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Original Research Article

Vaccine hesitancy among mothers of under-five children: A community based cross-sectional study in migrant settlements of Ahmedabad

Sudhanshu Saurabh*, Hothal Vegad, Aparajita Shukla

Department of Community Medicine, Smt. NHL Municipal Medical College, Ahmedabad, Gujarat
*Correspondence: Dr. Sudhanshu Saurabh (rx.sudhanshu@gmail.com)

ABSTRACT

Background: Vaccine hesitancy remains a major barrier to achieving optimal childhood immunization coverage, particularly among underserved communities. This study assessed the prevalence of vaccine hesitancy and its predictors among mothers of under-five children residing in migrant settlements of Ahmedabad, Gujarat.

Material and methods: A community-based cross-sectional study was conducted from April 2025 to March 2026 among 361 mothers of under-five children in nine migrant settlements under Jodhpur Urban Primary Health Centre (UPHC), Ahmedabad. Participants were selected using probability proportional to size (PPS) allocation and snowball sampling. Data were collected through face-to-face interviews using the WHO–SAGE Vaccine Hesitancy Questionnaire and verification of immunization cards. Multivariable logistic regression was performed to identify independent predictors of vaccine hesitancy.

Results: The prevalence of vaccine hesitancy was found to be 38.2%. The highest vaccine-specific hesitancy was observed for Pentavalent vaccines (19.6%) followed by Hepatitis B birth dose (17.7%). Fear of side effects (34.9%) and child illness at the time of vaccination (25.3%) were the most common reasons for hesitancy. Significant predictors of vaccine hesitancy were found to be low socioeconomic status (AOR=4.102, p<0.001), maternal education ≤ primary level (AOR=2.511, p=0.001), migrant status (AOR=2.215, p=0.003), paternal education ≤ primary level (AOR=2.140, p=0.005), distance >10 km from a health facility (AOR=1.614, p=0.045), and nuclear family structure (AOR=1.543, p=0.049).

Conclusion: More than one-third of mothers exhibited vaccine hesitancy. Injectable vaccines were found to carry higher hesitancy among mothers of under 5 children. Socioeconomic disadvantage, low parental education, migration, poor accessibility to health facilities, and family structure significantly influenced hesitancy.

Keywords: Vaccine hesitancy, Vaccination, Migrant, Child, Preschool

INTRODUCTION

Vaccination, remains one of the most effective and cost-efficient public health interventions for preventing childhood morbidity and mortality. Despite substantial improvements in immunization coverage in India, vaccine-preventable diseases (VPDs) continue to disrupt health statistics, constantly contributing to under-five morbidity, especially among socioeconomically disadvantaged populations. Vaccine hesitancy is defined by the World Health Organization (WHO) as the delay in acceptance or refusal of vaccines despite availability of vaccination services. In recent years, it has emerged as a major public health challenge in achieving optimal immunization coverage and bringing substantial gains in child health outcomes.[1] Various studies in the past have highlighted concerns regarding vaccine safety, fear of adverse events, misinformation, and lack of trust in healthcare systems as a major contributor to vaccine hesitancy among underserved communities.[2,3,4] Universal Immunization Programme (UIP) in India, has played a significant role in expanding access to routine childhood vaccines; however, inequalities in vaccine uptake across marginalized and hard-to-reach populations continue to raise the burden of

VPDs. Migrant communities, particularly those residing in urban informal settlements, remain at higher risk of contracting diseases particularly due to incomplete or delayed immunization. This is mainly driven by frequent mobility, poor living conditions, low literacy, irregular access to healthcare services, and socioeconomic instability.[5] Previous studies conducted among disadvantaged communities in India have demonstrated lower vaccination coverage and multiple barriers affecting routine immunization practices.[6]

Mothers are the primary decision-makers regarding child healthcare and immunization in most of the Indian households; therefore, maternal perceptions and attitudes toward vaccines critically influence vaccination uptake among under-five children. Evidence from urban slum settings has shown that misconceptions regarding vaccine safety, fear of side effects, inadequate awareness, and social influences significantly contribute to vaccine hesitancy among caregivers.[7] Furthermore, rapid urbanization and migration in urban cities have resulted in the unplanned expansion of migrant settlements often characterized by overcrowding, inadequate sanitation, poor healthcare accessibility, and social vulnerability, all of which adversely affect vaccination-seeking behavior.

