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Original Research Article

Perception and preference of caregivers towards routine immunization amidst COVID-19

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ABSTRACT

Background: Immunization rates for routine vaccines show a drop during the COVID-19 pandemic. To assess the perception and preferences of caregivers towards routine immunization services amidst COVID-19.
Methods: A cross-sectional study was conducted in southern Chennai and adjoining districts of Chengalpattu and Kanchipuram, Tamil Nadu. The duration of the study was from January to June 2021. Parents of under-five children residing in the community for the last 3 years were selected as the study population. Using a simple random technique, 431 participants were selected. A pilot study was conducted with 50 participants to check for the comprehension and validity of the questionnaire and subsequent changes have been done. The co Guide version V.1.0.3 was used for statistical analysis.
Results: The majority 236 (54.76%) of the study population were residents of the urban locality. Two hundred (46.40%) participants were women attending antenatal clinics. A majority (395, 91.65%) felt their child needs all recommended vaccines according to national immunization schedule. If vaccines were missed, the major reason was (168, 38.98%) lockdown.
Conclusions: The present study population was well aware of routine immunization. Imposition of lockdown caused a disturbance in scheduled vaccinations and there was hesitancy of caregivers for COVID-19 vaccine to their children.

Keywords: COVID-19, Routine Immunization, Lockdown, Vaccination

INTRODUCTION

Routine immunization is the cornerstone of a country's ability to give access to life-saving vaccines and control and eradicate vaccine-preventable diseases (VPDs). It is the process of regularly vaccinating people with vaccinations considered necessary for a particular country to reduce morbidity and mortality. This procedure is facilitated by a country's health system and maintained by a collection of management subsystems required to continuously deliver the complete complement of planned vaccinations, monitor their safety, control population coverage, and assess their epidemiological impact.[1-4] VPDs are still responsible for roughly one-fourth of all fatalities in children under five. As a result, VPDs create a severe economic and social catastrophe for individuals, families, and entire communities.[5,6]

Vaccine hesitancy refers to delay in accepting or refusing immunization even though vaccination services readily available. Awareness about immunization is considered a complicated process which is context, time, location and type of vaccine dependent. Complacency, convenience, and confidence are all variables that impact it.[7]

COVID-19 is a once-in-a-lifetime occurrence that has forced nearly four billion people into seclusion, social

distance, and strict adherence to public health precautions, including regular handwashing and indoor face-covering. People worldwide have been stranded at home for months, incurring substantial financial, social, and emotional expenses in the process. In the aftermath of an unseen, ubiquitous, and potent epidemic, they've been feeling worried, irritated, fearful, and ambivalent.[8]

Individual immunity has a critical impact on the prevention and severity of illness. A return of measles cases might occur if the immunization campaign is interrupted. This comeback may lead to the use of potent immunosuppressive drugs, which can lead to an increase in the incidence of COVID-19 and a rise in the number of severe cases, and, ultimately, a higher death rate.

Furthermore, suppressing immune function can lead to a rise in various illnesses, putting a strain on the healthcare system, which is already overburdened due to a lack of resources.[9] The nationwide lockdown in India, which began on March 24, 2020, may have halted the spread of the SARS-CoV-2 virus and prevented COVID-19-related deaths. However, the lockdown imposed significant limits on travel and was linked to interruptions in healthcare service delivery and health-seeking behaviors.[10,11]

The COVID-19 pandemic is a major cause for postponing immunizations in low- and middle-income countries.[12,13]According to Manjunath et al study, in India, 50% of 12-24-month-old children are completely vaccinated, 31.3% are partially immunized, and 18.7% are not inoculated at all. Initial vaccination rates are high, but OPV3/DPT3 (62.7%) and measles (51.8%) immunizations are low, indicating that the vaccination schedule must be completed.[14] According to a poll, in the first survey 424 (33.4%) and in the second survey 141 (7.8%) who belonged to 26 of 36 Indian states and union territories, respectively, reported full stoppage of immunization services. It was observed that 83.1 percent thought vaccination services had reduced by half in April-June 2020, followed by 32.6 percent in September 2020, indicating a sluggish services return.[15] There has been a disturbance in routine immunization services due to COVID-19. Hence, this study assessed caregivers' perceptions and preferences toward routine immunization services amidst COVID-19.

