



Secondary Attack Rate and Epidemiological Determinants of Secondary High-Risk Contacts of SARS COV-2; Lessons to Learn: A Study from North Gujarat

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ABSTRACT

Background: Transmission of the SARS CoV-2 disease among secondary contacts is a challenge and must be addressed. Secondary attack rate (SAR) is the probability that an infection occurs among susceptible contact within incubation period. It can be influenced by many factors including personal hygiene habits, behaviors, and characteristics of close-contact environments.

Objectives: The study was conducted to find out the Secondary Attack Rate among Household contacts of Covid19 positive patients; to study the socio-demographic and other factors affecting the Secondary Attack Rate; and to compare the disease outcomes in the primary cases and secondary contacts.

Methodology: Observational Retrospective Study was conducted telephonically among randomly selected 444 primary contacts from District Patan and their 1059 secondary high-risk contacts.

Results and conclusion: The overall SAR was found to be 5.6% which was highest (21%) in >60 years age group followed by 18 to <60 years age group (5.6%). Death rates were higher (18%) in Primary cases compared to High Risk secondary contacts (8%). Gender, age, symptomatic contacts, presence of toilet facility, Travel History and co-morbid conditions were found to be statistically significant in High Risk secondary contacts. Home isolation seems to be a good measure for Covid 19 positive cases except for those >60 years old.

Key words: SAR, High Risk Secondary contacts, Covid-19

INTRODUCTION

The ongoing pandemic caused by novel coronavirus SARS-CoV-2, has now affected 188 countries globally. As of June 8, 2020, more than 7 million reported cases and over 400 000 deaths had been reported¹. The elderly and individuals with comorbid conditions such as diabetes and cardiovascular disease are most susceptible to severe disease and death². Though we have limited knowledge but current understanding of disease showed active tracking of positive cases, quarantine/isolating the infected ones and their close contacts and screening of contacts for presence of disease have been the most promising strategies so

far for breaking the chain of virus transmission^{3,4}. Some studies have highlighted that the highest-risk exposure setting for COVID-19 transmission was the household contacts of the infected cases.^{5,6} But Nations continued to experience exponential rise in COVID-19 cases in spite of national lockdowns and extreme social-distancing norms that may have substantially contributed by household transmission. Transmissibility within households or through other types of close contact remains under-investigated, and this study on Secondary Attack Rate carried out for Patan District of North Gujarat may contribute significantly in designing and developing infection control and prevention

policies for COVID-19 that can limit further spread/transmission of the disease.

AIM AND OBJECTIVES

The study was conducted to find out the Secondary Attack Rate among Household contacts of Covid19 positive patients. It also aimed to study the socio-demographic and other factors effecting the Secondary Attack Rate and to compare the disease outcomes in the primary cases and secondary contacts.

MATERIAL AND METHODS

This was a retrospective observational study conducted in Patan District situated in North Gujarat and comprising of 9 talukas. The study conducted during April to August 2020.

The study conducted among randomly selected positive Covid-19 cases (N=444) and their positive high-risk household contacts (N=1059) using a Pre-Designed and Pre-tested questionnaire.

Sample Size: According to study by ICMR the SAR for Gujarat is 7.8% .Taking $p=8\%$,allowable error= 2.8% and non-response as 10% ,the sample size calculated by applying $4pq/l^2$ was 412.The total number of cases in Patan District as on 29th August were 1200.So a line list of 1200 positive cases was made and numbers were randomly selected according to the Random number list generated using WinPepi software. Data was ultimately collected from 444 primary Covid-19 positive cases and 1059 susceptible high-risk household contacts.

