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A Survey Examining the Impact of COVID-19 on Food Protein-Induced Enterocolitis Syndrome (FPIES)

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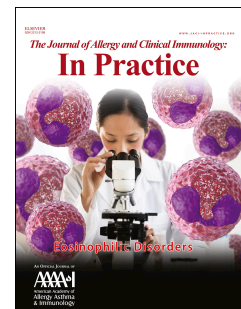
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Syndrome (FPIES)

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Title: A Survey Examining the Impact of COVID-19 on Food Protein-Induced Enterocolitis Syndrome (FPIES)

Clinical Implications Statement: To assess the burden of COVID-19 on patients and caregivers with FPIES, an anonymous survey was distributed online from March to June, 2020. Respondents reported heightened stress with regards to food access, financial security, and health concerns related to FPIES.

Manuscript:

Over the past year and a half, the COVID-19 pandemic has set off a cascade of new challenges to the health, safety, and economic stability of families around the world. Given limitations in accessing safe food and decreased options for emergency assistance, food-allergic individuals have been identified as particularly vulnerable to food insecurity during COVID-19.¹ While prior studies have considered this issue in the context of IgE-mediated food allergies, food protein-induced enterocolitis syndrome (FPIES) is another serious food allergy affecting over 900,000

North Americans, which should be considered as a risk factor for food insecurity during times of disruption.² FPIES is a non-IgE-mediated food allergy that frequently presents with protracted vomiting 1-4 hours after eating a trigger food, sometimes followed by watery diarrhea, and with severe symptoms including lethargy, hypotension, and shock in up to 15% of cases.³ In prior studies, parents of children with FPIES reported significant stress and decreased quality of life related to this condition.⁴ With this survey, we examined whether the widespread disruption caused by the COVID-19 pandemic contributed to increased difficulty obtaining safe food and other stressors in a population affected by FPIES.

To assess the impact of COVID-19 on caregivers and patients with FPIES, an anonymous survey was distributed online via the website of the International FPIES Association (fpies.org), a 501(c)3 nonprofit organization that provides education and advocacy for families affected by FPIES. Surveys were collected from March-June, 2020 (full survey material available in the online repository). During the study period, the survey link was opened 357 times. 151 surveys were completed, 142 of which were submitted by mothers of children affected by FPIES. The 9 additional responders were mothers of children with FPIES who also reported being affected by FPIES themselves (median age 37 years). Children affected by FPIES ranged in age from infancy to adolescence (median age 2.0 years), lived in suburban/urban areas, resided in the United States, and were primarily non-Hispanic white. Demographic characteristics of the respondents are reported in Table 1.

As reported in Table 1, the burden and clinical manifestations of FPIES prior to the pandemic were substantial in this study group, with a majority of responders reporting prior use of the emergency department due to FPIES and about one third requiring treatment with intravenous fluids. Of note, these clinical findings suggest a study population with more severe

FPIES than average, with possible implications for study generalizability.³ There were no known or suspected COVID-19 cases among the 151 respondents of all ages. However, secondary impacts of COVID-19 were widespread (Table 2). A majority of respondents reporting increased difficulty buying safe, nutritious food, and having to utilize multiple stores/online retailers to buy safe foods during the pandemic. Most responders also reported spending more money on food during the COVID-19 pandemic than previously, and many reported having to modify their diet or find alternative foods due to the pandemic. These findings are in line with prior research showing that FPIES (and in particular, multi-food trigger FPIES) can result in onerous dietary restrictions that may be complicated due to food shortages during times of disruption.⁵

We hypothesized that caregivers managing multi-food-trigger FPIES, or those dealing with both FPIES and IgE-mediated food allergy, would report higher level of stress related to obtaining adequate nutrition due to the difficulty in managing multiple food restrictions. However, while mean stress levels were higher for those reporting multi-food FPIES compared to single-food FPIES (6.52 vs 6.10 on 10-point scale), and for families reporting both FPIES and IgE-mediated food allergies compared to FPIES alone (6.70 vs 6.31), these results were not statistically significant (independent samples T-test, $p=0.430$ and 0.4165 , respectively). This survey may have been underpowered to detect these differences.

