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Research Article

Finding the major risk factors for higher COVID-19 prevalence in various Districts of Khyber Pakhtunkhwa, Pakistan

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Abstract

The emergence and rapid spread of the coronavirus disease-2019 (COVID-19) pandemic around the world has focused attention on the relationship between the disease transmission and people's attitude toward understanding it. The aim of this study is to know the public opinion about COVID-19 and to find the key factors responsible for increased spread of the disease in different districts of Khyber Pakhtunkhwa, Pakistan. Our data revealed that COVID-19 was more prevalent in colder districts (Abbottabad & Swat) as compared to warmer districts (Peshawar, Mardan & Karak). In addition, male had a higher COVID-19 infection rate than women. Additionally, our data revealed that COVID-19 was more prevalent in less educated people, urban areas and unvaccinated people as compared to high educated, rural areas and vaccinated people, respectively. People who practiced social distancing and followed proper COVID-19 standard operating procedures had lower COVID-19 infection rate. This study concludes that COVID-19 was more communicable in urban areas, among men and colder climates than it was in rural areas, among women and warmer climates, respectively. Therefore we recommend proper vaccination as future strategic plan to prevent spread of such pandemics. This research will provide valuable insights on managing infectious disease and developing efficient preventive strategies.

Keywords: Corona virus; Covid-19; Health; Pandemic; Pakistan

Introduction

The coronavirus, which is a member of the coronavirade family, was named the new coronavirus disease-2019 (COVID-19). This virus is tiny (65 to 125 nm in diameter) and includes a single stranded ribonucleic acid with a length ranging from 26 to 32 kbs **[1]**. COVID-19 was detected in Wuhan in December 2019. Various schools of thought claimed various explanations for its huge spread, with wet markets playing a crucial role **[2]**. This virus was extremely hazardous to human health. Initially, experts had little information about the pandemic of this virus

and assumed that only a few people would be affected, but the epidemic spread quickly. This disease spreads through person-to-person contact via aerosols [3].

The severe acute respiratory syndrome coronavirus, or COVID-19, is a highly contagious respiratory disease that has caused a pandemic and a global health emergency [4]. It is distinguished mostly by coughing, sneezing, or short breathing. COVID-19 symptoms include a high body temperature above 38 ℃ and a dry cough. Some people experience shortness of breath, particularly during strenuous activity. Many persons are infected with COVID-19 have muscle soreness or pains, headaches, and a sore throat 2-14 days after being infected with the virus [5]. Due to its high contagious potential, COVID-19 standard operating procedures (SOPs) are critical in preventing the spread of this pandemic. Health officials have recommended many SOPs, including vaccination, social distancing, and smart lockdown, to protect public health or slow the spread of the disease. Vaccine immunization minimizes serious sickness and avoids pandemic COVID-19 outbreaks. Another essential tool for preventing the spread of COVID-19 is using a facemask. The use of sanitizer and a social distance of minimum 3 feet play a key role in the prevention of the COVID-19 epidemic. Since the COVID-19 virus is susceptible to detergent, washing hands with soap for at least 20 sec will disinfect the virus [6]. Hand sanitizers with 60% alcohol are also beneficial for maintaining hand sanitization after exposure to public locations. In pandemic zones, self-isolation is also important for protecting against COVID-19 [7]. We designed this study to know the public opinion about COVID-19 and to find the key factors responsible for increase spread of this disease in different districts of Khyber Pakhtunkhwa (KPK), Pakistan.