METHODS

This was a hospital-based cross-sectional study conducted in southern Chennai and adjoining districts of Chengalpattu and Kanchipuram, Tamil Nadu. These are the field practice areas of Chettinad hospital and research institute, Chennai. The duration of the study was from January to June 2021. Four hundred thirty-one parents of under-five children were selected as the study population. The inclusion criteria was the parents who had under 5 children and residing in the community for the last 3 years. Those who were not available even after three visits and recent migrants to the study area were excluded. The block office obtained a line listing of all the males and females with children under 5 years of age. Using a simple random technique, the participants were selected. In case both the males and females belong to the same family, only the males were interviewed (as earlier investigations have shown the males to be the decision-makers). This process was continued till the desired sample size was achieved. The participants were contacted over the phone or via personal visit, and the questionnaire was administered. The study was approved by the institutional ethical research committee, and written informed consent was obtained from participants before their enrolment in the study (IHEC number:105/IHEC/August 2020).

Sample size calculation

To obtain a maximum sample size, the anticipated population proportion, i.e., the number of persons who had adequate knowledge regarding vaccination, was assumed to be 50%. To estimate the prevalence within 5 percentage points of actual value with 95% confidence, the sample size was calculated to be 385. Considering an attrition rate of 10%, the sample size was 428.

Sample size was calculated using formula $n=z^2p(1-p)/l^2$-

p=anticipated population proportion-50%, d=absolute precision (45-55%)-5 percentage points.

A pilot study was conducted with 50 participants to check for the comprehension and validity of the questionnaire in assessing the knowledge and perception of the participants. The questionnaire was modified as per the feedback of the participants involved in the pilot study. The details of the study participants, like socio-demographic details, were followed by administering the questionnaire.

Statistical methods

Descriptive statistics were applied- mean, 95% confidence interval (CI; lower and upper boundaries), median, minimum and maximum, and percentage were used to represent the data when applicable. The coGuide version V.1.0.3 was used for statistical analysis.[16]

RESULTS

A total of 431 participants were included in the study. The mean age (in years) of the study children was 1.71±1.13 and ranged from 0.03 to 7.73, 233 (54.06%) were male and 198 (45.94%) were female. A majority (236, 54.76%) were living in the urban area. There were 372 (86.31%) fathers as graduates whereas there were only 316 (73.32%) graduated mothers. The gross family gross monthly income ranges from Rs. 20 thousand to Rs. 50 thousand. The majority 253 (58.70%) earn Rs. 50000 per month (Table 1).

Table 1: Baseline characteristics of the study population, (n=431).

Parameters		N (%)
Age (Years)		1.71±1.13 (range 0.03 to 7.73)
Gender	Male	233 (54.06)
	Female	198 (45.94)
Residence	Urban	236 (54.76)
	Rural	25 (5.80)
	Semi-urban	170 (39.44)
Education of father	Illiterate	5 (1.16)
	Up to high school	54 (12.53)
	Graduate	372 (86.31)
Education of mother	Illiterate	9 (2.09)
	High school	106 (24.59)
	Graduate	316 (73.32)
Gross monthly income of the family	<5000	8 (1.86)
	5000 to 10000	14 (3.25)
	10000 to 20000	77 (17.87)
	20000 to 50000	253 (58.70)
	>50000	79 (18.33)

The most trusted source of information was from the Antenatal clinic 200 (46.40%), family and friends 184 (42.69%). The majority opined that a routine vaccine schedule is to be initiated at birth in 340 (78.89%) babies, at 45 days in 75 (17.40%) babies and 6 (1.39%) babies were at 2 months.

The majority 340 (78.89%) expressed that routine vaccines should be initiated at birth, followed by at 45 days 75 (17.4%) and at 2 months 6 (1.39%).

Two-thirds of 155 (35.96%) reported there will be protection due to vaccination for a child's entire life. 395 (91.65%) were non-hesitant to taking all recommended vaccines according to the national immunization schedule and 387 (89.79%) continue to feel those vaccines are necessary after the COVID-19 scenario. The 233 (54.06%) felt that all national immunization schedule vaccines should be continued in the current COVID scenario. The 275 (63.81%) felt that their children need optional vaccinations other than national immunization schedule vaccines. Among the study population, 173 (40.14%) participants have felt those optional vaccines are unnecessary before the pandemic where 277 (64.3%) participants felt those optional vaccines were necessary after the pandemic. The 209 (75.45%) expressed that optional vaccines would make the child immune, 46 (16.61%) believe that it will prevent the spread of disease and 22 (7.94%) agreed with doctor advice.

