

Original Research Article

Determinants of vaccine hesitancy among parents: a cross-sectional survey-based study

Abdulaziz Dhaifallah Al-Thobaiti^{1*}, Alaa Dhaifallah Al-Thobaiti², Ahmed S. Alzahrani¹,
Wejdan Abdulraheem Alotaibi³, Abdulrahman Ghurmullah Almalki³, Sami S. Alharthi⁴

¹Department of Preventive Medicine, Al-Hada Armed Forces Hospital, Taif, Saudi Arabia

²Department of Family Medicine, Diabetes Fellowship, Primary Health Care, Taif Health Cluster, Taif, Saudi Arabia

³Department of Family and Community Medicine, College of Medicine, Taif University, Taif, Saudi Arabia

⁴Department of Medicine, College of Medicine, Taif University, Taif, Saudi Arabia

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*Correspondence:

Dr. Abdulaziz Dhaifallah Al-Thobaiti,

E-mail: moom51111@gmail.com

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ABSTRACT

Background: Vaccine hesitancy is among the top 10 global health threats. In Saudi Arabia, despite good vaccination coverage (e.g., 96% for measles-mumps-rubella), parental confidence is low. This study assessed the frequency of vaccine hesitancy among parents in Taif City, Saudi Arabia, and its associated demographic and health-related characteristics, including domain-specific attitudes (behavior, attitude, safety, and efficacy).

Methods: Parents of children aged 2 months-7 years completed an online Arabic questionnaire collecting sociodemographic data, vaccination history, and the parent attitudes on childhood vaccines (PACV) measure. The scale ranged from 0 to 100, with a score of 50 or higher suggesting indecision. Associations were analyzed by the chi-square or Fisher's exact test, the Mann-Whitney U test, or the Kruskal-Wallis H test.

Results: The prevalence of hesitating was 19.8% (87/440). The mean PACV score was 34.1±19.4. The highest score was in the attitude category (4.99±3.9), followed by safety and efficacy (4.12±2.5) and behavior (1.03±1.4). Strong predictors were divorced or widowed status (50.0% versus 17.2%; $p<0.001$), younger age (75.0%; $p=0.017$), incomplete immunization (38.5% versus 14.2%; $p<0.001$), and previous refusal (62.3% versus 14.0%; $p<0.001$).

Conclusions: Hesitancy towards vaccination was observed among ~20% of the parents in Taif. Their attitudes and concerns regarding safety and efficacy were of great significance. General hesitancy is low, but specific communication strategies, systematic screening with the PACV measure, and interventions for first-time parents and single mothers are recommended.

Keywords: Determinants, PACV scale, Parents, Saudi Arabia, Taif city, Vaccine hesitancy

INTRODUCTION

Vaccination is considered one of the safest and most effective tools in public health, cutting down the global burden of vaccine-preventable diseases.¹ A troubling decline in vaccine confidence has been observed across several countries.²⁻⁴ Public concern has shifted toward possible vaccine risks and side effects.⁵⁻⁷

In 2019, the World Health Organization listed vaccine hesitancy as one of the top 10 global health threats.⁸ Their

Strategic Advisory Group of Experts (SAGE) defines it as a delay in accepting or outright refusing vaccines when they're available.^{9,10} A SAGE working group highlighted the need for standardized measurement tools; the PACV survey was developed by Opel et al.^{11,12}

Saudi Arabia launched its national immunization program in 1979, initially including vaccines for diphtheria, tetanus, pertussis (DTP), polio, and tuberculosis, and the program has expanded since then.¹³ Coverage appears strong; vaccination coverage rates were 96% for MMR and 98%

for DTP as of 2017.¹⁴ High vaccination rates do not necessarily indicate that parents are confident in vaccines. Many families vaccinate because their children need the shots to start school.¹⁵ Among those who do vaccinate, many hold misconceptions.¹⁶

Previous research from Saudi Arabia and the broader Eastern Mediterranean region has identified several factors that drive vaccine hesitancy, including media influence, a mother's age and nationality, turning to social media for health information, and general safety concerns.¹¹ However, few studies have examined vaccine hesitancy among parents of young children in Taif city, using a validated Arabic-language instrument. This study aimed to evaluate the prevalence and determinants of vaccine hesitancy among parents in Taif, Saudi Arabia.