Although multiple studies in the past have explored immunization coverage and vaccine acceptance, evidence specifically addressing vaccine hesitancy among families residing in migrant settlements remains limited. Multiple outbreaks of VPDs in recent years have increased the need for estimating the prevalence of vaccine hesitancy and exploring its determinants particularly in urban informal settings. It is essential for developing targeted interventions aimed at improving vaccine confidence and strengthening routine immunization services.

Therefore, this study was conducted to a estimate the prevalence of vaccine hesitancy and identify its predictors among mothers of under-five children residing in migrant settlements of South Ahmedabad through a community-based cross-sectional study.

MATERIAL AND METHODS

Study design and settings

A community-based cross-sectional study was conducted in migrant settlements of Jodhpur Urban Primary Health Centre (UPHC) in south-west zone of Ahmedabad Municipal Corporation (AMC), Gujarat from April 2025 to March 2026.

Study participants and sampling

The sample size was calculated using the formula:

$N=4pq/L^2$

where p is the estimated prevalence of vaccine hesitancy (83%) as per previous study conducted in Siliguri[3] and L represent the allowable margin of error (5% of p) at 95% confidence interval. Sample size was calculated to be 328. Taking 10% non-response rate, final sample size was calculated to be 361.

All the migrant settlements in the study area (9 slums with migration) were covered to meet the sample size. Sample allocation across the nine identified migrant settlements was determined proportional to population size (PPS). Due to the lack of formal household registries in these informal settlements, participants within each slum were recruited utilizing a snowball sampling approach.

Inclusion Criteria

Mothers with at least one child ≤ five years of age residing in the study area for at least 3 months were included in the study.

Exclusion Criteria

Mothers who were not willing to give consent or had no immunization cards were excluded from the study.

Data collection tool

The data collection tool comprised of three sections: (1) sociodemographic profile of the parents and children; (2) SAGE working vaccine hesitancy survey questionnaire (close-ended questions);[8] (3) identification of predictors of vaccine hesitancy and reasons for vaccine hesitancy (open-ended question)

Demographic profile of the parents and children included child's age, child's gender, birth order, mother's age, type of family (nuclear or joint), parents' education, migration, socioeconomic status (BG prasad classification)[9] etc. Migrants were defined as those families/ households who were living in Ahmedabad away from their usual place of residence (UPR) outside Gujarat for a period of at least 3 months. Usual place of residence is the place where the person belongs (as per birth history / aadhar card) and stayed continuously for a period of 6 months or more before migrating

SAGE working vaccine hesitancy survey questionnaire comprised of 11 questions distributed under four sections: awareness, access, acceptance at the individual level, and acceptance at the community level.

Vaccine hesitancy was determined by interviewing mothers and checking immunization cards of children. For the purpose of study, vaccine hesitancy was considered to be present in those families who refused or were reluctant, or delayed any of the recommended vaccine doses, as per the age (0–60 months) of the child. Vaccine "delay" was operationally defined as any dose received beyond 24 hours for birth dose of Hepatitis-B. However, any doses received beyond 14 days of expected date were considered as "delay" for other vaccines.[10] Expected date for a particular dose of vaccine was calculated as per the child's date of birth as recorded in the immunization cards. "Vaccine refusal/reluctance" was defined as refusal of or reluctance to any dose of a vaccine, resulting in the

child not receiving the dose despite the availability of vaccination services. Vaccine hesitancy was considered absent, if the child, received all the recommended vaccines within stipulated time as operationally defined.

Reasons for vaccine hesitancy was ascertained by asking an open-ended question, "What were the possible reasons for your or your child's refusal/ vaccination delay?" The responses were recorded & grouped into discrete nonoverlapping categories for further analysis.

Data collection technique

Data was collected using face-to-face interviews with the mothers, using WHO–SAGE working group vaccine hesitancy questionnaire. The WHO-SAGE Vaccine Hesitancy Questionnaire is a previously developed and widely used instrument. The questionnaire was translated from English to Gujarati & Hindi with the help of professional translator and back-translated to ensure linguistic equivalence before using it in the local setting. It was followed by a pilot study conducted in migrant settlement of Jodhpur UPHC. In case of presence of more than one child of the required age group in the same household, the youngest child was included in the study purposively. All the responses were recorded using pen-and-paper method.

