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RESEARCH PAPER



Vaccine hesitancy and its determinants among Arab parents: a cross-sectional survey in the United Arab Emirates

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ABSTRACT

Background: Vaccine hesitancy is a leading threat to public health. It has been studied extensively in North America and Europe but much less in Arab countries. The Parent Attitudes about Childhood Vaccines (PACV) survey is a validated tool for identifying vaccine-hesitant parents; however, Arabic version is not available. This study aimed to assess the reliability of the PACV survey in the Arabic language and to determine the prevalence of vaccine hesitancy among parents in the United Arab Emirates (UAE).

Methods: Forward and backward translation of the PACV in the Arabic language was carried out. The reliability of the Arabic-PACV survey was tested among parents with children. The same survey was used to study vaccine hesitancy among parents attending seven ambulatory health-care services in Al-Ain city, UAE. The associations between vaccine hesitancy and socio-demographic characteristics were explored.

Results: The Cronbach alpha for Arabic-PACV scores was 0.79. Three hundred participants answered the survey (response rate, 85.7%). The majority were Emirati mothers (77%) in the age group (30–49 years). Only 36 parents (12%, 95% CI 8.5,16.2) were found to be vaccine-hesitant. Parent's greatest concerns were mainly the side effects (35%), safety of vaccines (17% unsure and 28% concerned) and getting too many injections (28%). Divorced marital status was significantly associated with vaccine hesitancy ($p < .001$).

Conclusion: The Arabic-PACV survey could serve as a tool in the evaluation of vaccine hesitancy among parents in UAE and other Arabic-speaking countries. Many parents in our community were concerned about the vaccine safety. Targeted preventive measures are needed.

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Vaccine hesitancy; UAE; PACV; vaccine safety

Introduction

Vaccine hesitancy presents a real threat to global health as declared by the World Health Organization (WHO).¹ It is one of the major challenges facing childhood vaccination nowadays.² While vaccinations are preventing around 2–3 million deaths every year, more than 19 million infants worldwide did not benefit from routine immunization services in 2018.³ The success of any vaccination program relies heavily on maintaining high vaccine coverage that ensures direct protection to the vaccinated people as well as indirect protection for the overall community.⁴

The WHO defines vaccine hesitancy as a “delay in acceptance or refusal of vaccines despite the availability of vaccination services.” It is complex, context-specific, and varies across time, place, and vaccines.⁵ Vaccine-hesitant individuals are a heterogeneous group. They may refuse some vaccines but agree to others; they may also delay vaccines or accept vaccines according to the recommended schedule while still remaining unsure.^{6,7}

As observed in other countries, social media in the United Arab Emirates (UAE) greatly influence people's beliefs and behaviors and might have an impact on vaccination uptake.⁸ Health-care

vaccination opinions in the UAE are on the rise especially during the recent national measles vaccine campaign and following the introduction of Human Papillomavirus vaccine. In Italy, there was around an 18% decline in influenza vaccine coverage between the years 2013 and 2014 because of media reporting on the adverse effects of vaccines.⁹ In the UAE, vaccine coverage estimates for the last 10 years have been consistently above 95% for most childhood vaccines including DTP and MMR.¹⁰ Despite the high coverage, in the year 2018, 4290 cases of chickenpox, 57 cases of measles, 227 cases of mumps, and 65 cases of pertussis were reported to the Health Authority of Abu Dhabi, UAE. Unfortunately, the vaccination status of these individuals was not documented.¹¹

To the best of our knowledge, parents' vaccine hesitancy has never been explored in the UAE.¹² In the wake of these new movements against vaccination, exploring and understanding vaccine hesitancy among parents in the UAE is essential to inform decision-makers so that appropriate strategies can be adopted to mitigate these barriers and improve public health.

The Parent Attitudes About Childhood Vaccines (PACV) survey is a validated tool that has been successfully used in several countries to identify vaccine-hesitant parents.^{6,13–17} It can predict child under-immunization especially in those of

parents with high PACV scores.⁶ However, as the PACV was originally developed in the English language and used mainly among parents in North America and Europe, its performance among Arab populations is unknown.

The aims of this study are to evaluate the reliability of the PACV survey in the Arabic language, assess the prevalence of vaccine hesitancy, analyze the parental attitudes and concerns pertaining to vaccines, and identify sociodemographic factors associated with vaccine hesitancy among parents in the UAE.