METHODS

Study design and setting

This study used a cross-sectional survey method, focusing on parents in the Taif community in Saudi Arabia. Taif, a major city in the Mecca Province, is known for its diverse socioeconomic and educational backgrounds.

Study population

Parents or legal guardians of children aged 2 months to 7 years who had been living in Taif city throughout the study period were eligible for inclusion. Parents of immunocompromised children, healthcare workers, and families in which another member had already participated were excluded.

Sample size

The minimum sample size was determined using the Raosoft online calculator, based on a 5% margin of error, a 95% confidence level, and maximum variability (a 50% response distribution). That calculation gave the required minimum of 377 participants. To allow for incomplete or invalid responses, an extra 10% was added, bringing the target sample size to 415.

Data collection tool

Data collection was conducted using a structured, self-administered Arabic questionnaire divided into three sections. The first section gathered demographic and health details: the parent's age, their relation to the child, how many children they had, the child's age and sex, whether the child had any long-term illness, the parent's nationality, whether they lived in an urban or rural area, their marital status, level of education, employment status, health insurance, monthly income, and how much daily time they spent with their children. The second part focused on immunization history and where parents got their information. It asked whether the child was fully, partially, or not vaccinated; whether they had ever refused

vaccines; and the main sources parents used to get vaccine information, such as doctors, nurses, the internet, social media, family, friends, television, or health books. The third part used the validated Arabic version of the parent attitudes about childhood vaccines (PACV) scale.¹⁷ This 15-item tool has three domains: behavior (2 items), attitude (9 items), and safety and efficacy (4 items). Items use multiple formats: yes/no/don't know, a 5-point Likert scale, and an 11-point certainty scale (0= "not sure at all" to 10= "completely sure"). Each response is scored 0, 1, or 2, with higher scores indicating greater hesitancy. The raw score (0-30) is converted to a 0-100 scale using: (raw score) $\times$ (100/30) or (raw score) $\times$ 3.333. A parent was classified as hesitant if the rescaled score was ≥ 50 (raw score ≥ 15); < 50 indicated non-hesitancy.

Data collection technique

The questionnaire was converted into an online Google Form and distributed electronically via social media platforms and messaging applications to reach parents in Taif. The survey was available only in Arabic, and all responses were anonymized. Data collection took place between March and April 2025.

Data analysis

Statistical analyses were performed using IBM SPSS 26.0. Descriptive statistics were calculated for all variables. Continuous variables were mean $\pm$ SD or median (IQR) when not normally distributed. Categorical variables were frequencies and percentages. The total PACV raw score (0-30) was rescaled to 0-100 using: raw score $\times$ (100/30). Parents with a rescaled score ≥ 50 were classified as vaccine-hesitant. Associations with binary hesitancy were examined using Chi-square tests (or Fisher's exact test when expected cell counts < 5). To compare the three PACV domain scores across subgroups, Mann-Whitney U (two groups) or Kruskal-Wallis H (≥ 3 groups) tests were used, as domain scores were not normally distributed. A p value < 0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the institutional review board (IRB). Before taking the survey, all participants gave their informed consent. Confidentiality was maintained throughout the study. In addition, all data were anonymized and securely stored in accordance with data protection regulations.

Ethical approval was obtained from the research ethics committee (REC) of the Armed Forces Hospitals (Approval No.: H-02-T-078 / REC. 2025-1153).

RESULTS

440 parents participated in the study. Most parents were aged 31-50 years (64.9%), and mothers constituted 57.3% of the participants. Most parents were Saudi nationals

(98%) and lived in the city (95%). More than half of the participants had a university degree or higher (79.5%) and were employed (68.6%). Regarding children, 57% of the participants reported that the child was not their firstborn, and 50.2% had three children. The child's age was 1-5 years in 49.2% of cases. Most children (89.1%) had no health issues. Full vaccination was reported for 68.9% of

the children, and 12% of parents had previously refused a vaccine. Doctors and nurses were the common sources of vaccine information, providing information to 56.1% of the parents. The internet and social media were used, with 18.2% and 16.8% of parents, respectively, getting information from these sources (Table 1).

Table 1: Sociodemographic characteristics of the participants in Taif City (n=440).

