Impact of COVID-19 Lockdown on Pulmonary and Nutritional Status in Children and Young Adults With Cystic Fibrosis, in Greece

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Abstract
During the first wave of the coronavirus pandemic in 2020, Greece adopted strict lockdown measures. We aimed to investigate the effects of lockdown and the resultant changes in the standard of care, on the lung function and somatic growth of cystic fibrosis (CF) patients. We analyzed data on body mass index and lung function of 103 CF patients 5.0- to 23.0-years-old before and after the lockdown period. Body mass index did not change significantly, but there was a significant improvement in lung function after the end of the lockdown period.

Keywords
cystic fibrosis, lung function, lockdown, COVID-19

Introduction
The advent of the coronavirus pandemic imposed great challenges on the care of cystic fibrosis (CF) patients. During the first wave of the pandemic, Greece, like many other countries worldwide, adopted strict lockdown measures in an effort to slow the spread of COVID-19. A direct consequence of the lockdown decision for CF patients was the transition from regular and face-to-face follow-up appointments to telephone consultations. Also, schools remained closed and all organized physical activities were canceled during the lockdown; children with CF had to stay indoors, with few opportunities for physical exercise. Nevertheless, the level of anxiety was not higher in children with CF than healthy children (1) and on the whole, CF patients may have accepted and adjusted to the imposed restrictions more easily than the general population due to being accustomed to health-preserving behaviors (2).

In the present study, we aimed to investigate the effects of lockdown and the resultant changes in the standard of care on the lung function and body mass index (BMI) of CF patients.

Method
We retrospectively retrieved and analyzed data on BMI and lung function of all children, adolescents, and young adults who attended our CF department and were able to perform spirometry effectively. Specifically, we compared their percent predicted forced expiratory volume in the first second (FEV1 [ppFEV1]) and body mass index z-score (z-BMI) of their last visit before the start of the lockdown on March 10, 2020 (visit A) and their first visit after the end of lockdown on May 5, 2020 (visit B), when the clinical activity of the department returned to normal. Patients who had not been examined for the 3 months that preceded the lockdown or for the 3 months that followed the end of lockdown were excluded. z-score BMI was calculated with the use of exact age at the time of each visit and according to the UK growth charts which provide reference values up to the age of 23 years. Variables were expressed as means ± SD. The analysis was performed with paired t test.

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Results
The study included 103 patients aged from 5.0 to 23.0 years; 61 (59.2%) were females, 89 (86.4%) were pancreatic insufficient, and 47 (45.6%) were on cystic fibrosis transmembrane conductance regulator (CFTR) modulator treatments. The mean ages at visits A and B were 12.79 ± 4.06, and 13.00 ± 4.10 years, respectively, and the time interval that elapsed between visits were 140.0 ± 40.1 days. There was a significant improvement in ppFEV1 between visits A and B (99.1 ± 17.8 and 105.5 ± 17.7, respectively, \( P < .001 \)), whereas the corresponding values of \( z \)-BMI did not change significantly (0.36 ± 0.10 and 0.37 ± 0.10, respectively, \( P = .89 \)).

Discussion
We observed an improvement in the lung function of CF patients after the lockdown period. A plausible explanation is the reduced exposure of patients to common respiratory viruses which represent a major trigger for exacerbations. Apart from that, patients had more time to improve the quality of physiotherapy and nebulizing therapy (3). The warnings from CDC and other public health authorities (4) that CF represents a group that might be at an increased risk of severe illness from SARS-CoV-2 and the high anxiety of parents (1) may also have urged patients to better adherence to treatment. The reduced physical activity during the lockdown either did not affect considerably the patients because of its relatively short duration or its negative effects were compensated from the overall improvement in lung function.

Although patients may have been eating better during the lockdown (3) their \( z \)-BMI did not change considerably probably due to the limited duration of the lockdown. Consistent with our findings were the results of Osterbauer et al who found that children and adolescents with CF had a significant and clinically relevant improvement of respiratory symptom domain of Cystic Fibrosis Questionnaire-Revised (5).

The lockdown period highlighted the ability of CF patients to adapt positively to an adversely changing environment by improving their self-management. A challenge that remains for both patients and physicians is to capitalize on this unexpected development and promote resilience when not faced with dire circumstances such as a pandemic.

Limitations
A major limitation of our study was the lack of a control group. We did not compare data on height and other measures of growth apart from BMI because of the short time frame of the lockdown. In general, differences in these parameters need more time to become observable. Our data superficially suggest that the lockdown conditions could improve the health of CF patients, but such a conclusion is not warranted when periods longer than 2 months are considered. Also, our results refer to a population with high FEV1 values and may not apply to patients with worse lung function. Nevertheless, the conclusion of the study is that the lockdown period did not pose a risk but rather improved the lung function of our CF patients.

Authors’ Note
The study was approved by the “Agia Sofia” Ethics Committee.

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