Methods

Study setting, population, and sampling

This cross-sectional study was conducted from April to July 2019 among parents attending antenatal and postnatal clinics in the Ambulatory Healthcare Services (AHS) in Al-Ain city, UAE. We used a convenience sample of parents attending seven AHS centers in different geographic parts of Al Ain city capturing both urban and rural areas. We approached Arabic-speaking parents who were present in the waiting areas and invited them to participate. Parents who are expecting a child or have had at least one child before were approached to fill in the questionnaire. The questionnaire was completed autonomously by the respondent unless the respondent herself or himself approached the researchers for help and assistance. Participation was voluntary. We obtained a written informed consent from all participants. Assuming that 10.5% are hesitant, in accordance with regional literature,^{15,18} to obtain a representative sample of the population with a 95% confidence and an error of 5%, a sample size of 120 subjects was required. However, considering a potential low response rate of 30% in our population, the final sample size was increased to 350 subjects.

PACV translation into Arabic

For the purpose of this study, we translated the original PACV survey into the Arabic language using forward and backward method. First, a bilingual investigator (SA) individually translated the PACV survey into the Arabic version. Next, another bilingual investigator (IE), unaware of the original English version, performed a back translation into the English language. All investigators discussed the discrepancies resulting from the forward-backward translations and refined the Arabic version accordingly to maintain the meanings of the original survey. Moreover, the Arabic version was pre-tested on a random sample of 25 parents (not included in the final sample) to assess the clarity of questions before finalizing the Arabic-PACV version.

PACV description

The Arabic-PACV used in the current study (Supplementary Material) contains 15 items under 3 domains: behavior (items 1–2), safety and efficacy (items 7–10), and general attitude and trust (items 3–6 and 11–15). We also added demographic questions including parental age, parental educational level, marital status, nationality, relationship to child, number of children in

the household and household income. As previously described, the PACV was scored by assigning a numeric score of 2 for non-demographic items answered with a hesitant response, a score of 1 for items answered with a response of “don’t know or not sure,” and a score of 0 for items answered with a non-hesitant response. PACV scores range from 0 to 100 and a non-hesitant parent was defined with a score <50 and a hesitant with a value ≥50. For converting the PACV raw score to the scale of 0 to 100, we used a simple linear transformation that accounts for missing data similar to that used by the original PACV author.¹³

Data analysis

Data was analyzed using STATA 15 package (College Station, Texas, USA.). Internal consistency for the Arabic-PACV was evaluated using Cronbach’s alpha test. The univariate association between the hesitancy status with each of the explanatory variables was analyzed with Chi-square test for proportions and expressed as unadjusted odds ratio (OR) with 95% confidence intervals (ci). The variables significant in the univariate model with a *P* value < .1 were then fitted into a stepwise backward logistic regression model to test their association with hesitancy while adjusting for all the other variables. Only the variables with a *P* value < .05 were considered to be significantly associated with hesitancy and the results were expressed as adjusted OR with 95% ci.

Ethics consideration

Ethics approval was obtained from the Ambulatory Healthcare Services (AHS) – Human Research Ethics Committee at Abu Dhabi Health Services Company – SEHA.

Results

Participation and inclusion in the study

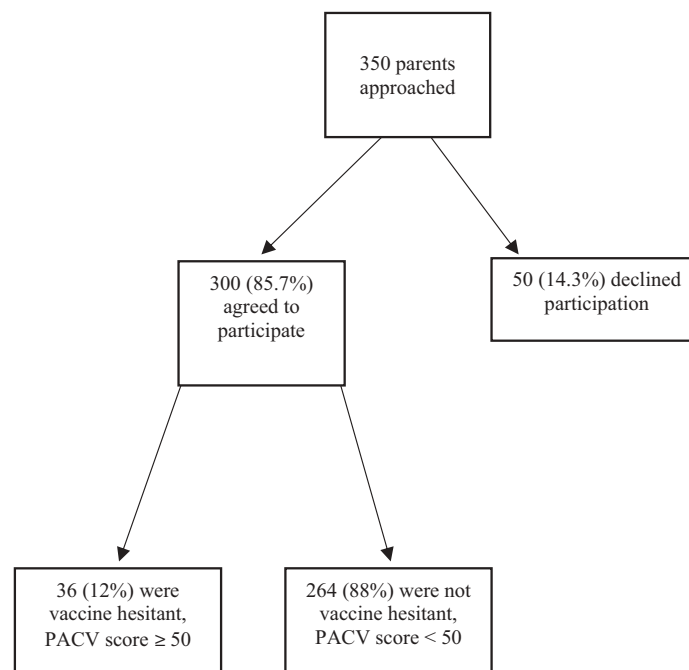
A total of 350 surveys were distributed (50 surveys to each of the 7 health-care centers), 300 were filled and returned (response rate, 85.7%), [Figure 1](#). As this number exceeded the calculated sample size of 120, we then stopped further enrollment.