Reasons expressed for not opting for optional vaccines were-would make child weaker 74 (18.97%), cause unnecessary infection 56 (14.36%), cause further spread of disease 34 (8.72%).

Among the study participants, 191 (48.97%) thought that there is across protection from other vaccines in addition to natural infection conferring protection and 296 (68.68%) believed that vaccinating one child protects other children. The 137 (31.79%) participants believed that the same holds good for COVID-19 vaccines (Table 2).

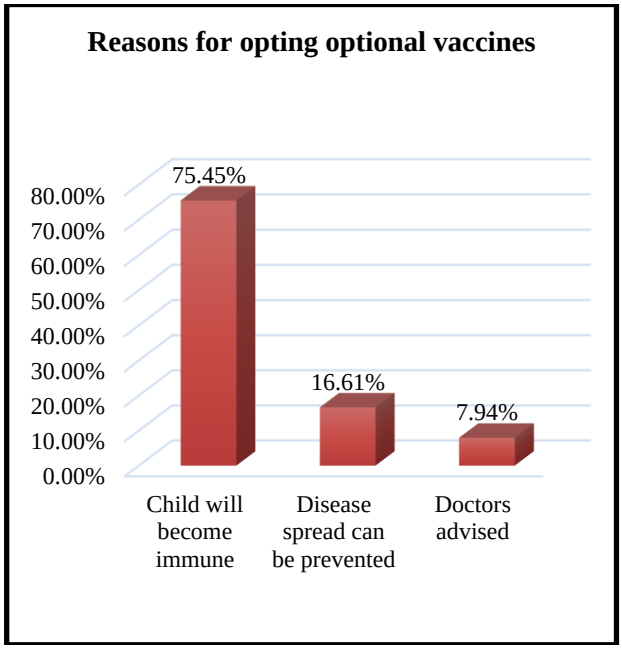

Figure 1: Optional vaccines, (n=431).

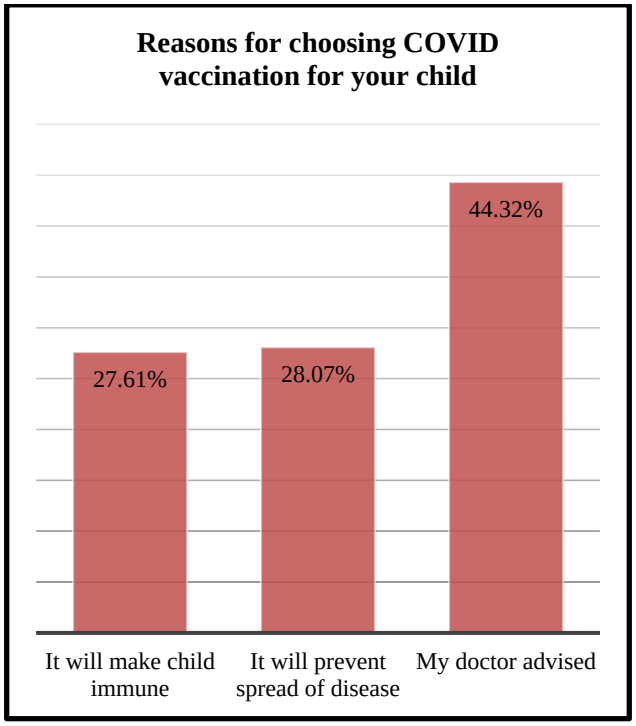

Figure 2: Reasons for choosing COVID-19 vaccine for their children, (n=431). Cluster bar chart of COVID vaccine becomes available, will you provide the child with the same, (n=431).

Table 2: Knowledge and perceptions about routine immunization practices, (n=431).

