despite these achievements there is hesitancy prevailing among mothers to vaccinate their children.8

WHO defines Vaccine Hesitancy as delay in acceptance or refusal of vaccines despite availability of vaccine services. It is influenced by

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Delayed immunization leads to outbreak of many Vaccine Preventable Diseases (VPD). One such example is the outbreak of Measles during the Ebola epidemic in African countries (2014–2015). Further if the number of children missing vaccination is increased it has high chance of bringing herd immunity below the threshold.

The COVID-19 pandemic caused hampering of routine immunization which has made the population vulnerable for VPD outbreaks and thus jeopardizing the past coveted achievements of the vaccination programmes. This study was a small initiative to understand the confusions, fears and struggles faced by mothers to vaccinate their children during the COVID-19 pandemic.

2. Methodology

It was a community based cross-sectional study done in urban field practice area under the department of community medicine, JSS medical college, Mysuru, for 3 months to estimate the prevalence of hesitancy for routine immunization among urban mothers during COVID-19 pandemic and to find out the factors responsible for their hesitancy. Women above 18 years who were having children <6 years of age were included in the study.

Assuming percentage of vaccine hesitancy among mothers as 20% (Pilot study done with 20 participants), with absolute precision of 5% and confidence interval of 95% sample size of 246 mothers were interviewed using pre-tested semi structured questionnaire by means of both offline forms and online Google forms. We took the help of ASHA worker’s database to find the mothers with children under 6 years of age. Written consent obtained for offline forms and digital consent for online forms. The questionnaire included details regarding sociodemographic profile of mothers, vaccine status of her children and reasons for vaccine hesitancy.

3. Analysis

The data collected was entered in MS Excel and statistical analysis was done using SPSS version 23 (licensed to JSSAHER). The data were represented using Arithmetic mean, Standard deviation, Percentages, bar diagrams. Prevalence for vaccine hesitancy was calculated in percentage. Chi square test was applied to find out the association. Multivariate logistic regression was also performed to predict the association of various factors with vaccine hesitancy during COVID-19 pandemic.

4. Results

A total of 246 mothers were studied where in 72% (178) mothers were in the age group of 20–30 years, 19% (48) were in the age group of 31–40 years. Of all the mothers 29% belonged to upper class 29% belonged to upper-lower class [according to modified Kuppuswamy scale of socioeconomic classification (SEC)] and none of them belonged to lower class. Majority of mothers had professional/post graduate degree (27.2%), few were graduates (21%) and few completed secondary education (20%). Majority were homemakers (72.8%), whereas few were professionals (19.5%). Regarding type of family most of the study participants were living in a joint family (54.9%) whereas few preferred nuclear families (43.1%). Majority of the mothers were Hindus (43.1%) and 35% were Muslims, 4.5% were Christians.

Most of the mothers had single child (51.2%) and 34.6% mothers had 2 children. For vaccinating their children 44% mothers preferred Primary Health Care (PHC), 13.8% preferred Anganwadi and 28.9% preferred private clinics/institutions (Table 1).

Around 5.3% of our study mothers had hesitated for vaccination even before the pandemic and surprisingly the hesitancy has risen to 38% during the COVID-19 pandemic (Fig. 1).

The main concern among mothers was fear of exposure to COVID-19 (40%), Few were worried about the safety measures followed at vaccination centre (23.7%), handful of them (17.2%) complained that their paediatrician had closed the clinic or the hospitals for routine immunization due to ongoing pandemic (Fig. 2).

The hesitancy for routine vaccination prior and during pandemic was found to be rose from 5.3% to 38% and it was found to be statistically significant (p = 0.003). We also found that socioeconomic status (SES)

