The Transmission Potential of Sars-Cov-2 during the Early Outbreak

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ABSTRACT

Background: The newly emerging respiratory disease called COVID-19 , originated from a metropolitan city of the Hubei Province of China, called Wuhan, in Dec 2019, demonstrated its epidemic potential with a rapid spread of this virus across the globe in just 2 months period. This highlights the higher rate of transmissibility of this virus and further its higher morbidity and mortality specially in aged population or people with co-morbidities and immune gap.

Objectives: To determine the clinical significance of travel history to an epidemic area and social distancing with COIVD -19 infections.

Material and methods: This cross sectional study was conducted in major/only tertiary care hospital of Nowshera in collaboration with District Health Office, Nowshera from 15th Feb to 24th April 2020. Relevant information's were recorded in a predesigned proforma prepared in SPSS version 25th for descriptive and inferential analysis.

Results: Out of total 378 suspects/patients, 272(72%) were males and 106(28%) females. The Mean with Standard deviation of age of the suspects was 35±16.1 years. A significant relationship of an increase in age with positive cases *(Chi-square value=10.73, p=0.013)* was observed**.** 13/41(31.70%) of the positive cases had a history of travel to an epidemic area. A statistically significant relationship between COVID-19 infection and travel history *(Chi-Square=5.86, p=0.015)* was noted. The probability of the infection in patients/suspects with history of travel to an epidemic area was 2.38 times *(OR=2.38, 95%CI, 2.5-14.9)*. The relative risk of infection was *(rr=1.75, 95%CI, 1.16-4.88)* as compared to suspects with no contact *(rr=0.81, 95%CI, 0.6-1.0)* respectively.

Conclusion: There is a significant impact of travel history to an area with COVID19 epidemics. This data also speaks itself on the importance of social distancing in terms of history of travel to combat COVID-19.

Key words: COVID-19, Travel history, Social distancing, risk assessment, probability of disease, correlation of disease.

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INTRODUCTION

The newly emerging respiratory disease called COVID-19 , originated from a metropolitan city of the Hubei Province of China, called Wuhan, in Dec 2019, demonstrated its epidemic potential with a rapid spread of this virus across the globe in just 2 months period. This highlights the higher rate of transmissibility of this virus and further its higher morbidity and mortality specially in aged population or people with co-morbidities and immune gap[1]. Case fatality rate of 2.3% has been reported from china that is lower than SARS(9.5%), MERS (34.4%) and H7N9 (39%)[2].

In China unprecedented measures were taken well in time to control the rapid spread of COVID-19 epidemics. They succeeded to adhere people to homes that were properly achieved by their improved awareness, attitude and approach towards COVID-19[3]. The World Health Organization declared an emergency after ongoing rapid epidemic of COVID-19 in china by the mid of February 2020, the number of laboratory confirmed cases reached to sixty thousand with more than 1700 death and the virus reached more than 30 countries outside the China[4]. In China they improved the detection rate and contained virus in mainland by enhancing the quarantine and isolation strategy and putting stress on social distancing[5]. The response to COVID-19 was tremendous when strategies to contain virus, like closure of schools, offices, roads and other transits, cancellation of all mass gatherings in order to give mandatory quarantine to uninfected people without knowing their viral status[6]. Italy is the second mostly affected country, with more than 80000 cases of SARS-CoV infection. They attributed these infections with poor compliance of the people towards precautionary measures during the early stages of current epidemic and with travel history to China[7].

Present study was therefore designed as to determine the clinical significance of travel history to an epidemic area and social distancing with COIVD -19 infection in district Nowshera, Pakistan.

Research Hypotheses (Null, H_0): Hypotheses are the tentative answers for research questions. Based on literature search, following hypotheses were proposed to answers our research question. Our null hypothesis was that there is no correlation of viral infectivity with history of travel to an epidemic area in population of district Nowshera.

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MATERIAL AND METHODS

This cross sectional study was conducted from 15th Feb to 24th April 2020 in a major tertiary care hospital of Nowshera in collaboration with District Health Office Nowshera. A total of 378 suspected/ COVID-19 patients were included.

Population & Sampling

Assuming 4% prevalence of COVID-19 in general population from the study of Zhou X et al [8]; a reference population of 100,000 patients was estimated to reside in the catchment area of our hospital, belonging to district Nowshera of Khyber Pakhtunkhwa, Pakistan. A sample size of 75 was calculated through open epi software, an online sample size calculator, with Absolute precision of 5%, confidence interval of 95%, and a drop out of 10%.

All the suspects attended the COVID-19 clinic irrespective of age and gender was randomly selected. All patients with any type of symptoms came to emergency or outdoor patients department were excluded.

Ethical endorsement was obtained from the institutional ethical review board of Nowshera Medical College hospital administration before the execution of the survey.

Prior informed consent was obtained from all suspects and they were assured of confidentiality. All those suspect with COVOD proforma score more than 5 were subjected for testing their nasopharyngeal swabs for 2019-nCoV. This scoring system applies only on sampling from QHAMC.

Data of COVID-19 clinic of Qazi Hussain Ahmed Medical Complex 274(72.5%), however the patient whose PCR was sent by the distract health authorities were also included from the district line list 104(27.5%).

All samples were sent under strict observance of protocols to the Public health research laboratory of Khyber medical university Peshawar (a designated Lab for PCR of 2019nCoV by the Government of Khyber Pukhtunkhwa).

Results were received in 2- 3 days, all 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.

Operational definitions

Child: Article 1 of The United Nations Convention on the Rights of the Child defines a child as "for the purposes of the present Convention, a child means every human being below the age of 18 years unless under the law applicable to the child, majority is attained earlier".[9]

Adult: Young adult 19-35 years, middle-aged adult 36-55 years and older adult $\geq$ 56 years.[10]

Data was entered in SPSS 25th version and descriptive and correlation statistics were applied. The frequency and proportion of numerical and categorical variables were presented in percentages.