Parameters		Summary (%)
Most trusted source of information about vaccination	Friends and family	184 (42.69)
	Antenatal clinic	200 (46.40)
	Hospital where baby delivered	5 (1.16)
	Mass media	42 (9.74)
Knowledge of the right age for initiation of the routine vaccination schedule	At birth	340 (78.89)
	45 days of life	75 (17.40)
	2 months	6 (1.39)
	Don't know	10 (2.32)
Perception on national immunization schedule (NIS)	Does protection due to vaccination stay for a child's entire life	155 (35.96)
	Does your child need all recommended vaccines according to NIS	395 (91.65)
	Should all NIS vaccines be continued in the current COVID scenario	233 (54.06)
	Do you feel those vaccines as per NIS are necessary after COVID-19	387 (89.79)
	Does your child need optional vaccinations other than national immunization schedule vaccines	275 (63.81)
	Perception about the need for optional-Before the pandemic vaccines	173 (40.14)
	Perception about the need for optional -Post pandemic vaccines	277 (64.31)
Reason for choosing the optional vaccines post-pandemic, (n=277)	The child will become immune	209 (75.45)
	Disease spread can be prevented	46 (16.61)
	Doctors advised	22 (7.94)
Reason for not choosing the optional vaccines post-pandemic, (n=154)	A child will become weak	74 (18.97)
	sub-clinical infection may occur	56 (14.36)
	The spread of disease may raise	35 (8.97)
	Other flu vaccines will protect	34 (8.72)
It's better than the child develops a natural infection and develops immunity		191 (48.97)
Perception about vaccinating your child indirectly protect other children from that disease		296 (68.68)
Is the same apply to the COVID vaccine?		137 (31.79)

Table 3: Summary of COVID and optional vaccine-related parameter, (n=431).

Parameters		Summary (%)
Perception about missing vaccinations		
Reason for missing vaccination	Don't feel necessary	147 (34.11)
	Lockdown	168 (38.98)
	Afraid of exposure in hospital	106 (24.59)
Willingness to get missed vaccination again	I prefer to get during the pandemic	24 (5.57)
	After the pandemic	143 (33.18)
	As per government advice	146 (33.87)
	As per the paediatrician's advice	118 (27.38)
	Get the vaccine as soon as possible	165 (38.28)
	Restart the entire schedule	188 (43.62)
Perception of COVID-19 vaccination		
Does COVID alter the protection given by vaccines?		228 (52.90)
Would you vaccinate when child has COVID?		147 (34.11)
Are you worried about vaccination affecting your child's immune status?		216 (50.12)
If yes, do you think they will be more prone to COVID?		226 (52.44)
Are you eagerly waiting for COVID vaccine?		182 (42.23)
When COVID vaccine becomes available, will you provide the child with the same?		148 (34.34)
Reasons for choosing COVID vaccination for your child	It will make the child immune	119 (27.61)
	It will prevent the spread of disease	121 (28.07)
	My doctor advised	191 (44.32)
Reasons for poor acceptance of COVID vaccination among other parents	It will make the child weak	192 (44.55)
	It will create sub-clinical infection	67 (15.55)
	Other flu vaccines will protect	72 (16.71)
	It is better than the child develops a natural infection and develop immunity	70 (16.24)

Continued.

Parameters		Summary (%)
Optional vaccination referred	*Pneumococcal* vaccine	248 (57.54)
	Influenza vaccine	217 (50.35)
	Chicken Pox vaccine	101 (23.43)
	Typhoid vaccine	160 (37.122)
	Hepatitis vaccine	47 (10.90)
Constraints in preferring optional vaccination	Cost factor	248 (57.54)
	Feel too much number of vaccines injected into your child	277 (64.27)
	My child is already immune	124 (28.77)

Among study participants, 228 (52.90%) felt that COVID alter the protection given by vaccines. Lockdown was the main reason for 168 (38.98%) of the participants to miss the vaccine in children and 146 (33.87%) said they will get missed vaccines as per government advice. When they were asked what will they do when there is a delay in getting a vaccine due to COVID, 188 (43.62%) said that government should restart the vaccine schedule, while 147 (34.11%) said they will vaccinate their child during COVID. Among the study participants, 182 (42.23%) were eagerly waiting for the COVID vaccine. Opinion was asked about when COVID Vaccine becomes available and will they provide the child with the same, 192 (44.55%) felt that it will make the child weak. Among the study population, 248 (57.54%) preferred the *Pneumococcal* vaccine, 217 (50.35%) favouring the influenza vaccine, and 101 (23.43%) were chicken boxes, 160 (37.122%) were typhoid vaccine, 47 (10.90%) were hepatitis vaccine. Cost factors felt too much number of vaccines injected into their child and the child is already immune. They are considering the constraints to the optional vaccines (Table 3).