Methodology: A team of four members consisting of two well qualified faculty from PSM department and two trained interns collected data telephonically based on the questionnaire after explaining the purpose of the study and taking verbal consent over a period of one week. The Questionnaire consisted of three sections: First Section consisted questions related to primary contact and Secondary positive contacts: Age, Sex, Date of positive test, co-morbid condition, outcome; Section II : had questions related to household: Place of residence, area of household, separate Toilet and Bathroom facility, number of household contacts (age-wise); Section III: had questions related to cost incurred during treatment ,type of facility where treatment was taken and any out of pocket expenditure. SAR was calculated as follows:

SAR for Covid-19= Total number of secondary cases occurring within the range of Incubation Period (14 days) following exposure to primary case/Total susceptible persons (Household contacts)

Analysis: The information thus obtained was entered in Microsoft Excel and frequencies were tabulated. To find out Statistical significance and correlations; Epi info version z 7.2.4.0 and WinPepi version z11.65 is used.

RESULTS

Total 444 primary cases were enrolled in study. There was 67% male and 33% female cases. 70% cases from age group less than 60 years. Around 65.5 % primary cases were symptomatic, 34 % had co morbid condition and 75% primary cases had separate Toilet facility. Cure rate was observed in around 81% of primary cases (Table 1).

Most of the secondary positive contacts were males (58%) [95% CI; 0.4167-0.7372], majority (68%) were from 18-60 years age group [95% CI;0.5580-0.7913]. Most of them (68%) had Covid symptoms [95% CI; 0.0312-0.1750] and half of them had no co-morbid conditions [95% CI;0.3750-0.6250]. Majority (73%) had separate toilet/Bathroom facility [95% CI; 0.6112-0.8334] (Table 2). Most (84%) of them had no Travel History [95% CI;0.7230-0.9121] and around 85% contacts who developed symptoms were positive within 7 days of contact [95% CI;0.7426-0.9243] with the primary case. The overall secondary attack rate was found to be 5.6% The SAR is comparatively found high in Covid 19 positive contacts >60 years old i.e 21% and varied in all other age groups from 2.7 % to 5.6 %.

Table: 1 Characteristics of Primary Case (n=444)

Variables	Primary Cases (%)
Gender	
Male	298 (67)
Female	146 (33)
Age	
18-<60 years	310 (70)
>60 years	131 (30)
Nature of Symptoms	
Symptomatic	291 (65.5)
Asymptomatic	112 (25)
Don't know	41 (9.5)
Type of Test	
RTPCR	294 (66)
Antigen	104 (23)
Don't Know	46 (11)
Any co-morbid condition	
Yes	152 (34)
No	241 (54)
Don't Know	51 (12)
Availability of separate bathroom/Toilet	
Yes	334 (75)
No	48 (11)
No response	62 (14)
Outcome	
Cured	362 (81.5)
Death	82 (18.5)

Table 2: Characteristics of Positive Secondary Household Contacts (N=60)

Variables	Positive Secondary Contacts (%)	95% CI of %
Gender		
Male	35 (58)	.4167-.7372
Female	25 (42)	.2973-.5439
Age		
<5 years	2 (3)	.0056-.1058
5- <18 years	5 (8)	.0312-.1750
18- < 60 years	41 (68)	.5580-.7913
>60 years	12 (21)	.1131-.3152
Nature of Symptoms		
Symptomatic	41 (68)	.0312-.1750
Asymptomatic	19 (32)	.2087-.4420
Type of Test		
RTPCR	39 (65)	.5234-.7624
Antigen	21 (35)	.2376-.4766
Any co-morbid condition		
Yes	19 (31.6)	.2087-.4420
No	30 (50)	.3750-.6250
Not Known	11 (18.4)	.1004-.2962
Availability of separate bathroom/Toilet		
Yes	44 (73)	.6112-.8334
No	16 (27)	.1666-.3888
Outcome		
Cured	55 (92)	.8250-.9688
Death	5 (8)	.0312-.1750
Duration of contact with primary case		
<7 days	51 (85)	.7426-.9243
>7 days	9 (15)	.0757-.2574
Travel History		
Yes	5 (8)	.0312-.1750
No	50 (84)	.7230-.9121
Not Known	5 (8)	.0312-.1750

CI= Confidence interval

Table 3: Characteristics of Household (N=389)

