

Research Article

Caregivers' Knowledge, Attitudes, and Perceptions (KAP) Towards Pediatric COVID-19 Vaccination and Pandemic Amid Emerging New Variants in a Low Socio-Economic Community Hospital in New York

Tanya Tandon, MD¹; Mahmoud Hassanein, MD¹; Min-Kyung Jung²; Fernanda Kupferman, MD¹

¹Department of Pediatrics, OBH Brookdale Hospital Medical Center, USA

²New York Institute of Technology 1855 Broadway, USA

***Corresponding author:** Tanya Tandon MD, OBH Brookdale Hospital Medical Center Brooklyn New York Department of Pediatrics, 1 Brookdale Plaza 11063, USA. Email: tandontant11@gmail.com

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Abstract

Objectives: Prevalence of COVID-19 vaccination rates among the pediatric population is currently suboptimal. Past research has been done to understand vaccine hesitancy; however our research tries to expand more on the perception of caregivers and explores vaccination trends based on their knowledge as the pediatric population depends on its caregivers for their medical decisions. Our study assessed the KPA of caregivers towards the COVID-19 pandemic and vaccination and compared these factors between healthcare professionals (HCP) and nonhealthcare professionals (NHCP).

Methods: This descriptive, cross-sectional survey involved English-proficient caregivers of children aged 0-17 years, seeking routine checkups or hospital admissions. A novel 4-part survey was developed from previous studies wherein KPA was scored as 2 points for each correct Knowledge question (n=12). A score of ≥ 12 was considered adequate (K). Perception and Attitude were assessed using a 10-point Likert scale. Demographics, KPA and vaccination likelihoods were collected and statistically analyzed using frequencies, mean with standard deviation (SD) and Mann-Whitney U tests to check for significance.

Results: In our study, 63% of caregivers were African American, and most had good knowledge of COVID-19, yet only 55% recognized full vaccination as a key preventive measure. Despite using the CDC as their main information source, caregivers doubted its veracity showing low to moderate trust levels and expressed concerns about vaccine safety, with 36.1% viewing vaccines as a potential cause of their child's illness. The unvaccinated rate among children in our study was higher than the national average. HCP demonstrated significantly higher knowledge and trust in CDC information compared to Non-NHCP although vaccination rates among their children did not differ significantly.

Conclusions: This study shows the complex nature of vaccine decision-making, where knowledge alone may not be sufficient to change behavior. It further highlights the need for targeted education and outreach efforts to address vaccine hesitancy.

Keywords: KPA: Knowledge; Perception; Attitude

Introduction

The current outbreak termed Coronavirus Disease 2019 (COVID-19) was officially declared a pandemic by the World Health Organization (WHO) on March 11, 2020 [1]. Since then, measures to mitigate this virus' effects have been taken by countries across the Globe like masking, washing hands and social distancing along with the development of vaccines to protect the population from the severity of this disease and reduce the spread of new mutants like Delta and Omicron [2]. In the United States of America, as of the 2020 Census report, children under age of 18 years make up 22.2% of the total US population [3]. Hence to mitigate the effects of the COVID-19 pandemic in this vulnerable population, the FDA approved the use of

Pfizer- BioNTech 3 dose primary series, Moderna two-dose primary series for ages 6 months to 4 years and two-dose primary series for both Pfizer-BioNTech and Moderna for ages 5 years-17 years as of August 5, 2022, with a robust roll out and availability in all regions of the country [4]. Since the pandemic began, 17.9% of children have tested positive for Covid-19 but only 56% of children have been vaccinated (CDC report May 2023) [5]. Since the beginning of this research in November 2022 the vaccination numbers have crept up very slowly and are insufficient to provide adequate herd immunity. With the emergence of new variants and less-than-ideal vaccination rates amongst various strata of the pediatric population it

is important to assess the current state of mind of caregivers of the pediatric population. As the pediatric age group depends directly on their parents/legal guardians for their healthcare, it can be assumed that the knowledge, perception and attitude of caregivers towards the pandemic and pediatric vaccination against COVID-19 will likely influence vaccination rates seen in the pediatric population.

