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Studying the Relationship between COVID-19 and Clinical, Laboratory, and Demographic Data in Patients Referring to Shahid Rajaei Governmental Health Centers in Bandar Lengeh

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ABSTRACT

Background: Many factors are involved in the development of SARS-CoV-2 infection in individuals in each region, such as physiological conditions, underlying diseases, and observance of personal protection and hygiene; therefore, this study aimed to investigate factors affecting the incidence of COVID-19 in Bandar Lengeh, Hormozgan province, southern Iran.

Materials & Methods: Blood samples and demographic information were collected from suspected COVID-19 patients referring to Shahid Rajaei governmental health centers in Bandar Lengeh city. Hematological, biochemical, and serological tests were performed on the samples. PCR experiment was conducted to confirm SARS-CoV-2 infection. The thorax computed tomography (CT) was performed for all patients.

Findings: According to the PCR test results, the prevalence rate of SARS-CoV-2 infection was 26.92% among 130 individuals enrolled in this study. SARS-CoV-2 infection was more prevalent among clerks than in other occupational groups (p=0.017). Increased ESR (erythrocyte sedimentation rate) and decreased WBC (white blood cell), lymphocyte, and platelet counts were evident in COVID-19 patients. Also, the prevalence of COVID-19 infection was higher in patients with blood group A (33.3%) than in patients with other blood groups. The CRP (C-reactive protein) test was positive for 31 patients whose PCR test was positive for SARS-CoV-2. In addition, LDH (lactate dehydrogenase) level was higher in infected individuals compared to other participants (p=0.018).

Conclusion: In addition to the PCR test result, the most effective factors for diagnosing COVID-19 patients best on blood tests were as follows: increased CRP, ESR, and LDH levels and decreased WBC, lymphocyte, and platelet counts.

Keywords: COVID-19, Bandar Lengeh, Factors affecting, Iran.

CITATION LINKS

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Introduction

Coronaviridae family members are RNA viruses with a single-stranded, positive-sense viral genome of 26-32 kb in length [1]. Studies have reported the presence of coronaviruses in various avian and mammalian hosts, such as camels, bats, masked palm civets, mice, dogs, and cats [2, 3]. In recent decades, new mammalian coronaviruses have intermittently emerged at different times [1]. So far, seven coronavirus species, causing human diseases, have been identified [4]. Among which, 229E, OC43, NL63, and HKU1 are more prevalent and usually cause symptoms such as the common cold in people with a normal immune system [5], while SARS-CoV (severe acute respiratory syndrome coronavirus) and MERS-CoV (Middle East respiratory syndrome coronavirus) are zoonotic in origin and occasionally cause deadly diseases [6-9]. SARS-CoV was the causative agent of the outbreak of severe acute respiratory syndrome in 2002 and 2003 in Guangdong province, China [10].

In late December 2019, some local healthcare centers reported several pneumonia cases of an unknown cause, which were epidemiologically associated with a seafood wholesale market in Wuhan, Hubei province, China [11]. The disease and its causative agent were later named as COVID-19 (coronavirus disease 2019) and SARS-CoV-2 (severe acute respiratory syndrome coronavirus-2) by the World Health Organization (WHO), which is currently considered as a global public health, concern [12-14].

During the 2019–20 SARS-CoV-2 pandemic, the first confirmed COVID-19 cases in Iran were reported in Qom on February 19, 2020 [15]. Shortly thereafter, the disease disseminated rapidly in the neighboring provinces of Qom, such as Tehran, Markazi, Semnan, and Isfahan, and then in all 31 provinces of the country [16].

According to recent reports, most people who are deficient in vitamin D3, B12, and zinc are more likely to be infected with SARS-CoV-2 [17, 18]. People with underlying diseases such as diabetes, cancer, hypothyroidism, and cardiovascular disease are also at higher risk of developing the disease, while people with blood group O are less likely to be infected [19]. The disease clinical signs are different in different patients, including increased LDH (lactate dehydrogenase), SGOT (aspartate transaminase), SGPT (alanine aminotransferase), ALK (alkaline phosphatase), ESR (erythrocyte sedimentation rate), and CRP (C-reactive protein) levels and decreased WBC (white blood cell) count as well as HCT (hematocrit) and Hb (hemoglobin) levels [20, 21]. In addition, the standard diagnostic test for coronavirus in Iran is polymerase chain reaction (PCR) test [22]. On the other hands, the thorax computed tomography (CT) results are promising in COVID-19 screening and testing [23]. Bandar Lengeh is one of the cities of Homozgan province located in the south of Iran.

