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Prevalence of Sars-Cov-2 Infection among Symptomatic and Asymptomatic Contacts of Individuals Infected with Covid-19 in a Tertiary Care Centre, Thanjavur

Authors
Dr Maruthuthurai S., Dr V. Saiprabha*, Dr J.K. Jeyabharathi, Dr Eunice Swarna Jacob, Dr Hari Prasanth
*Corresponding Author
Dr V. Saiprabha

Abstract

Background and Objectives: *As Severe Acute Respiratory Syndrome Corona virus 2 (SARS-CoV-2) continues to spread, it is important that we continue to expand our knowledge about its transmission. Asymptomatic cases missed by surveillance and their ability to transmit SARS-CoV-2, will tamper any hopes of stopping the COVID-19 Pandemic .This study provides various insights in interpreting disease transmission, evaluating interventions, and setting public health policies.*

This study is to determine the rate of secondary infection among Symptomatic and Asymptomatic contacts of individuals with confirmed Corona Virus disease 2019 (COVID-19) in Tertiary care centre, Thanjavur.

Contact tracing is a central public health response to infectious disease outbreaks, especially in the early stages of an outbreak when specific treatments are limited.

Methods: *From May, 2020 to September, 2020 (5 months), overall 200718 cases were tested by RT-PCR which includes In-patients, Out-patients, Contacts of Covid-19 infected cases, and general surveillance population.*

In this, the Data of Contacts of Individuals with RT-PCR confirmed COVID-19 infection were taken .The contacts were then categorized as Symptomatic and Asymptomatic contacts of RT-PCR positive COVID-19 cases. The Secondary attack rate among the Symptomatic and Asymptomatic contacts were compared and analyzed.

Results: *From May, 2020 to September, 2020 (5 months), 23895 contacts Of Covid-19 RTPCR positive patients, among which 6057 were symptomatic (25%) and 17838 were asymptomatic (75%) were traced. They were tested for SARS-CoV-2 infection by RTPCR. Among Symptomatic contacts, 943 were tested positive (16%) and 5114 were tested negative (84%). Among Asymptomatic contacts, 2706 were tested positive (15%) and 15132 were tested negative (85%).*

Among the 23895 contacts, 3649 secondary cases of COVID-19 infection (including 2706 asymptomatic infections) were detected, with an overall infection risk of 15.27% (95% CI, 14.82%-15.73%, Taylor series). The secondary clinical attack rate was 15.57% (95% CI, 14.68%-16.5%) among symptomatic contacts and 15.17% (95% CI, 14.65%-15.7%) among asymptomatic contacts.

Discussion: *This study explored transmission risk factors for COVID-19 and the proportion of asymptomatic cases that would have been missed by testing symptomatic individuals only. Our analysis revealed a similar clinical attack rate between the contacts that were symptomatic and asymptomatic. This observation was consistent with a reasonably high rate of asymptomatic carriage. For prevention of transmission, early identification of COVID-19 index cases and contacts is important. In view of the significant number of missed diagnoses in a symptom-based testing strategy, testing of all contacts, including asymptomatic individuals, is recommended.*

Keywords: *COVID-19, SARS-CoV-2, Symptomatic and Asymptomatic contacts, Secondary attack rate.*

Introduction

Corona viruses are large, enveloped, single-stranded RNA viruses found in humans and other mammals, such as dogs, cattle, pigs. Corona viruses cause respiratory, gastrointestinal, and neurological disease. The most common corona viruses in clinical practice are 229E, OC43, NL63, and HKU1, which typically cause common cold symptoms in immunocompetent individuals.[1]

SARS-CoV-2 is the third corona virus that has caused severe disease in humans to spread globally in the past 2 decades. The first corona virus that caused severe disease was severe acute respiratory syndrome (SARS), which was thought to originate in Foshan, China, and resulted in the 2002-2003 SARS-CoV pandemic.[7]. The second was the corona virus-caused Middle East respiratory syndrome (MERS), which originated from the Arabian peninsula in 2012.[8]

The corona virus disease 2019 (COVID-19) pandemic has caused a sudden significant increase in hospitalizations for pneumonia with multi-organ disease. COVID-19 is caused by the novel severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). SARS-CoV-2 infection may be asymptomatic or it may cause a wide spectrum of symptoms, such as mild symptoms of upper respiratory tract infection and life-threatening sepsis. COVID-19 first emerged in December 2019, when a cluster of patients with pneumonia of unknown cause was recognized in Wuhan, China. As of July 1, 2020, SARS-CoV-2 has affected more than 200 countries, resulting in more than 10 million[1, 2].