Characteristics	Categories	Value
Parent Age, N (%) (n=436)	16-30 years	114 (26.1)
	31-50 years	283 (64.9)
	51-73 years	39 (8.9)
Relationship with child	Father	170 (38.6)
	Mother	252 (57.3)
	Others	18 (4.1)
Is this the first child?	Yes	189 (43)
	No	251 (57)
Number of children	1	116 (26.4)
	2	103 (23.4)
	3	221 (50.2)
Child Age (years), N (%) (n=435)	2 months - 12 months	11(2.5)
	1-5 years	214 (49.2)
	6-10 years	143 (32.9)
	>10 years	67 (15.4)
Age at the time of enrolment (Years), N (%) (n=438)	2 months - 18 years	432 (98.6)
	19-35 years	4 (0.9)
	≥36 years	2 (0.5)
Child gender	Male	219 (49.8)
	Female	221 (50.2)
Does the child suffer from a chronic illness?	Yes	48 (10.9)
	No	392 (89.1)
Parent Nationality	Saudi	431 (98)
	Non-Saudi	9 (2)
Place of residence	Rural/ village	14 (3.2)
	City	418 (95)
	Urban	8 (1.8)
Maternal statue	Married	406 (92.3)
	Divorced / Widowed	34 (7.7)
Parent level of education	Master's/ university	350 (79.5)
	Secondary	75 (17)
	Primary	9 (2)
	Non-education	6 (1.4)
Parent occupation	Employee	302 (68.6)
	Non-employee	138 (31.4)
Do you work in the health/medical sector?	Yes	81 (18.4)
	No	359 (81.6)
Insurance	No insurance	244 (55.5)
	General	110 (25)
	Private	86 (19.5)
Monthly income	Less than 10,000	155 (35.2)
	10,000-20,000	221 (50.2)
	Higher than 20,000	62 (14.5)
Time spent with children daily (in hours)	Less than 4 hours	70 (15.9)
	4-6 hours	152 (34.5)

Continued.

Characteristics	Categories	Value
	Up to 6 hours	218 (49.5)
Child vaccination status	No vaccination	13 (3)
	Semi vaccination	124 (28.2)
	Full vaccination	303 (68.9)
Have you ever refused to vaccinate your child?	Yes	53 (12)
	No	387 (88)
Source of information about vaccines	Doctors or nurses	247 (56.1)
	Internet	80 (18.2)
	Social media	74 (16.8)
	Relatives and friends	24 (5.5)
	Health books	13 (3)
	International doctors on social media and the internet	1 (0.2)
	My Health app	1 (0.2)

Table 2: PACV domains and score.

Categories	Mean±SD	Median (IQR)	Min-Max
Behavior domain	1.03±1.4	0 (2)	0-4
Attitude domain	4.99±3.9	4 (6)	0-16
Safety and efficacy domain	4.12±2.5	4 (4)	0-8
Total PACV score	10.23±5.8	9 (8)	0-28
Total PACV scale 0-100	34.10±19.38	30 (26.6)	0-93.3

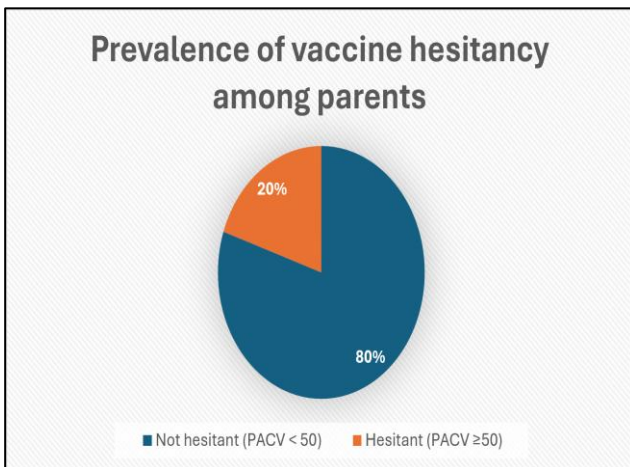


Figure 1: Prevalence of vaccine hesitancy among parents in Taif City (n=440).

Overall, 80.2% of parents were classified as not hesitant ($PACV < 50$), while 19.8% were classified as hesitant ($PACV \geq 50$). This indicates that most participants held favorable attitudes toward childhood vaccination, with only a minority showing significant vaccine hesitancy (Figure 1).