Participants sociodemographic characteristics

[Table 1](#) demonstrates the sociodemographic characteristics of 300 recruited parents. The majority of participants were Emirati mothers (77%) in the age group (30–49 years). About half had attended university or higher education. Around one-quarter of parents (27%) had a monthly household income less than 10,000 Emirati dirhams (≈US \$ 2,700).

Performance of Arabic-PACV and vaccine hesitancy in the studied population

The Cronbach alpha for the total Arabic-PACV scores was 0.79. Using the Arabic-PACV survey, only 36 parents (12%, 95% CI 8.5,16.2) were identified to be vaccine-hesitant (PACV score ≥50). This is consistent with the 10% self-reported prevalence of vaccine hesitancy in the survey (item 12).



PACV: Parent Attitudes About Childhood Vaccines

Figure 1. Flowchart of parents attending Ambulatory Healthcare Services who were offered participation in the study.
PACV: Parent Attitudes About Childhood Vaccines.

Parental attitudes and concerns pertaining to vaccines

Forty-four (16%) of all 300 surveyed parents self-reported that they ever delayed their children's vaccination and 6% of them had decided not to vaccinate their children, [Table 2](#). Of the 36 vaccine-hesitant parents, 14 (40%) self-reported delaying their child receiving a shot versus 30 (11.5%) of those with no hesitancy ($P < .001$). Moreover, 10 (27.8%) of the parents with vaccine hesitancy had already decided at some point not to have their child get a shot versus 8 (3%) of those with no hesitancy ($P < .001$). Parent's greatest concerns were mainly the vaccines side effects (35%), safety of vaccines (17% unsure and 28% concerned) and getting too many injections (28%), [Figure 2](#) and [Table 2](#).

Univariate and multivariate analysis of factors predicting vaccine hesitancy among parents

In the univariate analysis, fathers and divorced status were significantly more vaccine-hesitant ($p < .05$) than mothers or other listed marital statuses, while other sociodemographic factors such as age, educational level, household income, nationality, and first-born child status did not have any significant association with vaccine hesitancy. In the multivariate logistic regression model, only the divorced status remained significantly associated with hesitancy ($P < .001$), [Table 3](#).

Discussion

The Arabic-PACV has an overall Cronbach alpha score of 0.79 indicating a reliable internal consistency that is comparable with the original PACV and other translated versions.^{14,16,19}

Using the Arabic-PACV, we identified that 12% of the studied UAE population are vaccine-hesitant. These findings are similar to other studies using the same tool from Kuala Lumpur, Malaysia (11.6%) and Erbil, Iraq (9.9%) and lower than those reported in USA (30.4%) and Italy (34.7%).^{6,16,18,19} Using an 11-item vaccine hesitancy scale, designed by the WHO Strategic Advisory Group of Experts (SAGE) on immunization, a recent study from Saudi Arabia reported that 20% of parents were hesitant to get their child vaccinated.²⁰ The reported differences in the prevalence of vaccine hesitancy are likely related to the unique characteristics of the different studied populations, study settings (hospital vs. community) and the survey tool used.

Although 16% of parents in our studied population self-reported delaying their children's vaccination and 6% decided not to vaccinate their children, neither the reasons for the delay or decision not to vaccinate, nor if those decisions were vaccine-specific are known. To overcome this limitation, Abd Halim et al. suggested to convert items 1 and 2 on the PACV survey into a numerical scale indicating the number of times vaccines have been delayed or refused and to provide space for parents to provide their reasons.¹⁹

A national survey involving more than 11,000 parents in the USA identified that parents who delayed and refused vaccines were more likely to have vaccine safety concerns and perceive fewer benefits associated with vaccines.²¹ Similarly, in this study, vaccine safety issues and getting too many shots were cited as parents' top concerns. Vaccine providers must understand parents' specific beliefs and concerns about vaccines and tailor counseling to the family from a sociocultural perspective.