In India, the first case of COVID-19 was reported on January 30, 2020, in a medical student who travelled from Wuhan, China.[3]. In the beginning, COVID-19 cases in India were associated with international travel among returnees from COVID-19 affected countries There is a wide variation in the reporting of cases across the States/Union Territories and across the districts within each State.[4]

The case reporting is based on the testing of individuals by real-time reverse transcription-polymerase chain reaction (RT-qPCR). Laboratory capacity for testing, health-seeking behaviors and testing strategy in terms of who gets tested, influence the numbers reported. Furthermore, the current testing criteria, which prioritize symptomatic testing, will miss many asymptomatic and mild infections.[6]

It has been suspected that infected persons who remain asymptomatic play a significant role in the ongoing pandemic, but their relative number and effect have been uncertain. Asymptomatic infection may be associated with subclinical lung abnormalities, as detected by computed tomography. Because of the high risk for silent spread by asymptomatic persons, it is imperative that testing programs include those without symptoms.[5]

This study is to determine the rate of secondary infection among Symptomatic and Asymptomatic contacts of individuals with confirmed Corona Virus disease 2019 (COVID-19) in Tertiary care centre, Thanjavur.

Materials and Methods

All COVID-19 cases were diagnosed by real time reverse transcriptase polymerase chain reaction (qRT-PCR) in the Microbiology Laboratory at Government Thanjavur Medical College and hospital. In addition, other microbiology laboratories in the private sector could also detect COVID-19 cases, but all positive cases must be communicated to Epidemiologic Division. When a COVID-19 case was notified, an epidemiological survey was implemented by the Epidemiologic Division to know circumstances of disease transmission and their closed contacts.

From May, 2020 to September, 2020 (5 months), overall 200718 cases were tested by RT-PCR out of which 8348 (4%) cases were tested positive. (Fig-1-A ,B,C)