The mean overall PACV score was 10.23 on a 28-point scale (SD 5.8) or 34.10 on a 0-100 scale (SD 19.38). Total score was 9 (IQR 8, median). The highest average score by

subdomain was attitude (4.99, SD 3.9, median 4, IQR 6), followed by safety and efficacy (4.12, SD 2.5, median 4, IQR 4), and behavior (1.03, SD 1.4, median 0, IQR 2) (Table 2).

In Table 3 chi-square tests showed that 19.8% of parents were hesitant ($PACV \geq 50$). No significant associations were found for parent age ($p=0.428$), relationship with child ($p=0.630$), first child status ($p=0.380$), number of children ($p=0.096$), child age ($p=0.753$), child gender ($p=0.376$), chronic illness ($p=0.335$), nationality ($p=0.852$), residence ($p=0.265$), education ($p=0.311$), occupation ($p=0.484$), health sector work ($p=0.352$), insurance type ($p=0.770$), income ($p=0.975$), time with children ($p=0.951$), or vaccine information source ($p=0.333$). Significant factors included age at enrolment ($p=0.017$): hesitancy was 19.4% in the 0-18 years group, 75.0% in 19-35 years, and 0% in ≥ 36 years. Maternal status was strongly associated ($p < 0.001$): 17.2% of married parents were hesitant versus 50.0% of divorced/widowed. Child vaccination status ($p < 0.001$): hesitancy decreased from 38.5% (unvaccinated) to 31.5% (partially) to 14.2% (fully vaccinated). Parents who had ever refused a vaccine were much more hesitant (62.3%) than those who had never refused (14.0%, $p < 0.001$). Thus, maternal marital status, age at enrolment, vaccination status, and previous refusal are key determinants of hesitancy.

Table 3: Relationship between demographic characteristics and vaccine.

Characteristics		Hesitant (PACV $\geq$ 50) (%)	Not hesitant (PACV<50) (%)	P value
Parent age in years (n=436)	16-30 years	18 (15.8)	96 (84.2)	0.428
	31-50 years	61 (21.6)	222 (78.4)	
	51-73 years	8 (20.5)	31 (79.5)	
Relationship with child	Father	35 (20.6)	135 (79.4)	0.630
	Mother	50 (19.8)	202 (80.2)	
	Others	2 (11.1)	16 (88.9)	
Is this the first child?	Yes	41 (21.7)	148 (78.3)	0.380
	No	46 (18.3)	205 (81.7)	
Number of children	1	21 (18.1)	95 (81.9)	0.096
	2	28 (27.2)	75 (72.8)	
	3	38 (17.2)	183 (82.8)	
Child Age (years) (n=435)	<1	1 (9.1)	10 (90.9)	0.753
	1-5	41 (19.2)	173 (80.8)	
	6-10	31 (21.7)	112 (78.3)	
	>10	14 (20.9)	53 (79.1)	
Age at the time of enrolment (years) (n=438)	0-18	84 (19.4)	348 (80.6)	0.017
	19-35	3 (75.0)	1 (25.0)	
	$\geq$ 36	0 (0.0)	2 (100.0)	
Child gender	Male	47 (21.5)	172 (78.5)	0.376
	Female	40 (18.1)	181 (81.9)	
Does the child suffer from a chronic illness?	Yes	12 (25.0)	36 (75.0)	0.335
	No	75 (19.1)	317 (80.9)	
Parent Nationality	Saudi	85 (19.7)	346 (80.3)	0.852
	Non-Saudi	2 (22.2)	7 (77.8)	
Place of residence	Urban	0 (0.0)	8 (100.0)	0.265
	City	83 (19.9)	335 (80.1)	
	Rural/village	4 (28.6)	10 (71.4)	
Maternal status	Married	70 (17.2)	336 (82.8)	<0.001
	Divorced/widowed	17 (50.0)	17 (50.0)	
Parent level of education	Master's/university	68 (19.4)	282 (80.6)	0.311
	Secondary	14 (18.7)	61 (81.3)	
	Primary	4 (44.4)	5 (55.6)	
	Non-education	1 (16.7)	5 (83.3)	
Parent Occupation	Employee	57 (18.9)	245 (81.1)	0.484
	Non-employee	30 (21.7)	108 (78.3)	
Do you work in the health/medical sector?	Yes	13 (16.0)	68 (84.0)	0.352
	No	74 (20.6)	285 (79.4)	
Insurance	No insurance	51 (20.9)	193 (79.1)	0.770
	General	21 (19.1)	89 (80.9)	
	Private	15 (17.4)	71 (82.6)	
Monthly income (Saudi Riyal)	Less than 10,000	31 (20.0)	124 (80.0)	0.975
	10,000-20,000	44 (19.9)	177 (80.1)	
	Higher than 20,000	12 (18.8)	52 (81.3)	
Time spent with children daily (hours)	Less than 4 hours	13 (18.6)	57 (81.4)	0.951
	4-6 hours	31 (20.4)	121 (79.6)	
	Up to 6 hours	43 (19.7)	175 (80.3)	
Child vaccination status	No vaccination	5 (38.5)	8 (61.5)	<0.001
	Semi vaccination	39 (31.5)	85 (68.5)	
	Full vaccination	43 (14.2)	260 (85.8)	
Have you ever refused to vaccinate your child?	Yes	33 (62.3)	20 (37.7)	<0.001
	No	54 (14.0)	333 (86.0)	
Source of information about vaccines	Social media and health app	39 (23.2)	129 (76.8)	0.333
	Medical professionals	43 (17.3)	205 (82.7)	
	Personal network	5 (20.8)	19 (79.2)	