Table 1. Characteristics of the participants (N = 300).

	N	%
Parent		
Mother	230	77
Father	69	23
Health center		
Rural	83	28
Urban	217	72
Age group (years)		
< 18	9	3
18–29	60	20
30–39	133	45
40–49	86	29
≥ 50	9	3
Marital status		
Married	266	94
Widowed	5	2
Divorced	12	4
Nationality		
Emirati	225	77
Others	68	23
Educational level		
Illiterate	2	1
Less than high school	34	11
High school	97	33
University	131	44
Masters or PhD	32	11
Household income (Emirati dirhams*)		
< 10,000	75	27
10,000–30,000	134	48
30,000–50,000	48	17
>50,000	24	8
Is this child your firstborn? Yes	70	23
Number of children in the household		
1	35	12
2	59	20
3	55	18
≥4	149	50

Total number for each characteristic may not add up to 300 because of missing values.

* 10,000 Emirati dirhams ≈ US\$ 2,700.

In a study involving more than 7000 parents, around 80% of parents stated that their decision to vaccinate was positively influenced by their primary care provider.²² Another recent multi-center study involving 1820 pregnant women from 15 Italian cities revealed that women who had confidence in

health-care professional information agreed more on mandatory vaccination than did the other women.²³ Consistently, in the present study, 216 (73%) parents indicated almost complete trust in their child's doctor. Therefore, training of health-care providers to effectively communicate immunization issues should be included in their teaching curriculum and throughout their continuous medical education.

In the univariate analysis, fathers and divorced status were found significantly associated with vaccine hesitancy. However, there were no associations with parent's age, educational level, household income, nationality, and first-born child status. The NAVIDAD study in Italy showed that vaccine hesitancy is mainly present in higher-income and highly educated mothers older than 35 years.²³ In contrast, a Malaysian study found that pregnant mothers expecting their first child and unemployed parents were more vaccine-hesitant.¹⁵ It is likely that the significant differences in demographic, social, cultural, religious, educational, economic, and environmental factors amongst countries account for any observed differences in underlying determinants of vaccine hesitancy.

In the multivariate analysis and following adjustment for all other variables, vaccine hesitancy was found to be associated with divorced status only. Similarly, Anokye et al. reported that being divorced ($p = .048$) had a significant and positive association with immunization incompleteness among 280 caregivers/mothers in Koforidua, Ghana.²⁴ In the UAE, divorce cases are rising up.²⁵ In 2010, the divorce rate in Abu Dhabi was 0.9 per 1000 population.²⁶ In 2017, Dubai Statistics Center reported an average divorce rate of 2.4 per 1,000 citizens at the age of marriage for UAE nationals residing in Dubai. This rate goes up to 3.9 cases per 1000 citizens when considering both UAE and non-UAE nationals.²⁷ In a study involving 1742 divorced women in the UAE, health effects on children after divorce were apparent and involved sleep disorders, weight changes, depression, headaches, thumb sucking, stuttering, bed-wetting, bad language, and alcohol abuse.²⁸ Our study is the first in UAE to report the association

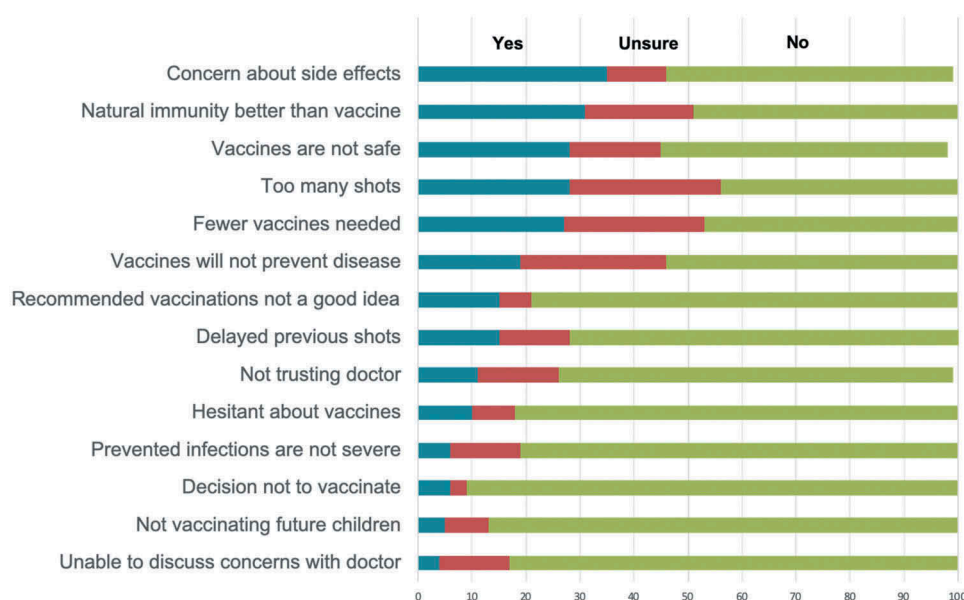
**Figure 2.** PACV factors associated with vaccine hesitancy (coded as Yes), by descending order of frequency (percentage).

