SARS COV – 2 In Gangetic Belt: Varanasi Pilot Study

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***Abstract*—SARS CoV - 2 pandemic is in second to third wave in different countries, across the globe. With current infection rate in millions per day, we have been witnessing good recovery rates in Indian population. This paper focuses on the behaviour of disease and its interaction with the population of Varanasi, which is one of the ancient cities in the world. Being predominantly, Hindu population, city residents, use Ganga water for bathing and drinking. In previous scientific communication, Ganga River is considered to have rich variety and density of phages, which do have properties to resist growth of microorganisms. In this research article, we have hypothesized, whether Ganga water play role in better recovery in Indian population?**

***Key words*: SARS CoV – 2, Phage, Ganga, Pandemic**

I. INTRODUCTION

As on today, globally, there are 162,538,008 SARS CoV – 2 cases, out of which 140,397,997 recovered and 3,371,426 died. On contrary, India with total population of 1,391,568,121, have lower deaths (191) per million as compared to USA (1801/1 million), France (1643/ 1 million), Italy (2052/ 1 million). Indian population had also shown better recovery rates, as compared to countries with much better medical facilities. There are various studies supporting presence of huge number of phages in the Ganga water. Phages in the Ganga are 3-4 times more than River Yamuna and Saraswati [1]. These phages are deeply involved in providing the immunity to the body and helps in building the immune homeostasis [2]. In the present study, we hypothesized that SARS CoV-2 infection has been contained naturally by Gangetic phage. Hence, the present study, aimed to find out the SARS CoV-2 infection rate in the population along the bank of river Ganga in the city of Varanasi, where indigenous residents as well as pilgrims from all over world use the water of Holy River for drinking, bathing and household activities.

II. MATERIAL AND METHOD

Varanasi, a city with 45 million populations, in the Uttar Pradesh province, is one of the oldest cities of the world and the religious and cultural capital of India. People live on the banks of Ganges at Varanasi, since ages. We selected the residents along the bank within a range of 50 meters of Ganga presuming that these people would have direct effect of Ganga in their livelihood. The peoples were divided into two groups: Group I included people which were using Ganga water for more than 15 years for bathing and drinking and Group II contained people which reside in the same locality but not using the Ganga water. We compared the SARS CoV-2 load in these two groups. People with less than 15 years and more than 105 years of age were excluded from the study. Those who suffered any other kind of illness apart from COVID-19, diabetes and hypertension were also excluded from the study. These people have been residing in these places for more than 3 generations. Tourists and pilgrims were not included in the study. In Pandemics, people were fearful of giving nasal samples. To allay their fear and ignorance, COVID awareness feature film was screened in localities, before testing.

Those two groups were tested for COVID-19 by both means- antigen card test as well as RT-PCR test along with keeping the record of their diabetes and hypertension status.

III. STATISTICAL METHOD

Chi-square test was applied using SPSS Software 26.0 version. The data uploaded for analysis included the data of Group I and Group II. The P-values for COVID-19, asthma, diabetes, and hypertension of both the groups were tested and reported.

TABLE I

Age Group (In Years)	Numbers	Sex (M:F)	Ganga water Use		COVID -19 Test Positive (Total tests)	
			For Drinking	For Bathing	SARS CoV-2 Antigen	SARS CoV-2 RT-PCR
15 – 30	23	19:4	15	23	Nil (9)	Nil (3)
31 - 45	46	43:3	42	46	1 (14)	1 (6)
46 - 60	128	104:24	119	128	Nil (45)	Nil (4)
61 - 75	103	98:5	101	103	Nil (23)	Nil (2)
76 - 90	23	23:0	23	23	Nil (7)	Nil (0)
91 - 105	2	2:0	2	2	Nil (1)	Nil(1)

Group I – Subjects which were using Ganga water (> 15 Years)

TABLE II

Age Group (In Years)	Numbers	Sex (M:F)	Ganga water Use		COVID -19 Test Positive (Total tests)	
			For Drinking	For Bathing	SARS CoV – 2 Antigen	SARS CoV – 2 RTPCR
15 – 30	39	23:16	Nil	Nil	3(14)	3(3)
31 - 45	89	67:22	Nil	Nil	9(21)	7(9)
46 - 60	137	122:15	Nil	Nil	5(53)	4(22)
61 - 75	12	9:3	Nil	Nil	7(10)	2(9)
76 - 90	9	9:0	Nil	Nil	2(7)	0(3)
91 - 105	1	1:0	Nil	Nil	0(0)	0(0)

Group II – Subjects which never used Ganga water

IV. RESULTS

In the study, we recruited 613 participants living in the 50 meters range of Ganga River. Group I include 326 participants while Group II had 287. The median age of Group I participants was 43.21±15 and for Group II population also it is 42.96±17. Women accounted for the study were 5.5% of the trial participants for Group I and 16 % for Group II.
5.9% of group II participants were positive for Covid-19 while only 0.3 % Group I population were Covid-19 positive (P-value <0.001). In Group II, 12.9% of the population had hypertension and 8.7% were diabetic. Whereas in Group I, 2.4% were hypertensive and 3.9% were diabetic (P-value < 0.001). The group of population which were using Ganga water, when tested with Antigen and RT-PCR, each of the age group showed negative result except the one participant who was tested positive in 31-45 age group. While, the Group II peoples who are not in the direct contact with Ganga river and did not use the Ganga water gives several positive Antigen and RT-PCR test results in each of the age group.

V. DISCUSSION

Varanasi city is most sacred city for 1 billion Hindu populations, globally. At present, Ganga originates from the Himalayan Glacier Gomukh permafrost [3], and travels 5 states of India and then Bangladesh, before draining in Bay of Bengal. It is a 2525 km long river, which is 6th longest River in the World. On the way to sea, Ganga water supports life of billions of people living alongside river. Ganga River is used for farming in 60% land of India. It also has a self-cleansing property with lot of microbes residing together and enhancing its property which makes it very beneficial and of therapeutic use for Humans [4].

Since the Pandemic have affected India, it was projected, that India will have maximum patients and casualty in world as compared to western world. However, on contrary, the cases in India, were contained, nationally and significantly showed low infectivity rate and good recovery in cities, on the banks of Ganga River.

The study shows that River Ganga has its major effect on the life of people living on the banks. Ganga water has been proved to contain a huge quantity of the phages. The earlier studies give us the evidence that phage, whether it is in the Ganga water or the phage which resides in the human gut has a huge impact in a healthy well-being of an individual [6]. In an interesting study, Ganga River, have more than 1200 varieties of phage, as compared to Yamuna River, which have merely 400 varieties. A research study shows that phage has the protective property through building immunity and activating the immune cells including lymphocytes, monocytes, platelets and some of the important interleukins [2]. In one of our published review article, we have discussed the possibilities of Phage as one of the possible treatment of SARS CoV- 2 [7].

It is well known that Phage has the specific property to identify and kill the bacteria, reason it is called Bacteriophage. However, apart from that it can act against some of the non-bacterial infection including viral infection also [8]. It can resist the viral infection through building the immunity against it. It has been observed that the cities located at the bank of River Ganga gives better recovery rate against COVID-19 than the other cities of India. The recovery rate for Varanasi, Prayagraj, Ghazipur, Haridwar and Kanpur is 97.8%, 93%, 98.02%, 89.8% and 85.12% respectively. The observation shows that River Ganga could be a major factor in enhancing the recovery in these cities.

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