

ORIGINAL PAPER

Respiratory Medicine

Differential clinical diagnosis and prevalence rate of allergic rhinitis, asthma and chronic obstructive pulmonary disease among COVID-19 patients

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Abstract

Background: There is a great need to make a rapid differential clinical diagnosis of COVID-19 among respiratory disease patients and determining the prevalence rate of these diseases among the COVID-19 population.

Method: Approximately 522 patients with allergic rhinitis, asthma, COPD, and COVID-19 were analysed for demographic and clinical features. Radiological features were analysed only for COVID-19 patients.

Results: COPD and asthma were more common among COVID-19 patients than allergic rhinitis. All chest CT scans of COVID-19 patients showed bilateral ground-glass opacity. Fever, dry cough, diarrhea, loss of sense of smell and taste, shortness of breath, and blue lips were significantly higher in all COVID-19 patients compared to COPD, asthma, and allergic rhinitis patients.

Conclusion: The presence of clinical symptoms such as fever, dry cough, diarrhea, loss of sense of smell and taste, shortness of breath, and blue lips in COVID-19 patients, can be used for differential diagnosis between COVID-19 patients and other respiratory diseases. Then, the diagnosis can be confirmed by chest CT scan for COVID-19 patients without the need for a nasopharyngeal swab or PCR test, especially in epidemic countries. Allergic rhinitis patients are the least exposed to COVID-19 infection among other respiratory disease patients.

There is a great interest to make a rapid differential clinical diagnosis of COVID-19 among respiratory disease patients and determine the prevalence rate of these diseases among the COVID-19 population. Symptom screening became a prevalent tool in the attempt to control local dissemination of COVID-19, starting from affected cities to quarantines.¹ This can be attributed to that the coronavirus family may cause varied symptoms, such as fever, pneumonia, lung infection and breathing difficulty.² All this has pushed several studies to review the characteristics and symptoms of adults infected with COVID-19.³ In our retrospective study, approximately 522 patients with allergic rhinitis, asthma, COPD and COVID-19 were collected from Beni-Suef University hospital and Hospital of Chest Diseases in Beni-Suef, Egypt and analysed for demographic and clinical features.

Radiological features were analysed for all COVID-19 patients. About 312 (59.8%) females and 210 (40.2%) males were included in the study. They were of different age groups, 146 (28%) patients were from the ages of 18-30 years, 253 (48.5%) patients were from the ages of 30-45 years, and 123 (23.5%) patients were from the ages of 45-60 years.

The patients were grouped into five groups: (1) allergic rhinitis patients, (2) asthmatic patients, (3) asthmatic patients with allergic rhinitis, (4) COPD patients and (5) COVID-19 patients. COVID-19 patients were subdivided into three groups: (5a) COVID-19 patients only, (5b) COVID-19 patients with COPD, (5c) COVID-19 patients with asthma (Table 1). Approximately, the prevalence of allergic rhinitis, asthma and COPD among the 228 participated COVID-19

patients was 0%, 30.7% and 35.1%, respectively (Figure 1). There was a significant difference in the prevalence of the three respiratory diseases among COVID-19 patients. The numbers of COVID-19 patients, having asthma or COPD, were significantly higher compared with the number of COVID-19 patients with allergic rhinitis at $P < .05$. There was no significant difference between the number of COPD ($n = 80$) or asthmatic patients ($n = 70$) among COVID-19 patients. All chest CT scans of COVID-19 patients (228 patients, 100%) showed bilateral ground-glass opacity with abnormal findings on chest CT. Comparing categorical variables between patients groups using the chi-square test showed that symptoms of all COVID-19 patients were significantly different compared with allergic rhinitis, COPD, and asthmatic patients who did not have COVID-19 infection

What's known

- Differential diagnosis of COVID-19 between respiratory disease patients became complicated due to the symptom pattern overlap.

What's new

- Clinical diagnosis is a significant tool in differentiation between COVID-19 and other respiratory diseases.
- COPD and asthmatic patients are more susceptible to COVID-19 infection than allergic rhinitis patients.

