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# **Original Research Article**

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# "Aarogya Setu"- India's COVID-19 contact tracing mobile application: an assessment of awareness and utility among residents of India during the COVID-19 pandemic

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#### **ABSTRACT**

**Background:** As the world was hit by the COVID-19 pandemic, various steps were taken to curb its spread. Government of India introduced contact tracing "Aarogya Setu" app. In this study we assessed the awareness and utility of the app among the residents of India which in turn affects its usage.

**Methods:** This was a community based online cross-section survey. The snowball sampling technique was used for data collection. The questionnaire was developed to understand the knowledge and practices pertaining to COVID-19 but for publication purpose, items related to Aarogya Setu application have been analysed. The data was collected in the 1<sup>st</sup> week of July 2020. Frequency tables for various socio-demographic details of the participants were formed. Chi Square test of significance was used to analyse the awareness and utility of the app against sociodemographic characteristics.

**Results:** Majority of the participants were aware about the app, using it and found it useful. The awareness and use of the app was found to be significantly associated with gender, age, education and occupation and the usefulness was found to be significantly associated with gender and occupation. Awareness was found to be higher among males, age group 45-59 years, with professional degree and government employees.

**Conclusions:** These findings can be taken by policy makers while considering promotion of the application. Future steps should involve developing relevant training and communication material to enhance the use of the application.

Keywords: Aarogya Setu, Awareness, COVID-19, India, Utility

#### INTRODUCTION

World Health Organization (WHO) had declared Coronavirus disease 2019 (COVID-19) as global pandemic on 11th March 2020. Since the onset of 1st cluster of unusual pneumonia cases in Wuhan in late December 2019, the rapid human to human transmission of virus via droplets and close contacts resulted in unprecedented, swift and frantic global spread affecting 215 countries and territories with confirmed cases

globally more than 30 million and in India more than 5.3 million (as on 16<sup>th</sup> September 2020).<sup>2</sup> It created panic amongst the medical, public health and general community due to lack of treatment and vaccine available. The most essential defence remained the fundamental of public health measures, such as personal hygiene and mass physical distancing.

WHO recommended following infection prevention and control (IPC) measures to mitigate COVID-19 spread: 1)

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hand washing; 2) social distancing of 6 feet; 3) avoid touching mucus membrane of mouth, eyes and nose; 4) respiratory protection and hygiene by using personal protective equipment (PPE), masks; 5) identification of infected personnel and contact tracings; 6) travel restrictions.<sup>3</sup>

To control the spread of COVID-19, interventions need to break the chains of human-to-human transmission, ensuring that the number of new cases generated by each confirmed case is maintained below 1 (effective reproduction number <1). As part of a comprehensive strategy, case identification, isolation, testing and care, and contact tracing and quarantine, are critical activities to reduce transmission and control the epidemic. Contact tracing is the process of identifying, assessing, and managing people who have been exposed to a disease to prevent onward transmission.<sup>4</sup>

COVID-19 has impacted daily lives extensively with far reaching consequences. It had on healthcare, social and economic ramifications like challenges in the diagnosis, quarantine and treatment of suspected or confirmed cases, slowing of the manufacturing of essential good, undue stress among the population amongst many.<sup>5</sup>

Attention has turned to the digital health community to provide possible solutions in this time of unprecedented medical crisis to mitigate the impact of this pandemic.<sup>5</sup> The potential benefits of mobile health (mHealth) initiatives to manage the coronavirus disease-2019 (COVID-19) pandemic has been explored. Contact tracing, testing, and surveillance- each an essential part of the overall public health measures in keeping the outbreak within a manageable scale- were each augmented in China by data-driven technologies. One widely used application by the general public was one allowed people to trace if they were ever on the same train or flight or otherwise in close proximity with any confirmed cases in the past two weeks.<sup>6</sup>

Considering the demand, the Government of India, launched the 'Aarogya Setu' mobile app (also referred to as 'app' elsewhere) on 2<sup>nd</sup> April 2020 for the containment of COVID-19, with an objective of enabling Bluetoothbased contact tracing, mapping of likely hotspots and dissemination of relevant information about COVID-19.7 The Ministry of Electronics and Information Technology, Government of India, has taken proactive measures to promote the installation and usage of the Aarogya Setu app. For the first time, the country has introduced Participatory Disease Surveillance (PDS) model for any disease. Participation in this platform was voluntary. The core function of the app is risk assessment with the option of reporting oneself to the government.8 The penetration of the app is critical to the success of the technologyenabled contact tracing. Evidence suggests that 70 per cent of the population should have the app installed for the digital contact tracing efforts to be effective.<sup>9</sup>

