ORIGINAL ARTICLE

Statistics of Viral Infectivity in Close Contacts with Covid-19 Patients: A Joint Hospital and Community Adventure in District Nowshera of Pakistan

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Abstract

Background: Present study was designed as to determine the probability and relative risk of COVID-19 in suspects with positive contacts history.

Methods: A cross sectional observational study was conducted in district Nowshera on COVID-19 suspects/patients. A total of 365 suspects/patients were included from Feb 10 to April 20, 2020. All the data was uploaded on SPSS version 25 that was designed for this particular study.

Results: Out of total 365, 264(72.3%) were males and 101(27.7%) females. The descriptive statistics of age with mean and standard deviation was 35 ± 16 years. 12/41(29.26%) positive cases were recorded in age>55 years of age. Historyof contact with positive COVID-19 patients was contributing in35/41(85.36%) confirmed cases. There was a significant relation of an increase in age with viral infectivity *(Chi-Square=11.48, p=0.009).* A strong relationship of positive close contact history with COVID-19 infection *(Chi-Square=19.56, p=0.001)* was recorded. The probability of the infection with 2019-nCoV in patients with close contact history was 6.12 times more than suspects with no contact history *(OR=6.12, 95%CI, 2.5-14.9).* The relative risk of infection was *(rr=1.75, 95%CI, 1.4-2.07)* in suspects with positive contacts as compared to no contacts history *(rr=0.28, 95%CI, 0.1-0.6).*

Conclusion: The probability, relative risk and correlation of history of contacts with strong suspects/ COVID-19 patients increase the chances of infectivity with 2019nCoV in folds.

Keywords: 2019nCoV; COVID-19; relative risk; probability of infection; correlation; contact history

Introduction

COVID-19 (Corona virus disease) supposedly originated from , Wuhan, Hubei province of China. It was reported to the world health organization in Dec 2019. It causes severe respiratory disease/pneumonia. It clinically manifests with high grade fever, cough, generalized body aches, loss of taste and smell and dyspnea [1] By date April 15, 2020 globally 19 million people are infected with Corona virus disease (COVID-19) with more than 120 thousand deaths from all over the world [2]

In Pakistan, the literature so for covering the prevalence and incidence is still emerging and we found no published data. The reported data from government sources declares more than 6000

confirmed cases with 138 deaths. Punjab is the province with highest number of corona cases reaching 2000 at the time of writing this paper, and the toll is rising exponentially with each passing day. (3)

The exact pathogenesis of the COVID-19 is still unknown, but majority of the researchers correlates it to have originated from the zoonotic corona virus called SARS-COV that emerged in 2002. In China it was first associated with a wild meat market of Wuhan from where the first cases were reported (4).'

Anzai A et al reported 30% of the confirmed cases had a positive history of contacts with strong suspects or confirmed cases of COVID-19 (5). Another study concluded that the exposure risk of health care workers was higher than general population and they experienced a risk of transmission of the disease to their families through direct contacts, though the rate of transmission of the disease was lower(6).

Qiu H et al (7) reported from the infected zone of China that strong suspects from among the family members and other close contacts of COVID-19 patients, the infectivity ratio was as higher as 89% while it was (33%) for history of exposure to epidemic areas.

The battle against COVID-19 is still continuing across the globe in all affected countries. For that valued reason the people adherence to preventive and precautionary measures are essential, which largely depends on the knowledge attitude and practice of people toward COVID, as travel and contact history increases the chances of infectivity in exponential mode. (8)

Therefore, present study was designed as to ascertain the probability of exposure and relative risk of COVID-19 in suspects with positive contacts history.

Methodology

We did a cross sectional study from 10th Feb to 20th April 2020 in COVID-19 clinic of QHAMC Nowshera. A total of 365 suspected COVID-19 cases were enrolled in the study.

We took a reference study of Zhou X et al (9); with an assumption of prevalence of COVID-19 at the rate of 4% in the 100000, population of Nowshera, residing under the catchment area of our teaching hospital. Statistical software of Open-epi was used and a sample size of 365 with absolute precision of 5% and confidence internal of 95% was calculated.