Ethical Considerations

Ethical approval was obtained from Institutional Review Board (IRB) (NHLIRB/2024/10/18th/No.-14). After securing necessary permissions from health departments of AMC, families were identified and explained about the purpose of the study. Informed consent was obtained followed by interview of the mothers. No incentives were provided to the participants.

Data analysis

Data was entered in Microsoft Excel and analysed through IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA).

Descriptive analyses were performed to summarize the sociodemographic characteristics, vaccination status and various reasons and determinants of vaccine hesitancy. Univariate logistic regression was employed to assess statistically significant associations. All variables with p-value <0.1 in the bivariate analyses were included in the multivariate logistic regression models. Additionally key variables such as mother's age, child's age, gender and birth order were included irrespective of statistical significance based on epidemiological relevance to identify the predictors of vaccine hesitancy. To examine the behavioural and perceptual drivers of vaccine hesitancy, only bivariate analysis was performed on individual WHO-SAGE constructs because several WHO-SAGE variables were conceptually linked to the outcome (vaccine hesitancy), making multivariable adjustment susceptible to overadjustment and multicollinearity.

RESULTS

Demographics

A total of 361 mothers were approached and all of them consented to participate in the study. In the current study, the majority of the respondents were aged less than 28 years (187, 51.8%), lived in nuclear family (212, 58.7%), had at least primary education (198, 54.8%) and had less than 4 antenatal visits (248, 68.7%). The mean age of the children studied was 23.8 months (SD = 12.4). Among all the under 5 children studied, most of them were male (188, 52.1%), had first birth order (228, 63.2%) and were non migrants (249, 69%). Majority of the families resided within 10 kilometres from the health facility (238, 65.9%). The sociodemographic profile of study participants is depicted in Table 1.

Table - 1: Sociodemographic characteristics of study participants. (N=361)

Variable	Category	Frequency, n (%)
Age of mother (years)	< 28	187 (51.8)
	≥ 28	174 (48.2)
Mean age = 28.04 ± 1.6 years		
Age of child (months)	≤ 24	238 (65.9)
	> 24	123 (34.1)
Mean age = 23.8 ± 12.4 months		
Gender of child	Male	188 (52.1)
	Female	173 (47.9)
Birth order	First birth	228 (63.2)
	Second or higher	133 (36.8)
Type of family	Nuclear	212 (58.7)
	Joint	149 (41.3)
Mother's education	≤ Primary	198 (54.8)
	> Primary	163 (45.2)
Father's education	≤ Primary	208 (57.6)
	> Primary	153 (42.4)
Socioeconomic status	Low SES (Class IV–V)	180 (49.9)
	High SES (Class I–III)	181 (50.1)

Antenatal visits	< 4 visits	248 (68.7)
	≥ 4 visits	113 (31.3)
Distance from health facility	≤ 10 km	238 (65.9)
	> 10 km	123 (34.1)
Migration status	Migrant	112 (31.0)
	Non-migrant	249 (69.0)

Vaccine hesitancy

The prevalence of vaccine hesitancy was found to be 38.2%, i.e 138 mothers out of all the participants were vaccine-hesitant (refusal/reluctance = 68; delay = 70). The study revealed that delay as a measure of vaccine hesitancy was present for all the vaccines. Maximum hesitancy was found for vaccines like Pentavalent (19.6%) and Hepatitis B birth dose (17.7%). More than 80% of the children were fully vaccinated as per the UIP. The vaccine hesitancy in the form of delay or refusal for the individual vaccine is represented in Table 2.