Table 2. Responses to individual PACV statements by 300 participants.

No.	Item	Response	N (%)
1	Have you ever delayed having your child get a shot (not including seasonal flu) for reasons other than illness or allergy?	Yes	44 (16)
		No	235 (84)
		Don't know	
2	Have you ever delayed having your child get a shot (not including seasonal flu) for reasons other than illness or allergy?	Yes	18 (6)
		No	271 (94)
		Don't know	
3	How sure are you that following the recommended shot schedule is a good idea for your child? From 0 (not at all sure) to 10 (completely sure)	0–5	44 (15)
		8–10	234 (79)
		6–7	20 (6)
4	Children get more shots than are good for them.	Disagree	131 (44)
		Unsure	84 (28)
		Agree	84 (28)
5	I believe that many of the illnesses that shots prevent are severe.	Disagree	242 (81)
		Unsure	40 (13)
		Agree	18 (6)
6	It is better for my child to develop immunity by getting sick than to get a shot	Disagree	146 (49)
		Unsure	59 (20)
		Agree	92 (31)
7	It is better for children to get fewer vaccines at the same time.	Disagree	140 (47)
		Unsure	78 (26)
		Agree	81 (27)
8	How concerned are you that your child might have a serious side effect from a shot?	Not concerned	160 (53)
		Unsure	33 (11)
		Concerned	106 (35)
9	How concerned are you that anyone of the childhood shots might not be safe?	Not concerned	161 (53)
		Unsure	53 (17)
		Concerned	85 (28)
10	How concerned are you that a shot might not prevent the disease?	Not concerned	162 (54)
		Unsure	81 (27)
		Concerned	56 (19)
11	If you had another infant today, would you want him/her to get all the recommended shots	Yes	258 (87)
		Don't know	23 (8)
		No	15 (5)
12	Overall, how hesitant about childhood shots would you consider yourself to be?	Not hesitant	245 (82)
		Unsure	23 (8)
		Hesitant	29 (10)
13	I trust the information I receive about shots.	Agree	251 (84)
		Unsure	37 (12)
		Disagree	9 (3)
14	I am able to openly discuss my concerns about shots with my child's doctor.	Agree	247(83)
		Unsure	38 (13)
		Disagree	12 (4)
15	All things considered; how much do you trust your child's doctor? From 0 (no trust at all) to 10 (completely trust)	8–10	216 (73)
		6–7	45 (15)
		0–5	34 (11)

PACV: Parent Attitude about Childhood Vaccines. The answer "Do not know" in questions 1 and 2 is counted as missing data. The shaded answers reflect vaccine hesitancy. The total number for each characteristic may not add up to 300 because of missing values.

between divorced status and vaccine hesitancy. Taken together, society including health-care authorities and workers should support the family structure that has the best chance of generating healthy children.

In some European countries, mandatory vaccination policies were found associated with higher vaccination coverage.²⁹ However, mandatory vaccination should not be the sole approach in addressing vaccine hesitancy. In the context of UAE and the adoption of mandatory vaccination policies, it would be valuable to consider a multiple approach method, which includes educational intervention and raising awareness as well as ensuring strong immunization programs. Parents should be advised to understand why the immunization of their children is so important. Additionally, the possibility of enforcing a law for mandatory vaccination could be considered.

