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COVID-19 contact tracing in a tertiary care hospital: A retrospective chart review

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ABSTRACT

Background: Contact tracing is one of the strategies used to control COVID-19 pandemic. It played an important role in the beginning to identify all contacts and minimise the spread of the infection.

Methods: A retrospective chart review was carried out of contact tracing records during the one-month period, starting from the onset of the first lockdown in India. The largest wave of 372 contacts was analysed in detail to find out the association between the result of COVID-19 test and various factors (age, gender, type of contact).

Results: A total of 372 contacts (214 males and 158 females) were traced and around 21% contacts were tested positive on COVID-19 RT-PCR test. Chi-square test didn't find the significant difference between COVID-19 test result and proportions of male and female contacts, $\chi 2$ (1) 0.033, $p = 0.855$. Female positive contacts had lower mean age compared to male positive contacts, though not statistically significant, $t(75) = -1.809$, $p = 0.0745$. No difference was found in either median or mean age of contacts with respect to COVID-19 test result. Odds of tested COVID-19 positive among household contacts much higher than community contacts, OR = 24.52, 95% CI 12.45–48.29, $p < 0.05$.

Conclusion: No difference was noted in the rate of contracting infection with respect to age and gender of contacts. Type of contact, household or community, significantly affected the probability of becoming infected with the coronavirus. Occupation of primary case was probably responsible for large number of contacts found positive for COVID-19.

Introduction

World Health Organisation (WHO) has recommended contract tracing for identifying and containing the infection of coronavirus in the community. It has played an important role in controlling community spread of coronavirus in Wuhan city of China (Horby et al., 2020). Rapid response teams (RRTs) are one of emergency response strategy used in many countries

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including India to deliver a fast and effective response in COVID-19 pandemic. (Stehling-Ariza et al., 2017)· (Greiner et al., 2020)· (Hellewell et al., 2020) India has sent several RRTs to other countries like Bangladesh, Bhutan, Sri Lanka, Afghanistan and Kuwait (India readying rapid resp, 2020). Their rapid focused action and liaison with a regional health care facility authorised by state authority have played an important role to contain spread of infection (Meghwal et al., 2020).

As COVID-19 pandemic is passing through India and affecting different regions, local strategies are changing in response to the pattern of spread of infection in the region which is monitored by RRT and epidemiologist analysing data of contact tracing (Micro Plan for Containing, 2020).

The word 'wave' was first time used to describe geographical and temporal pattern of influenza epidemic of 1889–90 in European cities (Kempińska-Mirosławska & Woźniak-Kosek, 2013). Since then it has been used in many epidemiological studies to describe spread of infection which leads to episodic appearance of the large number of cases in short period of time in affected region (Olson et al., 2005). In this study, the word 'Wave' is used by health workers facing the sudden appearance of a large number of contacts traced by RRT which required immediate arrangement for their isolation, testing for COVID-19 and further management.

Contacts of an index case of COVID-19 can vary from very few (household contacts) to very large (community contacts). This presents a great challenge to health professional involved in deterring further course of action like home quarantined vs isolation in hospital, observation vs prophylaxis medicines. Moreover, the result of COVID-19 test is not available in a short time and may take 12 h–72 h depending upon the availability and capacity of COVID-19 testing facility. (Total Operational (initia, 2020)· (Burki, 2020) Rapid test developed recently can give the result within an hour but they are yet to be available in public health facilities. This presents a huge challenge to corona warriors dealing with 'wave' of the sudden appearance of contacts of a COVID-19 positive patient.

There are very few studies regarding outcome and analysis of contact tracing of COVID-19 patients in the community, mostly from China (Li et al., 2020). Epidemiological pattern of COVID-19 is not fully known. Public health data are emerging daily from various regions of the country and indicates that different parts of India are not equally affected (Nangia, 2020). While some states like Maharashtra is struggling with a large number of positive cases in comparison to other regions, few states have recently declared themselves free from new cases of COVID-19 (Leung, 2020).

It is useful to know if the characteristics of contacts or primary case affect the likelihood of contracting the infection. This may help us both understand the epidemiological aspect of infection spread in the community and decision making of when such a 'wave' hits health centre.

This study, a type of retrospective chart review, was carried to find the pattern of infection spread based on 'wave' of contacts traced by RRT in response to the index case of COVID-19.

Methodology

A retrospective chart review was carried out of the records of contact tracing during the one month, starting from the onset of the first lockdown on March 25, 2020 announced by Government of India. Symptomatic patient who reached our hospital and found positive was labelled as Primary or Index case. Rapid response team (RRT) takes details of contacts with primary case and traces them in community. Because large number of contacts were brought to our hospital by RRT in a very short period of time (usually less than 24 h), it was labelled as wave. Between March 25, 2020 to April 24, 2020, four waves did hit our centre with respectively 54, 91, 372 and 32 contacts.

The largest wave of contacts was analysed in detail with respect to age, gender, type of contact, result of COVID-19 test. Contacts living in same house with primary case was labelled as household and all other as community contacts.

Mean range and standard deviation were calculated for age. Chi-square test used to compare the categorical variables. Independent sample *t*-test was used to find the difference between the mean age. Spearman correlation was used to find a difference between age and result of COVID-19 RT-PCR test.

The study was approved by Institutional Ethics Committee, letter no: 1533/Acad-III/MCA/2020.

Results

Age and Gender distribution of all contacts of index case are shown in Table 1. Female contacts were younger than male, though difference was not significant, t (370) = - 908, p = 0.364. Result of COVID-19 test is given in Table 2. Rate of the positive test was similar in male and female and almost equal to the overall prevalence of infection among contacts.

Table 1
Details of the contact of COVID-19 patient.