Materials and Methods

The survey was conducted from November 2022 to February 2023 in different districts of KPK province, Pakistan. In order to conduct sporadic interviews with locals, our team traveled to several districts in KPK i.e., Peshawar, Mardan, Nowshera, Karak, Swat, and Abbottabad. We also distributed 100 questionnaires to both male and female in these districts. The questionnaire was developed in the national language due to the ambiguity of regional languages and the disparity in literacy rates (although it is translated into English here). We sent four team members to different districts of KPK to collect data of COVID-19-affected people in order to determine the cause behind the higher prevalence of COVID-19 cases in a certain location and to report people's attitudes towards COVID-19 control. This study will help in the development of future strategic policies in the event of a calamity. In collecting data from individuals, the team members opted for basic tools, including a regular pen, white papers, questionnaire sheets, sanitizers, and safety clothing. In addition, we communicated with target people via the Zoom and WhatsApp applications, if necessary. Before conducting the questionnaire, team members informed the respondents about the goal of the survey/questionnaire. We also recorded the interviewee's social, economic, and educational life, food patterns, and grocery preferences. During the interview, we maintained social distance and followed proper COVID-19 SOPs such as facemask, safety clothes etc.

Results

Prevalence of COVID-19 in different districts of KPK

We have randomly selected people in different districts of KPK i.e., Peshawar, Mardan, Nowshehra, Karak, Swat and Abbottabad to conduct their interviews and circulated questionnaire among people. Interested candidates were interviewed and

guided how to fill the questionnaire. In each district, 100 questionnaires (both male and female) were completed for the general prevalence of COVID-19. We found that the highest number of men infected with COVID-19 was found in Swat (75%) while the highest number of females infected with COVID-19 was found in district Abbottabad (61%). The number of COVID-19 infected men in Karak, Peshawar, Mardan, Nowshera, Swat and Abbottabad were 60, 64, 67, 66, 75 and 72% while the infected women percentage were 53, 53, 45, 59, 59, and 61%, respectively as shown in (Table 1).

Table 1. Percent prevalence of COVID-19 in different districts of KPK

Districts	COVID-19 infected male (%)	COVID-19 infected female (%)
Peshawar	64%	53%
Karak	60%	53%
Mardan	67%	45%
Nowshehra	66%	59%
Swat	75%	59%
Abbottabad	72%	61%

Prevalence of COVID-19 in cold vs warm districts of KPK

We have classified Peshawar, Karak, Mardan and Nowshehra as warm districts while Abbottabad and Swat districts were considered cold districts. According to our results, compared to warm districts, COVID-19 infection was more common in cold districts, among both males and females. The average of males infected with COVID-19 in cold districts were 73.5% and females were 63.48%, while in warm districts the percentage of infected males were 60% and females were 56.59% as shown in (Table 2).

Table 2. Percent prevalence of COVID-19 in cold vs warm districts of KPK

Districts	COVID-19 infected male (%)	COVID-19 infected female (%)
Cold districts	73.5%	63.48%
Warm districts	60.0%	56.59%

Prevalence of COVID-19 in rural and urban areas of different districts of KPK

Then we sought to analyze the COVID-19 prevalence in rural and urban area of each district i.e., Peshawar, Karak, Mardan, Nowshehra, Swat and Abbottabad. For this purpose we identified the rural and urban areas of each district. We circulated 100 questionnaires in rural and urban areas of each district. Our data showed a high prevalence of COVID-19 in urban areas as compared to rural areas. The percent of COVID-19 positive cases in urban areas of Peshawar, Karak, Mardan, Nowshehra, Swat and Abbottabad was 45, 43, 48, 39, 60 & 55%, while in rural areas was 40, 39, 35, 31, 55 and 45%, respectively as shown in (Table 3).

Prevalence of COVID-19 in literate and illiterate people in different districts of KPK

Our data showed a high prevalence of COVID-19 in illiterate people as compared to literate. The percentage of COVID-19 cases in literate people of Peshawar, Karak, Mardan, Nowshehra, Swat and Abbottabad was 19, 22, 21, 18, 27, & 24%, while in illiterate it was 37, 30, 26, 25, 31 and 30%, respectively as shown in (Table 4).