Aims

1. To assess Knowledge and Perception of caregivers of pediatric population towards the pandemic and vaccination against COVID-19 virus

2. To assess differences in Knowledge, Perception and Attitude (KPA) of Healthcare (HCP) vs non-healthcare professions (NHCP).

Material/methods

Study Design

This was a cross-sectional study conducted at Brookdale Hospital Medical Center and affiliated Family Care Pediatric Clinics using a 4-part questionnaire. English-speaking caregivers (parents/legal guardians) belonging to both medical and non-medical professions with children aged 0 days-17 years, who consented to participate, were included. The calculated sample size was 100. For caregivers with more than one child, the age of the youngest child, irrespective of eligibility for vaccination, was considered. Due to the novelty of this study, a standardized questionnaire covering all aspects was not available. Hence, a literature review of studies conducted in this field was undertaken. [6,7] Using questions on vaccine hesitancy, knowledge and awareness regarding COVID-19 pandemic and pediatric vaccines, the authors of this article formed a novel 4-part questionnaire. Data collection was done over a 10-month period starting in November 2022. The study received IRB approval at Brookdale Hospital Medical Center. Verbal consent from each caregiver and verbal assent from each pediatric patient was taken before administering this novel questionnaire.

Statistical Analysis

Part 1 of the questionnaire collected basic demographic information of the survey responders which was reported as frequencies. Part 2 of the questionnaire assessed Knowledge of caregivers regarding the pandemic and vaccines for pediatric ages against Covid-19 virus. This was done using a point-based system wherein 2 points were awarded for each correct answer choice and no negative marking was done. This section consisted for 5 total questions. Each question contained 2-3 answer choices, wherein caregivers could select multiple options. Maximum score was 24 points and mean was taken as 12 points to categorize knowledge as good (<12 points) vs poor (> 12 points) knowledge. Part 3 and 4 of the questionnaires collected data pertaining to Perception and Attitude of caregivers which was done through multiple choice questions as well as a 10-point Likert scale. Data regarding vaccination status of a caregiver's child included only Moderna as the primary series as this was the only vaccine available in the hospital and clinics at the time of this research. Data was analyzed and reported using frequencies, mean with Standard Deviation (SD) and Mann-Whitney U tests for significance.

Results

Out of 105 caregivers that consented to participate, Table 1 shows African American caregivers constituted 66 (63%) responses with a median child age of 5 years. Gender demographics showed male and female children of almost equal proportions. Based on the profession of caregivers 38 responders (36.2%) were healthcare workers. Overall table 2 shows that 101 (96.2%) caregivers had a good knowledge score (≥ 12). Knowledge regarding the pandemic and ways to prevent the spread of covid-19 virus other than vaccinations showed that an average of 90% caregivers accepted strategies like social distancing, masking and handwashing, etc. However, only 55% percent of caregivers identified fully vaccinating their child as a method to prevent Covid-19 disease. Further analysis on knowledge regarding vaccines against Covid-19 virus showed that 89 caregivers (84.8%) identify Pfizer and 60 responders (57.1%) identifies Moderna correctly as FDA approved vaccines but 20% caregivers wrongly

Table 1: Demographics (N=105).

Demographics	n(%)
Total survey responders	105 (100%)
Caregiver's race	
African American/Black	66 (62.9%)
Latino/Hispanic	21 (20.0%)
White	7 (6.7%)
Others	11(10.5%)
Child's age (Median (IQR))	5 (7) years
Male children n (%)	53 (50.5%)
Caregiver's Profession	
Healthcare profession	38 (36.2%)
Non-healthcare profession	67 (63.8%)

Table 2: Knowledge of caregivers (N = 105).