Objectives: This research aimed to investigate the relationship between COVID-19 and clinical, laboratory, and demographic data in patients referring to Shahid Rajaei governmental health centers in Bandar Lengeh, Hormozgan province, southern Iran.

Materials and Methods

This descriptive cross-sectional research was performed on 130 suspected COVID-19 patients referring to Shahid Rajaei governmental health centers in Bandar Lengeh city from October to January 2020 by observing ethical instructions of the Ethics Committee of Hormozgan University of Medical Sciences after obtaining the ethics code (IR. HUMS.REC.1399.205).

After obtaining informed consent from all referring patients, demographic information and data including age, education, occupation, observing quarantine, and

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wearing facial masks and disposable gloves were collected through interviews.

After 8-10 hours of fasting, blood samples were taken from all patients. Then hematological (blood group and cell blood count), biochemical (vitamin D3, vitamin B12, zinc, SGOT, SGPT, ALK, and LDH) and serological (CRP and ESR) tests were performed on the samples. Vitamin D3 and vitamin B12 were checked by ELISA readers (Stat Fax 4200); zinc, SGOT, SGPT, ALK, and LDH levels were determined by Auto-Analyzer (BT 1500); and CBC (cell blood count) was determined by Nihon Kohden cell counter (Model 6318). Hematological tests were performed in less than an hour, but for serological and biochemical tests, sera of blood samples were isolated and kept at -20 °C to be tested.

Nasal and nasopharyngeal swabs were taken from all patients by experienced technicians. After sampling, both types of swabs were inserted into a vial containing 5 mL of virus transport medium (VTM). Then the collected samples were sent to the Research Center of Bandar Abbas University of Medical Sciences for SARS-CoV-2 PCR experiment.

Eventually, CT scan was done for all patients in Shohada hospital, Bandar-e-Lengeh.

Statistical analysis: All data were analyzed using SPSS software Version 21 by employing Student's t-test and one-way ANOVA test to analyze the significant differences among values. The results were represented as mean ± SD. A p value of ≤0.05 was considered as statistically significant.

Findings

A total of 130 patients, including 83 males and 47 females, with the age range of 1 to 69 years were enrolled in this study. They were classified into four groups based on their age; the predominant age group was the age group of 20 to 40 years old. According to the PCR test results, SARS-CoV-2 was detected in 35 out of 130 participants (26.92%). Among the participants, 84 individuals were married, 46 were single, and 66 had college education. They belonged to families of one to ten people, while most of them belonged to families of four. In terms of employment status, they were unemployed, employed, clerk, worker, housewife, college student, or soldier; SARS-CoV-2 infection was more prevalent among clerks than in other occupational groups (p=0.017).

By examining preventive behaviors in individuals, it was found that 91.4% of infected individuals wore face masks, 12.5% always wore gloves, and 26% washed their hands regularly. On the other hand, 27.9% of infected individuals used washing liquid & gel, and 27% of them had a history of recent travels to provinces affected by COVID-19 disease.

Common clinical symptoms among patients were sore throat, fever, cough, body pain, and headache, respectively. It should be noted that there was no significant association between COVID-19 disease and underlying diseases such as high blood pressure, diabetes, and cardiovascular, pulmonary, and kidney diseases (Table1).

Hematological tests revealed an increase in ESR level and a decrease in WBC, lymphocyte, and platelet counts in infected patients (Table2). O-positive was also the most prevalent blood group among the participants in this project, while COVID-19 was more prevalent in patients with blood group A (33.3%) than in patients with other blood groups; however, there was no significant association between blood group and SARS-CoV-2 infection.

Based on the serological test results, the CRP test was positive for 31 patients whose PCR test was also positive for SARS-CoV-2.

According to the biochemical tests results (Table 3), LDH level increased in COVID-19 patients compared to other participants (p=0.018).

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Table 1) Relationship between COVID-19 and clinical symptoms, sex, and age in patients referring to Shahid Rajaei governmental health centers in Bandar Lengeh

