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COVID-19 Surveillance in Nowshera District, Pakistan

Hamzullah Khan[1], Muhammad Khalid[2], Mansoor Akhtar[3], Muhammad Haris[4]

[1]Associate Professor Hematology, Nowshera Medical College, MTI Nowshera, Pakistan; [2]Associate Professor Medicine, Nowshera Medical College, Nowshera, Pakistan; [3]Medical Officer, In-charge Anesthesia, Mian Rashid Hussain Shaheed Memorial Hospital Pabbi, Nowshera, Pakistan; [4]Assistant Professor, Nowshera Medical College, Nowshera, Pakistan

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Corresponding Author
Dr. Hamzullah Khan, MBBS, M.PhiL
Associate Professor of Hematology
Nowshera Medical College,
Peshawar 25000, Pakistan
Tel: +923344802902
E-mail: hamzakmc@gmail.com

Objectives: To determine the frequency of 2019-nCoV infectivity and correlation of different variables with COVID-19 in the population of Nowshera District, Pakistan. **Methods:** In this prospective observational study, a total of 365 people suspected of having COVID-19 were included from February5, 2020, to April 25, 2020. Spearman's correlation was used to assess the correlation of various factors with COVID-19 test positivity. **Results:** The mean age and standard deviation of those assessed were 35 ± 16 years. Of the total, 264 (72.3%) were males and 101(27.7%) females. Of the 365 people suspected of having COVID-19, 148(40.54%) were selected for viral detection through PCR. Of 148, 41(27.70%) were COVID-19 positive. One hundred ninety-three (52.9%) of the participants had a history of contact with COVID-19 people suspected of having COVID-19, and 68 (18.6%) had a history of travel to an epidemic area with COVID-19. there was a positive correlation of PCR positivity of the participants with exposure (rs=0.23, p = 0.001) and travel history (rs = 0.12, p = 0.02), respectively. In gender groups, we observed a positive correlation of male gender with travel history (rs = 0.13, p = 0.02) and an increase in age (rs = 0.14, p = 0.006). **Conclusions:** The prevalence of infection was 27.70% using the PCR technique. Male gender and older age people were more at risk of developing COVID-19. There was a statistically significant correlation between viral infection and a history of travel to an epidemic area and close contact with COVID-19 patients..

Keywords: COVID-19, Pandemic, 2019-nCoV, Epidemiology, Pakistan

Introduction

By April 15, 2020, at least 19 million people globally have been infected with Coronavirus disease (COVID-19), with more than 120,000 deaths worldwide [1]. This new deadly virus emerged in December 2019 with a presentation of deadly pneumonia of unknown cause. Later, the Chinese Centre for Disease Control and Prevention and the local CDC attributed it to a novel virus belonging to the corona family and was termed as 2019-nCoV [2].

COVID-19 was first reported from the metropolitan city of Wuhan, in Hubei province of China, in December 2019 as cases of severe respiratory disease/pneumonia. The etiology of COVID-19 is yet to be confirmed, but most scientists agree that it most likely originated from the zoonotic coronavirus, SARS-CoV, that emerged in 2002 [3]. The current outbreak seems to have started at the Huanan food market in Wuhan city, as the reports suggest 66% of the infected patients had a contact history with this seafood market [4].

Regarding the transmissibility of the COVID-19, the basic reproductive number (R0), which is a measure of the expected number of cases generated from one positive case, is 1.5-3 for SARS-CoV, compared to 1.5-5 for MERS-CoV [5]. The majority of the infected cases are asymptomatic. However, 20% of the cases develop viral pneumonia characterized by fever, cough shortness of breath, and acute lung injury, with an overall mortality rate of 2.3% [6].

In China keeping view the importance of clinical presentation, travel history to an epidemic area or close contact with COVID-19 infected person they defined their suspect as any patient presenting with a history of fever, flu, cough, shortness of breath, history of travel to the epidemic area (Hubei Province), or with a positive contact history while a confirmed case was a person with a positive molecular test (PCR) [7].