Table 3. Percent prevalence of COVID-19 in rural and urban areas of different districts of KPK

Districts	Urban COVID-19 infection rate (%)	Rural COVID-19 infection rate (%)
Peshawar	45%	40%
Karak	43%	39%
Mardan	48%	35%
Nowshehra	39%	31%
Swat	60%	55%
Abbottabad	55%	45%

Table 4. Percent prevalence of COVID-19 in literate and illiterate people in different districts of KPK

Districts	Literate (positive percentage)	Illiterate (positive percentage)
Peshawar	19%	37%
Karak	22%	30%
Mardan	21%	26%
Nowshehra	18%	25%
Swat	27%	31%
Abbottabad	24%	30%

Response to questionnaire

The people response to questionnaire varied in different districts. Majority of the people reported that they have observed this kind of disease before. They might misunderstand COVID-19 with influenza or other flue disease. The people recommended proper vaccination to control the COVID-19. The people in different districts reported that COVID-19 has mixed kind of symptoms such as high body temperature, coughing and loss of body strength. People were vaccinated with COVID-19 and they knew about doses of COVID-19 vaccine. According to the people response to questionnaire they follow COVID-19 SOPs such as use of sanitizers, frequent hand washing with soap and maintaining social distancing. In labs, nose samples were often utilized to evaluate COVID-19, and recovery rates were high in various districts. We revealed via questionnaires that those with lower levels of education and illiteracy had a higher COVID-19 prevalence because they were less aware of the COVID-19 SOPs. The people response to questionnaire is given in (Table 5).

Table 5. Response to questionnaire

S #	Question	Choices	Peshawar	Karak	Mardan	Nowshehra	Abbottabad	Swat
1	Did you ever observe disease like this before?	Yes/No	Yes: 60 No: 40	Yes: 30 No: 70	Yes: 40 No: 60	Yes: 60 No: 40	Yes: 30 No: 70	Yes: 20 No: 80
2	What you recommend to control COVID-19?	a) Vaccination b) Medication c) self-Isolation d) Other local treatment.	a: 40 b: 20 c: 40 d: 0	a: 60 b: 10 c: 30 d: 0	a: 60 b: 10 c: 30 d: 0	a: 50 b: 10 c: 40 d: 0	a: 60 b: 5 c: 35 d: 0	a: 75 b: 5 c: 20 d: 0
3	What is the main symptom of this disease?	a) Temperature b) Coughing c) Strength less.	a: 30 b: 50 c: 20	a: 50 b: 30 c: 20	a: 55 b: 20 c: 25	a: 35 b: 30 c: 25	a: 50 b: 20 c: 30	a: 60 b: 30 c: 10
4	Did you get the vaccination of this disease?	Yes/No	Yes: 100 No: 0	Yes: 80 No: 20	Yes: 50 No: 50	Yes: 87 No: 13	Yes: 100 No: 0	Yes: 90 No: 10
5	Do you have information about COVID-19 vaccine doses?	Yes/No	Yes: 100 No: 0	Yes: 100 No: 0	Yes: 100 No: 0	Yes: 100 No: 0	Yes: 100 No: 0	Yes: 100 No: 0
6	Had you followed the SOPs of COVID-19?	a) Sanitizers b) Practice of social distancing c) Hand washing with soap	a: 60 b: 20 c: 20	a: 70 b: 10 c: 20	a: 50 b: 40 c: 10	a: 40 b: 30 c: 30	a: 50 b: 40 c: 10	a: 50 b: 30 c: 20
7	Which sample was used to test COVID-19?	a) Nose b) Throat c) Saliva d) Fecal	a: 60 b: 20 c: 20 d: 0	a: 70 b: 20 c: 10 d: 0	a: 80 b: 10 c: 10 d: 0	a: 40 b: 30 c: 30 d: 0	a: 30 b: 40 c: 30 d: 0	a: 60 b: 30 c: 10 d: 0
8	How many persons get recovered through treatment?	a) Less b) More c) None	a: 5 b: 80 c: 15	a: 10 b: 90 c: 0	a: 10 b: 90 c: 0	a: 30 b: 70 c: 0	a: 40 b: 40 c: 20	a: 50 b: 30 c: 20