		Positive Cases (%)N	Negative Cases (%)N	Total N (%)	P-Value	OR	CI%
Sex	Man	19(22.9)	64(77.1)	83(63.8)	.217	1.739	(0.778-3.836)
	Female	16 (34)	31 (66)	47 (36.2)			
Age group	1-20	2 (20)	8(80)	10(7.69)	.607	0.659	(0.133-3.266
	20-40	23(27.4)	61(72.6)	84(64.6)	1	1.068	(0.473-2.412)
	40-60	7(24.1)	22(75.9)	29(23.3)	.815	0.83	(0.319-2.157)
	> 60	3(50)	3(50)	6(38.46)	1	0.659	(0.133-3.266)
Sore throat	Yes	18(37.5)	30 (62.5)	48(36.9)	.564	0.699	(0.207-2.36)
	No	17(20.7)	65(79.3)	82(63.1)			
Chills	Yes	19(54.3)	16(45.7)	35(26.9)	.13	0.391	(0.116-1.319)
	No	16(16.8)	79(83.2)	95(73.8)			
Fever	Yes	21(50)	21(50)	42(32.3)	.18	0.397	(0.103-1.531)
	No	14(15.9)	74(84.1)	88(67.7)			
Decreased sense of smell	Yes	14(53.8)	12(46.2)	26(20)	.004	0.114	(0.026-0.494)
	No	21(20.2)	83(79.8)	104(80)			
Shortness of breath	Yes	3(13)	20(87)	23(17.6)	.021	6.875	(1.340-35.2)
	No	32(29.9)	75(70.1)	107(82.4)			
Stomach ache	Yes	6(27.3)	16(72.7)	22(17)	.366	2.113	(0.417-10.721)
	No	29(26.9)	79(73.1)	108(83)			
Cough	Yes	20(40.8)	29(59.2)	49(37.7)	.639	0.725	(0.157-17.231)
	No	15(18.5)	66(81.5)	81(62.3)			
Body pain	Yes	24(42.1)	33(57.9)	57(43.8)	.285	0.52	(0.157-1.723)
	No	11(15.1)	62(84.9)	73(56.2)			
Nausea and vomiting	Yes	6(50)	6(50)	12(9.3)	.778	0.756	(0.108-5.281)
	No	29(24.6)	89(75.4)	118(90.7)			
Headache	Yes	21(35)	39(65)	60(46.2)	.52	1.501	(0.435-5.719)
	No						
Diarrhea	Yes	9(45)	11(55)	20(15.4)	.577	0.685	(0.182-2.581)
	No	26(23.6)	84(76.4)	110(84.6)			
Decreased sense of taste	Yes	5(35.7)	9(64.3)	14(10.8)	.4	2.173	(0.357-13.215)
	No	30(25.9)	86(74.1)	116(89.2)			
Underlying diseases		35(26.9)	95(73.1)	130(100)	.459	0.598	(0.179-2.321)

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Table 2) Relationship between COVID-19 and hematological tests results in patients referring to Shahid Rajaei governmental health centers in Bandar Lengeh

Test	Reference Value	Mean of Positive Cases (± SD)(%)	Mean of Negative Cases (± SD)(%)	P-Value
WBC	4000-10000 /UI	4.73±1.26	6.7±8.26	.164
Lymphocyte	%	44.79±12.23	45.38±13.26	.817
Mixed	%	5.59±2.53	4.91±2.11	.15
RBC	M:4.5-6.3 Miluon/UI F: 4.2-5.4 Miluon/UI	5.11±0.655	4.94±0.752	.208
Hb	M:14-18 Miluon/UI F: 12-16 Miluon/UI	12.91±1.57	13.37±2.34	.286
Hct	M:40.0-50.0 Miluon/UI F: 36.0-46.0 Miluon/UI	42.2±4.52	43.1±5.58	.39
MCV	80.0-100.0 FL	83.59±7.98	88.00±9.56	.016
MCH	27.0-32.0 Pg	27.3±10.08	27.9±6.77	.712
MCHC	33.0-38.0%	30.58±1.02	31.17±1.28	.817
PLt	150-400 1000/Unit	224.14±69.39	244.51±74.92	.163
ESR	Male <15 mm/hr Female <20 mm/hr	15.50±10.04	11.21±9.68	.028

According to the CT test results, 44.4% of COVID-19 patients had lung problems.

Discussion

In this study, biochemical, hematological, and clinical signs and symptoms as well as demographic characteristics were investigated in COVID-19 patients referring to Shahid Rajaei governmental health centers in Bandar Lengeh, Hormozgan province, southern Iran. Based on the PCR test results, 26.92% of participants were diagnosed with COVID-19. Different provinces of Iran with different strengths and weaknesses have been affected by SARS-CoV-2 [24]. In this study ,although %91.4 of COVID-19 patients always wore masks ,their occupation played an important role in their disease; SARS-CoV-2 infection was more prevalent among clerks than in other occupational groups. It should be noted that Iran has been more successful in controlling and preventing the death of patients than some developed countries, despite facing many problems in controlling the pandemic [24]. One of the most effective measures taken in Iran at the beginning of COVID-19 pandemic was to encourage people to stay at home [24]; but staying at home was not possible for some people such as clerks. On the other hand, in this study, 27% of infected individuals had a history of recent travels to provinces affected by SARS-CoV-2, while one of the ways to control COVID-19 disease in Iran was to impose restrictions on unnecessary travels by the government [24].

