Androgenetic alopecia in women and men is not related to COVID-19 infection severity: a prospective cohort study of hospitalized COVID-19 patients

To the Editor,

The ongoing outbreak of COVID-19 has posed significant threats to international health. The first biologic step of potential infectivity of COVID-19 is the priming of the spike proteins by transmembrane protease, serine 2 (TMPRSS2). TMPRSS2 cleave angiotensin converting enzyme 2 for augmented viral entry and thus is regarded as essential for viral spread and pathogenesis in the infected hosts.1,2 Androgen receptor activity is considered as a requirement for the transcription of the TMPRSS2 gene and no other regulatory element of the TMPRSS2 promoter has been described in human to date.3 Thus, this led us to hypothesize that variations in the androgen receptor gene may predispose male COVID-19 patients to increased disease severity.

Through a prospective study, 116 hospitalized patients due to severe COVID-19 infection (confirmed with viral nucleic acid testing) were involved in the study. Lung high-resolution computed tomography (HRCT) findings as well as laboratory data, and disease outcome including discharge, intensive care unit (ICU) care, intubation and death, were recorded for each patient. hyper-androgenic skin manifestations including androgenetic alopecia (AGA), acne severity, seborrheic dermatitis and hirsutism were examined by a dermatologist. Severity of AGA was assessed using Hamilton scale and Ludwig scale for male and female patients, respectively. Patients with immunosuppressive conditions and anti-androgenic medication were excluded. Analyses were carried out by Statistical Package for Social Sciences computer software (SPSS version 16, Chicago, IL, USA).

Totally, 118 confirmed COVID-19 patients including 61 men (51.7%) and 57 women (48.3%) with mean age of 60.45 ± 15.99 (ranging 18–100) years were investigated. All the patients were symptomatic. Triad of dyspnoea, cough and fatigue were the most common symptoms that were recorded in 100 (84.7%), 78 (66.1%) and 57 (48.3%) patients, respectively. Twenty-nine patients (24.4%) had all the symptoms of the triad (Table 1).

Chest HRCT showed abnormalities in 115 patients (97.4%) whom all of them had more than one involved lobe. Lesions were inclined to distribute in the lower lobes. Right inferior (92.3%) and right middle lobes (61.0%) were the most and the least affected lobes, respectively. Combination of ground glass opacification and consolidation which was presented in 65 patients (55.1%) was the most involved pattern.

Androgenetic alopecia was present in 45 men out of 61 (73.7%) including 13 (28.8%) severe AGA (Hamilton scale >5), 22 (48.8%), moderate AGA (Hamilton scale 3–4) and 10 (22.2%) mild AGA (Hamilton scale 1–2). In total, 32 women out of 57 (56.1%) had AGA including 2 (6.2%) severe AGA (Ludwig score advanced and frontal), 14 (43.7%) moderate AGA (Ludwig score 2–3) and 16 (50.0%) mild AGA (Ludwig score 1). Both the mortality rate and AGA severity were significantly higher in patients over 60 years old (P = 0.003 and 0.020, respectively). AGA was significantly higher in men than women (P = 0.045). AGA severity did not show any significant correlation with HRCT severity, neither with patients’ ICU care, intubation and expire in both genders. Similarly, other hyper-androgenic manifestations did not significantly correlate with disease outcome and HRCT severity (Table 2).

Among disease outcomes, ICU care, intubation and death were recorded in 48 patients (40.7%), 16 (13.6%) and 22 (18.6%) patients, respectively. Mortality rate was 18.0% among males (11 patients) and 19.3% among women (11 patients). No significant difference was observed between the two genders in terms of disease outcome.

The precise prevalence of AGA among healthy Iranian population is unknown; however, based on literature, prevalence of age-matched AGA in a similar white population is estimated 31–53% in men and up to 38% in women.4 Our results indicated substantial proportion of AGA in hospitalized COVID-19 patients considering estimated age-matched AGA in healthy population. Moreover, hyper-androgenic phenotypes have been recently observed by some authors to have correlation with severe forms of COVID-19.5–8 However, the results of this study revealed that AGA as well as other skin hyper-androgenic manifestations are not related risk of severe COVID-19 infection. Additional large-scale prospective studies are recommended.

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Conflict of interest

None declared.
Table 1: Demographic characteristics, clinical history, symptoms and signs of 118 patients admitted to hospitals with confirmed COVID-19 infection