Correlation tests using spearman ranked correlation was used to determine the correlation of PCR positivity with violation of social distancing. Chi-square test was used to show a relationship of the viral infectivity with age categories of suspects/cases.

Relative risk analysis was done for risk estimation in groups with and without history of travel to an epidemic area with strong suspects/COVID-19 patients.

Odd ratio was calculated to show the probability of COVID-19 in patients with and without history of travel.

The criteria and scoring for patient selection for PCR testing is mentioned in Table 1 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	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
Contact history with confirm 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: 8-10	Labs : Needs Isolation/admission inform Focal Person

RESULTS

The total number of suspects under observations was 378, with 272(72%) males and 106(28%) females (Table 2). The Mean with Standard deviation of age of the suspects was 35±16.1 years. 195(63%) of the suspects were in the age range 18-35 years while 53(14%) had age more than 55 years. There was a significant relationship of an increase in age with positive cases *(chi-square value=10.73, p=0.013).* (Table 3). Travel history matter when talking about the viral infectivity, 22/41(53.65%) of the positive cases had a history of travel to an epidemic area. There was a strong relationship between COVID-19 infection and travel history *(Chi-Square=5.86, p=0.015).* (Table 4).

The probability of the infection in patients/suspects with history of travel to an epidemic area was 2.38 times more than suspects with no contact history *(OR=2.38, 95%CI, 2.5-14.9).* The relative risk of infection was *(rr=1.75, 95%CI, 1.16-4.88)* as compared to suspects with no contact *(rr=0.81, 95%CI, 0.6-1.0)* respectively. (Table 5)

Table 2. Gender-wise distribution of patients/suspects

	Frequency	Percent	Cumulative Percent
Male	272	72	72
Female	106	28	100
Total	378	100	

Table 3. Age-wise distribution of cases and suspects/patients and its impact on disease status

	Frequency	Percent	Cumulative Percent
age<17 years	43	11.4	11.4
18-35 years	195	51.6	63
36-55 years	87	23	86
>55 years	53	14	100
Total	378	100	
Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.733[a]	3	***0.013***

Table 4. Relationship of travel history with COVID-19

		Travel history to an epidemic area		Total
		Yes	No	
PCRCAT	Positive	13	28	41
	Negative	55	282	337
	Total	68	310	378
Chi-Square Tests				
	Value	df	Asymptotic Significance (2-sided)	
Pearson Chi-Square	5.866a	1	***0.015***	
N of Valid Cases	378			

Table 5. Correlation and risk assessment for travel history and COVID-19

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for PCRCAT (1.00 / 2.00)	***2.38***	1.161	4.883
For cohort with travel history to an epidemic area = Yes	***1.94***	1.166	3.236
For cohort with travel history to an epidemic area = No	0.81	0.659	1.011
N of Valid Cases	378		

DISCUSSION

In order to contain virus transmission, several measures like border control, airport screening, quarantine, travel restrictions are implemented by nearly all the countries with reported cases of COVID-19. These measures have been appraised to control the rate of spread of this deadly virus from China to other countries, but still the virus touches the boundaries of the globe in very short span[11.] Studies from china have reported that travel restrictions have reduced the exportation of virus by 81 to 90% [11.12].

We observed that out of 378 suspects there were 41 positive cases by 25th Aril in district Nowshera. Out of those 41 cases 13(31.70%) had history of travel to an epidemic area with reported cases of COVID-19.

Another study from the mainland China reported (32, 89%) positive cases in contacts of family members of COVID-19 patients and (12, 33%) with history of exposure to epidemic areas that matches our findings[13.] Our finding coincides with Anzai A et al[14] who also reported 30% of the contribution of the travel history to the positive cases.

It was astonishing to note that the percentages of contribution of travel history so tightly matching the proportions of the other countries with COVID epidemics. There was a strong relationship between COVID-19 infection and travel history *(Chi-Square=5.86, p=0.015).*

There was a significant relation of infectivity, and relatively high probability of getting infected in cases with history of travel to an epidemic area *(p=0.01 OR=2.38,rr=1.75*) that rejects the *null hypothesis (H_0).*

Lau H et al[15] have reported a significant correlation of travel history to Wuhan and getting infection as compared to those without a travel history *(p=0.01)* that matches out findings.

Travel history has its importance in the transmission of COVID-19. Countries have imposed strict restrictions on travel including the borders restrictions especially for the people of China, or those who travelled China in last 14 days, to contain the virus[16].

China has succeeded to control and get rid of this deadly virus by taking strict, including suspension of public transport, closing of recreation places, ban on social gathering and isolation and care of suspected cases in quarantine to succeed the fight against corona[1,13,17]

In Italy again, SARS-CoV infection with history of travel to the epidemic area were initially reported in Lombardia and Veneto regions.[7]

We concluded that there is a significant impact of travel history to an area with COVID19 epidemics. This data also speaks itself on the importance of social distancing in terms of history of travel to combat COVID-19.

Social distancing of 6 feets (2meters) is recommended in public spaces to reduce the transmission of the disease.

It is further suggested that future studies the social distance needs to be further elaborated and also needs to be discussed in terms of close control, high risk exposure, how risk exposure.

Therefore to conclude; the message is to **"STAY IN HOME"** travel history especially to an infected area with positive cases can increase the chances of getting infection with 2019-nCoV. Travel to an epidemic area is a strong risk factor for COVID-19.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Khan H:	Concept and design of study, Collection of data, statistical analysis
Arif M:	Writing of manuscript, critical review of manuscript
Bari F:	Analysis and interpretation of data, statistical analysis Data collection, bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.