In this study, there was no significant association between underlying diseases and COVID-19, while people with underlying diseases, such as diabetes, cardiovascular disease, cancer, and chronic respiratory disease, as well as the elderly are at higher risk of developing severe illnesses [19]. In the current study, the most common symptoms in

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Table 3) Relationship between COVID-19 and biochemical tests results in patients referring to Shahid Rajaei governmental health centers in Bandar Lengeh

Test	Reference Value	Mean of Positive Cases (%) (± SD)	Mean of Negative Cases (± SD)(%)	P-Value
SGOT	0.0-42.0 IU/L	28.57 ± 11.35	26.64±11.95	.41
SGPT	0.0-40.0 IU/L	33.74±23.19	27.65±22.23	.177
ALK	Y/O <15: 180.0-1200.0 IU/L F>15 Y/O: 64.0-306.0 IU/L M>15 Y/O: 80.0-306.0 IU/L	194.28±128.37	206.77±71.62	.485
LDH	100.0-500.0 UNITS/L	361.88±84.49	328.83±63.64	.018
Zn	M: 72.6-127 Ug/dL F: 70.0-114 Ug/dL	86.10±18.32	86.00±13.80	.972
Vit D3	Deficient<10 ng/mL Insufficient= 10-30 ng/mL Sufficient= 30-100 ng/mL INTOXICATION>100 ng/mL	20.23±7.22	19.33±7.15	.522
Vit B12	Newborn: 160.0-1300.0 pg/mL Adult: 200.0-835.0 pg/mL Adult>60Y: 110.0-800.0 pg/mL	328.28±124.56	327.61±225.41	.987

patients were sore throat, fever, cough, body pain, and headache, respectively. According to the WHO, COVID-19 patients may have different symptoms ranging from a mild respiratory disease (respiratory disorders, fever, cough, breath shortness, and difficulty in breathing) to severe illnesses (pneumonia, acute respiratory distress syndrome, renal failure, and death) [25].

This research showed that COVID-19 disease was more prevalent among patients with blood group A than in people with other blood groups. Boudin L et al. (2020) showed that blood group A was related to an increased risk of developing SARS-CoV-2 infection, while blood group O was related to a reduced risk of SARS-CoV-2 infection [26]. In this study, an increase in ESR and LDH levels and a decrease in WBC, lymphocyte, and platelet counts were observed in COVID patients compared to other participants. In line with this study results, Han et al. (2020) found that LDH level could be considered as a potent predictor for early diagnosis of lung lesions and severe cases of COVID-19 infection [27]. While in the present study, no correlation was observed between COVID-19 and the mean levels of vitamin D, zinc, B12, and liver enzymes (SGOT, SGPT, and ALK), Ilie et al. (2020) found a negative association between the mean level of vitamin D and the number of COVID-19 patients in each country [28]. Tan et al. (2020) reported that the levels of vitamin D, magnesium, and vitamin B12 were significantly correlated with the improvement or deterioration of clinical conditions in older COVID-19 patients requiring oxygen support and intensive care [29]. Based on some reviewed articles, methylcobalamin (vitamin B12) appears to be able to attenuate COVID-19 symptoms [30]. In this study, the CRP test was positive for 31 out of 35 COVID-19 patients. Chen et al. (2020) reported that in the early stages of COVID-19 disease, the level of CRP could reflect the extent of lung injury and the disease severity [31].

By applying CT method, it was found that less than half of the patients under study had pulmonary COVID-19. Zhao et al. (2020)

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also reported that it is possible to predict whether a person is infected with SARS-CoV-2 or not by strengthening research, developing/applying deep learning methods, and analyzing CTs [23].

Conclusion

By examining the data of patients with suspected SARS-CoV-2 infection in Bandar Lengeh, it was found that the type of occupation (even with observing personal protection) was associated with COVID-19 disease. Factors such as the type of occupation, blood group, and history of trip in recent weeks to other provinces were identifies as factors affecting the incidence of COVID-19 disease in this area. It is worth noting that increased CRP, ESR, and LDH levels and decreased WBC, lymphocyte, and platelet counts in COVID-19 patients along with PCR test results could be used to diagnose this disease.

Therefore, it is suggest that in future studies, the factors affecting the incidence of COVID-19 disease in other provinces of Iran be studied with a wider and higher statistical population.

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Conflicts of interest: There are no conflicts of interest.

Authors Contribution: Conceptualization: All authors ; data curation: All authors; formal analysis: All authors; funding acquisition: All authors; Investigation: All authors; methodology: All authors; projectadministration: ZF; resources: All authors; software: All authors; supervision: writing of the original draft: All authors; writing-review and editing: All authors.

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