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Parental anxiety and pediatric vaccine refusal in a US national sample of parents

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Abstract

Objectives.—Understanding vaccine hesitancy among parents is of emerging interest and of rising importance for promoting vaccine uptake to prevent pediatric illness. Here, we examine associations between vaccine refusal, parental demographics, and anxiety.

Methods.—Our cross-sectional survey assessed pediatric vaccine refusal in 1,699 parents in a US national sample. Participants completed a sociodemographic questionnaire, the Vaccine Hesitancy Scale, and symptoms of anxiety (GAD-7).

Results.—The prevalence of pediatric vaccine refusal was 15.5%. Parent symptoms of anxiety were related to vaccine refusal (OR = 1.07 [1.03, 1.10]). Mild (1.88 [1.39, 2.54], $p < .001$) and clinically significant (2.14 [1.39, 3.31], $p < .001$) symptoms of anxiety were also related to pediatric vaccine refusal.

Parental anxiety was also associated with perceived risks of vaccines and reduced confidence.

Conclusions.—Findings highlight the need to consider parental anxiety in the development of public health interventions that address substandard pediatric vaccine uptake.

Keywords

vaccine hesitancy; vaccine refusal; pediatrics

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Introduction

Vaccine hesitancy refers to the continuum of vaccine rejection and acceptance, including delayed acceptance, and a loss of confidence in vaccines leading to vaccine refusal, despite available resources.^{1,2} Vaccine hesitancy was declared a global health threat by the World Health Organization (WHO).³ An increasing number of studies have been dedicated to exploring the norms, attitudes, and beliefs that influence parental vaccine hesitancy.⁴⁻⁶ Though understanding vaccine hesitancy among parents is of emerging interest in promoting pediatric vaccine uptake and preventing pediatric illness, our understanding of vaccine hesitancy and refusal remains insufficient.

Vaccine refusal is associated with perceived side effects of vaccination; perceiving vaccines as worse than illness; religious beliefs; lack of trust in government and systems; and extreme emotions associated with vaccines (e.g., fear, anger).⁴⁻⁶ Misinformation, anecdotal experiences, as well as mistrust in the pharmaceutical industry can fuel a skewed perception, often rooted in a lack of adequate knowledge about the benefits of vaccination and the dangers posed by preventable disease.⁴⁻⁶ More recent reviews have highlighted the need to identify factors related to all forms of pediatric vaccine refusal, from outright refusal to more nuanced forms of hesitancy, such as selective vaccination. There are also varying degrees and likely different drivers of vaccine hesitancy for various vaccines. For example, the uptake of school-entry vaccination is generally high,⁷ while for elective vaccines (e.g., influenza, HPV, COVID-19), uptake is lower, with substantial ethnoracial differences in these rates.⁸

Reviews have also examined role of parental psychological distress,⁹ which may be a significant contributing factor.⁶ Studies in Australia have found maternal anxiety and distress are related to vaccine refusal, implying a correlation between a higher level of anxiety in mothers and an increased likelihood of vaccine refusal, whereas others have not been able to corroborate this connection.⁶ These findings are, however, limited by the high proportion of mothers included in previous studies (>80%),⁵ which limits the generalizability of these findings to other caregivers, including fathers. Notably, there is also dearth of research on parental distress and vaccine refusal among parents of children and adolescents in the United States (US).

Determining the prevalence of pediatric vaccine refusal and identifying factors related to refusal is essential to develop interventions that address substandard vaccine uptake. Thus, in this study, we describe vaccine hesitancy and refusal among parents in a United States national sample. In addition, we examine associations between parental demographics and anxiety and vaccine refusal using a cross-sectional survey-based study assessing the prevalence of vaccine refusal among parents in a US national sample.

Methods

Ethical Approval

Ethical approval from the University of Georgia Institutional Review Board was obtained.

Participant Eligibility

Eligible parents for the interviews and survey were at least 18 years of age, parenting at least one child aged 3–17 years, and living with their target child at least 50% of the time. If the parent reported having more than one child, the parent was asked to choose the one with the most recent birthday.

National Survey

The survey, completed in English, was distributed by QualtricsXM, a data collection and management company as part of larger psychometric study intended to validate a parenting assessment for youth aged 3 to 17. Available participants in Qualtrics panels are nationally representative samples of adults who volunteer to participate in surveys online in exchange for monetary compensation. The sample was geographically distributed across the US according to US Census proportions and demographics.^{10,11}

Measures

Participants were asked to complete a sociodemographic questionnaire, the Vaccine Hesitancy Scale (VHS),¹² and GAD-7 (General Anxiety Disorder-7).¹³

Statistical Analyses

Descriptive analyses were conducted to describe the sample as well as key variables in the study. Then, a logistic regression was conducted to assess the association between vaccine refusal and parental symptoms as a continuous variable. As a sensitivity analysis, we re-examined this association using a GAD-7 cut-off of 10 or greater for clinically significant symptoms of anxiety. Correlations were then conducted to examine associations between the VHS subscales and parental symptoms of anxiety.