In Pakistan, as of April 24, 2020, the reported data from government sources declare 11,940 confirmed cases with 253 deaths. Punjab is the province with the highest number of coronavirus cases reaching 5046, followed by Sindh 3945, Khyber Pukhtoonkhwa 1708, Balochistan 656 and the capital of Islamabad with 223 cases [8].

Studies from China report that individuals of extreme age and those with an immunocompromised state are at higher risk of getting a 2019-nCoV infection [9]. A history of travel to an epidemic area does matter in the acquisition of this deadly viral infection. Italy was the second epicenter, with more than 80,000 cases of SARS-COV-2 infection. These infections were attributed to poor compliance with precautionary measures during the early stages of the epidemic and travel history to China [10].

The populations for high risk of infection are close contacts of COVID-19-infected patients, healthcare workers, and family members of infected patients. A study from mainland China reported that the incidence of infection was 89% in family members and other close contacts of COVID-19 patients [11].

Our study aimed to estimate the frequency of 2019-nCoV infection in the population of Nowshera District, Pakistan, and to examine statistical correlations of variables like age, gender, travel and exposure history with acquiring a 2019-nCoV infection.

Materials and Methods

Study design and setting

This prospective cohort study was conducted from February 5, 2020, to April 25, 2020, mainly in the COVID-19 Clinic of Qazi Hussain Ahmed Medical Complex Nowshera and from the available data of COVID-19 of Nowshera District epidemiologic database. A total of 365 participants were included in the study.

Population and sampling

The number of participants required to optimally represent the population of 100,000 people estimated to reside in the catchment area of our hospital, belonging to Nowshera District of Khyber Pakhtunkhwa, Pakistan, was determined. A sample size of 365 was calculated through Raosoft® [12], an online sample size calculator, using a margin of error of 1.81%, confidence interval of 95%, a population size of 100,000 and an estimated 1% prevalence of COVID-19 in the general population. The sample was selected through consecutive, non-probability technique. All people who were suspected of having COVID-19 who presented to the COVID-19 Clinic, irrespective of age and gender, were prospectively enrolled as study participants. People who presented to the COVID-19 Clinic for other medical problems, injuries or other outpatient departments were excluded.

Procedure and techniques

All study participants who presented to Qazi Hussain Ahmed Medical Complex with symptoms suggesting COVID-19 were screened for PCR testing using the criteria approved by the administration of Qazi Hussain Ahmed Medical Complex on the recommendation of the Infectious Disease Control Committee, keeping in view the shortage of viral transport media supplied by the government (Table 1). People who scored more than 5 were tested for 2019-nCoV using nasopharyngeal swabs. All study participants with scores of less than five were not tested and were advised to go home and take precautionary measures. All samples were sent under strict observance of protocols of the Public Health Research Laboratory of Khyber Medical University Peshawar (a lab designated for 2019nCoV PCR testing by the government of Khyber Pukhtunkhwa).

All tested participants were isolated in the isolation unit of Qazi Hussain Ahmed Medical Complex, as well as quarantine/ isolation designated by the government like in Mian Rashid Hussain Shaheed Memorial Hospital Pabbi, District Headquarter Hospital, Nowshera. In some cases, close contacts of these participants were isolated at home under strict observance of the health/district administration to contain the virus.

The PCR results were received in 2- 3 days, all study participants with a positive PCR report were isolated and kept under treatment, and their sample was repeated after seven days of isolation/treatment. Those who were negative in the repeated samples were shifted to quarantine to complete the incubation period for at least 14 days.

All study participants with a score less than five were not subjected to lab investigation, advised precautionary measures and sent home.

Operational definitions

Our study used the definition of child and adults found in Article 1 of The United Nations Convention on the Rights of the Child which defines "a child means every human being below the age of 18 years unless under the law applicable to the child, majority is attained earlier" [13]. A young adult was defined 19-35 years of age, middle-aged adult 36-55 years and older adult >56 years [14].

Statistical analysis

The frequency and proportion of numerical and categorical variables were presented in percentages. The Spearman's rank correlation coefficient (rs) was used to determine the correlation of PCR positivity, with the patient's age, gender, contact and travel history. Relative risk analysis was done to estimate the risk in groups with and without a history of contact with someone with COVID-19. Odds ratios were calculated to determine the probability of COVID-19 in study participants with and without a history of contact and the duration of contact. All analyses were performed using SPSS version 25.