Chi-square test.

Table 4: Relationship between demographic characteristics and PACV domains.

		Behavior domain Median (IQR)	P value	Attitude domain median (IQR)	P value	Safety and efficacy domain median (IQR)	P value
Parent Age *	16-30 years	0 (2)	0.437	4 (7)	0.340	5 (5)	0.079
	31-50 years	0 (2)		4 (6)		4 (4)	
	51-73 years	1 (2)		4 (4)		4 (4)	
Relationship with children *	Father	0 (2)	0.352	4 (6)	0.305	3.5 (4)	0.003
	Mother	0 (2)		4 (6)		4.5 (5)	
	Others	0 (2)		2 (6)		2 (3)	
Is this the first child? **	Yes	0 (2)	0.801	5 (7)	0.023	4 (5)	0.015
	No	0 (2)		4 (5)		4 (4)	
Number of children *	1	0 (2)	0.004	4 (6)	0.637	5 (5)	<0.001
	2	1 (3)		4 (7)		4 (5)	
	3	0 (2)		4 (6)		3 (4)	
Child Age (years)*	<1	0 (2)	0.529	3 (4)	0.015	5 (4)	0.325
	1-5	0 (2)		3 (7)		4 (5)	
	6-10	0 (2)		4 (6)		4 (4)	
	>10	0 (2)		5 (5)		3 (4)	
Age at the time of enrolment (Years) *	0-18	0 (2)	0.125	4 (6)	0.103	4 (4)	0.661
	19-35	2 (2)		10 (7)		6 (4)	
	≥36	2.5 (-)		5.5 (-)		3.5 (-)	
Child gender **	Male	0 (2)	0.565	4 (6)	0.362	4 (4)	0.614
	Female	0 (2)		4 (6)		4 (4)	
Does the child suffer from chronic illnesses? **	Yes	0.5 (2)	0.101	6 (7)	0.055	3 (4)	0.313
	No	0 (2)		4 (6)		4 (4)	
Parent Nationality **	Saudi	0 (2)	0.711	4 (6)	0.785	4 (4)	0.651
	Non-Saudi	0 (2)		3 (8)		7 (8)	
Place of residence *	Urban	0 (0)	0.178	3.5 (3)	0.281	3 (3)	0.773
	City	0 (2)		4 (6)		4 (4)	
	Rural/village	0 (1)		6 (7)		4.5 (5)	
Maternal statue **	Married	0 (2)	0.155	4 (6)	<0.001	4 (4)	0.119
	Divorced/widowed	0 (4)		8 (7)		5 (5)	
Parent level of education *	Master's/university	0 (2)	0.943	4 (6)	0.130	4 (4)	0.169
	Secondary	0 (2)		4 (6)		3 (4)	
	Primary	0 (3)		4 (9)		6 (5)	
	Non-education	0 (4)		8 (2)		2 (3)	
Parent Occupation **	Employee	0 (2)	0.144	4 (6)	0.484	3 (4)	0.027
	Non-employee	0 (2)		4 (6)		5 (5)	
Do you work in the health/medical sector? **	Yes	0 (3)	0.240	4 (6)	0.870	3 (4)	0.100
	No	0 (2)		4 (6)		4 (5)	
Insurance *	No insurance	0 (2)	0.120	4 (6)	0.002	4 (4)	0.002
	General	0 (2)		5 (6)		3 (4)	
	Private	0 (2)		2 (7)		6 (5)	
Monthly income *	Less than 10,000	0 (2)	0.576	4 (6)	0.209	4 (4)	0.111
	10,000-20,000	0 (2)		4 (6)		4 (5)	
	Higher than 20,000	0 (2)		4 (7)		3 (4)	
Time spent with children daily (in hours) *	Less than 4 hours	0 (2)	0.243	5 (6)	0.373	4 (5)	0.466
	4-6 hours	0 (2)		4 (6)		4 (4)	
	Up to 6 hours	0 (2)		4 (6)		4 (5)	
Child vaccination status *	No vaccination	2 (4)	0.001	8 (5)	<0.001	3 (4)	0.649
	Semi vaccination	0.5 (2)		5 (7)		5 (5)	
	Full vaccination	0 (2)		4 (5)		4 (4)	
Have you ever refused to vaccinate your child? **	Yes	2 (4)	<0.001	10 (5)	<0.001	6 (5)	0.006
	No	0 (2)		4 (5)		4 (4)	