TABLE 1 Clinical and Epidemiological Characteristics of 522 patients with allergic rhinitis, asthma, COPD and COVID-19

Disease	AR	BA	BA and AR	COPD	COVID-19	COVID-19 & COPD	COVID-19 & BA
Number of cases (522 Total)	83	69	75	67	78	80	70
Variables							
Symptoms ^a							
Fever ^b (greater than 38.0°C)	2 (2.4%)	1 (1.4%)	2 (2.7)	4 (6%)	76 (97.4%)	79 (98.8%)	69 (98.6%)
Dry cough	8 (9.6%)	15 (21.7%)	13 (17.3%)	22 (32.8%)	53 (67.9%)	27 (33.8%)	42 (60%)
Cough with sputum	36 (43.3%)	51 (73.9%)	57 (76%)	45 (67.2%)	25 (32.1%)	53 (66.7%)	28 (40%)
Headache ^d	78 (94%)	42 (60.9%)	72 (96%)	8 (11.9%)	7 (9%)	5 (6.3%)	7 (10%)
Throat pain ^d	49 (59%)	51 (73.9%)	55 (73.3%)	2 (3%)	5 (6.4%)	7 (8.8%)	6 (8.6%)
Diarrhea ^b	2 (2.4%)	1 (1.4%)	1 (1.3%)	0 (0%)	34 (43.6%)	40 (50%)	28 (40%)
Runny nose ^c	49 (59%)	12 (17.4%)	39 (52%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Bad breath	60 (72.2%)	30 (43.5%)	47 (62.7%)	0 (0%)	0 (0%)	0 (0%)	5 (7.1%)
Weakness in smell and taste senses ^b	27 (32.5%)	6 (8.7%)	28 (37.3%)	3 (4.5%)	60 (76.9%)	53 (66.3%)	45 (64.3%)
Hoarseness ^c	44 (53%)	8 (11.6%)	32 (42.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Pain in the ears or teeth ^c	55 (66.2%)	3 (4.3%)	43 (57.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Shortness of breath ^b	42 (50.6%)	30 (43.5%)	46 (61.3%)	67 (100%)	78 (100%)	80 (100%)	70 (100%)
Wheezing	10 (12%)	24 (34.8%)	45 (60%)	56 (83.6%)	0 (0%)	67 (83.8%)	53 (75.7%)
Tachypnea	14 (16.8%)	24 (34.8%)	34 (45.3%)	56 (83.6%)	67 (85.9%)	67 (83.8%)	56 (80%)
Swelling around the eyes or nose	20 (24.1%)	9 (13%)	18 (24%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Blue color in the lips ^b	1 (1.2%)	0 (0%)	6 (8%)	22 (32.8%)	34 (43.6%)	67 (83.8%)	14 (20%)
Fatigue	80 (96.4%)	63 (91.3%)	72 (96%)	64 (95.5%)	73 (93.6%)	72 (90%)	66 (94.3%)
Symptoms increase with exposure to cold air or dust ^{a d}	78 (94%)	66 (95.7%)	73 (97.3%)	0 (0%)	0 (0%)	0 (0%)	14 (20%)
Symptoms duration ^a							
Persistent	21 (25.3%)	3 (4.3%)	28 (37.3%)	57 (85%)	76 (97.4%)	80 (100%)	69 (98.6%)
Intermittent	62 (74.7%)	66 (95.7%)	47 (62.7%)	10 (15%)	2 (2.6%)	0 (0%)	1 (0.4%)

Abbreviations: AR, allergic rhinitis; BA, bronchial asthma; chronic obstructive pulmonary disease; COPD; COVID-19, coronavirus disease 2019.

^a The values are given as the number of patients, with the percentage in parentheses for each group separately.

^b Indicates significant difference in symptoms of fever, diarrhea, shortness of breath, blue color in the lips, and weakness in smell and taste senses, on comparing all COVID-19 groups to allergic rhinitis, asthma and COPD patients at $P < .05$.

