P223 / A1865 - Longitudinal Trends in Air Quality and Home-Recorded Spirometry in Pulmonary Fibrosis Patients in the Dallas-Fort Worth Area

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RATIONALE

Idiopathic pulmonary fibrosis (IPF) is a chronic, progressive, and incurable lung disease that affects middle-aged and older adults.

Previous studies have reported that air pollution exposure is associated with acute exacerbation, disease progression, and mortality in patients with IPF.[1,2,3] In particular, ozone exposure is associated with increased risk of acute exacerbation of IPF[1].

Historically, the Dallas-Fort Worth area has experienced unhealthy levels of ozone pollution, putting people who live with IPF at risk of poor health. Dallas-Fort Worth currently ranks as the 17th most ozone polluted metropolitan area in the United States (out of 227 metropolitan areas).[4]

Ozone production is strongly influenced by meteorological variables, such as temperature, and consequently results in high summertime ozone concentrations in the Dallas-Fort Worth area.

OBJECTIVES

The objective of this study was to investigate longitudinal trends in air quality and home-recorded spirometry in pulmonary fibrosis patients in the Dallas-Fort Worth area.

Figure 1: The patientMpower mobile application and MIR Spirobank Smart spirometer used in this study.

METHODS

Study participants were recruited via the PF Warriors patient support group based in Dallas-Fort Worth, Texas, USA.

Participants were provided with the patientMpower mobile application for IPF and a portable Bluetooth spirometer (Spirobank Smart, MIR Inc., Italy).

Participants were free to use the patientMpower app and MIR spirometer as often as they wished.

Historical ground level ozone (O_3) and particulate matter < 2.5 µm ($PM_{2.5}$) data were obtained from the AirNow database for the Dallas-Fort Worth area[5].

For every lung function measurement recorded via the patientMpower app, corresponding O_3 and $PM_{2.5}$ data were obtained from the AirNow database.

RESULTS

Between July 2017 and October 2018, 17 people living with IPF in the Dallas-Fort Worth area used the patientMpower app and Spirobank Smart spirometer. Table 1 details the characteristics of the participants.

Table 1: Cohort Characteristics (N=17)

Variable	Value
Age, y	64.3 ± 8.4
Sex - male	13 (76%)
Ethnicity - white	15 (88%)
Height, cm	174.3 ± 7.4
FVC absolute, L	2.46 ± 1.12
FVC % predicted	59.3 ± 26.9

Data are presented as mean ± SD or No. (%). FVC absolute values are from available home spirometry.

The 17 participants recorded 837 home spirometry readings (average: 49, median: 13, range: 1-418).

Figure 1 shows the percentage of predicted Forced Vital Capacity (FVC) and the O_3 category level for the 17 participants, while Figure 2 shows the percentage of predicted FVC versus $PM_{2.5}$.

Figure 2: Percent predicted FVC and O_3 category level ("good" versus "moderate/unhealthy") in the 17 participants.

Figure 3: Percent predicted FVC and $PM_{2.5}$ category level ("good" versus "moderate/unhealthy") in the 17 participants.

It was observed that this group of IPF patients were exposed to higher levels of O_3 in the summer months compared to winter months.

80% of patients used the patientMpower app and Spirobank Smart spirometer on days with unhealthy levels of O_3.

CONCLUSIONS

This study demonstrated the feasibility of employing the patientMpower app and Spirobank Smart spirometer as a tool to longitudinally monitor IPF patients' real-world lung function measurements, in addition to corresponding air quality information.

IPF patients in the Dallas-Fort Worth area are frequently exposed to moderate or unhealthy levels of air pollution.

This tool may be of clinical value in analyzing the impact of air quality on FVC and lung health in a specific geographic region such as the Dallas-Fort Worth area.

More research is needed to evaluate the sensitivity of the system in predicting lung function decline and exacerbations in IPF patients.

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