Results

A total of $N = 1,699$ parents participated in the survey. Parents were, on average, 37 years of age ($SD = 9.10$). Other parent demographic characteristics as well as comparisons by vaccine refusal are in Table 1. Average child age was 9.75 ($SD = 4.36$). Parents reported that their target child's sex was female ($n = 808$; 47.6%), male ($n = 886$; 52.1%), or preferred not to answer ($n = 5$; <1 %). Parents reported that their children were, on average, 9.75 ($SD = 4.37$) years of age, and 52% were male.

Prevalence of Vaccine Refusal

Vaccine refusal was reported by 15.5% ($n = 264$) of parents. Though parents were asked to specify which vaccine they had refused, only $n = 161$ of parents reporting having refused a vaccine listed one. Of these, $n = 23$ parents reported refusing an influenza vaccine, $n = 6$ reported an HPV vaccine, $n = 117$ a COVID-19 vaccine, $n = 7$ other vaccine, and $n = 10$ refused all vaccines.

Association Between Parental Anxiety with Pediatric Vaccination Refusal

Logistic regression showed that that GAD-7 scores were greater among parents who had not vaccinated their children, compared with those who vaccinated their children ($M = 2.89$ ($SD = 4.05$) versus $M = 1.89$ ($SD = 3.36$); $Z = 6.83$, $p < .001$). Parental symptoms of anxiety, when symptoms of anxiety were examined as a continuous score, were associated with greater odds of pediatric vaccination refusal (OR [95% CI] = 1.08 [1.04, 1.11], $p < .001$).

Examining the association using a GAD-7 cutoff of 10 (or greater) for clinically significant symptoms of anxiety predicting pediatric vaccine refusal, the OR was 2.14 [1.39, 3.31], $p < .001$, suggesting that parents with clinically significant symptoms of anxiety (GAD-7 score of 10 or higher) are approximately 2.14 times more likely to refuse pediatric vaccines compared to individuals without clinically significant anxiety symptoms. Using a GAD-7 of 5 (for mild symptoms of anxiety), the OR was 1.88 [1.39, 2.54], $p < .001$, suggesting that parents with mild symptoms of anxiety had 1.88 times the odds of pediatric vaccine refusal compared to those without mild symptoms of anxiety.

We further examined associations between parental anxiety and VHS total scores as well as individual scale factors (Reduced Confidence and Perceived Risks). Parental anxiety was positively associated with both perceived risks of vaccines ($r = .146$, $p < .001$), lower confidence in vaccines ($r = .065$, $p = .014$), and the total score combining the two factors ($r = .109$, $p < .001$).

Discussion

Vaccine hesitancy is an important global health concern with countless consequences, from the reappearance of preventable diseases to preventable strain on healthcare systems. In this study, we examined the prevalence of pediatric vaccine refusal and identified factors related to refusal in a US national sample of parents of children and adolescents. In addition, we examined associations between parental anxiety and vaccine refusal. Findings from the current national sample indicate that pediatric vaccine refusal is high (15.5%) and may be related to parental symptoms of anxiety. Overall, this study contributes to the understanding of vaccine hesitancy among parents and offers insights into vaccine refusal among parents. By focusing on a US national sample, compared to previous studies, it provides a foundation for future research on vaccine refusal and the potential design of targeted interventions to address suboptimal vaccine uptake in the US.

Findings suggest that parents' symptoms of anxiety may be linked to the decision to refuse pediatric vaccines, as well as associations with higher perceived risks and lower confidence in vaccines, though we lack information about the timing of vaccine refusal. Specifically, the odds ratio of 1.08 suggests that for each one-unit increase in the parents' GAD-7 score, there is an 8% increase in the odds of pediatric vaccination refusal. This finding was supported by sensitivity analyses demonstrating that parents with clinically significant symptoms of anxiety were had 2.14 greater odds of refusing pediatric vaccines compared to individuals without clinically significant anxiety symptoms—this finding was also true of parents with mild symptoms of anxiety, with a lower OR of 1.88. Though the current

study is cross-sectional, the theoretical underpinnings of anxiety might explain that parents with symptoms of anxiety could potentially face challenges in evaluating the information regarding the validity of vaccines, as anxiety is characterized by fear and worries about the future.^{14,15} There are multiple pathways by which a parent's anxiety can influence the decisions they make about their child's vaccination status. First, anxiety is characterized by increased worry and fear, which might make parents more cautious and hesitant about vaccines. Second, parents with anxiety might be more susceptible to information overload, especially in today's digital age where information is readily available online. Parents may also come across conflicting or alarming information about vaccines, which can exacerbate their anxiety and contribute to vaccine hesitancy. Third, anxiety often comes with a desire for predictability. Vaccination decisions can be seen as a loss of control over a child's health, and decreased predictability. Finally, symptoms of anxiety are associated with a heightened sense of risk perception.¹⁶ Therefore, parents with symptoms of anxiety may be more risk-averse in various aspects of life, including or particularly the healthcare decisions that involve their children. Nevertheless, we did not explore these potential pathways in the current study, and as such, warrant evaluation in future research.