Table - 2: Status of vaccination and vaccine hesitancy among study participants. (N=361)

Vaccines	Delay, n(%)	Refusal/Reluctance, n(%)	No Delay, n(%)
BCG	12 (3.3)	–	349 (96.7)
OPV	41 (11.4)	–	320 (88.6)
Hepatitis B birth dose	47 (13)	17 (4.7)	297 (82.3)
OPV 1, 2 and 3	23 (6.4)	–	338 (93.6)
Pentavalent 1, 2 and 3	53 (14.7)	18 (4.9)	290 (80.4)
fIPV 1, 2	50 (13.9)	2 (0.5)	309 (85.6)
OPV-B*	12 (3.4)	3 (0.8)	346 (95.3)
DPT-B*	16 (4.4)	12 (3.3)	295 (91.3)
MR 1, 2*	32 (8.8)	16 (4.5)	313 (86.7)
Rota 1, 2 and 3	24 (6.7)	–	337 (93.3)

*Not applicable for children less than 9 months of age, > 9 months (n=323); Frequencies reported for individual vaccines are not mutually exclusive because a child may have experienced hesitancy for more than one vaccine dose.

Reasons for vaccine hesitancy

Fear of side-effects post vaccination (48, 34.9%) was found to be the main reason behind vaccine hesitancy followed by illness of child at the time of vaccination (35, 25.3%). About 5.8% (8) of the participants were never counselled about vaccination and missed dates due to unawareness. Apart from the reasons enumerated in the Table 3; some participants (28, 20.3%) mentioned language barrier, lack of time due to work and personal / religious reasons for not vaccinating their child. The distribution of the reasons expressed by the vaccine-hesitant mothers are represented in Table 3.

Table- 3: Reasons for vaccine hesitancy among study participants. (N=138)

Reason	Frequency, n (%)
Unaware about the vaccination (location, schedule)	8 (5.8)
Sick child	35 (25.3)
Fear of side-effects post vaccination	48 (34.9)
Distance problem	2 (1.4)
Discouragement from family	2 (1.4)
Lack of trust on health care providers	4 (2.9)
Mother went to parents' home	10 (7.3)
Cultural reasons	1 (0.7)
Others	28 (20.3)

Predictors of vaccine hesitancy

The multivariate logistic regression analysis found type of family, parental education, socio-economic status, distance from the facility and migration status to be the significant predictors of vaccine hesitancy. Participants who were migrants (AOR: 2.215; 95%CI: 1.314–3.734; p=0.003), resided at least 10 kms away from nearest health facility (AOR: 1.614; 95%CI: 1.011–2.577; p=0.045), had nuclear families (AOR: 1.543; 95%CI: 1.002–2.376; p=0.049) and belonged to lower socioeconomic class (AOR: 4.102; 95% CI: 2.410–6.982; p<0.001) had significantly higher chances of being vaccine hesitant as compared to those who were non-migrants, resided within 10 kms from the facility, had joint families and belonged to higher socio-economic class respectively. Additionally, families in which mothers (AOR: 2.511; 95%CI: 1.482–4.254; p=0.001) and fathers (AOR: 2.140; 95%CI: 1.264–3.623; p=0.005) had primary education or less were significantly more likely to be vaccine hesitant as compared to their educated counterparts. Various factors associated with vaccine hesitancy are represented in Table 4.

Table - 4: Predictors of vaccine hesitancy among study participants. (N=361)