Continued.

		Behavior domain Median (IQR)	P value	Attitude domain median (IQR)	P value	Safety and efficacy domain median (IQR)	P value
Source of information about vaccines *	Social media and Health app	0 (2)	0.350	4 (6)	0.007	4 (5)	0.045
	Medical professionals	0.5 (2)		5 (6)		3 (4)	
	Personal network	0 (2)		4.5 (7)		3.5 (4)	

*Kruskal-Wallis, **Mann-Whitney.

In Table 4 non-parametric tests showed no significant domain differences for parent age, child gender, chronic illness, nationality, residence, health sector work, income, or time with children ($p>0.05$). Significant factors included: first-time parents (higher attitude and safety and efficacy, $p<0.05$); number of children (behavior $p=0.004$, safety and efficacy $p<0.001$: two children higher behavior, one child highest safety and efficacy); child age (attitude $p=0.015$, older children higher); maternal status (attitude $p<0.001$, divorced/widowed higher); occupation (safety and efficacy $p=0.027$, non-employees higher); insurance type (attitude and safety and efficacy $p=0.002$ each: private insurance lowest attitude but highest safety and efficacy); vaccination status (behavior $p=0.001$, attitude $p<0.001$, unvaccinated highest); prior refusal (all domains $p\leq 0.006$, refusers higher); information source (attitude $p=0.007$, safety and efficacy $p=0.045$). Attitude and safety and Efficacy were most sensitive to demographic differences.

DISCUSSION

This cross-sectional study using the validated Arabic PACV scale found a vaccine hesitancy rate of 19.8% (1 in 5 parents) in Taif, consistent with other Middle Eastern studies reporting regional rates of 13-25%.¹² It aligns with global estimates, showing that vaccine hesitancy in high- and middle-income countries typically falls between 10% and 30%.³ The average scaled PACV score was 34.1 out of 100, suggesting that most parents aren't deeply hesitant, and that aligns with Saudi Arabia's high vaccination coverage, such as the 96% rate for MMR.¹⁴ Looking at the three PACV domains, the attitude domain scored the highest on average (4.99 ± 3.9), followed by safety and efficacy (4.12 ± 2.5) and then behavior (1.03 ± 1.4). These findings confirm Opel and his team found earlier that attitudinal questions tend to drive the overall PACV score more than anything else.^{11,17} This implies trust-building interventions may be more effective than behavior-focused ones. A previous Taif COVID-19 study confirmed safety and efficacy concerns are central to parental decision-making, citing fear of side effects (93.8%), safety concerns (84.4%), and believing fewer vaccines are needed (78.1%).⁸