Discussion

We have collected the data in different districts of KPK to find the major risk factors responsible for increased spread of COVID-19 prevalence and to know people response about COVID-19. The prevalence of COVID-19 was higher in males as compared to females because male were more exposed to outside as compared to females. This observation underscores the gender sensitivity of COVID-19 [8]. The working people were more infected with COVID-19 as compared to those who stayed at home or jobless. In addition, the districts with colder climate have more prevalence of COVID-19 as compared to warmer districts. This may be attributed to the favorable environment for COVID-19 virus in cold environment, where the cold atmosphere supports the spread of this virus [9]. The elevated incidence of COVID-19 in colder regions can be explained by considering the relationship with human body temperature and the immune system. Colder environment may impact the body's ability to resist the virus, as lower temperature can potentially weaken the immune response, making individuals more susceptible to infection. Additionally, the virus might thrive better in cooler environment, contributing to a higher outbreak in colder regions. [10] findings corroborated our observation of a higher prevalence of COVID-19 in urban areas compared to rural ones. This alignment in results emphasizes the significance of adopting protective measures. Taking proactive actions, such as practicing good hygiene, following recommended safety guidelines, and adhering to preventive measures, can play a crucial role in safeguarding yourself, your family, and your community from illnesses related to COVID-19.

COVID-19 vaccinations assist our body in developing immunity to the virus that causes COVID-19. Although individuals who have received COVID-19 vaccinations can still contract the virus, being up to date on COVID-19 immunizations significantly lowers the likelihood of experiencing severe illness, requiring hospitalization, or facing a fatal outcome from COVID-19. In essence, being vaccinated provides crucial antibodies of protection, mitigating the severity of the disease [11]. Avoiding contact with persons who have COVID-19, whether they are sick or not, can lower your risk of contracting the virus from them. Implement as many feasible prevention tactics, such as practicing hand hygiene, constantly and correctly using a high-quality facemask, boosting ventilation, and keeping as much distance as possible from the ill or infected person may prevent or reduce the spread of COVID-19. Understanding people's initial beliefs, behaviors, and norms, along with their subsequent changes, are crucial in mitigating the spread of COVID-19. Survey data has proven valuable in exploring factors such as risk perception, attitudes toward mask-wearing and other preventive behaviors, and the reliability of information sources within communities. By gaining insights into these aspects, public health initiatives can be tailored more effectively, promoting informed decision-making and encouraging behaviors that contribute to reducing the transmission of COVID-19. By leveraging comprehensive and detailed survey datasets on people's beliefs, behaviors, and norms amid a global pandemic, this resource has the potential to pave the way for new avenues of research in the fields of public health, communication, and economic policy. The wealth of information contained in this survey can provide valuable insights that contribute to a better understanding of societal responses during such crises, facilitating the development of more effective strategies in health management, communication practices, and economic decision-making. Several other studies have

examined risk perception, attitudes toward wearing masks and other preventative behaviors, as well as trust in information sources among communities using data from the COVID-19 beliefs, behaviors, and norms survey **[12, 13, 14, 15, 16]**. Overall, we find that the COVID-19 preventative practices of mask use, physical separation, hand washing, and avoiding unnecessary shopping, domestic travel, and public transportation were not linked to believing that COVID-19 is unavoidable but however it reduces the spread of this pandemic. People may be persuaded to engage in these behaviors by hearing messages that emphasize how they can help to safeguard themselves, friends and family.

Conclusion

The observations indicate that COVID-19 spreads more extensively in colder districts than in warmer districts. Additionally, urban areas exhibited higher COVID-19 cases compared to rural areas. Individuals who neglected to adhere to COVID-19 SOPs, including practices like hand washing and social distancing, were more susceptible to the disease. Furthermore, males showed a higher infection rate. To address and potentially eliminate this pandemic, it is recommended to prioritize and implement proper COVID-19 vaccination measures.

Authors' contributions

Conceived and designed the experiments: A Iqbal & MI Khan, Performed the experiments: A Iqbal, A Iqbal, K Zaib & SU Islam, Analyzed the data: A Iqbal & MI Khan, Contributed reagents/ materials/ analysis tools: A Iqbal, A Iqbal, K Zaib & SU Islam, Wrote the paper: A Iqbal & SU Islam.

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