All the suspects attended the COVID-19 clinic irrespective of age and gender was randomly selected.

Suspected cases were defined as the cases that scored more than 5 on the scoring chart prepared as an extract from the Guidelines Clinical Management Guidelines for COVID-19 Infections Ministry of National health services regulation and coordination, Islamabad, Pakistan (10), April 2, 2020 Patients received from outdoor patient's department with complaint irrespective of matching Covid-19 or vice versa were excluded from the study.

We obtained an ethical committee approval from the Ethical review committee of Nowshera Medical College and proper data permission from the hospital administration vide notification No-1114-22/HD/QHAMC, March 2020, for execution of the study.

Informed verbal consent of the patients was ensured, keeping the confidentiality.

All those suspected cases with score more than 5 were subjected for testing nasopharyngeal swabs for detection of 2019-nCoVData of COVID-19 clinic of Qazi Hussain Ahmed Medical Complex 261(71.5%), however the patient whose PCR was sent by the distract health authorities were also included from the district line list 104(28.5%).

All samples were sent under strict observance of protocols to the Public health research laboratory of Khyber Medical University Peshawar.

Results from the lab were received after 2- 3 days. All cases with positive PCR report were isolated and kept under treatment, and their sample was repeated after 7 days of isolation/treatment. Those who were negative in repeated sample reporting were shifted to quarantine to complete the incubation period.

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

We defined our age categories as per article 1 of the United Nations convention on the rights of the children where children are defined as age lower than 18 years, adults with age 19-35 years of age, middle age as 36-55 years and older age with more than 56 years of age [11,12].

Data was uploaded on SPSS version 25 for descriptive and correlation analysis.

The categorical variables were presented in percentages. Numerical variables were presented with mean with standard deviation and range.

Chi-square test was applied to show the association of categorical variables alike age categories and history of contacts with infection. Using descriptive statistic

with cross tabulation on dichotomous variables of categories of Gender, age & PCR reports we calculated the quantitative risk of acquiring infection. Odd ratio was calculated to show the probability of COVID-19 in patients with and without history of contacts.

The criteria and scoring for patient selection for PCR testing is mentioned in table 1 based on Guidelines Clinical Management Guidelines for COVID-19 Infections Ministry of National health services regulation and coordination, Islamabad, Pakistan [10], April 2, 2020 was approved by the administration of QHAMC on the recommendation of the infectious disease control committee, keeping in view the shortage of Viral Transport Media (VTM) supplied by the government.

Table 1. Criteria for COVID-19 scoring system.

Fever, cough, sore throat, Contact history with of epidemic area traveler, Mass gathering, Lymphopenia, myalgia, loss of taste and smell, diarrhea, shortness of breath each		10
Contact history with confirmed case/ Close relatives of the COVID-19 patients		6
TOTAL :		16
Strategy to act:		
Score <5 :	Quarantine /stay home	
Score: 6-8	Do Labs & Inform Focal Person	
Score: >8	Labs : Needs Isolation/admission inform Focal Person	

Results

In this clinical trial a total of 365 suspects/patients were included, out of total 264(72.3%) were males and 101(27.7%) females. (Table 2)

The descriptive statistics of age with mean and standard deviation was 35$\pm$16 years. 12/41(29.26%) positive cases were recorded in age>55 years of age. There was a significant relation of an increase in age with viral infectivity *(Chi-Square=11.48, p=0.009).*(Table 3a)

The contact history matter when talking about the viral infectivity 35/41(85.36%) of the positive cases had a close contact history with COVID-infected patients/strong suspects. There was a strong relationship between COVID-19 infection and positive contact history *(Chi-Square=19.56, p=0.001).*(Table 3b).