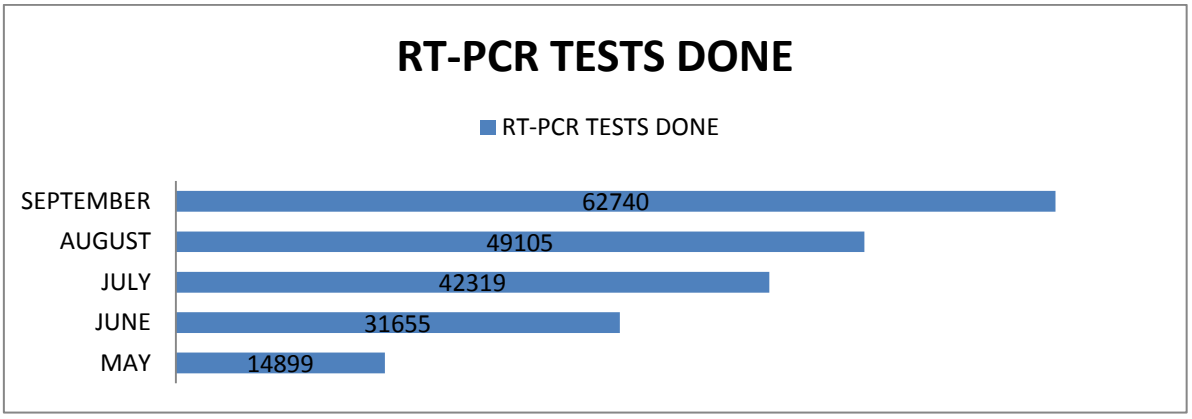

Fig – 1 – A

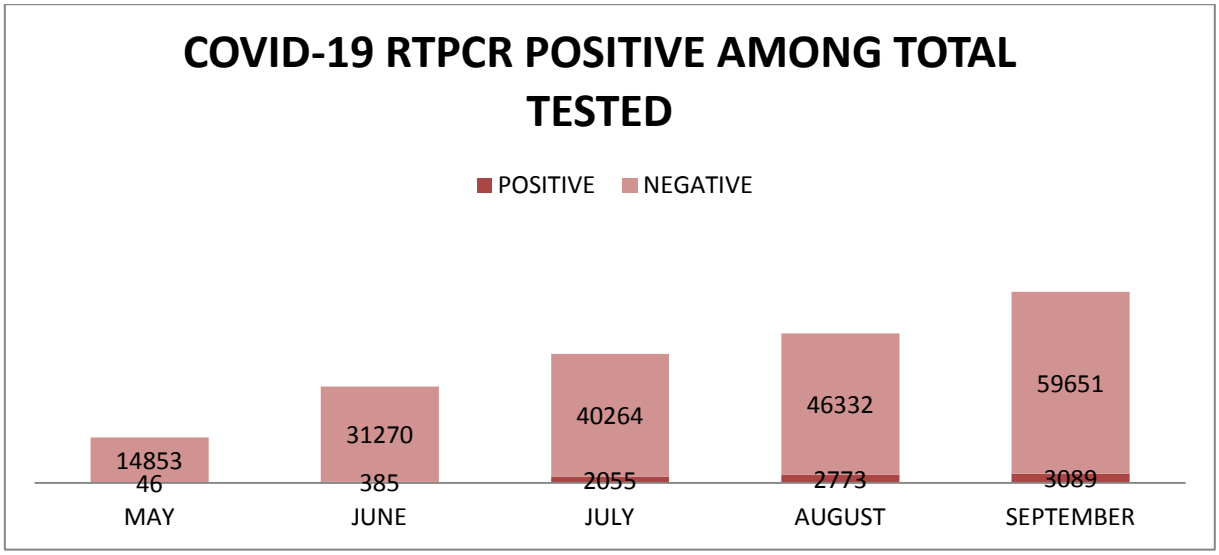

Fig – 1 - B

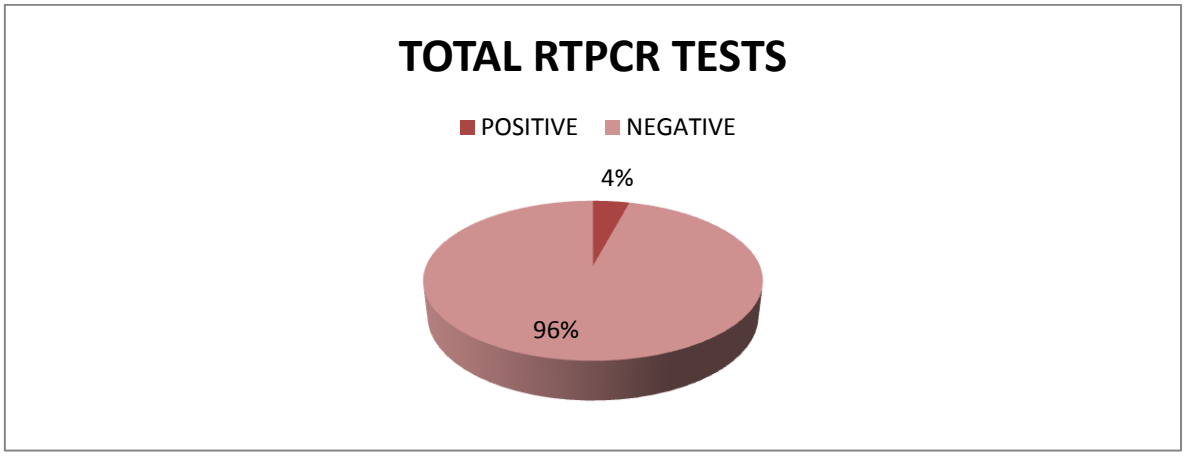

Fig – 1 - C

Study Participants and Data Collection

This analysis uses the data of contacts of individuals with confirmed severe acute respiratory syndrome Corona virus 2 (SARS-CoV-2) infections from May, 2020 to September, 2020 (5 months) taken from the Department of Microbiology, Central diagnostic microbiology laboratory, Thanjavur Medical college.23895 contacts data were taken from the 200718 tested cases for this study. Inclusion criteria for data collection are Symptomatic contacts of RT-PCR Positive COVID-19 cases (25%) and asymptomatic contacts of RT-PCR Positive COVID-19 cases (75%). (Fig-2 – A,B)