Ethical statement

Ethical endorsement was obtained from the Institutional Ethical Review Board of the Nowshera Medical College (letter No. 69/ ERB/NMC Dated February 10, 2020) before the study began. Prior informed consent was obtained from all study participants, and they were assured of confidentiality.

Results

The study participants ranged from 1 to 85 years of age, with a mean (±SD) of 35 ± 16 years. The majority of the participants were 18-35 years of age (190, 52.1%), followed by fewer in the 36-55 year age group (83, 22.7%) and the least in the greater than 55 years of age category (50,13.7%). Of the total, 264 (72.3%) were males and 101(27.7%) females (Table 2). The mean duration of exposure to someone suspected of having or confirmed to have COVID-19 was 6 ± 2 days (Table 2).

Table 1. Criteria for COVID-19 scoring system

Risk Factor	Number of Points
Fever	1
Cough	1
Sore throat	1
Diarrhea along with other respiratory symptoms	2
Shortness of breath	2
Travel history	2
Contact history with of epidemic area traveler, chest pain, mass gathering, leucopenia, lymphopenia	1
Exposure history with confirmed case/close relatives of the COVID-19 patients	6
Total	16

Score	Action based on Score
<5	Quarantine at home
6-8	Get labs and inform public health official
8-10	Get labs, admit/isolate, and inform public health official

We applied Spearman's correlation to assess the correlation of various factors with COVID-19 test positivity (Table 4). We observed a highly statistically significant but weakly positive correlation of a positive PCR test with COVID-19 exposure (rs = 0.23, p = 0.001). Travel history to a known outbreak was also weakly correlated (rs = 0.12, p = 0.02).

Table 2. Demographic information and duration of exposure

Age categories	Frequency	Percent	Cumulative Percent
age<18 years	42	11.5	11.5
19-35 years	190	52.1	63.6
36-55 years	83	22.7	86.3
>55 years	50	13.7	100
Total	365	100	
Gender	Frequency	Percent	Cumulative Percent
Male	264	72.3	72.3
Female	101	27.7	100
Total	365	100	
		Age (years)	
No. of cases	Mean	SD	Range
365	35	16	1 to 85
		Duration of exposure (days)	
No. of cases	Mean	SD	Range
365	6	1	1 to 7

Of the 365 participants, 148 (40.54%) were selected for viral detection through PCR. Of the 148, 41 (27.70%) tested positive for COVID-19, 80 (54.05%) negative, 3 (2.03%) inconclusive, with the result pending in 24 (16.22%). One hundred ninety-three (52.9%) of the participants had a history of exposure to COVID-19 patients or those suspected of having it, and 68 (18.6%) had a history of travel to an epidemic area with COVID-19 (Table3).

Table 3. Frequency of testing, test results, travel and contact exposure

PCR Report	Frequency	Percent	Cumulative Percent
Negative	80	54.05	54.5
Positive	41	27.7	81.75
Pending	24	16.22	97.97
Inconclusive	3	2.03	100
Total PCR done	148	40.5	40.5
PCR not done	217	59.5	100
Total	365	100	
Contact History			
Yes	193	52.9	52.9
No	172	47.1	100
Total	365	100	
Travel history			
Yes	68	18.6	18.6
No	297	81.4	100
Total	365	100	

Regarding gender, we observed a weak positive correlation of male gender with travel history (rs = 0.13, p = 0.02) and an increasing age (rs = 0.14, p = 0.006).

Table 4. Correlation matrix showing the Spearman's correlation coefficient (rs) for PCR positivity with the various risk factors

		PCR Positivity	Gender	Age categories	Travel History
Gender	r_s	0.026			
	p	0.619			
Age categories	r_s	0.144	-0.05		
	p	0.006	0.344		
Travel History to an epidemic area	r_s	0.119	0.107	0.107	
	p	0.022	0.041	0.041	
Exposure History	r_s	0.232	0.091	0.074	0.071
	p	0.000	0.083	0.159	0.175
No of respondents		365	365	365	365

Statistically significant correlation coefficients and their p-values (two-tailed) are shown in bold font

Table 5 shows the importance of the duration of exposure. Patients with a history of exposure to someone suspected of having or confirmed having COVID-19for more than 48 hours had nearly six times the risk of acquiring COVID-19 compared to those having no known history of exposure (OR = 5.7). The relative risk of the disease was 1.6 for participants with a positive exposure (RR = 1.6, 95% CI 1.4 - 1.9).