By assessing the correlation between the infection and contact history using spearman correlation we found that there was a moderate uphill positive correlation between the positive contacts and COVID-19 disease. The probability of the infection in patients with close contacts was 6 times more than suspects with no contact history *(OR=6.12, 95%CI, 2.5-14.9).* The relative risk of infection was *(rr=1.75, 95%CI, 1.4-2.07)* as compared to suspects with no contact *(rr=0.28, 95%CI, 0.1-0.6)* respectively. (Table 4a & 4b).

Table 2. Gender-wise distribution of patients.

Gender	No of suspects	Percent	Cumulative Percent
Male	264	72.3	72.3
Female	101	27.7	100
Total	365	100	

Table 3b. Relationship of positive contact history with COVID-19

Contact History	PCR Result			p-values
	Positive	Negative	Total	
Yes	35	158	193	0.001
No	6	166	172	
Total	41	324	365	

Table (4. a) Correlation and risk assessment for positive contacts and COVID-19

	rho	p-value
Spearman Correlation	0.232	0.001
N of cases	365	
(4.b) Risk Estimate analysis		

	Values	95% CI	
		Lower value	Upper value
Odds Ratio for PCRCAT (1.00 / 2.00)	6.129	2.509	14.969
For cohort Contact History = Yes	1.751	1.479	2.073
For cohort Contact History = No	0.286	0.135	0.603
N of Valid Cases	365		

Discussion

As per our knowledge this is the first study to give statistical information's on the correlation, probability and relationship of the close contact history with rate of infectivity with COVID-19 from the state of Khyber Puhktoonkhwa, Pakistan.

As for corona infection, person to person transmission is well learned from the data of China and Italy. Epidemiological investigations were carried out among the close relatives of the COVID patients, and they observed mild to severe types of clinical features/manifestations in these contacts. However, the communicable period can last for up to three weeks to develop symptoms, (13,14)

In present study we observed a strong statistically significant relationship between COVID-19 infection and positive contact history *(Chi-Square=19.56, p=0.001).* 85.36% of the positive cases had a close contact history with COVID-infected patients/strong suspects. Our findings strongly matches with the findings of the Qiu H et al (7) reported the infectivity ratio was as higher as 89% from the infected zone of China from among the family members and other close contacts of COVID-19 patients. Similarly, Anzai A et al[15] reported 33% of the infectivity in suspects with strong contacts but not with a contact directly COVID-19 patient. Shi Y et al (15) reported from Wuhan city, a significant relation of close contacts more infected family members *(p = 0.031)* with COVID-19.

The findings of Zhou X et al. (17%) (16) and Tian S et al. (5%), (17) match to our study who reported a strong correlation of acquiring infection in those reporting with history of travel to high epidemic areas of China.

We observed that the probability of this deadly viral infection in patients with close contacts was 6 times more than suspects with no contact history *(OR=6.12, 95%CI, 2.5-14.9).* The relative risk of infection was *(rr=1.75, 95%CI, 1.4-2.07)* as compared to suspects with no contact *(rr=0.28)* respectively. Tan W et al (18) reported relative risk ratio of *(rr=2.03, 95% CI 1.54–2.68)* that strongly matches our findings. The rate of infectivity depends widely on the incubation period that is reported between 2-14 days in the literature and also on the duration of exposure and also on the immune status of the patient to acquire infection (19)

The current situation will not go away overnight "it's a marathon and not the sprint". The policy makers should focus on long term occupational capacity rather than repeated short-term crisis response plans.

It is concluded that the message to stay home may come true, as whenever we don't follow the isolation and quarantine strategy, we expose ourselves to a higher rate of infection with 2019-nCoV, due to unusual contacts with COVID-19 patients. Therefore, the best only option to contain the virus is to reduce mobility/travel, to reduce contacts and to appraise the message of social distancing.

Furthermore, based on the findings, it is suggested that special care should be given to suspects with higher risks like close contact of COVID-19 patients/suspects.

There were some un-avoidable limitations in the study like limited resources, limited VTM/UTM (Virus/Universal Transport Medium), short duration of study and low number of positive cases, though we had an acceptable population of suspects. Therefore, further studies should explore the more hidden aspects of the viral transmissibility in Pakistani population.

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