This study has a few limitations. First, as with any self-administered survey, there is a risk of potential recall bias because participants may not accurately remember or truthfully report the information. Additionally, immunization records

were not verified to corroborate the parental response. Furthermore, we approached a convenience sample of Arabic-speaking parents attending public primary health-care centers in Al Ain city and this may bias the results as most parents attending these centers are UAE national benefiting from a specific type of health insurance unavailable to others. As the study was undertaken in Al-Ain city, with different socioeconomic and educational backgrounds of its population when compared to other parts of the country, selection bias is possible and generalization beyond the study population cannot, therefore, be made. Future studies should involve community settings in different parts of the UAE such as Dubai and Abu Dhabi where the majority of the population are non-UAE nationals and with different health insurance schemes.

In conclusion, many parents in our community were concerned of the safety and side effects of vaccines. Targeted preventive and educational measures should be carried out to prevent the emerging and increasing trend of vaccine hesitancy in the country. More support is needed for vulnerable groups

Table 3. Associations between vaccine hesitancy and sociodemographic characteristics. Results expressed as number of respondents (percentage).

	Hesitant n = 36 (12%)	Non hesitant n = 264 (88%)	Univariate analysis*		Multivariate analysis [†]	
			OR (95% ci)	P value	aOR (95% ci)	P value
Parent			0.3 (0.1, 0.6)	0.001	0.2 (0.09, 0.76)	0.01
Mother	20 (9)	210 (91)	0.3			
Father	16 (23)	53 (77)	Reference			
Health Center			0.7 (0.4, 1.8)	0.2	NA	NA
Rural	11 (13)	72 (87)	0.8			
Urban	25 (12)	192 (88)	Reference			
Age group (years)			0.9 (0.6, 1.4)	0.6	NA	NA
< 18	1 (11)	8 (89)	Reference			
18–29	9 (15)	51 (85)	1.4			
30–39	13 (10)	120 (90)	0.8			
40–49	12 (14)	74 (86)	1.3			
≥ 50	0 (0)	9 (199)	NA			
Marital status			3.0 (1.6, 5.4)	<0.001	15.6 (2.9, 82.6)	<0.001
Married	23 (8)	243 (92)	Reference			
Widowed	0 (0)	5 (100)	1.0			
Divorced	6 (50)	6 (50)	10.5			
Nationality			0.5 (0.2, 1.4)	0.2	NA	NA
Emirati	29 (13)	196 (87)	1.8			
Others	5 (7)	63 (93)	Reference			
Educational level			0.7 (0.5, 1.2)	0.2	NA	NA
Illiterate	0 (0)	2 (100)	NA			
Less than high school	5 (15)	29 (85)	Reference			
High school	15 (15)	82 (84)	1.06			
University	11 (8)	120 (92)	0.53			
Masters or PhD	4 (12)	28 (88)	0.8			
Household income (Emirati dirhams*)			1.3 (0.9, 1.9)	0.1	1.5 (0.3, 8.5)	0.7
< 10,000	9 (12)	66 (88)	Reference			
10,000–30,000	11 (8)	123 (92)	0.6			
30,000–50,000	10 (21)	38 (79)	1.9			
>50,000	4 (12)	20 (88)	1.4			
This child your firstborn	13 (19)	57 (81)	0.5 (0.2, 1.0)	0.06	0.9 (0.2, 3.9)	0.3
Number of children in the household			0.9 (0.8, 1.3)	0.8	NA	NA
1	4 (11)	31 (89)	Reference			
2	7 (12)	52 (88)	1.04			
3	8 (15)	47 (85)	1.3			
>4	16 (11)	133 (89)	0.9			

PACV: Parent Attitude about Childhood Vaccines; OR: odds ratio; aOR: adjusted odds ratio; *: Chi-squared test; Multivariate logistic regression; NA: not applicable. Total number for each characteristic may not add up to 300 because of missing values.

like divorced parents to improve compliance with vaccination schedule. Moreover, our findings support the use of the validated Arabic-PACV among parents in any Arabic-speaking country.

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Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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Authors' contributions

ARA conceptualized and designed the study, coordinated data collection and drafted the manuscript. IE participated in the study design and manuscript preparation. SA carried out data collection, reviewed and revised the manuscript. RA participated in data collection, reviewed and revised the

manuscript. MSH participated in the study design, reviewed and revised the manuscript. HN carried out data analysis and interpretation and participated in manuscript preparation. All authors approved the final manuscript.

Data availability

All data generated or analyzed in this study are included in the manuscript.

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