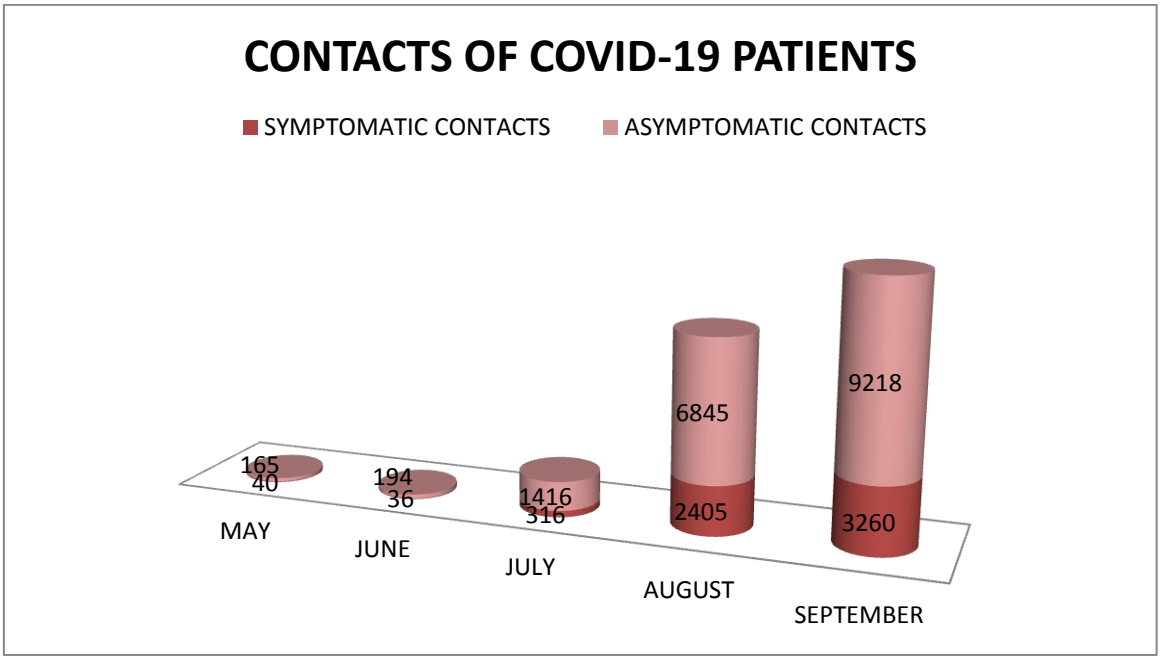

Fig – 2 - A

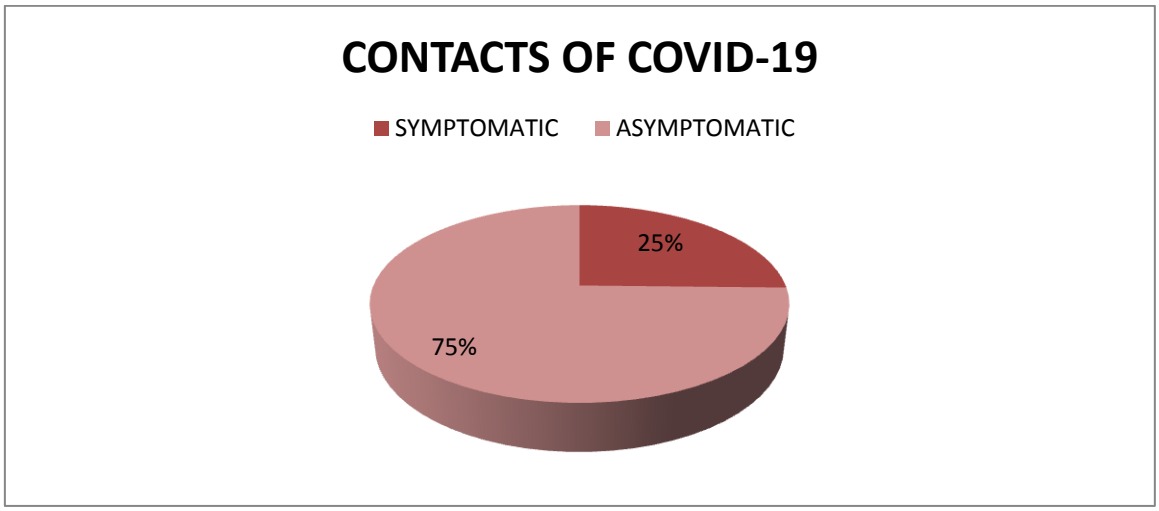

Fig – 2 - B

Contact Definition

We define contacts as individuals who had close, prolonged, and repeated interactions with the source cases.

Laboratory Procedures

Detection of SARS-CoV-2 RNA from upper or lower respiratory samples collected in viral transport medium[9], by reverse transcription polymerase chain reaction (RT-PCR). The Real Time PCR assays used in our laboratory amplify and detect different regions of the SARS-CoV-2 genome: envelope (E), RNA-dependent RNA polymerase (RdRp) [10]. We used: Roche - Light Cycler® Systems, Bio RAD –CFX96 Touch Real-Time PCR Detection System.

Data Analysis

Secondary attack rate was defined as the proportion of secondary cases from the total contacts. Acute infection symptoms include fever, cough, headache, sore throat, weakness, loss of smell and taste, vomits and diarrhea, symptoms associated with COVID-19 disease. Secondary case was dependent variable. Confidence interval (CI) of 95% was calculated. Chi-square test – to compare the frequency/proportions between the groups with sample >30 is considered.

Ethics Statement

The research protocol was approved by the institutional ethical committee for human studies, Government Thanjavur Medical College,

Thanjavur on 02.11.2020.Certificate number – 798.

Results

Out of 200718 RT-PCR testing done from May, 2020 to September, 2020 (5 months), 8348 (4%) cases were tested positive. (Fig-1). 23895 contacts details were taken from these total tested cases. Out of these 23895 contacts, 3649 (15%) were tested positive by reverse transcription polymerase chain reaction (RT-PCR). (Fig -3 – A,B)