Knowledge of caregivers regarding: (multiple choices could be selected)	n (%)
1. Spread of Covid-19 virus	
Exposure to nose/mouth droplets of a potentially infected individual without a mask	104 (99.0%)
Exposure to nose/mouth droplets while talking to a potentially infected individual without a mask	100 (95.2%)
Touching highly used surfaces previously in contact with potentially infected individual	97(92.4%)
2. Correct measures to protect child against new Covid-19 variants	
Social distancing	90 (85.7%)
Hand washing	95 (90.5%)
Fully vaccinating	58 (55.2%)
Mask wearing	89 (84.8%)
3. FDA approved vaccines for eligible pediatric	
Pfizer	89 (84.8%)
Moderna	60 (57.1%)
J&J	21 (20.0%)
Not sure/Other	5 (4.8%)
4. Age group(s) eligible to receive FDA approved Covid-19 vaccines	
0 month to less than 6 months	8 (7.6%)
6 months to less than 5 years	49 (46.7%)
5 years to 17 years	96 (91.4%)
None of the above	3 (2.9%)
5. Advantages of getting child fully vaccinated with primary series	
My child will not get Cov-19 at all	2 (1.9%)
My child may get Cov-19 but the symptom will be less severe	89 (84.8%)
Vaccines have no advantages	14 (13.3%)
6. Total Knowledge scores of caregivers	
Knowledge score less than 12/inadequate knowledge	4 (3.80%)
Knowledge score equal to 12 or more/adequate knowledge	101 (96.2%)

Table 3: Perception and Attitude of Caregivers calculated with frequencies (n, %), mean (SD) and median (IQR) where applicable (N=105 if not otherwise mentioned).

Sources of information used by caregivers to receive updated news regarding COVID-19 pandemic and vaccines= n (%) (multiple choices available)		
CDC official website		76 (72.4%)
Newspaper		21 (20.0%)
TV news channels		44 (41.9%)
Phone/mobile news apps		31 (29.5%)
Social media platforms		23 (21.9%)
Vaccination status of caregiver's child= n (%)		
Child not vaccinated (0/2 doses)		67 (64%)
Partially vaccinated (1/2 doses)		6 (6%)
Fully vaccinated (2/2 doses)		32 (30%)
Recipients of Moderna primary who tested positive for Covid-19 via rapid antigen or PCR testing (n=32) (%)		13 (40%)
Recipients of Moderna primary series with a positive test who experienced symptoms (n= 13) (%)		9 (69%)
Attitude of caregivers towards:		
	Median (IQR)	Mean (SD)
Effectiveness of social distancing of 6 ft or more (range: 1 least effective to 10 most effective)	8 (4)	7.6 (2.5)
Effectiveness of hand washing (range: 1 least effective to 10 most effective)	10 (2)	9.0 (1.9)
Effectiveness of masking in public (range: 1 least effective to 10 most effective)	10 (2)	8.5 (2.0)
Safety of COVID-19 vaccine(s) (range: 1 least concerned to 10 most concerned)	7 (7)	6.3 (3.3)
Effectiveness of COVID-19 vaccine(s) (range: 1 least concerned to 10 most concerned)	7 (4)	6.5 (3.0)
Level of trust towards vaccine-related information given by official bodies (range: 1 least trusting to 10 most trusting)	6 (5)	5.8 (2.9)
Attitude of caregivers towards viewing vaccines as a possible reason for getting the COVID-19 disease? (n=102) (%)		
Yes		38 (36.1%)
No		64 (61.0%)
Outcomes		
	Median (IQR)	Mean (SD)
Likelihood of caregivers to get their child fully vaccinated (2/2 doses)	5 (6)	5.6 (3.6)
Change in attitude towards COVID-19 vaccines since they were made available	0 (2)	1.0 (2.1)
Attitude towards vaccinating their children in the future if new vaccine is available	4 (6)	4.5 (3.1)

Table 4: Comparison of Attitude with Knowledge of caregivers. Mann-Whitney U test used for significance where (*) marks significant p-value (p<0.05).

