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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

Back ground: 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 2014.⁷ 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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various factors such as complacency, convenience and confidence.⁸ Delayed immunization leads to outbreak of many Vaccine Preventable Diseases (VPD). One such example is the outbreak of Measles during Ebola epidemic in African countries (2014–2015).² Further if the number of children missing vaccination is increased it has high chance of bringing herd immunity below the threshold.⁹

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 <6years 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 socio-demographic 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 Kuppaswamy scale of socioeconomic classification (SEC)]¹⁰ 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

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		
HOMEMAKERS	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

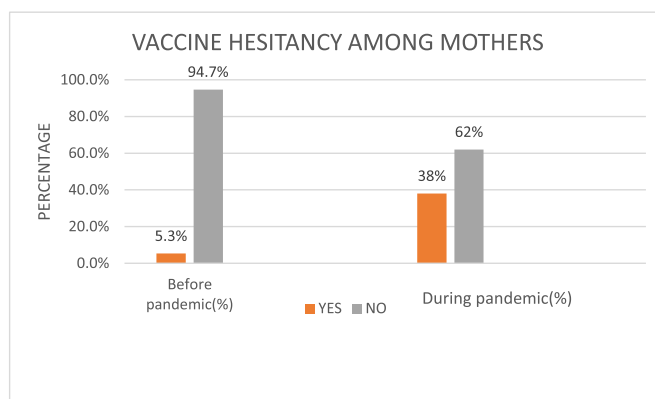


Fig. 1. Vaccine hesitancy among mothers before & during COVID 19 Pandemic.

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)