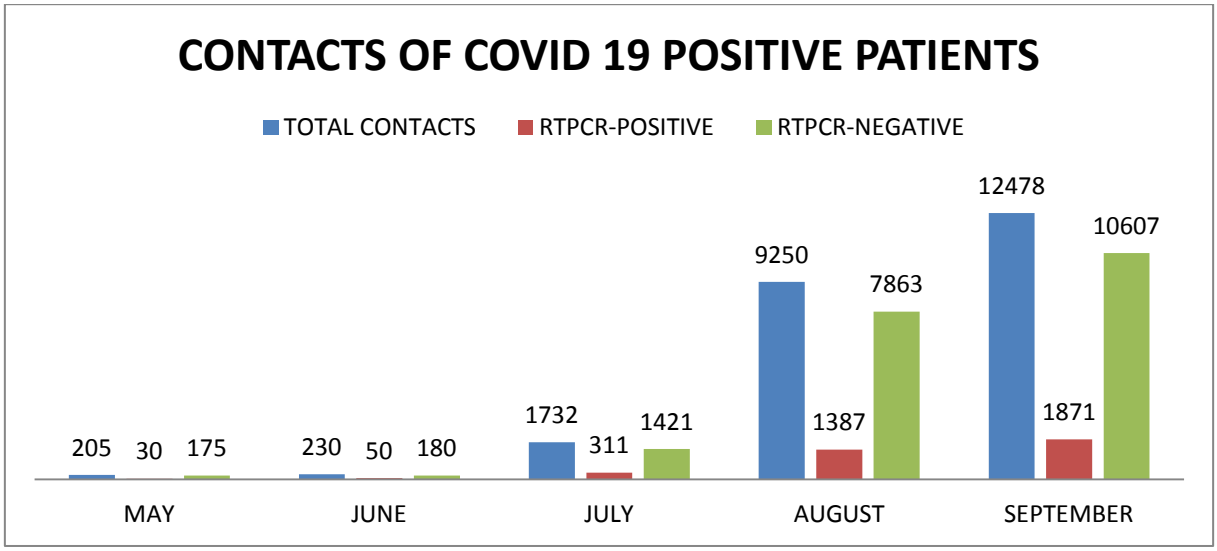

Fig – 3 -A

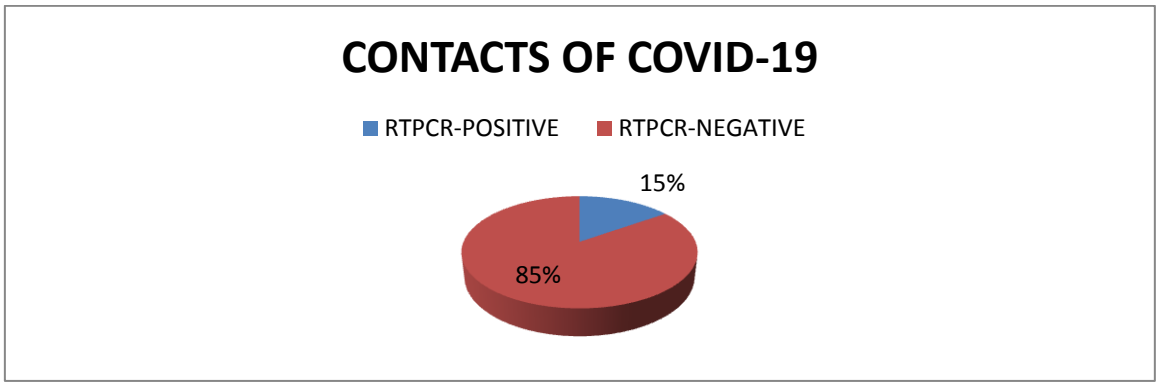

Fig – 3 - B

These 23895 contacts were then categorized as Symptomatic and Asymptomatic. (Fig – 2). The Symptomatic distribution is shown in Fig – 4.

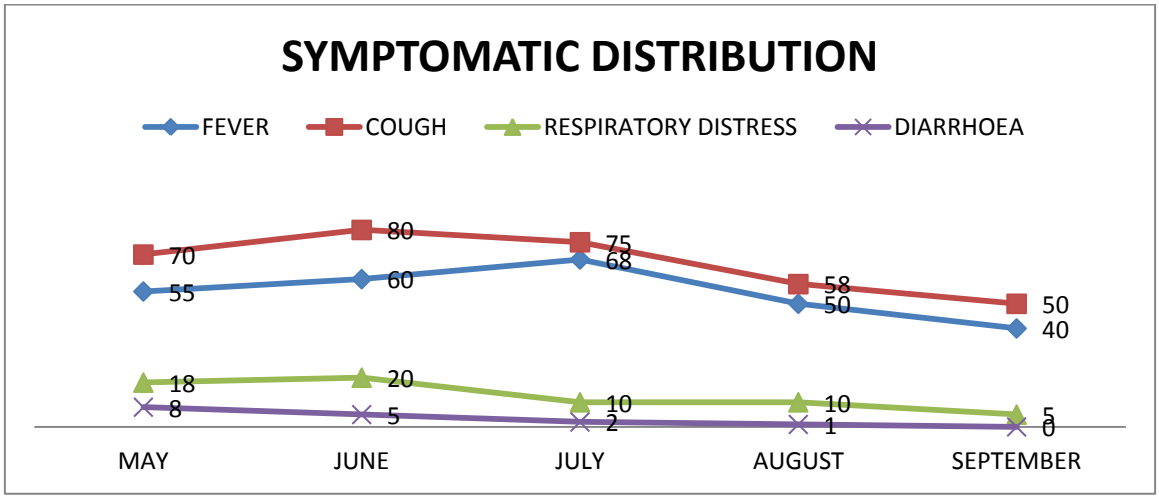

Fig - 4

The symptomatic contacts (6057) were tested by RT-PCR and the positivity rate was calculated. (Fig-5)