| Table 1 Sociodemographic profile. |
|-----------------------------------|
| FREQUENCY | PERCENT(%) |
| AGE       |           |
| <20YEARS  | 19        | 7.7       |
| 21-30YEARS| 178       | 72.3      |
| 31-40YEARS| 48        | 19.5      |
| >41YEARS  | 1         | 0.4       |
| RELIGION  |           |
| HINDU     | 147       | 59.3      |
| MUSLIM    | 86        | 35        |
| CHRISTIAN | 11        | 4.5       |
| OTHERS    | 2         | 0.8       |
| EDUCATION OF MOTHERS               |
| ILLITERATE | 10        | 4.1       |
| PRIMARY   | 35        | 14.2      |
| MIDDLE    | 49        | 19.9      |
| HIGH/PRE UNIVERSITY  | 23        | 9.3       |
| INTERMEDIATE/DIPLOMA | 10       | 4.1       |
| GRADUATE  | 52        | 21.1      |
| PROFESSIONAL/POST GRADUATE | 67 | 27.2 |
| OCCUPATION OF MOTHER               |
| HOMEWORKERS | 179       | 72.8      |
| UNSKILLED | 5         | 2         |
| SEMISKILLED | 3        | 1.2       |
| SKILLED   | 3         | 1.2       |
| CLERICAL/SHOP/FARM | 5 | 2 |
| SEMI PROFESSIONAL | 3 | 1.2 |
| PROFESSIONAL | 48 | 19.5 |
| TYPE OF FAMILY                     |
| NUCLEAR    | 106       | 43.1      |
| JOINT      | 135       | 54.9      |
| EXTENDED   | 5         | 2         |
| NO.OF CHILDREN |           |           |
| <=2        | 211       | 85.8      |
| >2         | 35        | 14.2      |
| SOCIOECONOMIC STATUS               |
| UPPER      | 72        | 29.3      |
| UPPER MIDDLE | 46      | 18.7      |
| LOWER MIDDLE | 56      | 22.8      |
| UPPER LOWER | 72      | 29.3      |
| PLACE OF VACCINATION               |
| ANGANWADI | 34        | 13.8      |
| PHC       | 110       | 44.7      |
| UHC       | 23        | 9.3       |
| GH        | 8         | 3.3       |
| PRIVATE   | 71        | 28.9      |

Fig. 1. Vaccine hesitancy among mothers before & during COVID 19 Pandemic.
and vaccine hesitancy has a association with \( p = 0.045 \), thus SES plays a significant role in vaccine hesitancy.

Five out of 6 variables (except religion) found to be statistically significant. All variables were entered into a multiple logistic regression analysis, the results of which are shown in Table 2.

In the univariate analysis the people having educational level diploma/intermediate had a hesitancy towards the vaccine 1.545 (95% CI 0.40–5.97) times than that of professional, under occupation professional found to be hesitant than others, under socioeconomic status of modified Kuppuswamy classification people of class I SES were hesitant 2.684 times (95% CI 1.325–5.439) than class 4, people belonging to extended family had more hesitancy than others, people who were hesitant towards vaccination prior to COVID pandemic had 6.024 times (95% CI 1.613–22.501) hesitancy than those who were not hesitant prior to COVID pandemic and socioeconomic class & prior to pandemic hesitancy found to be statistically significant.

In the multivariate analysis the people having educational level diploma/intermediate had a hesitancy towards the vaccine 2.291 (95% CI 0.464–11.311) times than that of professional, under occupation housewives found to be 1.133 (CI 95% 0.240–5.350) hesitant than professionals, under socioeconomic status of modified Kuppuswamy classification people of class 3 SES were hesitant 1.786 (95% CI 0.702–4.545) times than class 4, people belonging to extended family had more hesitancy than others, people who were hesitant towards vaccination prior to COVID pandemic had 5.277 (95% CI 1.325–21.023) times hesitancy than those who were not hesitant prior to COVID pandemic. On the multivariate analysis only prior to pandemic hesitancy retained statistical significance.

### 5. Discussion

Vaccination is a key element in public health. WHO declared vaccine hesitancy as one of the top 10 global threat to public health.\(^{11}\) Identifying and overcoming the reasons for Vaccine hesitancy is one of the most important challenge faced by immunization officers and program managers. A study conducted in Quebec by eve dube et al. in 2014–2015 using PACV (Parents Attitude about Childhood Vaccine) scale showed 15% mothers had high vaccine hesitancy score, the main reason stated was that they were concerned about the serious adverse effects of vaccination.\(^{12}\) Similar reason was stated by mothers in a study conducted by Abraham L wagner in Chandigarh in 2017–2018 which showed 10% of mothers had vaccine hesitancy.\(^{13}\) But in contrast a study conducted by Rekha thappar et al. in Mangalore in 2017 showed very low vaccine hesitancy proportion(3.5%), the low vaccine hesitancy was believed to be due to high literacy rate and wide vaccine coverage in that area.\(^{14}\) WHO and UNICEF (United Nations Children’s Fund) warned regarding decline of vaccination during COVID-19 pandemic. A survey conducted in June 2020 among 82 countries reported a disruption in immunization services due to COVID-19 with 14 countries less than 80% vaccination count.\(^{15}\) According to Ministry of Health and Family wel fare there is about 19.4% drop in HPV vaccination and 31% drop-in vaccination session held in health facilities and outreach areas from April to June 2020 as compared to the same period last year as per health management information system.\(^{16}\) This study showed that there is a significant increase in hesitancy by mothers to vaccinate their child due to COVID-19 pandemic. Likewise, a study done by Vasavada H et al. in tertiary health centre showed that there is significant reduction in