Attitude of caregivers (mean (SD))	Knowledge			
	Lower than 12 (n=4)	More than or equal to 12 (n=101)	Z-score	p-value
Effectiveness of social distancing of 6 ft or more (range: 1 least effective to 10 most effective)	8.0 (1.6)	7.6 (2.5)	-0.09	0.93
Effectiveness of hand washing (range: 1 least effective to 10 most effective)	9.3 (1.5)	9.0 (1.9)	-0.15	0.88
Effectiveness of masking in public (range: 1 least effective to 10 most effective)	9.5 (1.0)	8.5 (2.0)	-1.04	0.3
Safety of Cov-19 vaccine(s) Safety of Cov-19 vaccine(s) (range: 1 least concerned to 10 most concerned)	2.5 (3.0)	6.4 (3.3)	2.29	0.02*
Effectiveness of Cov-19 vaccine(s) (range: 1 least concerned, 10 most concerned) (n=4,98)	3.0 (2.7)	6.7 (3.0)	2.18	0.03*
Level of trust towards information given by official bodies about Cov-19 vaccination (range: 1 least trusting, 10 most trusting) (N=4;98)	6.5 (4.0)	5.8 (2.9)	-0.56	0.6

identified J and J as a vaccine available for pediatric patients. Forty-nine responders (46%) correctly marked vaccines being available for ages 6 months to < 5yrs however 8 responders (7.6%) marked 0 days-6 months as an eligible age to receive FDA approved vaccine. In our study, CDC was used by most caregivers for receiving pandemic and vaccine related information. Table 3 shows 67 (64%) children were unvaccinated which is more than the current national average. Of the fully vaccinated population 13 (40%) children tested positive for the virus with rapid testing/PCR but only 9 out of the 13 (69%) children experienced symptoms like nasal congestion, myalgias etc. Survey responder's median trust in CDC guidance like hand washing, social distancing and masking was high (>8) but they showed more concern towards the safety and efficacy of vaccines against COVID-19. Thirty-

eight (36.1%) caregivers admitted to viewing COVID-19 vaccines as a potential reason for their child getting the disease. Three survey responders did not answer this question hence was n=102. Even though responders did use CDC as their source of information, their median level of trust in this information was neither trusting nor distrusting [6]. The mean likelihood of caregivers to fully vaccinate their child was 5.6 with no change in caregiver's attitude towards COVID-19 vaccines since they were first made available. Their attitude towards vaccinating their child in the face of potential new strains was low [4]. Table 4 depicts comparison between caregivers on the basis of knowledge scores. We saw that caregivers with good knowledge were significantly more concerned about COVID-19 vaccine's safety and efficacy (p<0.05). Table 5 shows comparison between Healthcare

Table 5: Comparison between Healthcare Professionals and Non-Healthcare Professionals. Mann-Whitney U t-test used for significance where (*) marks significant p-value (p<0.05).

	Profession			
	Healthcare (n=38)	Non-healthcare (n=67)	z-score (^) or X2 (df)(#)	p-value
Total knowledge score (mean (SD))	20.8 (3.6)	18.8 (3.6)	3.30^	<0.001*
Source of information used: CDC official website (n (%))	33 (86.8%)	43 (64.2%)	6.23 (1)^#	0.01*
Source of information used: TV news channels (n (%))	11 (28.9%)	33 (49.3%)	4.11 (1)^#	0.04*
Vaccination status of a child (n (%))			1.14 (2)^	0.57
Not vaccinated (0/2 doses)	22 (57.9%)	45 (67.2%)		
Partially vaccinated (1 dose only)	2 (5.3%)	4 (6.0%)		
Fully vaccinated (2/2 doses)	14 (36.8%)	18 (26.9%)		
Attitude: (mean (SD))				
Effectiveness of social distancing of 6 ft or more (range: 1 least effective to 10 most effective)	8.0 (2.2)	7.4 (2.6)	0.88^	0.38
Effectiveness of hand washing (range: 1 least effective to 10 most effective)	9.3 (1.4)	8.9 (2.1)	0.63^	0.53
Effectiveness of masking in public (range: 1 least effective to 10 most effective)	8.6 (1.6)	8.5 (2.2)	- 0.48^	0.63
Safety of Cov-19 vaccine(s) (range: 1 least concerned to 10 most concerned)	4.9 (3.4)	7.0 (3.1)	-3.02^	0.003*
Effectiveness of Cov-19 vaccine(s) (range: 1 least concerned to 10 most concerned)	5.2 (3.2)	7.3 (2.6)	-3.36^	<0.001*
Level of trust towards information given by official bodies about Cov-19 vaccination (range: 1 least trusting, 10 most trusting)	7.1 (2.8)	5.1 (2.7)	-3.36^	<0.001*