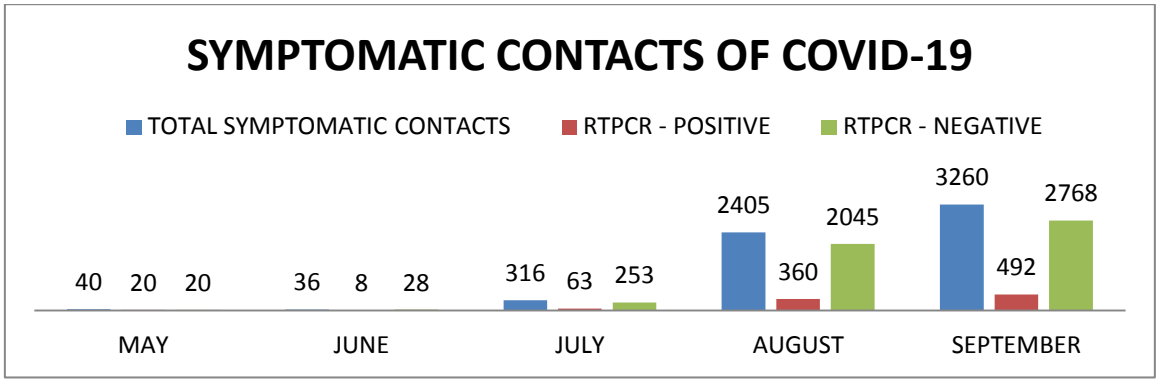

Fig – 5

Likewise, the Positivity rate among asymptomatic contacts (17838) was tested by RT-PCR. (Fig – 6)

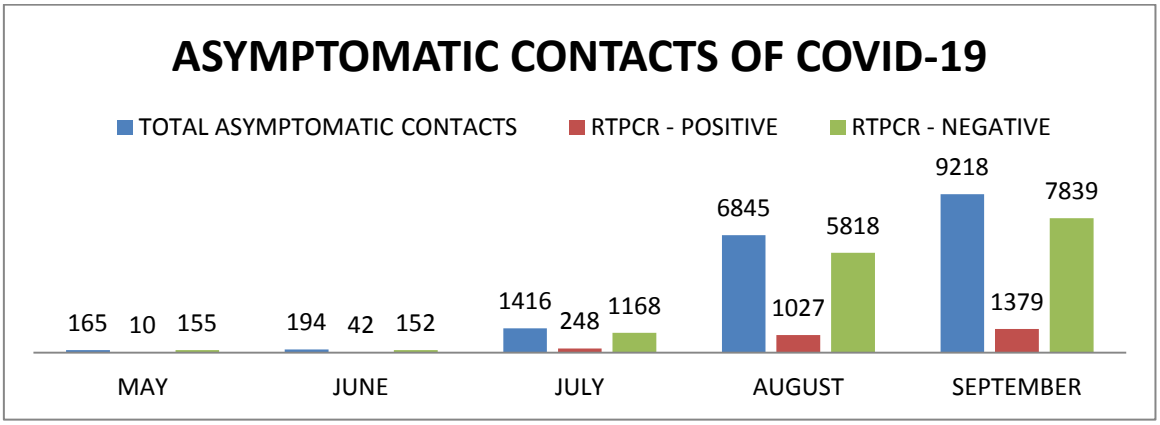

Fig – 6

The Attack rate among the contacts were calculated as follows,

Table analysis,

		RTPCR		
		(+)	(-)	
SYMPTOMS	(+)	943	5114	6057
	(-)	2706	15132	17838
		3649	20246	23895

Table – 1

Chi Square and Exact Measures of Association

Test	Value	p-value(1-tail)	p-value(2-tail)
Uncorrected chi square	0.5561	0.2279	0.4558
Yates corrected chi square	0.5257	0.2342	0.4684

Risk-Based* Estimates and 95% Confidence Intervals

Point Estimates		Confidence Limits	
Type	Value	Lower, Upper	Type
Risk in Symptomatic	15.57%	14.68, 16.5	Taylor series
Risk in Asymptomatic	15.17%	14.65, 15.7	Taylor series
Overall Risk	15.27%	14.82, 15.73	Taylor series
Risk Ratio	1.026	0.9587, 1.099[1]	Taylor series
Odds Ratio	1.031	0.9513, 1.118[1]	Taylor series

Assuming that test-positive contacts were infected by the index case to whom they were traced, we estimated that the secondary attack rate among symptomatic (Fig – 7) was 15.57% (95% CI, 14.68% to 16.6%, Taylor series), and among asymptomatic (Fig – 8) as 15.17% (95%CI, 14.65% to 15.7%) and the overall attack rate is estimated as 15.27% (95% CI, 14.82% to 15.73%).