Table 5. Estimation of risk for developing COVID-19 due to a history of more than a 48-hour exposure to someone suspected of having or confirmed to have COVID-19

	OR	95% Confidence Interval (CI)	
		Lower	Upper
Odds Ratio (Positive / Negative)	5.7	1.8	12.12
For cohort with history of known exposure	1.6	1.41	1.96
For cohort with no history of known exposure	0.19	0.11	0.42
Number of valid cases			365

Discussion

Research is done to answer the questions and help the decision-maker to decide based on the facts and figures. It solves the problem for a specified population on a specific issue, such as the number of cases of COVID-19 that has now infected nearly every district of the country. To the best of our knowledge, this is the first study to give information on the frequency of COVID-19 infection in Pakistan and factors contributing to increased risk of infection and mortality associated with this deadly disease.

Out of 365 participants, 148 (40.54%) satisfied our study's criteria for viral detection through PCR testing. Of 148 people strongly suspected of having COVID-19, 41 (27.70%) were PCR positive. A study from Japan reported a lower proportion of 17.9% (95% CI: 15.5–20.2%) positive cases. They further stated that infection in most of their patients had occurred before they were quarantined [15]. A study of 72,314 people from the Hubei province ofChinareported that 44,672 (62%) were positive via the detection of viral nucleic acid by the PCR technique [16]. Their ratio of positivity was higher than our study, but their findings were from a very highly infected zone.

We observed that 193 (52.9%) of the participants had a history of contact with people who had or were highly suspected of having COVID-19 in the last 14 days in our study. Of 41 positive cases, the history of contact with COVID-19 positive patients was identified in 35 (85.36%). As the district administration followed the family members of the positive cases, 85% of them also were infected. Furthermore, there was a positive correlation of PCR positivity of the participants with exposure history (rs = 0.23, p = 0.001). The findings of Luo et al. [17] showed a case positivity of 10% in the suspects with a low history of exposure, while the findings of the Qiu et al. [18] were much higher. The reason for this difference is they directly followed the family members of COVID-19 patients, where the prevalence of infection was as high as 89%.

We observed the 68 (18.6%) of the participants had a history of travel to an epidemic area with COVID-19. Amongst the positive cases, 13/41 (31.7%) had a history of travel to an epidemic area. There was a positive correlation of PCR positivity of the participants with travel history to an epidemic area (rs = 0.12, p = 0.02). A study from China showed a strong positive correlation of COVID-19 with travel to Wuhan (Pearson correlation r=0.93) [19].

Regarding age we identified a significant correlation of infection with age (rs = 0.14, p = 0.006). The 2019 CDC report showed that 53% of the COVID-19 patients needed ICU admission, and of those, 80% of the deaths occurred in elderly people age>65 years, while no ICU admissions or deaths were recorded in people less than 19 years of age [20].

Our study had some unavoidable limitations like limited resources, limited virus transport medium during the early period of the epidemic in Pakistan, the short duration of the study, and fewer positive cases despite having an acceptable potentially infected population attending the COVID-19 Clinic. Future studies should be carried out covering the duration of the epidemic, including the maximum number of COVID-19 patients. This will help us understand the high number of deaths reported so far and correlate different risk factors with the infectivity and fatality of this menace.

Conclusions

We concluded that the prevalence of infection was 27.70% in our study participants. People with male gender and older age were more prone to develop COVID-19. A history of travel to an epidemic area and close contact with COVID-19 patients or those suspected of having it was significantly correlated with acquiring COVID-19.

Conflict of Interest

The authors declare that they have no competing interests.