Variable	Category	Vaccine Hesitancy		COR (95% CI)	AOR (95% CI)	P-value
		Present, n (%)	Absent, n (%)			
Age of mother (in years)	< 28	74 (39.6)	113 (60.4)	1.126 (0.736–1.722)	1.025 (0.641–1.639)	0.918
	≥ 28	64 (36.4)	110 (63.6)	Ref	Ref	
Birth order	First birth	86 (37.7)	142 (62.3)	0.943 (0.608–1.464)	0.952 (0.598–1.516)	0.838
	2nd or higher	52 (39.1)	81 (60.9)	Ref	Ref	
Age of child (in months)	≤ 24	92 (38.6)	146 (61.4)	1.055 (0.673–1.652)	1.018 (0.630–1.645)	0.942
	> 24	46 (37.3)	77 (62.7)	Ref	Ref	
Gender of child	Female	66 (38.2)	107 (61.8)	0.994 (0.650–1.520)	1.142 (0.701–1.861)	0.597
	Male	72 (38.3)	116 (61.7)	Ref	Ref	
Type of family	Nuclear	92 (43.4)	120 (56.6)	1.717 (1.104–2.668)*	1.543 (1.002–2.376)	0.049
	Joint	46 (30.9)	103 (69.1)	Ref	Ref	
Mother's education	≤ Primary	99 (50.0)	99 (50.0)	3.179 (2.017–5.012)*	2.511 (1.482–4.254)	0.001
	> Primary	39 (23.9)	124 (76.1)	Ref	Ref	
Father's education	≤ Primary	101 (48.6)	107 (51.4)	2.959 (1.870–4.684)*	2.140 (1.264–3.623)	0.005
	> Primary	37 (24.1)	116 (75.9)	Ref	Ref	
Socioeconomic status	Low SES (Class IV–V)	103 (57.2)	77 (42.8)	5.580 (3.479–8.950)*	4.102 (2.410–6.982)	<0.001
	High SES (Class I–III)	35 (19.3)	146 (80.7)	Ref	Ref	
Antenatal visits	< 4 visits	116 (46.8)	132 (53.2)	3.635 (2.143–6.165)*	1.842 (0.994–3.415)	0.052
	≥ 4 visits	22 (19.5)	91 (80.5)	Ref	Ref	
Distance from facility	> 10 km	58 (47.2)	65 (52.8)	1.762 (1.130–2.749)*	1.614 (1.011–2.577)	0.045
	≤ 10 km	80 (33.6)	158 (66.4)	Ref	Ref	
Migration status	Migrant	61 (54.5)	51 (45.5)	2.672 (1.689–4.227)*	2.215 (1.314–3.734)	0.003
	Non-migrant	77 (30.9)	172 (69.1)	Ref	Ref	

'*': P<0.05 indicates significant variables (COR calculations), COR was determined using univariate binary logistic regression. COR: Crude odds ratio, AOR: Adjusted odds ratio, CI: Confidence interval

SAGE working group constructs

Most of the parents believed that vaccines protect their children from infectious diseases (228, 63.2%) and that they must vaccinate their children against recommended vaccines (210, 58.2%). The majority (248, 68.7%) of the mothers found leaders (healthcare workers, religious leaders, and politicians) in their community supporting the vaccination among children less than five years. In this study, vaccine hesitancy was significantly higher among mothers who believed that vaccine do not protect their child against infectious diseases (COR: 0.560; 95%CI: 0.353–0.889; p=0.014), heard negative information (COR: 1.890; 95%CI: 1.220–2.927; p=0.004) and found distance, timing and cost of vaccination (COR: 2.300; 95%CI: 1.441–3.671; p<0.001) to be a major barrier to vaccination. Similarly, those participants who had reasons for not vaccinating their child (COR: 5.140; 95%CI: 3.180–8.311;p <0.001) and had refused vaccination in past (COR: 6.420; 95%CI: 3.778–10.912; p<0.001) were significantly more likely to be hesitant. Table 5 depicts the association of SAGE working group variables with vaccine hesitancy status, among mothers of under 5 children.

Table - 5: Association of Sage working group variables with vaccine hesitancy status of study participants. (N=361)