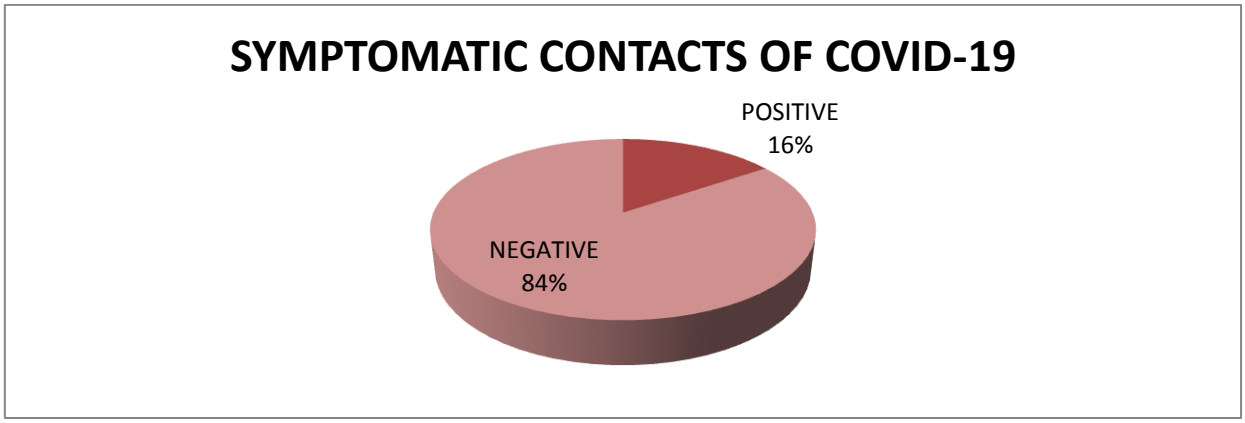

Fig - 7

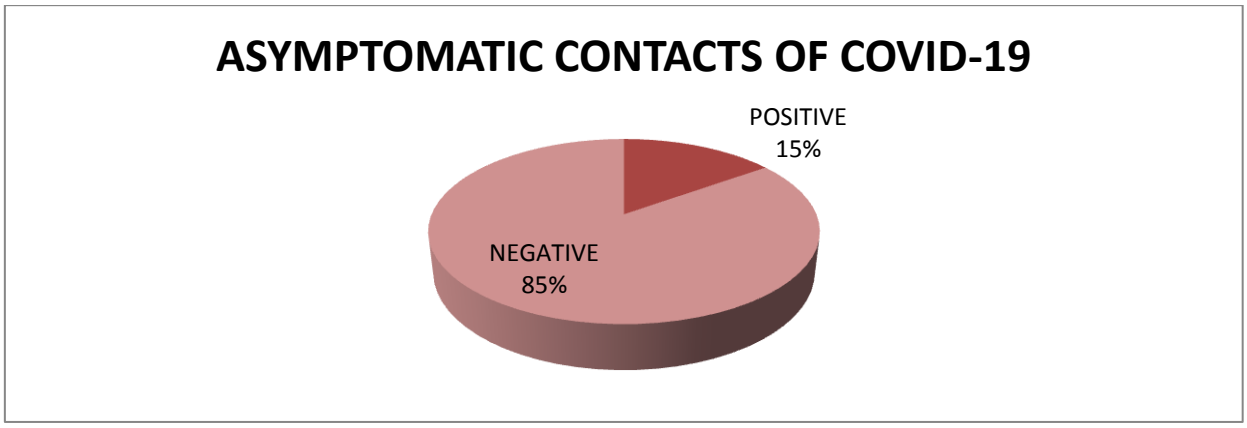

Fig – 8

The overall distribution among the contacts of Covid-19 infected cases is represented in the following figure - 9.