^c Indicates significant difference in symptoms of hoarseness, runny nose, and pain in the ears or teeth on comparing allergic rhinitis patients, either having asthma or not, to other groups at $P < .05$.

^d Indicates significant difference in symptoms of headache, throat pain and increase in symptoms with exposure to cold air or dust, on comparing asthmatic patients, allergic rhinitis patients, and patients with both diseases to other groups at $P < .05$.

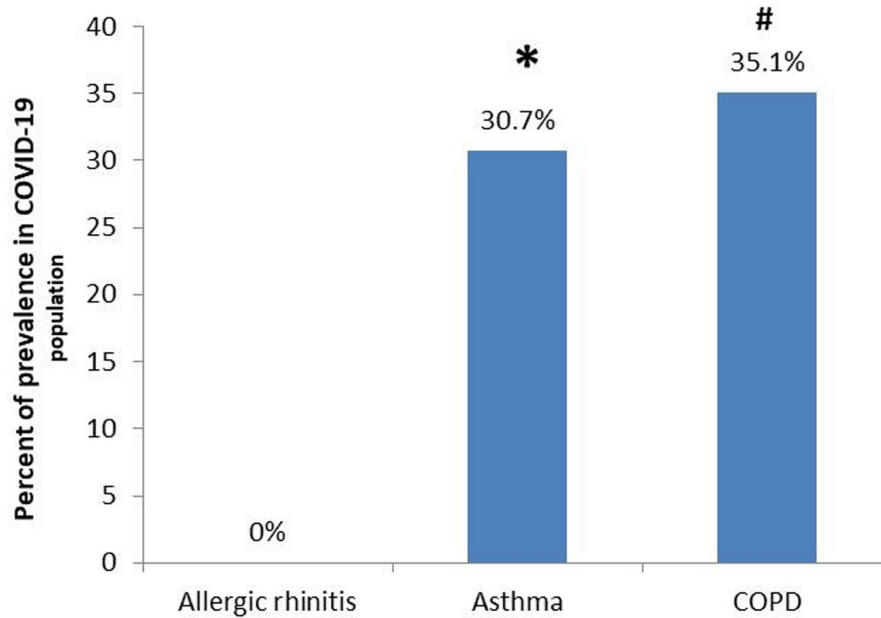


FIGURE 1 Prevalence rate of allergic rhinitis, asthma, and COPD in COVID-19 population. COPD = chronic obstructive pulmonary disease, COVID-19, coronavirus disease 2019. * A significant difference between the prevalence rate of asthma and allergic rhinitis in the COVID-19 population at $P < .05$. # A significant difference between the prevalence rate of COPD and allergic rhinitis in the COVID-19 population at $P < .05$

at $P < .05$. Fever, dry cough, diarrhoea, loss of smell and taste senses, shortness of breath and blue lips were significantly higher in all COVID-19 patients at $P < .05$ compared with other groups. There was no significant effect of age, gender, or patient comorbidities on the findings of each studied group.

We concluded that clinical diagnosis is a very important tool in differentiation between SARS-CoV-2 and other respiratory diseases, especially allergic rhinitis, asthma and COPD. Fever, dry cough, diarrhoea, loss of sense of smell and taste, shortness of breath and blue lips are the most distinguishing symptoms for COVID-19. After that, COVID-19 diagnosis should be confirmed by ground-glass opacity and abnormal findings on chest CT without the need for a nasopharyngeal swab especially in epidemic countries. Also, COPD and asthmatic patients are more susceptible to COVID-19 infection than allergic rhinitis patients.

DISCLOSURES

The authors declared no conflict of interest.

AUTHOR CONTRIBUTIONS

Conception and design: All authors. Administrative support: All authors. Provision of study materials or patients: All authors. Collection and assembly of data: All authors. Data analysis and interpretation: All authors. Manuscript writing: All authors. Final approval of manuscript: All authors.

ETHICAL STATEMENT

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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