SAGE Variables	Total n (%)	Hesitancy n (%)	COR (95% CI)	P-value
Awareness				
Do you think that vaccines can protect your child from serious diseases?				
Yes	228 (63.2)	73 (32.0)	0.560 (0.353–0.889)	0.014
No	133 (36.8)	65 (48.9)	Ref	
Do you think that most parents vaccinate their children against all recommended vaccines?				
Yes	210 (58.2)	76 (36.2)	0.840 (0.532–1.326)	0.456
No	151 (41.8)	62 (41.1)	Ref	
Accessibility				
Has distance, timing of hospital, time needed, or cost prevented immunization?				
Yes	120 (33.2)	61 (50.8)	2.300 (1.441–3.671)	<0.001
No	241 (66.8)	77 (32.0)	Ref	
Are there other pressures in your life that prevent timely immunization?				
Yes	142 (39.3)	58 (40.8)	1.220 (0.769–1.937)	0.396
No	219 (60.7)	80 (36.5)	Ref	
Acceptability at individual level				
Have you ever been reluctant to get a vaccination for your child?				
Yes	105 (29.1)	46 (43.8)	1.420 (0.881–2.289)	0.146
No	256 (70.9)	92 (35.9)	Ref	
Have you ever refused vaccination for your child?				
Yes	88 (24.4)	62 (70.5)	6.420 (3.778–10.912)	<0.001
No	273 (75.6)	76 (27.8)	Ref	
Are there any reasons you think that your children should not be vaccinated?				
Yes	140 (38.8)	88 (62.9)	5.140 (3.180–8.311)	<0.001
No	221 (61.2)	50 (22.6)	Ref	
Have you ever received or heard negative information about vaccination?				
Yes	205 (56.8)	95 (46.3)	1.890 (1.220–2.927)	0.004
No	156 (43.2)	43 (27.6)	Ref	
Did you take your child for vaccination after hearing negative information?				
Yes	148 (41.0)	49 (33.1)	0.650 (0.415–1.018)	0.059
No	213 (59.0)	89 (41.8)	Ref	
Community acceptance				
Do you think it is difficult for some ethnic/religious groups to access vaccination?				
Yes	132 (36.6)	55 (41.7)	1.220 (0.774–1.924)	0.392
No	229 (63.4)	83 (36.2)	Ref	
Do leaders in your community support vaccination for infants and children?				
Yes	248 (68.7)	90 (36.3)	0.800 (0.500–1.281)	0.349
No	113 (31.3)	48 (42.5)	Ref	

COR was determined using univariate binary logistic regression. COR: Crude odds ratio

DISCUSSION

This cross-sectional study was conducted in migrant settlements of Ahmedabad to study the burden of vaccine hesitancy among mothers of under 5 children and highlight its multifactorial nature involving socioeconomic, behavioural and access-related determinants.

The prevalence of vaccine hesitancy in the present study was found to be 38.2%, which is considerably lower compared to the findings reported by Dasgupta et al.[3] where prevalence of vaccine hesitancy was 83%. However, studies conducted by Goruntla et al.[4] and Cherian et al.[11] found prevalence of hesitancy to be 28.05% and 28.9% respectively which was lower than the findings of present study. Variation in prevalence across studies may be attributed to differences in study design, site, population characteristics, the questionnaire used, cutoff score, urban–rural fragmentation, or operational definitions of vaccine hesitancy.

In the present study, both delay (19.4%) and refusal/reluctance (18.8%) contributed to hesitancy, with delay being the predominant form across all vaccines. Similar observations were reported by Goruntla et al.,[4] who highlighted that vaccine delay (95.6%) is often more common than outright refusal (4.3%), particularly in distant communities, suggesting greater role of access barriers than

absolute vaccine rejection in creating vaccine hesitancy. Maximum hesitancy was observed for Pentavalent vaccine doses (19.6%) followed by Hepatitis B birth doses (17.7%) which may be attributed to increased caregiver concern regarding injectable vaccines and adverse events following immunization. Vaccines like BCG (3.3%) and OPV Booster (4.2%) carried lowest hesitancy in the present study. The study conducted by Goruntla et al.,[4] found Rota virus vaccine (16.7%) to have highest hesitancy followed by Pentavalent vaccines (16.6%). However, Dasgupta et al.[3] reported the highest hesitancy for the Hepatitis B birth dose (90.2%), whereas Choudhary et al.[7] identified the MR vaccine (34.8%) as having the greatest proportion of delayed administration among Indian children. These differences may be attributed to variations in study settings, population characteristics, vaccine schedules, and operational definitions used to assess vaccine hesitancy and vaccination delay.

The most common reason for vaccine hesitancy was fear of side effects (34.9%), followed by child illness at the time of vaccination (25.3%) in the present study. Similar findings were observed by Krishnamurthy et al.[12] where fear of adverse effect was the primary driver of vaccine hesitancy. However, studies conducted by Dasgupta et al.[3] and Goruntla et al.[4] found health issues with children (11.67%) and unawareness about vaccination (20.5%) as the major reasons for vaccine hesitancy respectively. The present study found lack of awareness regarding vaccines (schedule, timing, doses) among mothers (5.8%) and miscellaneous barriers (20.3%) such as language difficulties, occupational constraints, and religious factors as other important reasons for hesitancy. These findings reflect the complex interplay of structural and behavioural determinants influencing vaccine uptake in underserved communities.