Previous studies in Australia have found maternal anxiety and distress are related to vaccine refusal, whereas others have not.⁶ However, to the best of our knowledge, this is the first study in the US to examine this association. In the current divisive sociopolitical climate of the US, parents with symptoms of anxiety may find it more challenging to evaluate news and information on pediatric vaccinations, particularly in the absence of effective interventions to address pediatric vaccine hesitancy.¹⁷ This uncertainty in evaluating vaccine information may be exacerbated in the presence of ongoing symptoms of anxiety, or it may lead to heightened anxiety that generalizes to other domains.⁶ Pediatric vaccination refusal can have lasting negative health implications for youth.¹⁸ As such, these findings may suggest the need to target parental symptoms of anxiety in promoting pediatric vaccine uptake. Nevertheless, recognizing the cross-sectional nature of this study, it is unknown whether anxiety preceded the refusal of pediatric vaccines. Therefore, longitudinal studies may be needed to establish temporal order.

Further, our study illustrates disparities in vaccine refusal rates among different racial and ethnic groups, which is consistent with previous studies reporting ethnoracial differences in the uptake of pediatric vaccines.⁸ However, this previous study focused on elective vaccines,⁸ while our study focused on the general uptake of pediatric vaccines. Non-Hispanic Native American and White parents had the highest rates of vaccine refusal, followed by Non-Hispanic Black parents, Non-Hispanic Hispanic parents, and Non-Hispanic Asian parents. These findings are also consistent with previous research on the association between vaccine attitudes and sociodemographic factors.¹⁹ However, previous studies have found the highest prevalence of vaccine hesitancy in African Americans, which differs from the current findings.¹⁹ This finding may be related to the novelty and elective nature of the COVID-19 vaccine. Though not all parents specified which pediatric vaccine they had refused, those who did mostly reported refusing COVID-19 vaccination. As such, findings highlight the need to consider these ethnoracial differences in future research, and potentially, in the development of public health interventions that address substandard pediatric vaccine uptake.

Limitations in this study include the cross-sectional design of the survey, which limits causal inference, as well as restrictions on child age (ages 3 to 17). For example, we are unable to establish temporality and are unable to state that the exposure (anxiety) preceded the outcome (vaccine refusal). Further, the current study was designed as an online panel survey and may not represent the US population of parents. Nevertheless, this study also had of several major strengths, including the large sample size of parents from various sociodemographic groups and US regions, as well as the involvement of fathers, who have been underrepresented in the vaccine refusal literature.⁵ In addition, rather than focusing on maternal mental health and distress, as in previous studies, fathers' symptoms of anxiety were also evaluated.⁶ Given this, our findings are supported by the association between symptoms of anxiety and beliefs about pediatric vaccination.

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Table 1

Sociodemographic comparisons of parents refusing pediatric vaccination (N = 1699).

Variables	Did not refuse pediatric vaccination (n = 1,435)	Refused pediatric vaccination (n = 264)	t/X ² , p
Parent Sociodemographic Characteristics			
Age	38.07 (9.31)	37.00 (8.57)	1.85, 0.065
Sex			
Female	699 (84.9 %)	124 (15.1 %)	
Male	736 (84.0 %)	140 (16.0 %)	0.21, 0.650
Race/Ethnicity			
White	347 (81.1 %)	81 (18.9 %)	
Asian	341 (90.5 %)	36 (9.5 %)	
Black	332 (82.2 %)	72 (17.8 %)	
Hispanic	374 (86.0 %)	61 (14.0 %)	
Native American	25 (73.5 %)	9 (26.5 %)	
Other	16 (76.2 %)	5 (23.8 %)	20.6, 0.001
Sexual Orientation			
Heterosexual or straight	1308 (84.9 %)	232 (15.1 %)	
Gay or lesbian	21 (87.5 %)	3 (12.5 %)	
Bisexual	72 (78.3 %)	20 (21.7 %)	
Asexual	8 (88.9 %)	1 (11.1 %)	
Other (please specify)	12 (75.0 %)	4 (25.0 %)	
Do not know	14 (77.8 %)	4 (22.2 %)	4.97, 0.420
Relationship Status			
Never Married	243 (83.2 %)	49 (16.8 %)	
Separated or Divorced	115 (81.0 %)	27 (19.0 %)	
Married	853 (85.2 %)	148 (14.8 %)	
Widowed	12 (85.7 %)	2 (14.3 %)	
Prefer not to answer	9 (75.0 %)	3 (25.0 %)	
In a committed relationship	203 (85.3 %)	35 (14.7 %)	3.04, 0.693
Work Status			
Not employed	280 (81.6 %)	63 (18.4 %)	
Work part-time	214 (84.6 %)	39 (15.4 %)	
Work full-time	917 (85.2 %)	159 (14.8 %)	
Prefer not to answer	24 (84.5 %)	3 (11.1 %)	2.97, 0.396
Child Sociodemographic Characteristics			
Age	9.77 (4.38)	9.66 (4.29)	0.38, 0.705
Sex			
Female	685 (84.8 %)	123 (15.2 %)	
Male	745 (84.1 %)	141 (15.9 %)	
Prefer not to answer	5 (100.0 %)	0 (0.0 %)	1.08, 0.584