| Characteristics (Unit) | Results (Mean ± SD) N(%) | Characteristics (Unit) | Results (Mean ± SD) N(%) | Characteristics (Unit) | Results (Mean ± SD) N(%) | Characteristics (Unit) | Results (Mean ± SD) N(%) |
|------------------------|---------------------------|------------------------|---------------------------|------------------------|---------------------------|------------------------|---------------------------|
| Demography             |                           | History                |                           | Symptoms               |                           | Signs                  |                           |
| Gender                 |                           |                        |                           |                        |                           | Oral temperature        |                           |
| Men                    | 61 (51.7%)                | Smoking                | 30 (25.4)                 | Dyspnoea               | 100 (84.7%)               | ≥ 38                   | 42 (35.6%)               |
| Women                  | 57 (48.3%)                | Alcohol consumption    | 4 (3.4%)                  | Cough                  | 78 (66.1%)                | < 38                   | 76 (64.4%)               |
| Age                    | 60.45 ± 15.99             | Opium consumption      | 24 (20.3%)                | Fatigue                | 57 (48.3%)                | > 90                   | 31 (26.2%)               |
| Men                    | 58.36 ± 17.04             | Hypertension           | 40 (33.8%)                | Fever                  | 42 (35.6%)                | 80-90                  | 65 (55.0%)               |
| Women                  | 64.82 ± 13.60             | Diabetes mellitus      | 32 (27.1%)                | Muscle pain            | 40 (33.9%)                | < 80                   | 22 (18.6%)               |
| Height (cm)            | 166.89 ± 9.59             | Ischemic heart disease | 18 (15.2%)                | Chest pain             | 36 (30.5%)                | ≥ 20                   | 101 (85.6%)              |
| Educational status     |                           |                        |                           |                        |                           | < 20                   | 17 (14.4%)               |
| Illiterate             | 52 (44.1%)                | Family history of COVID-19 infection | 12 (10.2%) | Loss of appetite | 26 (22.0%) |                           |                           |
| Less than 11 years     | 46 (39.0%)                |                          |                           |                        |                           |                          |                           |
| More than 11 years     | 20 (16.9%)                |                          |                           |                        |                           |                          |                           |
| Job status             |                           |                          |                           |                        |                           |                          |                           |
| Employee               | 18 (15.3%)                |                          |                           |                        |                           |                          |                           |
| Self employed          | 28 (23.7%)                |                          |                           |                        |                           |                          |                           |
| Retired and unemployed | 20 (16.9%)                |                          |                           |                        |                           |                          |                           |
| Housewife              | 52 (44.1%)                |                          |                           |                        |                           |                          |                           |
| Location               |                           |                          |                           |                        |                           |                          |                           |
| Urban                  | 85 (72.0%)                |                          |                           |                        |                           |                          |                           |
| Rural                  | 33 (28.0%)                |                          |                           |                        |                           |                          |                           |
| Marital status         |                           |                          |                           |                        |                           |                          |                           |
| Single                 | 11 (9.3%)                 |                          |                           |                        |                           |                          |                           |
| Married                | 107 (80.7%)               |                          |                           |                        |                           |                          |                           |
| Days from symptom onset to admission |                       |                          |                           |                        |                           |                          |                           |
| Chilling               | 26 (22.0%)                |                          |                           |                        |                           |                          |                           |
| Sputum                 | 20 (16.9%)                |                          |                           |                        |                           |                          |                           |
| Sore throat            | 10 (8.5%)                 |                          |                           |                        |                           |                          |                           |
Table 2  Lung HRCT findings vs. hyper-androgenic finding in 118 patients admitted to hospitals with confirmed COVID-19 infection

| HRCT findings                                      | N (%) | Hyper-androgenic findings                                      | N (%) |
|---------------------------------------------------|-------|---------------------------------------------------------------|-------|
| Number of involved lobes (>5%)                    |       | Both genders (N = 118)                                        |       |
| 0                                                 | 3 (2.5%) | History of acne                                              | 18 (15.3%) |
| 1                                                 | 0 (0.0%) | Current acne                                                 | 7 (5.8%) |
| 2                                                 | 16 (13.6%) | Mild                                                        | 3 (2.5%) |
| 3                                                 | 21 (17.8%) | Moderate                                                    | 4 (3.4%) |
| 4                                                 | 31 (26.3%) | Severe                                                      | 0 (0.0%) |
| 5                                                 | 47 (39.8) | History of greasy skin                                       | 38 (32.2%) |
| Lobe of lesion distribution (>5%)                 |       |                                                               |       |
| Left upper lobe                                   | 90 (76.2%) | Current seborrheic dermatitis                               | 6 (5.1%) |
| Left lower lobe                                   | 105 (8.9%) | Androgenic alopecia (Hamilton-Norwood scale)               | 45 (73.7%) |
| Right upper lobe                                  | 78 (66.1%) | Mild                                                        | 10 (22.2%) |
| Right middle lobe                                 | 72 (61.0%) | Moderate                                                    | 22 (48.8%) |
| Right lower lobe                                  | 109 (92.3%) | Severe                                                      | 13 (28.8%) |
| Bilateral upper lobes                             | 70 (59.3%) | Excess hair                                                 | 24 (39.3%) |
| Bilateral lower lobes                             | 99 (83.9%) | Face                                                        | 21 (87.5%) |
|                                                  |       | Ear                                                         | 23 (95.8%) |
|                                                  |       | Chest                                                       | 6 (25.0%) |
|                                                  |       | Pre-puberty                                                 | 0 (0.0%) |
| Pleural effusion                                  | 21 (17.8%) | Androgenic alopecia (Ludwig scale)                          |       |
| Pericardial effusion                              | 1 (0.8%) | Mild                                                        | 16 (50.0%) |
| Cavitation                                        | 0 (0.0%) | Moderate                                                    | 14 (43.7%) |
|                                                  |       | Severe                                                      | 2 (6.2%) |
|                                                  |       | History of infertility                                      | 2 (3.5%) |
|                                                  |       | Dysmenorrhea                                                | 11 (19.3%) |
|                                                  |       | History of hirsutism                                        | 15 (26.3%) |
|                                                  |       | Current hirsutism                                           | 19 (33.3%) |
|                                                  |       | Face                                                        | 17 (89.4%) |
|                                                  |       | Nipple                                                      | 9 (47.3%) |

Disclosure statements

Nothing to disclose.

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