Variables	Household (%)
Area	
Rural	160(41)
Urban	229(59)
Separate Toilet/Bathroom Facility	
Yes	288(74)
No	101(26)
Age of Household Members	
	N=1503
<5 years	74(5)
5- <18years	203(13.5)
18- <60years	1038(69)
>60 years	188 (12.5)
Area of House (Avg)	389 sq feet

Table 4: Cost Incurred during Treatment (N=389)

Variables	Households (%)
Treatment at Public/Private Facility	
Private	89 (23)
Public	300 (77)
Out of Pocket Expenditure	
Yes	180 (46)
No	209 (64)

Chi Square for linear trends depicts that as the age increases the SAR also increases showing a linear trend. death rates were found to be more in Primary Covid 19 positive cases (18.5%) as compared to the positive secondary contacts (8%)

DISCUSSION

This study found that the crude secondary attack rate was 5.6% The SAR is comparatively found higher in above 60 years old. Cure rate was observed in around 81% of primary cases. The common characteristic of secondary cases includes male gender, age 18-60 years, having Covid symptoms and without co-morbid conditions. Death rates were found to be more in Primary Covid 19 positive cases (18.5%) as compared to the positive secondary contacts (8%).

5.6% Secondary attack rate was observed in our study which was much lower than Bi Q, Wu Y, et al⁷ study where they observed SAR around 11% and Jing QL, Li YG, Ma MM⁸, , et al found it around 46% in their study. In K. Shah, D. Saxena et al observed in their systematic review that SAR in different study ranged from 4.6% (95% CI, 2.3–9.3%) showing lowest incidence of SAR and the highest incidence 49.56% of SAR in china⁹. There can be many probable reasons for lower SAR is our study; Firstly, it can be milder nature of Covid 19 infection in the home isolated primary contacts (around 25% were asymptomatic and others had milder symptoms) which reduce the probability of transmission; Secondly large proportion of households (75%) had separate toilet/bathroom facility which again makes home isolation favorable for Primary cases and reduces the chances of transmission from them to their contacts. Difference in findings may be due to some limitations of our study like; may be only symptomatic contacts were tested for Covid-19, only household contacts were considered. Also, there is difference in validity of the two tests (RTPCR and Rapid Antigen test) used to test the primary cases of Covid-19. Approximately 66% were tested with RTPCR

Highest incidence of SAR was found 21% in age group >60 years in our study which was statistically significant and higher when compared with Sun WW, Ling F, Pan JR, etal¹⁰ and Park SY, Kim YM, et al in their study¹¹.

Significant proportion (94 %) of contacts did not develop infection in spite of continued contact with positive case that indicates possible role of natural immunity or resistance to disease which was comparable with Jing QL, Li YG, Ma MM, Gu YZ, Li K, Ma Y, et al⁸.in their cluster epidemics of COVID-19 in Guangzhou study¹².

Table 5: Secondary Attack Rate

	Household Contacts	Covid positive Household contacts	Secondary Attack Rate	Odds Ratio
Total	1059	60	5.6%	
<5 years	74	2	2.7%	1.000
5-<18 years	203	5	2.46%	0.911
18 -<60 years	728	41	5.6%	2.084
>60 years	57	12	21%	7.789

Chisquare for linear trend (Extended Mantel-Haenszel) 12.73 P value <0.001

CONCLUSION

Total 444 primary cases were enrolled in study. Around 65.5 % primary cases were symptomatic, 34 % had co morbid condition and 75% primary cases had separate Toilet facility. Cure rate was observed in around 81% of primary cases. The overall secondary attack rate was found to be 5.6% The SAR is comparatively found high in Covid 19 positive contacts >60 years old i.e 21% and varied in all other age groups from 2.7 % to 5.6 %. Also, death rates were found to be more in Primary Covid 19 positive cases (18.5%) as compared to the positive secondary contacts (8%).

RECOMMENDATIONS

Thus, keeping in mind, the above findings, Home isolation is a good measure for Covid 19 positive contacts except positive contacts >60 years old who should undergo Facility Isolation.

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