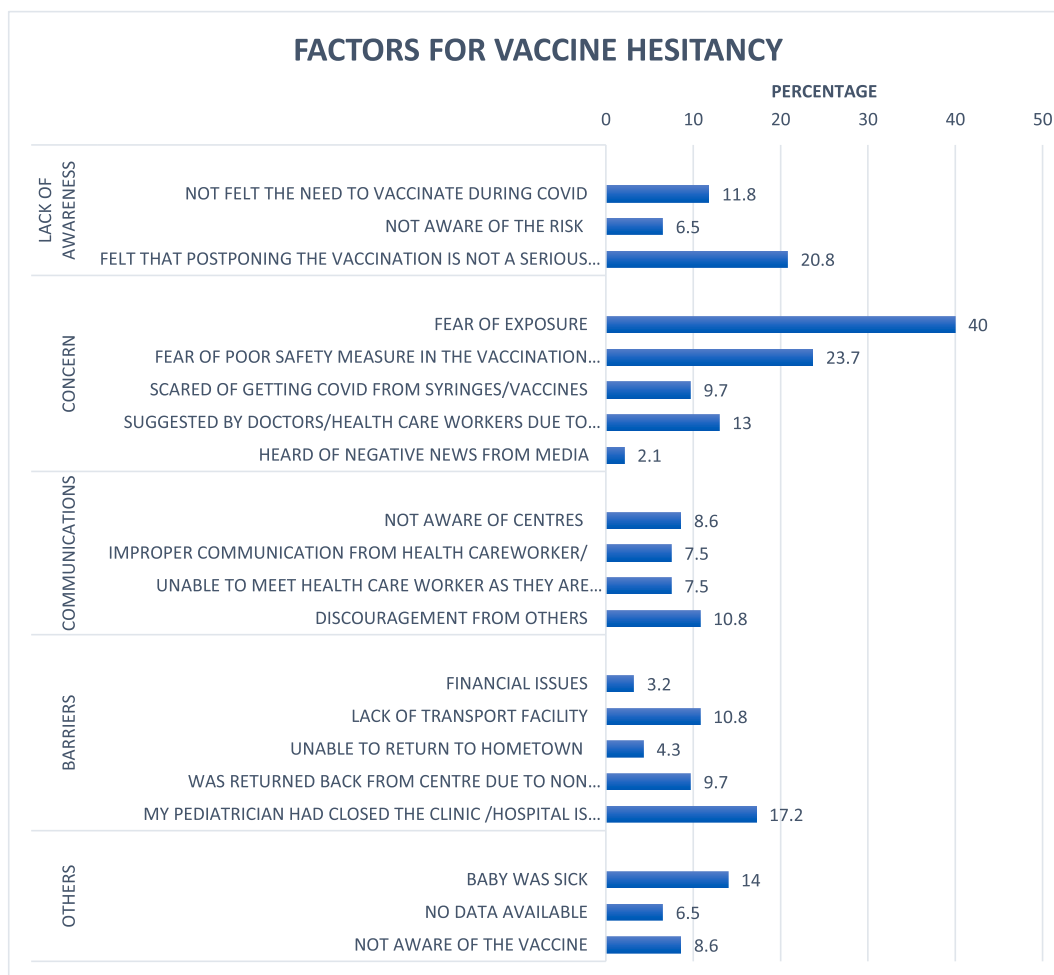


Fig. 2. Factors responsible for vaccine hesitancy.

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 Kuppaswamy 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 Kuppaswamy 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 welfare 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

Table 2

Univariate and Multivariate-adjusted odd's ratio with 95%ci of vaccine hesitancy due to covid-19 pandemic with other variables.

VARIABLES	CRUDE OR(95% CI)	P-value	ADJUSTED OR (95%)	P-value
EDUCATION				
PROFESSIONAL/POST GRADUATE	1.00(Reference)			
GRADUATE	0.644 (0.309–1.344)	0.241	0.668 (0.239–1.866)	0.442
INTERMEDIATE/DIPLOMA	1.545 (0.400–5.978)	0.528	2.291 (0.464–11.311)	0.309
HIGH/PRE UNIVERSITY	0.662 (0.252–1.738)	0.403	0.687 (0.177–2.658)	0.586
MIDDLE	0.232 (0.097–0.552)	0.001	0.286 (0.77–1.057)	0.06
PRIMARY	0.609 (0.264–1.405)	0.245	1.037 (0.250–4.298)	0.96
ILLITERATE	0.442 (0.105–1.854)	0.264	0.749 (0.121–4.636)	0.756
OCCUPATION				
PROFESSIONAL	1.00(Reference)			
HOUSEWIVES	0.465 (0.247–0.875)	0.018	1.133 (0.240–5.350)	0.874
OTHER WORKERS	0.962 (0.313–2.957)	0.945	0.636 (0.220–1.834)	0.402
SOCIO ECONOMIC STATUS				
CLASS 4	1.00(Reference)			
CLASS 3	2.062 (0.964–4.415)	0.062	1.786 (0.702–4.545)	0.224
CLASS 2	2.000 (0.899–4.452)	0.09	1.477 (0.471–4.631)	0.504
CLASS 1	2.684 (1.325–5.439)	0.006	1.213 (0.337–4.364)	0.768
TYPE OF FAMILY				
EXTENDED	1.00(Reference)			
JOINT	0.533 (0.086–3.295)	0.155	0.580 (0.86–3.897)	0.576
NUCLEAR	0.263 (0.042–1.654)	0.499	0.261 (0.038–1.791)	0.172
HESITATED TO VACCINE BEFORE COVID	6.024 (1.613–22.501)	0.008	5.277 (1.325–21.023)	0.018

OR ODDS RATIO.

CI CONFIDENCE INTERVAL.

AOR ADJUSTED ODDS RATIO.

attendance to immunization clinic during the lockdown period secondary to COVID-19 pandemic.¹⁷ 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.¹⁸

MohFW in its 2020 COVID-19 outbreak guidance has stated that, even when services are offered, people were unable to access them due fear of exposure to COVID-19, lack of safety measures in immunization centres, travel restriction and unavailability of health care workers as they were redeployed to COVID-19 response duties,¹⁹ the mothers in our study stated similar reasons for their hesitancy along with other factors like lack of awareness regarding centres for routine immunization, discouragement from people around them, rumours circulating in social medias and many more. The social media have a greater influence on people especially during these lockdown period as people started growing more dependent on it for updates, entertainment etc. Just like coin has two face social media can direct people both positively as well as negatively. Thus, it can be used as a great tool when used cautiously to create awareness regarding routine immunization and encourage the

people for vaccination.²⁰

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 persisting 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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