DISCUSSION

The current study showed that the majority of the caregivers belonged to urban residency and were graduates. Similar results were observed in the study conducted by Ahmed Abd-el Rahman et al, where they found that 70.1% of the mothers were from urban and nearly one-third of them had higher education.[17]Our results also show that most study subjects agreed that their child needed all recommended vaccines according to the national immunization schedule. This was similar to a study conducted by Mapatano et al as they found that 98% of the Mothers had positive attitudes toward immunization.[18] The overall Knowledge attitude and practice was good among most of the parents (87.2%) in a study by Habib et al.[19] Similarly, in a study conducted in Bangladesh, most participants (90.1%) thought that immunizing their children was very essential and did not delay or plan to delay any vaccine.[20]

The present study results reflected that the majority of the caregivers believed that the antenatal clinics were the most trusted source of information about immunization and thought that the initiation of the immunization schedule should start right from birth. The study conducted by Adeyinka et al found that 65.7% of the respondents got information about VPDs from antenatal clinics.[21] Similar to our study results common source of information was the antenatal clinic (46.8%) in the study by Adefolalu et al.[22]

While considering the COVID and the pandemic scenario, most of our study participants believed that routine immunization should be done and not delayed, and all the vaccines were necessary. Our findings matched those of a study conducted in the Kingdom of Saudi Arabia (KSA), in which roughly 60% of respondents assumed that routine childhood immunizations played no role in the spread of COVID-19 infection, and 59% believed that even with the COVID-19 pandemic, routine childhood vaccines must be administered on time.[23]Another study reported poor knowledge of vaccinations among the adolescent population.[24]

Overall, 73.2% of parents had continued their child's vaccination during the COVID-19 pandemic, according to research by Alsuhaibani et al. Furthermore, nearly half of the parents (47.8%) said their child's vaccine was delayed by more than two weeks.[25]According to available statistics, regular vaccination services were impacted in the majority of nations. An early signal of pandemic effect was in regular vaccine ordering by national or regional agencies, where vaccine orders fell early in the pandemic compared to 2019 trends, with significantly reduced orders recorded in the US and Europe in the mid-March to mid-April 2020 period.[12,26]

Almost half of the caregivers in the present study felt that COVID could alter the protection given by routine immunization vaccines. Also, most of them missed the vaccine due to the imposition of lockdown across the country. Similar findings were discovered in a research done in Pakistan's Sindh region, which indicated a 52.5% decrease in the daily average total number of vaccines delivered under lockdown when compared to the baseline.[27]

Due to COVID-19-related delays in regular vaccination, an estimated eighty million infant children are at risk of contracting these illnesses.[28]

According to a study by Masresha et al thirteen of the fifteen nations had a drop in the monthly average number of vaccination doses administered, with six countries experiencing a drop of more than 10%.[29]

Another study from Pakistan found that between May 10, 2020, and June 6, 2020, the average number of daily vaccination visits dropped by 272% (from 5184 to 3772 visits).[30]

Interestingly, our study results revealed there was not much difference in the study population who believed they would like to get missed vaccinations after a pandemic and those who said they would follow government advice. More than one-third (34%) of them cancelled the vaccinations scheduled because they were worried about the SARS-CoV-2 virus (44%) or because vaccination centres postponed the appointment (42%) or because the centre was closed to the public, according to research by Russo et al (13%).[31] Their findings were in agreement with our study.

In the present study, it was observed that the current study population was not in favour of providing vaccination for COVID to their children as many of them were of the thought process that it would make their child weaker. Teasdale et al found that 61.9% of parents plan to vaccinate their youngest kid for COVID-19, 14.8% do not plan to vaccinate their child, and 23.3 percent are undecided these were contrast findings as per our study.[32]

While understanding the perception towards the optional vaccines, we found that most of the study participants were aware of the optional vaccines and believed that optional vaccines are necessary after a pandemic to prevent the child from the disease. *Pneumococcal* vaccine was a choice of preference by many. The major constraint for optional vaccines was the thought that too many vaccines were injected into the children, and others were the cost factor. These results did not match with the study by Ambike et al where they found that overall awareness and knowledge about the optional vaccines was low, i.e., in only 32.5% of the total respondents and economic-related, travel constraints to the hospital were present in 5% of the total respondents.[33]Also, Only 18.3% (95% CI, 14.76-22.46) of the participants were aware that newer vaccines had been introduced into the program in a study by] Mukherjee et al.[34] A study conducted in Gurgaon presented that the awareness levels for hepatitis A and Chickenpox was at 100% of the respondents surveyed. In contrast, the awareness dropped to 64.3 % for rotavirus and 60.8% for *Pneumococcal meningitis*.[35]

The non-representativeness of our sample, due to the small sample size, is one of the study's limitations. This may restrict the generalizability of our findings to a larger population, as well as assertions concerning their directionality. We believe that comparable study should be carried out with bigger sample size.