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**Table 2: Factors for Vaccine Hesitancy**

| Factor | Percentage |
|--------|------------|
| Not felt the need to vaccinate during COVID | 11.8 |
| Not aware of the risk | 6.5 |
| Felt that postponing the vaccination is not a serious | 20.8 |
| Fear of exposure | 40 |
| Fear of poor safety measure in the vaccination... | 23.7 |
| Scared of getting COVID from syringes/vaccines | 9.7 |
| Suggested by doctors/health care workers due to... | 13 |
| Heard of negative news from media | 2.1 |
| Not aware of centers | 8.6 |
| Improper communication from health care worker/ | 7.5 |
| Unable to meet health care worker as they are... | 7.5 |
| Discouragement from others | 10.8 |
| Financial issues | 3.2 |
| Lack of transport facility | 10.8 |
| Unable to return to hometown | 4.3 |
| Was returned back from centre due to non... | 9.7 |
| My pediatrician had closed the clinic/hospital is... | 17.2 |
| Baby was sick | 14 |
| No data available | 6.5 |
| Not aware of the vaccine | 8.6 |

**Fig. 2. Factors responsible for vaccine hesitancy.**

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\(^{11}\) WHO and UNICEF (United Nations Children’s Fund) warned regarding decline of vaccination during COVID-19 pandemic. A survey conducted in June 2020 among 82 countries reported a disruption in immunization services due to COVID-19 with 14 countries less than 80% vaccination count.\(^{15}\) According to Ministry of Health and Family wel fare there is about 19.4% drop in HPV vaccination and 31% drop-in vaccination session held in health facilities and outreach areas from April to June 2020 as compared to the same period last year as per health management information system.\(^{16}\) This study showed that there is a significant increase in hesitancy by mothers to vaccinate their child due to COVID-19 pandemic. Likewise, a study done by Vasavada H et al. in tertiary health centre showed that there is significant reduction in

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Though our study covered mothers of different age groups, sociodemographic status, family type, but we had limitations to only certain accessible areas, the outreach rural and tribal areas could not be covered where hesitancy might be still more in number. Their attitude towards immunization is still not known.

The vaccine hesitancy may lead to outbreaks of epidemics of VPD during pandemics. Currently, sporadic outbreaks of measles have been reported in Cambodia, Nepal, Pakistan, Bangladesh, Iraq, and Nigeria; cholera has been reported in Cameroon, Yemen, and Bangladesh; and diphtheria has been reported in Pakistan, Bangladesh, and Nepal.

MohFW in its 2020 COVID-19 outbreak guidance has stated that, “First and foremost, step is to address the fear and uncertainty of mothers regarding vaccinating their children. The myths and misconceptions about routine immunization prevailing in the society should be resolved.”

Telecommunication like mass media/social media should come forward to help in creating awareness on the importance of vaccination despite pandemic and also regarding the risk of VPD outbreaks. Easy access should be made available for the people to contact the health care workers/officials through telephonic communication or any other modes to resolve their queries and proper guidance. Helplines regarding the vaccine centres should be updated to the people and also the safety measures adopted in those centres should be well informed.

Mass vaccination campaign should be temporarily stopped. To prevent overcrowding in centres and the number of centres should be expanded or should be conducted in shifts. Adherence to infection prevention and control should be properly ensured at every level. As people are solely depend on their health care workers for immunization services, all the health care workers should be resumed to their respective duties. Mobile and outreach session for immunization should be conducted by trained health care workers under proper safety and strict precautionary measures. List of children who missed their vaccination during this pandemic should be identified and vaccinated.

