

1 **Is 614G mutant of SARS-CoV-2 is an agent of the third wave of COVID-19 in Iran?**

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3 Seyed Ahmad Hashemi¹, Majid Ghafouri¹, Amirhosein Khoshi², Hamed Ghasemzadeh-moghaddam²,
4 Hasan Namdar-Ahmadabad², Amir Azimian^{2*}

5 1- Department of Infectious Diseases, School of Medicine, North Khorasan University of Medical
6 Sciences, Bojnurd, Iran.

7 2- Department of Pathobiology and Laboratory Sciences, School of Medicine, North Khorasan
8 University of Medical Sciences, Bojnurd, Iran.

9 * Corresponding author: Dr. Amir Azimian, PhD

10 Address: Department of Pathobiology, School of Medicine, North Khorasan University of
11 Medical Sciences, Bojnurd, Iran.

12 Tel: +985832239869

13 Fax: +985832237076

14 E-mail: amir_azimian2003@yahoo.com

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24 **Abstract**

25 In late 2019, an outbreak of respiratory disease named COVID-19 started in China and rapidly
26 spread to other parts of the world. To date, millions of cases of infection are reported worldwide.
27 Most researches performed on epidemiology and clinical features of COVID-19 and a small part
28 of studies have focused on the genetic characteristics of this virus. Here we performed six
29 months study on D614G mutation in SARS-CoV-2 isolates. Regarding the high price and low
30 availability of sequencing techniques in Iran, we designed the PCR-RFLP method for D614G
31 mutation detection and then evaluated 1440 SARS-CoV-2 positive samples isolated in six
32 months in Northeastern Iran. The first S-G type was detected on 2020 June 10; after that, the
33 number of S-G types increased in our samples, as in the last three weeks, from 2020 September
34 07 to 2020 September 26, all samples belonged to this type.

35 **Letter**

36 In late 2019, an outbreak of respiratory disease named COVID-19 started in the Wuhan, China,
37 and rapidly spread to other parts of the world (1). To date, millions of cases of infection are
38 reported worldwide, especially in Asia. Most researches performed on epidemiology and clinical
39 features of COVID-19, and a small part of studies have focused on the genetic characteristics of
40 this virus (2, 3). In their recent paper Becerra-Flore et. al reported that the G614 mutation led to
41 higher fatality rate (4). In agreement with their findings, we found that the increase of G614
42 mutation is related to higher infection rate and mortality in Iran. we performed a study on D614G
43 mutation in SARS-CoV-2 isolates from the beginning of the COVID-19 pandemic to date in
44 Northeastern Iran. Regarding the high price and low availability of sequencing techniques in
45 developing countries such as Iran, we designed the PCR-RFLP method for D614G mutation
46 detection and evaluated the ten samples per day from the beginning of pandemic until now. Our

47 results showed that the most prevalent type is S-D in our isolates in the first months of the
48 pandemic, and in the last months, the prevalent mutation shifted to S-G. The first S-G type was
49 detected at 2020 June 10; after that, the number of S-G types increased in our samples, as in the
50 last three weeks, from 2020 September 07 to 2020 September 26, all samples belonged to this
51 type. Based on the Ministry of Health reports, Iran now is in the third wave of the COVID-19
52 pandemic. We have a little information about the prevalence of D614G mutation in Iran but based on
53 our results, it seems that this pandemic is created by G614 mutants.

54 **Keywords.** Coronavirus, SARS-CoV-2, Polymerase Chain Reaction, Restriction Fragment Length
55 Polymorphism, mutation.

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57 **References**

- 58 1. Andersen KG, Rambaut A, Lipkin WI, Holmes EC, Garry RF. The proximal origin of SARS-
59 CoV-2. *Nature medicine*. 2020;26(4):450-2.
- 60 2. Yin C. Genotyping coronavirus SARS-CoV-2: methods and implications. *Genomics*. 2020.
- 61 3. Korber B, Fischer WM, Gnanakaran S, Yoon H, Theiler J, Abfalterer W, et al. Tracking
62 changes in SARS-CoV-2 Spike: evidence that D614G increases infectivity of the COVID-19 virus.
63 *Cell*. 2020;182(4):812-27. e19.
- 64 4. Becerra-Flores M, Cardozo T. SARS-CoV-2 viral spike G614 mutation exhibits higher case
65 fatality rate. *International Journal of Clinical Practice*. 2020.

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