CONCLUSION

The caregivers were aware of routine immunization and its benefits. Caregivers' type of residential area, education, and antenatal visits played a significant role in learning about the vaccines in the immunization schedule and optional vaccines. Results also highlight the fact that a significant belief is that COVID-19 will affect the immunity provided by routine immunization vaccines. The imposition of lockdown affected the scheduled vaccinations, and hesitancy towards the COVID vaccine was observed. There is a need for tailored interventions to promote routine immunization even during pandemic conditions.

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

REFERENCES

1. Steinglass R. Routine immunization: An essential but wobbly platform. Glob Heal Sci Pract. 2013;1(3):295-301.
2. Chan M. Beyond expectations: 40 years of EPI. Lancet (London, England). 2014;383(9930):1697-8.
3. Mansour Z, Arab J, Said R, Rady A, Hamadeh R, Gerbaka B et al. Impact of COVID-19 pandemic on the utilization of routine immunization services in Lebanon. PLoS One. 2021;16(2):e0246951.
4. MacDonald N, Mohsni E, Al-Mazrou Y, Kim Andrus J, Arora N, Elden S et al. Global vaccine action plan lessons learned I: Recommendations for the next decade. Vaccine. 2020;38(33):5364-71.
5. Sharma S, Kohli C, Sharma N, Mehra D. Incomplete Immunization Coverage in Delhi: Reasons and Solutions. Prim Heal Care Open Access. 2016;6(4):1-3.
6. Kindie YM. Factors Associated With Incomplete Childhood Vaccination among Children 12-23 Months of Age in Machakel Woreda, East Gojjam Zone: A Case Control Study. J Pregnancy Child Heal. 2015;2(4):180.
7. MacDonald NE, Eskola J, Liang X, Chaudhuri M, Dube E, Gellin B et al. Vaccine hesitancy: Definition, scope and determinants. Vaccine. 2015;33(34):4161-4.
8. Rashid T, McGrath RE. Strengths-based actions to enhance wellbeing in the time of COVID-19. Int J Wellbeing. 2020;10(4):113-32.
9. Ghatak N, Marzo RR, Saleem SM, Sharma N, Bhattacharya S, Singh A. Impact on Routine Immunization Services During the Lockdown Period in India: Implications and Future Recommendations. Ann Trop Med Public Heal. 2020;23(19):35-40.
10. Lancet T. COVID-19 in India: the dangers of false optimism. Lancet. 2020;396(10255):867.
11. Laxminarayan R, Jameel S, Sarkar S. India's Battle against COVID-19: Progress and Challenges. Am J Trop Med Hyg. 2020;103(4):1343-7.
12. Santoli JM, Lindley MC, DeSilva MB, Kharbanda EO, Daley MF, Galloway L et al. Effects of the COVID-19 Pandemic on Routine Pediatric Vaccine