Widespread changes in the utilization of healthcare services have occurred throughout the COVID-19 pandemic, particularly with relation to the use of emergency services and telemedicine. During infection surges, concerns about potential exposure to SARS-CoV-2 in medical settings, and particularly while seeking medical care in the emergency department (ED), were widespread. Indeed, responders in our survey reported significant concern about potentially having to go to the ED for FPIES reactions during the pandemic, with a high number of families

utilizing telemedicine during this period, consistent with broader trends towards increased telehealth during COVID-19 (Table 2).⁶ Around three quarters also reported significant concerns about introducing new foods during COVID-19, as well as concern about managing FPIES or anaphylactic reactions during COVID-19. These findings are unsurprising, given the high levels of anxiety that often accompany the introduction of new foods in this patient/caregiver population. This highlights the need for proactive management of FPIES, including assisting and empowering caregivers to expand the diet and remove unnecessary restrictions as much as possible. Concerns about exposure risk have recently prompted changes to the recommended management of both anaphylaxis and severe FPIES reactions during the pandemic, with at-home management recommended in non-severe cases.^{7,8}

This survey suggests that individuals affected by FPIES experienced stress during the COVID-19 pandemic across multiple psychosocial domains. As a cross-sectional survey, we are unable to determine how stress levels in this survey group may have evolved over time (including in the pre-pandemic era), or how they compare to populations unaffected by FPIES.⁴ Furthermore, this study population reported more severe manifestations of FPIES than average, suggesting that the survey responders may have been at increased risk of the adverse impacts of COVID-19 (and may also have greater need of intervention/support.) Because we used an internet-based survey, this population may also have greater access or experience with technology than the general public, with potential implications for generalizability. However, clinicians should be aware of these potential added burdens in families affected by FPIES even in the absence of acute COVID-19 infection in this population. In particular, respondents reported difficulty obtaining safe, nutritious food during the pandemic, a finding that is in line with prior research identifying food-allergic individuals as particularly vulnerable to food

insecurity.¹ In response to this finding, guidelines on the dietary management of FPIES during a pandemic (including recommendations regarding food label reading, ingredient selection, new food introduction, and supplementation) were recently published, and can act as an important resource for families affected by this condition.⁵ As the economic and systems-wide effects of the pandemic continue, particular attention should be paid to the issues of food security, health education, and access to healthcare among those affected by FPIES and food-allergies.

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Table 1: Survey Participant Demographics¹

Demographics	
Current age of child, median (range) (n=151)	2.0 years (2mo-16yrs)
Age of child at diagnosis of FPIES, median (range) (n=151)	12.5 months (birth-9yrs)
Current age of parent, median (range) (n=143)	39.5 years (24-65yrs)
Age of parent diagnosed with FPIES, median, (range) (n=9)	37 years (24-65yrs)
Country of residence	
USA	73.5% (n=111)
Canada	12.6% (n=19)
Other	11.3% (n=17)
Area of residence²	
Suburban	56.3% (n=85)
Urban	26.5% (n=40)
Rural	14.6% (n=22)
Race/ethnicity	
Non-Hispanic White	80.7% (n=122)
Hispanic	7.9% (n=12)
Non-Hispanic Black	1.4% (n=2)
Other	2.0% (n=4)
Prefer not to state	4.0% (n=6)
Annual Household income, median (range)	\$100-149k (\$12k-200k)
Clinical manifestations of FPIES	
Protracted vomiting following trigger	91.8% (n=135)
Prior ED or inpatient admission for FPIES	68.2% (n=103)
Required IV fluids for treatment of FPIES during ED/inpatient	42.4% (n=64)
Prior use of epinephrine autoinjector for FPIES	7.9% (n=12)
Top reported trigger foods	
Cow's milk	48.3% (n=71)
Oat	47.7% (n=70)
Rice	35.1% (n=52)
Egg	14.5% (n=22)
Banana	12.6% (n=19)
Multi-food FPIES	24.5% (n=37)
Patient-Reported Comorbidities³	
Atopic dermatitis	51.7% (n=76)
IgE-mediated food allergy	29.9% (n=44)
Asthma	23.1% (n=34)

¹ All available data were used when available. Missing data values were excluded.² Self-reported.³ Diagnosed by a physician.

Table 2: Impact of COVID-19

	% Positive response
Known or suspected cases of COVID-19	0% (n=0)
Supply of safe foods (compared to pre-COVID)	
Had to use multiple stores/online retailers to buy safe foods during the pandemic	82.3% (n=121)
Spent more money on food during the COVID-19 pandemic	80.9% (n=119)
Increased difficulty buying safe, nutritious food	57.1% (n=84)
Had to modify diet or find alternative foods due to inability to find safe foods	42.2% (n=62)
Consulted with dietician for meal planning during COVID-19	16.3% (n=24)
Stress/concern about acute FPIES reaction (compared to pre-COVID)	
Concern about needing to go to ED for FPIES reaction during pandemic	82.3% (n=121)
Fear of introducing new foods due to FPIES	77.6% (n=114)
Concern that FPIES will result in severe COVID-19 infection	64.6% (n=95)
Experienced increased stress due to FPIES	59.1% (n=87)
Access to care (compared to pre-COVID)	
Had physician appointment canceled due to COVID-19	59.9% (n=88)
Utilized telemedicine to contact physician	58.5% (n=86)
Contacted physician with questions on managing FPIES during COVID-19	36.1% (n=53)