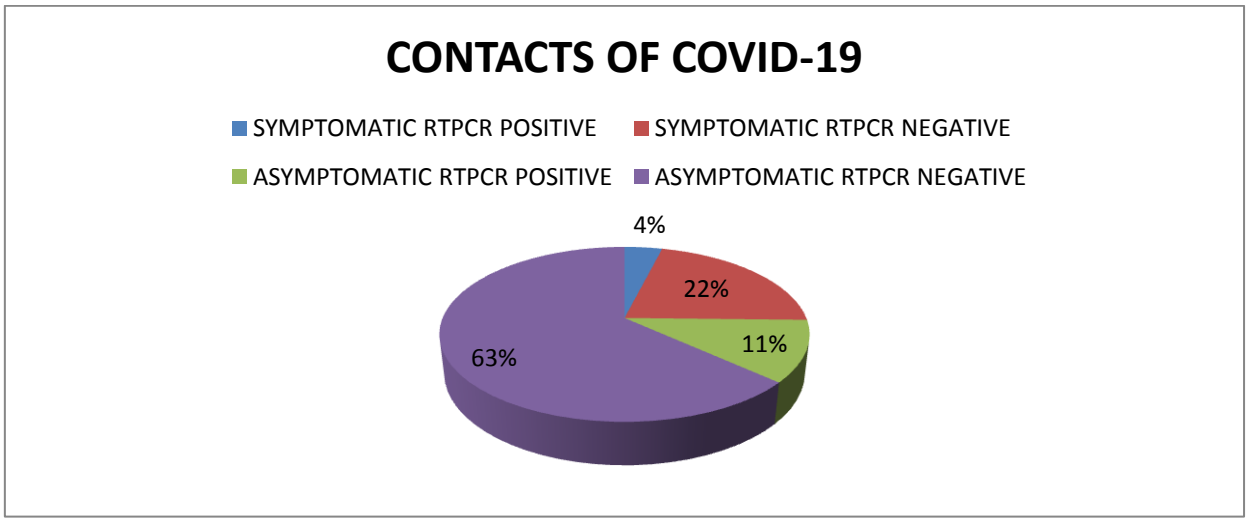

Fig - 9

Discussion

We found that there was strong evidence of COVID-19 transmission to asymptomatic contacts (15.17%) with more or less equal transmission rate as of symptomatic contacts (15.57%).As COVID-19 prevalence continues to increase, the attack rate from casual contact between individuals with COVID-19 and susceptible individuals is critical in understanding further spread of the pandemic.

MONTH	TOTAL TESTED	RT PCR POSITIVE	RT PCR NEGATIVE	CONTACTS	RT PCR POSITIVE	RT PCR NEGATIVE
MAY	14899	46	14853	205	30	175
JUNE	31655	385	31270	230	50	180
JULY	42319	2055	40264	1732	311	1421
AUGUST	49105	2773	46332	9250	1387	7863
SEPTEMBER	62740	3089	59651	12478	1871	10607
TOTAL	200718	8348	192370	23895	3649	20246
PERCENTAGE		**4%**	**96%**		**15%**	**85%**

Limitations of this study include the following: First we did not carry out a screening of COVID-19 test of close contacts and casual contacts separately. Second, more risk factors may play a role in viral transmission like environmental condition of homes. Third, higher severity of secondary cases may be due some selection bias, because it is more difficult following of hospitalized index cases. Fourth, unknown factors of transmission may be present in the household contacts of this new disease.

MONTH	SYMPTOMATIC CONTACTS	RT PCR POSITIVE	RT PCR NEGATIVE	ASYMPTOMATIC CONTACTS	RT PCR POSITIVE	RT PCR NEGATIVE
MAY	40	20	20	165	10	155
JUNE	36	8	28	194	42	152
JULY	316	63	253	1416	248	1168
AUGUST	2405	360	2045	6845	1027	5818
SEPTEMBER	3260	492	2768	9218	1379	7839
TOTAL	6057	943	5114	17838	2706	15132
PERCENTAGE		**16%**	**84%**		**15%**	**85%**

In this systematic review, we found that the proportion of asymptomatic infections at initial testing for COVID-19 appears high in many populations and such persons may have substantial transmission potential. Together, these findings suggest that exclusively carrying out symptom based testing will not be sufficient to eliminate transmission and will likely miss a large proportion of SARS-CoV-2 infections.

Rapid identification of COVID-19 positive persons, isolation, and contact tracing are essential for detection and prevention of secondary cases. In the absence of symptoms, strategies must be proactive and interrupt transmission chains. In symptomatic persons diagnosed with COVID-19, contact tracing should be extended to several days prior to symptom onset (i.e., up to 6 days based on viral shedding)[11,12] to ensure persons exposed to index patients while they were asymptomatic are identified.

Finally, current non-pharmaceutical measures, such as frequent hand washing, physical distancing, and use of facemasks should be continued as they limit exposure to persons who are infected but asymptomatic.

Conclusion

Among the populations evaluated, many COVID-19 infections were asymptomatic and transmission in the asymptomatic period was documented in numerous studies. Additional, unbiased research would further help inform the role that

asymptomatic infections are playing in the pandemic. Proactive steps should be taken to develop public health strategies aimed to identify and mitigate transmission from asymptomatic individuals. Systematic testing of high-risk populations should be performed regardless of symptoms. This should be augmented with thorough tracing and testing of all contacts in addition to existing non-pharmaceutical interventions. Given the large proportion of COVID-19 infections that are asymptomatic, such multifaceted strategies will be essential to prevent recrudescence as countries ease restrictions and reopen economies and schools.

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Potential Conflicts of Interest: None

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