Ordering and Administration-United States, 2020. MMWR Morb Mortal Wkly Rep. 2020;69(19):591-3.
13. Nelson R. COVID-19 disrupts vaccine delivery. Lancet Infect Dis. 2020;20(5):546.
14. Manjunath U, Pareek RP. Maternal knowledge and perceptions about the routine immunization programme-A study in a semiurban area in rajasthan. Indian J Med Sci. 2003;57(4):158-63.
15. Shet A, Dhaliwal B, Banerjee P, Carr K, DeLuca A, Britto C et al. COVID-19-related disruptions to routine vaccination services in India: a survey of pediatric providers. BMJ Paediatr open. 2021;5(1):e001060.
16. IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.
17. Ahmed SM, Abd-El Rahman TA, Masoed ES. Mothers' awareness and knowledge of under five years children regarding immunization in Minia city Egypt. Life Sci J. 2013;10(4):1224-32.
18. Mapatano M, Kayembe K, Piripiri L, Nyandwe K. Immunisation-related knowledge, attitudes and practices of mothers in Kinshasa, Democratic Republic of the Congo. South African Fam Pract. 2008;50(2):61.
19. Habib RF, Alsubhi RA, Saadawi DW. Assessment of Knowledge, Attitude and Practice of Parents towards Immunization of Children in Saudi Arabia, 2018. Egypt J Hosp Med. 2018;71(2):2585-9.
20. Herath NC, Kudagammana T, Sanathchandra TT, Gamage HK, Razik IM, Liynapathirana V. Brief report: Parental attitudes and knowledge on routine childhood immunization: an experience from Central Sri Lanka. BMC Res Notes. 2018;11(1):402.
21. Adeyinka DA, Adedayo D, Mbbs A, Mbbs OO, Esther F, Rn A et al. Uptake Of Childhood Immunization Among Mothers Of Under-Five In Southwestern Nigeria. Internet J Epidemiol. 2012;7(2):1-5.
22. Adefolalu OA, Kanma-Okafor OJ, Balogun MR. Maternal knowledge, attitude and compliance regarding immunization of under five children in Primary Health Care centres in Ikorodu Local Government Area, Lagos State. J Clin Sci. 2019;16(1):7.
23. Alzaher OA, Almutairi GA, AlModhayan SM, Khojah AA, Almutairi GA. Public Attitudes Toward Pediatric Routine Immunization During the COVID-19 Pandemic in Saudi Society. Cureus. 2021;13(9):e17899.
24. Raja TK, Buvnesh Kumar M, Sasithra S, Divyaparvathy J. COVID-19 and Adolescents of Chengalpattu District: A Cross-sectional Study. COVID-19 Other Communicable Dis. 2022;56-61
25. Alsuhaibani M, Alaqeel A. Impact of the COVID-19 Pandemic on Routine Childhood Immunization in Saudi Arabia. Vaccines. 2020;8(4):581.
26. Billon-Denis E, Tournier J-N. COVID-19 and vaccination: a global disruption. Med Sci (Paris). 2020;36(11):1034-7.
27. Chandir S, Siddiqi DA, Mehmood M, Setayesh H, Siddique M, Mirza A et al. Impact of COVID-19 pandemic response on uptake of routine immunizations in Sindh, Pakistan: An analysis of provincial electronic immunization registry data. Vaccine. 2020;38(45):7146-55.
28. WHO. At least 80 million children under one are at risk of diseases such as diphtheria, measles and polio as COVID-19 disrupts routine vaccination efforts, warn Gavi, WHO and UNICEF. World Health Organization. Published 2020. Available at: https://www.who.int/news/item/22-05-2020-at-least-80-million-children-under-one-at-risk-of-diseases-such-as-diphtheria-measles-and-polio-as-COVID-19-disrupts-routine-vaccination-efforts-warn-gavi-who-and-unicef. Accessed on Dec, 21, 2021.
29. Masresha BG, Luce RJ, Shibeshi ME, Ntsama B, N'Diaye A, Chakauya J et al. The performance of routine immunization in selected African countries during the first six months of the COVID-19 pandemic. Pan Afr Med J. 2020;37(1):12.
30. Chandir S, Siddiqi DA, Setayesh H, Khan AJ. Impact of COVID-19 lockdown on routine immunisation in Karachi, Pakistan. Lancet Glob Heal. 2020;8(9):e1118-20.
31. Russo R, Bozzola E, Palma P, Corsello G, Villani A. Pediatric routine vaccinations in the COVID 19 lockdown period: the survey of the Italian Pediatric Society. Ital J Pediatr. 2021;47(1):72.
32. Teasdale CA, Borrell LN, Shen Y, Kimball S, Rinke ML, Fleary SA et al. Parental plans to vaccinate children for COVID-19 in New York city. Vaccine. 2021;39(36):5082-6.
33. Ambike D, Tambade V, Poker F, Ahmed K. Parental knowledge on the optional vaccines and the barriers in their use: A rural hospital-based study. Indian J Child Health. 2017;4(1):88-90.
34. Health Mukherjee P. Awareness and attitudes of mothers towards new vaccines in the childhood vaccination programme in delhi state: a cross sectional study Seroprevalence of H1N1 infection View project Hepatitis A and E scenario in India View project Awareness and attitudes of mothers towards new vaccines in the childhood vaccination programme in Delhi state: a cross sectional study. Int J Community Med Public Heal. 2017;4(10):3859-63.
35. Munshi VA, Makkad M. A study on factors determining penetration of optional pediatric vaccines in urban India. Indian J Public Heal Res Dev. 2015;6(1):213-9.

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