The app has over 150 million users as on 1<sup>st</sup> September, which is more than any other contact tracing app in the world. The App is available in 12 languages and on Android, iOS and KaiOS platforms the App offers a comprehensive suite of interventions against COVID-19. The key features of the app includes automatic contact tracing using Bluetooth, self-assessment test based on Indian Council of Medical research (ICMR) guidelines, updates, advisory and best practices related to COVID-19 and integration of e-Pass for interstate travel. <sup>11</sup>

However, the true success of battle against COVID-19 depends on public adherence towards the proper use of the App, which is greatly affected by their perception, and usage towards the App. In this study we assessed the awareness and utility of the app among the residents of India objectives in detail. Additionally, the survey intended to contribute in designing the evidence based IEC material, planning for appropriate content and platforms for dispersal of information and thus containment of the epidemic in the country.

#### **METHODS**

This was a community based online cross-section survey. The data was collected from 1st July to 10th July 2020. Due to national lockdown, social media was used to conduct the survey across all states of India. The snowball sampling technique was used to pool the initial eligible respondents who could potentially recruit more respondents from their acquaintances. By using online free platform of "KoBoCollect" a semi-structured questionnaire with annexed informed consent form was developed in 2 languages (English and Hindi). The survey link was generated and was sent through online platforms like WhatsApp, e-mails and Facebook to the contacts of the investigators. The respondents were motivated to refer links to their contacts for participation. The participants were auto-directed to the survey on clicking the link. The participation was voluntary in nature and no incentives were rewarded.

#### Inclusion criteria

As it was an online survey, individuals with age  $\geq 18$  years, internet access and able to read and understand the questionnaire languages were recruited.

The questionnaire was developed to understand the knowledge and awareness pertaining to COVID-19 including items related to Aarogya Setu application. The component related to the application had structured questions with two options and few questions using the Likert scale. An open-ended question was devised to seek suggestions for additional features that should be incorporated in the app for its improvement. The data was received on MS Excel 16 and exported to SPSS 20.0 for data analysis. Frequency tables to describe the various socio-demographic details of the participants were formed and percentages were calculated. Chi square test

of significance was used to analyse the awareness and utility were described and compared according to various socio-demographic characteristics. The data was analysed with 95% confidence interval and level of significance of p value was set up at <0.05. For the open ended question thematic analysis was performed manually.

#### **RESULTS**

Across various states, a total of 822 individuals participated in the online survey. The participants belonged to 25 states or union territories of the country with maximum representation from Delhi 144 (17.5%) and Bihar (10%) (Figure 1).

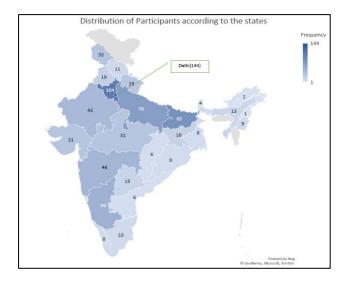


Figure 1: Distribution of the participants as per the states (n=number of participants).

Amongst the respondents, the proportion of males was slightly higher (536, 65%). Majority of the participants 398 (48.3%) were from the age group 30-44 years. 350 (42.5%) people were postgraduate or higher. As far as profession was concerned 367(44.5%) were employed with private sector and 268 (32.5%) were medical/paramedical professionals (Table 1).

Table 1: Socio-demographic characteristics of the participants.

Sociodomog	raphic characteristics	N	(%)
Sociodelliog			
Gender	Female	286	34.7
	Male	536	65.0
Age (years)	18-29	203	24.6
	30-44	398	48.3
	45-59	155	18.8
	More than 60	66	8.0
Marital status	Divorcee/ separated	12	1.5
	Married	599	72.7
	Unmarried	204	24.8
	Widow/widower	7	0.8
	Graduate	176	21.4
Education	Post-graduation and above	350	42.5
Education	Professional degree	250	30.3
	Senior secondary and below	46	3.5
	Government service	176	21.4
	Other	98	11.9
Occupation	Private service	367	44.5
Occupation	Retired	54	6.6
	Student	49	5.9
	Unemployed	78	9.5
Medical/par	268	32.5	
Total		822	100

### Awareness regarding Aarogya Setu app

Overwhelming majority (784, 95%) had heard about the Aarogya Setu App. When it was compared to see whether gender had any association with awareness about Aarogya setu app it was found that there was a statistical difference with p value (<0.001). Also males (96.6%) had slightly higher level of awareness than females (93%). Further the association between awareness and age, professional degree and occupation was also found to be statistically significant. Awareness was also slightly higher among the age group 45-59 years (96.8%), with professional degree (96.4%) and government service employees (97.2%) (Table 2).

