Comparative Evaluation of Peak Expiratory Flow Rate between Computerized Spirometry and Peak Flow Meter

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ABSTRACT

Peak expiratory flow rate (PEFR) is a simple, reliable, and easily reproducible and measurable lung function test. It has not been formally assessed whether the PEFR values measured with peak flow meter are in close correlation with the values measured by digital spirometer. The present study is carried out to determine whether there is a significant difference between the PEFR values derived from digital spirometer and peak flow meter in patients with respiratory symptoms.

Keywords: Peak flow meter, Peak expiratory flow rate, Spirometer.

INTRODUCTION

Peak expiratory flow rate (PEFR) is the maximum flow generated during expiration performed with maximal force and initiated after a full inspiration. It is expressed in liters per minute (L/min). This simple test can be performed using different types of instruments that are inexpensive, portable, and largely available and have made PEFR monitoring easy and feasible. Most of the digital spirometers measure PEFR along with forced expiratory volume (FEV)1 and forced vital capacity (FVC). It has been recorded in previous studies that different spirometers and different peak flow meters can record PEFR differently with some error rates, which can be up to 26% in laboratory calibration tests.

MATERIALS AND METHODS

Subjects

The participants were recruited from the patients presenting to the Department of Pulmonary Medicine at Rohilkhand Medical College and Hospital in Bareilly region. A total of 100 participants were taken in the study. Nature of the study was explained and informed consent was taken from each subject prior to participation in the study. A thorough history was taken and subjects were asked about the respiratory problems and any associated health conditions. Patients with severe respiratory distress and cardiovascular disease were excluded from the study.

Devices

For spirometry, Medical International Research (MIR) SPIROLAB 3 computerized spirometer was used and performed as per the American Thoracic Society (ATS) guidelines. Both pre- and postbronchodilation parameters including FEV1, FVC, FEV1/FVC, and PEFR were recorded. Peak expiratory flow rate values obtained in L/s were converted to L/min. Simultaneously, PEFR values were also obtained using Mini Wright’s peak flow meter in L/min.

Subjects were individually instructed for measuring their PEFR using peak flow meter. Minimum three efforts at a time were recorded and the best one was measured before and after bronchodilation. Peak expiratory flow rate was obtained in L/s. All measurements were performed in sitting position and data collected for analysis. Collected data were checked, and those with incomplete records and inadequate testing were rejected. Finally, 91 subjects were selected for inclusion into the study.

RESULTS

Data of a total of 91 subjects were analyzed. All the participants were males between the age group between 15 and 75. After careful interpretation of the history, clinical examination and spirometric results were concluded. The detailed characteristics of the Participants are mentioned in Table 1.

Of the total 91 subjects, 24 had normal spirometry; 45 subjects were diagnosed with chronic obstructive pulmonary disease (COPD) as per Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines and 22 subjects were diagnosed with asthma as per Global Initiative for Asthma (GINA) guidelines as depicted in Graph 1.

The comparison between the values of PEFR measured by digital spirometer and peak flow meter are given in Table 2.
DISCUSSION

The study aimed to compare the PEFR measured by spirometry and peak flow meter. The PEFR values by spirometer and mini-Wright Peak Flow Meter correlate well with each other with very little difference as demonstrated by other studies. However, other studies (Takara et al) have shown conflicting results and demonstrate no agreement between the spirometric values and values obtained with peak flow meter. The lack of agreement between the spirometric values and the values obtained from the meter does not indicate that they lack validity or perform poorly; it only indicates that the meters cannot replace the PEFR spirometric measurements. While spirometry provides measurements of variability, reversibility, and airflow limitation severity, and also confirms the diagnosis of asthma, its cost is higher and its availability is lower in both the public and private health care systems compared with peak flow meters.

In our study, the PEFR values in asthma patients were significantly comparable. The values were higher in patients with normal spirometry and lower in patients with COPD. Various authors (Reid and Holland; Higgins; Zamel and Prime; and Tomar) have expressed similar views in their study. This can be explained by the fact that asthma is a disease of larger airways and PEFR values represent primarily proximal airflow caliber, whereas COPD mainly affects the smaller airways.

The peak flow meter only measures the amount of airflow out of the large airways of the lungs and changes in airflow caused by the small airways will not be detected by it.

CONCLUSION

The two instruments compared in this study have produced comparable peak flow readings. The peak flow meter tended to give higher values in normal patients, lower in COPD patients, and almost identical values in asthma patients; the correlation results were significant.

Thus, it can be concluded from the study that there is no significant difference in the mean values of PEFR from peak flow meter and spirometer. Peak flow meter can, therefore, be used as an inexpensive, safe, easy to use, and sensitive tool for assessing obstructive airway diseases, where spirometry is not available.

REFERENCES