Professionals (HCP) and Non-Healthcare Professionals (NHCP). We observed a significantly higher knowledge score in HCP ($p < 0.05$) who used CDC as their information source and hence were more trusting of this information (vs) NHCP who used TV as their source of information and were significantly more concerned about the safety and effectiveness of Cov-19 vaccines. However, comparison of vaccination rates amongst their children showed no difference.

Discussion

The COVID-19 pandemic wreaked havoc with a high morbidity and mortality toll in the USA [8]. A low vaccination rate amongst the vulnerable pediatric population added to this dilemma. Studies done in the field of knowledge and attitude regarding the pandemic have been conducted in many countries across the globe [9-13]. Our study particularly explores the effect a parent's knowledge can have on health behaviors which is relevant considering that previous studies have shown an association between a parent's education on health literacy and consequently health behaviors [13]. To the best of our knowledge, the methodology of our study comparing KAP of HCPs vs NHCPs has not been replicated elsewhere which makes this novel research in the USA.

The vaccination rates observed within our study population were significantly lower than the national average [5-7]. Despite the caregivers' high levels of education and their acceptance of non-vaccine methods for disease prevention, their trust in vaccines approved by organizations such as the CDC and FDA was unexpectedly low. Notably, there has been no observable shift in the caregivers' attitudes toward COVID-19 vaccines since their introduction, which underscores the persistent challenge of vaccine hesitancy. Our study highlights the critical need for ongoing, targeted educational and outreach efforts aimed at addressing and mitigating vaccine hesitancy. It is important to emphasize that there was widespread agreement among the study population regarding previously endorsed preventive measures such as handwashing, mask-wearing, and social distancing-which were viewed as effective strategies for disease prevention. Consequently, it is reasonable to discuss that consistent reinforcement of these standard practices by healthcare providers and through credible information channels could potentially enhance caregivers' confidence and positively influence their attitudes towards vaccination as well.

Furthermore, our study revealed that NHCPs predominantly relied on television news as their primary source of information regarding COVID-19. This reliance on TV news presents a valuable opportunity for public health intervention strategies to target this demographic effectively and provide them with accurate and verified information concerning disease prevention. Additionally, this reliance may explain, in part, the low pediatric vaccination rates observed. Information disseminated through TV news often suffers from distortion and is sometimes influenced by political and religious biases, which can contribute to misleading or radicalized views about vaccines [9]. Our study reveals a striking finding: there was no significant difference in vaccination rates between children of HCPs and NHCPs. The absence of notable disparity in vaccination rates between these two groups highlights the complexity of the factors which contribute to vaccine hesitancy. It indicates that even among healthcare professionals who had greater knowledge, access to