**Table 2**

| VARIABLES                      | CRUDE OR(95% CI) | P-value | ADJUSTED OR (95%) | P-value |
|--------------------------------|-----------------|---------|------------------|---------|
| EDUCATION PROFESSIONAL/POST GRADUATE GRADUATE | 1.00(Reference) |         |                  |         |
|                              | 0.644 (0.309-1.344) | 0.241 | 0.668 (0.239-1.866) | 0.442 |
| INTERMEDIATE/ DIPLOMA HIGH/PRE UNIVERSITY MIDDLE | 1.545 (0.400-5.978) | 0.528 | 2.291 (0.464-11.311) | 0.309 |
|                              | 0.662 (0.252-1.738) | 0.403 | 0.667 (0.177-2.658) | 0.586 |
|                              | 0.232 | 0.001 | 0.286 | 0.06 |
| PRIMARY                         | 0.609 | 0.245 | 1.037 | 0.96 |
|                              | 0.264-1.405 |         | 0.250-2.928 |         |
| ILLITERATE                      | 0.442 | 0.264 | 0.749 | 0.756 |
|                              | 0.105-1.854 |         | 0.121-4.636 |         |
| OCCUPATION PROFESSIONAL HOUSEWIVES | 1.00(Reference) |         |                  |         |
|                              | 0.465 | 0.018 | 1.133 | 0.874 |
|                              | 0.247-0.875 |         | 0.240-5.530 |         |
| OTHER WORKERS                   | 0.962 | 0.945 | 0.636 | 0.402 |
|                              | 0.313-2.957 |         | 0.220-1.834 |         |
| SOCIO ECONOMIC STATUS           |                  |         |                  |         |
| CLASS 4                         | 1.00(Reference) |         |                  |         |
|                              | 2.062 | 0.062 | 1.786 | 0.224 |
|                              | 0.964-4.415 |         | 0.702-4.55 |         |
| CLASS 2                         | 2.000 | 0.09 | 1.477 | 0.504 |
|                              | 0.899-4.452 |         | 0.471-4.631 |         |
| CLASS 1                         | 2.684 | 0.006 | 1.213 | 0.768 |
|                              | 1.325-5.439 |         | 0.337-4.364 |         |
| TYPE OF FAMILY                  |                  |         |                  |         |
| EXTENDED JOINT                  | 1.00(Reference) |         |                  |         |
|                              | 0.533 | 0.155 | 0.580 | 0.576 |
|                              | 0.08-3.295 |         | 0.86-3.897 |         |
| NUCLEAR                         | 0.263 | 0.499 | 0.261 | 0.172 |
|                              | 0.042-1.654 |         | 0.038-1.791 |         |
| HESITATED TO VACCINE BEFORE COVID | 6.024 | 0.008 | 5.277 | 0.018 |
|                              | 1.613-22.501 |         | 1.325-21.023 |         |

OR ODDS RATIO.

CI CONFIDENCE INTERVAL.

AOR ADJUSTED ODDS RATIO.

6. Conclusion

From our study we infer that the pandemic has increased hesitancy among mothers, hampering routine immunization for their children. Steps should be taken to address the myths and misconception prevailing in the community regarding immunization. It is essential to gain people’s confidence in immunization and health care system to prevent outbreak of any vaccine preventable diseases. Thus, this domain deserves more consideration by health care officials and policy makers, to prevent disruption of the immunization programme and also for future prevention of situation in case if such scenarios arise.

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Recommendations

First and foremost, step is to address the fear and uncertainty of mothers regarding vaccinating their children. The myths and misconception about routine immunization prevailing in the society should be resolved.

Telecommunication like mass media/social media should come forward to help in creating awareness on the importance of vaccination despite pandemic and also regarding the risk of VPD outbreaks. Easy access should be made available for the people to contact the health care workers/officials through telephonic communication or any other modes to resolve their queries and for proper guidance. Helplines regarding the vaccine centres should be updated to the people and also the safety measures adopted in those centres should be well informed.

Mass vaccination campaign should be temporarily stopped. To prevent overcrowding in centres and the number of centres should be expanded or should be conducted in shifts. Adherence to infection prevention and control should be properly ensured at every level. As people are solely depend on their health care workers for immunization services, all the health care workers should be resumed to their respective duties. Mobile and outreach session for immunization should be conducted by trained health care workers under proper safety and strict precautionary measures. List of children who missed their vaccination during this pandemic should be identified and vaccinated.

CRediT authorship contribution statement

Shwethashree M: Conceptualization, Methodology, Formal analysis, Investigation, Supervision, Writing – original draft, Writing – review & editing. Vanmathi A: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing. Saurish: Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing. Amoghashree: Conceptualization, Methodology, Investigation, Supervision, Writing – original draft, Writing – review & editing. M.R. Narayanamurthy: Conceptualization, Methodology, Writing – review & editing, Supervision. Arun Gopi: Conceptualization, Methodology, Formal analysis, Writing – review & editing.

Declaration of competing interest

None.

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