Chi-square analysis showed significant associations: maternal marital status, age at enrollment, child

vaccination status, and prior refusal. Hesitancy was 50% among divorced/widowed parents versus 17.2% married ($p<0.001$). Single parents may have more stress, less social support, and poorer access to reliable health information, fuelling vaccine worries.⁹ A large US national survey found that single parents were significantly more hesitant about the COVID-19 vaccine than married parents.¹⁸ A Jordanian study reported that divorced parents had higher vaccine hesitancy than married parents (OR 1.80, 95% CI 1.05-3.12).¹⁹ And a cross-sectional study in Albania found that being single, widowed, separated, or divorced was a strong predictor of vaccine hesitancy (OR 1.91, 95% CI 1.4-2.7).²⁰ This consistent pattern across the Middle East, Europe, and North America identifies single parents as a susceptible demographic requiring targeted public health initiatives with tailored communication, better social support, and easier access to trustworthy vaccine information. Age at registration was important. Hesitancy was 75% among parents aged 19-35 years, but was not observed in parents aged ≥ 36 years. This may be due to a generational gap in experience with vaccine-preventable infections. Older parents saw measles, rubella, or polio firsthand and are more thankful for vaccination. Parents who are younger and grew up when these diseases became rare may be more susceptible to disinformation online.^{4,6}

A study from Makkah that used the same PACV tool found a different pattern: younger parents were less hesitant than older parents ($p<0.006$).²¹ That discrepancy could be due to differences in the age makeup of the study populations or local contextual factors, underscoring the importance of region-specific research on what drives vaccine hesitancy.

Child vaccination status and prior refusal were strong predictors. Hesitancy was highest among parents of unvaccinated children (38.5%) and prior refusers (62.3%), indicating past refusal signals ongoing hesitancy. The 12% prior refusal rate is concerning, as refusal clusters and creates under-vaccinated pockets.¹⁰

Many other demographic variables, such as parent age, education, income, occupation, whether they worked in the health sector, and their main source of vaccine information, did not show a significant association with the binary hesitancy outcome. That stands in contrast to some studies that have found lower hesitancy among healthcare workers or highly educated parents.¹² The lack

of significant demographic associations may reflect sample homogeneity (98% Saudi, 95% urban, 80% university-educated) or the complex, multi-faceted nature of vaccine hesitancy. A Madinah study reported higher hesitancy (73.9%) and found healthcare workers were less hesitant (15.5%) than non-healthcare parents (70.9%, $p=0.021$).²²

PACV domain analysis (Table 4) revealed a clearer picture than binary hesitancy alone. The safety and efficacy domain was sensitive to relationship (mothers higher than fathers), first-child status (first-time parents higher), number of children (only-child parents highest), employment status (non-employed higher), and insurance type (private insurance highest). Parents lacking firsthand experience (first-time parents, only children, or non-employed parents) may exhibit heightened safety concerns. Private insurance holders may have distinct risk perspectives. Greater hesitancy among first-time parents aligns with a previous Taif study recommending targeted education for this group.²³

Attitude domain was influenced by first-child status, child age (older higher), marital status, insurance, vaccination status, refusal history, and information source. Divorced/widowed parents scored higher. Medical professional users had higher Attitude scores (median 5) than social media users (median 4), contrasting with Safety and Efficacy, where medical professionals scored lower (better), suggesting opposing domain influences.

Recent research confirms that parents' vaccination decisions are heavily shaped by misinformation encountered on social media, and that anti-vaccine comments on official health posts can significantly increase parental vaccine hesitancy.²⁴ A systematic review of MMR hesitancy found that hesitant parents often preferred internet and social media narratives over physician-based information and had low trust in traditional health authorities.²⁵ Vaccination status (unvaccinated highest) and refusal history were correlated with behavior domain changes, as was the number of children (two children scored higher).

Limitations include the cross-sectional design preventing causal inference, limited generalizability due to sample homogeneity, potential recall and social desirability bias from self-administered online questionnaires, small subgroup sizes reducing statistical power and increasing type II error risk, and reliance on parental self-report rather than objective records.

CONCLUSION

About one in five parents in Taif City showed signs of vaccine hesitancy, with the main drivers being their general attitudes toward vaccines and concerns about safety and efficacy. Key factors included a mother's marital status, a younger parental age, having previously refused a vaccine, and turning to non-medical sources for

information. Making confidence in vaccines remains relatively high in this population. Routine screening and more targeted communication could further reduce hesitancy and maintain strong vaccination coverage across Saudi Arabia.

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