and understanding of medical information, the decision to vaccinate is not solely guided by knowledge. This finding suggests that other psychological, social, or cultural factors may play a significant role in shaping attitudes and behaviors related to childhood vaccinations. Our study hence shows the importance of providing consistent and reliable information regarding vaccines. As the policies are constantly changing regarding vaccines and eligibility, it is imperative to stay updated with them and give a united message to all caregivers while reinforcing this information during every healthcare visit. From a public health standpoint, it is imperative to implement sustained efforts and robust public health strategies to effectively communicate these messages. The dynamic nature of COVID-19 information necessitates that public health initiatives ensure that caregivers receive clear, accurate, and timely guidance. As our study was a novel effort to bring to light the complex vaccine decision-making process and the effect of caregiver's attitudes toward pediatric health behaviors, it is important to recognize that the study has several limitations. A potentially small sample size of 105 survey responders along with the majority of responders identifying as African-American may limit the generalizability of the study. Dealing with the intricate details of vaccine hesitancy and perceptions, the study adopted a novel, non-standardized questionnaire that could not be validated. The study's focus on Moderna vaccinations due to availability constraints limits the generalizability of the findings to other vaccines, such as Pfizer. Additionally, as a cross-sectional study was conducted, the changes in vaccination rates over time could not be captured. Our quantitative novel research hence opens up the field to a qualitative research methodology which could be built to explore how misinformation or biased information influences caregivers' perceptions. Future researchers could also implement longitudinal studies to track changes in vaccination attitudes and rates over time and compare attitudes towards different vaccines available.

Conclusions

Pediatric COVID-19 vaccination rates remain suboptimal. Existing research explores vaccine hesitancy in adult population, but our study delves into caregivers' perceptions and its impacts on the vulnerable pediatric population. Our study also compares knowledge, perception and attitudes of Healthcare Professionals (HCP) and non-HCP, revealing a complex decision-making landscape. We discuss such a critical health gap between caregiver knowledge and vaccination behavior, emphasizing the complex decision-making process leading to vaccine hesitancy. As the attitude of caregivers' shows resistance to change potentially affecting the pediatric vaccine rates, this research highlights that with bans pertaining to COVID-19 lifting, it becomes imperative to invest in educating the public regarding the benefits of vaccines. Further research and public health efforts are needed to bridge this gap between knowledge and vaccination behavior and to build trust in Advisory Committee on Immunization (ACI) of CDC.

References

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed.* 2020; 91: 157-160.
2. Centers for Disease Control and Prevention (CDC). COVID-19 Variants.
3. United States Census Bureau. Evaluation of the 2020 Census.
4. Centers for Disease Control and Prevention (CDC). COVID-19 Vaccines: Recommendations for Children and Teens.

5. Khubchandani J, Sharma S, Price JH, Wiblishauser MJ, Sharma M, Webb FJ. COVID-19 vaccination hesitancy in the United States: A rapid national assessment. *J Community Health*. 2021; 46: 270-277.
6. Johns Hopkins University. Early Herd Immunity Against COVID-19: A Dangerous Misconception.
7. American Academy of Pediatrics. Children and COVID-19 Vaccination Trends.
8. Xu H, Gonzalez Mendez MJ, Guo L, Chen Q, Zheng L, Chen P, et al. Knowledge, awareness, and attitudes relating to the COVID-19 pandemic among different populations in central China: Cross-sectional survey. *J Med Internet Res*. 2020; 15: e22628.
9. Stokes AC, Lundberg DJ, Elo IT, Hempstead K, Bor J, Preston SH. Assessing the impact of the COVID-19 pandemic on US mortality: a county-level analysis. *medRxiv*. 2020; 9: 10.
10. Orunta P, Ndu C, Ijioma C, Ogedegbe OJ, Ogundipe FA, Eze-Njoku CP. Knowledge and Practice of Precautions and Prevention of COVID-19 Among Adolescents in Umuahia, Nigeria: A Cross-Sectional Study. *Cureus*. 2024; 16: e64984.
11. Temsah MH, Alhuzaimi AN, Aljamaan F, Bahkali F, Al-Eyadhy A, Alrabiaah A, et al. Parental Attitudes and Hesitancy About COVID-19 vs. Routine Childhood Vaccinations: A National Survey. *Front Public Health*. 2021; 9: 752323.
12. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med*. 2011; 155: 97-107.
13. Alzaher OA, Almutairi GA, Almodhayan SM, Khojah AA, Almutairi GA. Public Attitudes Toward Pediatric Routine Immunization During the COVID-19 Pandemic in Saudi Society. *Cureus*. 2021; 13: e17899.