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References

1. World Health Organization, Coronavirus disease 2019 (COVID-19): situation report—86. Available at: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200415-sitrep-86-covid-19.pdf?sfvrsn=-c615ea20_6.
2. Cascella M, Rajnik M, Cuomo A. Features, evaluation and treatment coronavirus (covid-19). Available at: https://www.ncbi.nlm.nih.gov/books/NBK554776/.
3. Ahn DG, Shin HJ, Kim MH, Lee S, Myoung J, et al. Current status of epidemiology, diagnosis, therapeutics, and vaccines for novel coronavirus disease 2019 (covid-19). J Microbiol Biotechnol 2020; 30(3): 313-24.
4. Choijilsuren G, Bat-Erdene A, Lkhagvasuren E. Challenges and lessons from novel coronavirus infection. Cent Asian J Med Sci 2020; 6(1): 335-37.
5. Azamfirei R. The 2019 novel coronavirus: a crown jewel of pandemics? J Crit Care Med (Targu Mures) 2020; 6(1): 3–4.
6. Epidemiolgoy working group for NCIP epidemic response, Chinese center for disease control and prevention. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (covid-19) in China. Zhonghua Liu Xing Bing XueZaZhi 2020; 41(2):145–51.
7. Jin YH, Cai L, Cheng ZS. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). Mil Med Res 2020; 7(1): 4. doi: 10.1186/s40779-020-0233-6.
8. Situation analysis "Coronavirus in Pakistan - Confirmed Cases". Islamabad, Retrieved April 24, 2020. Available at: www.covid.gov.pk/.
9. National Health Commission of the People's Republic of China. Notice on printing and distributing the work plan for prevention and control of pneumonia caused by novel coronavirus infection in the near future. Beijing, Retrieved January 31, 2020. Available at: http://www.nhc.gov.cn/tigs/s7848/202001/808bbf75e5ce415aa19f74c78ddc653f.
10. Porcheddu R, Serra C, Kelvin D, Kelvin N, Rubino S. Similarity in case fatality rates (CFR) of covid-19/sars-cov-2 in Italy and China. J Infect Dev Ctries 2020; 14(2): 125-28.
11. Qiu H, Wu J, Hong L, Luo Y, Song Q, et al. Clinical and epidemiological features of 36 children with coronavirus disease 2019 (covid). Lancet Infect Dis 2020; 20(6): 689-96.
12. Raosoft® sample size calculator (internet). Seattle, WA, USA: Raosoft Inc.; 2004. (accessed January 13, 2019). Available at: http://www. raosoft.com/samplesize.html.
13. Unicef United Kingdom. The United Nations Convention on the Rights of the Child (internet). Unicef London: (cited January 13, 2019). Available at: https://www.unicef.org.uk/what-we-do/un-convention-child-rights/.
14. Petry NM. A comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers (internet). Gerontolog 2002; 42(1): 92–9.
15. Mizumoto K, Kagaya K, Zarebski A, Chowell G. Estimating the asymptomatic proportion of coronavirus disease 2019 (covid-19) cases on board the diamond princess cruise ship, Yokohama, Japan, 2020. Euro Surveill 2020; 25(10): 2000180. doi:10.2807/1560-7917.ES.2020.25.10.2000180.
16. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (covid-19) outbreak in China: summary of a report of 72 314 cases from the Chinese center for disease control and prevention.

JAMA 2020; 323(13): 1239–242.

17. Luo L, Liu D, Liao XL, Wu XB, Jing QL et al. Modes of contact and risk of transmission in covid-19 among close contacts. Available at: https://doi.org/10.1101/2020.03.24.20042606.
18. Qiu H, Wu J, Hong L, Luo Y, Song Q, et al. Clinical and epidemiological features of 36 children with coronavirus disease 2019 (covid). Lancet Infect Dis 2020; 20(6): 689-96.
19. Wang P. Epidemiological characteristics of 1212 covid-19 patients in Henan, China. Available at: https://www.researchgate.net/publication/339456629.
20. Center for Disease Control, CDC. Washington State report first COVID-19 death (Media statement). Atlanta, GA: US Department of Health and Human Services, CDC; 2020. Available at: https://www.cdc.gov/media/releases/2020/s0229-COVID-19-first-death.html.