This study found migration status to be significantly associated with vaccine hesitancy. Migrant mothers had higher odds of hesitancy compared to non-migrants. Similar findings were reported by Geddam et al.,[13] where migrant populations demonstrated significantly lower immunization uptake due to discontinuity of care and poor linkage with health systems.

Similarly, mothers from lower socioeconomic class had significantly higher odds of hesitancy as compared to those from higher socioeconomic groups. Similar associations were reported by Goruntla et al.[4] but no such association was observed by Dasgupta et al.[3]

Parental education was also significantly associated with vaccine hesitancy in the present study. Mothers as well as fathers with primary or no formal education had higher odds of hesitancy as compared to their educated counterparts. These findings are consistent with studies conducted by Geddam et al.[13] and Ogundele et al.[14] which demonstrated that low maternal education is associated with poor awareness, misconceptions, and reduced vaccine confidence.

Type of family was another significant determinant, with nuclear families showing higher chances of hesitancy as compared to joint families. These findings were in line with the findings by Dasgupta et al.,[3] suggesting joint family structures being more effective in providing social support and shared decision-making regarding child health practices.

Further, families residing more than 10 km away from nearest health facility had significantly higher chances of developing vaccine hesitancy as compared those who live closer to the health facility may be due to increased physical inaccessibility and financial constraints. This finding was in contrast to findings observed by Goruntla et al.,[4] where distance was not significantly associated with hesitancy. The study found no association between age of mother and vaccine hesitancy. This finding was in contrast to the finding by a study conducted by Damo et al.,[15] where older mothers showed higher odds of hesitancy as compared to their younger counterparts. Other factors like child's age and gender had no effect on vaccine hesitancy in the present study. This was in line with the findings by Wagner et al.[16] In this study, number of antenatal care visits was found to have no significant association with vaccine hesitancy may be due confounding effects of other variables. This finding contradicted the findings by Wagner et al.[16] and Goruntla et al.,[4] where mothers having more than 4 ANC visits were less hesitant to vaccination as compared to those who had lesser ANC visits.

Analysis based on SAGE working group constructs demonstrated that awareness, accessibility, and acceptability strongly influenced vaccine hesitancy. Mothers who were exposed to negative information, had perceived access barriers such as distance, timing, and cost and believed that vaccines do not protect their children against diseases, had higher odds of hesitancy. This was consistent with the findings by Goruntla et al.,[4] who reported that poor vaccine confidence, regular exposure to negative information and presence of physical barriers significantly increases hesitancy. Prior refusal of vaccination was the strongest behavioural predictor of hesitancy followed by self-reported reasons against vaccination. Similar associations were reported by MacDonald et al.,[1] who described vaccine hesitancy as a nexus influenced by confidence, convenience, and complacency.

Overall, the findings suggest that vaccine hesitancy is not merely a behavioural issue but a complex phenomenon influenced by structural deprivation, limited health literacy, mobility-related barriers, and concerns regarding vaccine safety.

This study focused only on the population residing in migrant settlements, thus findings in the study were representative only of the sampled migrant settlements and could not be generalized to general population. It was difficult to avoid recall bias, especially while assessing the immunization status of child. Further, due to statistical constraints, all the postulated factors associated with vaccine hesitancy among mothers were not studied.

CONCLUSIONS

The present study found substantial burden of vaccine hesitancy among mothers of under-five children, with a prevalence of 38.2% in migrant settlements of Ahmedabad. Vaccine hesitancy was mainly driven by delay rather than refusal. The main predictors of vaccine hesitancy were found to be low socioeconomic status (A, poor maternal education, nuclear family structure, poor paternal education, migrant status and increased distance from nearest health facility. The main reasons for vaccine hesitancy were found to be fear of side effects and sickness of the child. Behavioural factors such as exposure to negative information, having prior beliefs, preconceived reasons and prior refusal of vaccination further increased hesitancy. These findings highlight vaccine hesitancy as a multifactorial issue influenced by socioeconomic, accessibility, and behavioural determinants. Strengthening of targeted outreach services, improvement in health education among migrants and development of context-specific interventions addressing both structural barriers and vaccine confidence are required to improve immunization uptake and reduce inequities.

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