	No (%)	Age mean ± SD	Median Age	Age Range	
Total	372	27.66 ± 16.38	25 years	4 month to 86 years	MD = −1.560
Female	158 (42.47%)	26.76 ± 18.48	24 Years	6 month to 86 years	T = −0.908
Male	214 (57.52%)	28.32 ± 14.65	25.5 Years	4 month to 70 years	P = 0.3646

MD = difference of mean.
T = independent sample *t*-test.
P = at significance level of <0.05.

Table 2
Result of COVID-19 test.

	Positive N (%)	Negative N (%)	X^2 p
Female	32 (20.3%)	126 (79.7%)	0.03
Male	45 (21%)	169 (79%)	0.85
	77 (20.7%)	295 (79.3%)	

X^2 = chi-square test.
P = Not significant at $p < 0.05$.

Details of contacts found positive are given in Table 3. Female patients had lower mean age compare to males, though did not reach spastically significance, t (75) = - 1.809, p = 0.0745. There was no difference in proportion of COVID-19 positive cases among male and female contacts, χ2 (1) 0.033, p = 0.855. Both median and mean age of contacts tested positive did not differ from those tested negatives on COVID-19 test.

Probability of becoming COVID-19 positive was compared with respect to the type of contact (household, community and both). Odds of tested COVID-19 positive among household Contacts much higher than community contacts, OR = 24.52, 95% CI 12.45–48.29, p = 0.00. (Table 4). There was no mortality during study period among both index case or contacts found positive.

Discussion

According to WHO, the number of secondary infections generated from one COVID-19 patient is estimated to be between 2 and 2.5 for virus(Coronavirus disease 2019, 2020). In the this study, among 372 contacts of single primary case, 21% tested found positive on COVID-19 RT-PCR test. This means index in case in our study was able to infect 77 contacts. This exceptionally high reproductive number – the number of secondary infections generated from one infected individual –motivated the RRT to find out reasons for such high numbers. Patient's occupation as seller of female's cosmetic items and location of his shop and residence in could explain the spread of corona virus infection to such great extent. His shop and residence are in crowded area of the city which is a very famous religious tourist destination.

Tracing of contacts followed by COVID-19 testing found that people of both gender and diverse age groups contracted the infection from index case. This holds true irrespective type of contact, household and community Infection in 2 years old female child, 5 years old male child shows that children do not seem to immune to infection. No significant difference in the mean age of positive and negative contacts indicates that age has minimal effect on the probability of contracting the infection.

The higher age group among contacts (86 years) and those contracted infections (60 years) indicates that this study did not find the elderly are not prone to infection. However, these findings are not in contrast to clinical studies showing that elderly COVID-19 positive patients are at increased risk of severe infection and mortality (Leung, 2020). Once infected, older people are more likely to suffer from severe degree symptoms and contribute a major proportion of COVID-19 mortality (People at Increased Risk, 2020).

Table 3
Details of COVID-19 positive patients.

	N (%)	Age mean ± SD	Median Age	Age Range	
Total	77	26.4 ± 14.6	25 years	2–60 years	MD = 5.370
Female	32 (41.55%)	21.94 ± 14.43	20 Years	2–60 years	T = −1.809
Male	45 (58.44%)	27.31 ± 11.59	25 Years	5–52 years	P = 0.0745

MD = difference of mean.
T = independent sample *t*-test.
P = at significance level of <0.05.

Table 4
Type of contact and COVID-19 test result.

		Covid-19 Test		Total	
		Negative	Positive		
CONTACT_TYPE					OR = 24.52 CI = 12.45–48.29 P = 0.00
	Community Contact	279	32 (10.29%)	311	
	Household contact	16	45 (73.77%)	61	
Total		295	77 (20.70%)	372	

OR = Odds Ratio.
CI = 95% Confidence Interval.
p = a significance level of <0.05.

The median age of both contacts as both male and female contacts was found almost equally affected in this study, it seems that this risk of infection is not affected by gender. Among contacts found positive for COVID-19, females were relatively younger (mean difference in age 5.4) compared to male, though not found statistically significant ($p = 0.075$). One of the possibilities behind this could be the lower mean age of female in the sample.

Our study found that household contacts had an exceptionally high chance of becoming positive on COVID-19 testing. Approximately three-quarter of the household contacts were found infected compared to only one-tenth among community contacts. In China, Wei Li et al. conducted a household cohort study to determine the features of household transmission of COVID-19 (Li et al., 2020). They analysed the data from two local hospitals, Zaoyang First People's Hospital and Chibi People's Hospital. Similar to our study, the high infection attack rate was seen among contacts sharing the house with index patients before their admission. However, the rate of secondary infection in this study (16.4%) was lower than our study. The possible explanation could be that large family size and small house size is common in the Indian community, as it was in the sample community. Result of studies from other regions of the country will further clarify the above issue.

Average rate of infection transfer from index case to generate secondary infection (2–2.5 positive contacts) may not apply to every region or community. Bases on socio-demographic profile and nature of socio-occupational activity of index case, hospital isolation may be preferred because of their ability to general larger waves.

Conclusion

Retrospective chart review of 372 contacts of an index case of COVID-19 patient found no difference in the rate of contracting infection with respect to age and gender of contacts. Type of contact, household or community, significantly affected the probability of becoming infected with the coronavirus. We expect that report from other parts of the country and larger sample studies will further the knowledge in this aspect of epidemiology of COVID-19 pandemic.

Contribution

Dr Pinki Tak: Obtain ethic approval. Concept, Methodology, Data acquisition, Data analysis.

Dr Jitendra Rohilla: Revision of Manuscript, reply to reviewers' comments, Data Analysis, Review of Literature, Writing of Manuscript.

Declaration of competing interest

No.

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