Table 2: Awareness about Aarogya Setu app by demographic characteristics.

Socio-demographic characteristics		Awareness about Aarogya Setu app				
		Yes N (%)	No N (%)	Did not respond N (%)	P value	
Gender	Male (536)	518 (96.6)	12 (2.2)	6 (1.1)	< 0.001	
	Female (286)	266 (93.0)	14 (4.9)	6 (2.1)	<0.001	
Age (years)	18-29 (203)	187 (92.1)	11 (5.4)	5 (2.5)	<0.001	
	30-44 (398)	384 (96.5)	11 (2.8)	3 (0.8)		
	45- 59 (155)	150 (96.8)	3 (1.9)	2 (1.3)		
	>60 (66)	63 (95.5)	1 (1.5)	2 (3.0)		
Educational qualification	Graduate(176)	167 (94.9)	7 (4.0)	2 (1.1)		
	Post-Graduation and above (350)	335 (95.7)	10 (2.9)	5 (1.4)	< 0.001	
	Professional degree (250)	241 (96.4)	5 (2.0)	4 (1.6)	<0.001	
	Senior secondary and below (46)	41 (89.1)	4 (8.7)	1 (2.2)		

Continued.

Socio-demographic characteristics		Awareness about Aarogya Setu app				
		Yes N (%)	No N (%)	Did not respond N (%)	P value	
Occupation	Government service (176)	171 (97.2)	1 (0.6)	4 (2.3)	<0.001	
	Private service (367)	355 (96.7)	10 (2.7)	2 (0.5)		
	Retired (54)	52 (96.3)	0 (0.0)	2 (3.7)		
	Student (49)	42 (85.5)	6 (12.2)	1 (2.0)		
	Unemployed (78)	70 (89.7)	7 (9.0)	1 (1.3)		
	Others (98)	94 (95.9)	2 (2.0)	2 (0.5)		
Medical/paramedical professional (268)		261 (97.4)	4 (1.5)	3 (1.1)	< 0.001	

Table 3: Use of Aarogya Setu app by socio demographic characteristics.

Socio-Demographic characteristics		Use of Aarogya Setu app				
		Yes N (%)	No N (%)	Did not respond N (%)	P value	
Gender	Male (536)	434 (81.0)	83 (15.5)	19 (3.5)	< 0.001	
	Female (286)	204 (71.3)	59 (20.6)	23 (8.0)		
	18-29 (203)	142 (70.0)	42 (20.7)	19 (9.4)	<0.001	
Age (years)	30-44 (398)	325 (96.5)	58 (14.6)	15 (3.8)		
	45- 59 (155)	121 (78.1)	29 (18.7)	5 (3.2)		
	>60 (66)	50 (75.8)	13 (19.7)	3 (4.5)		
	Graduate (176)	137 (77.8)	29 (16.5)	10 (5.7)	<0.001	
Educational	Post-Graduation and above (350)	272 (77.7)	61 (17.4)	17 (4.9)		
qualification	Professional degree (250)	198 (79.2)	42 (16.8)	10 (4.0)		
	Senior secondary and below (46)	31 (67.4)	10 (21.7)	5 (10.9)		
	Government service (176)	141 (80.1)	28 (15.9)	7 (4.0)	<0.001	
	Private service (367)	302 (82.3)	52 (14.2)	13 (3.5)		
Occupation	Retired (54)	38 (70.4)	14 (25.9)	2 (3.7)		
	Student (49)	29 (59.2)	13 (26.5)	7 (14.3)		
	Unemployed (78)	57 (73.1)	12 (15.4)	9 (11.5)		
	Others (98)	71 (72.4)	23 (23.5)	4 (4.1)		
Medical/paramedical professional (268)		214 (79.9)	45 (16.8)	9 (3.4)	< 0.001	

Table 4: Usefulness of Aarogya Setu app by socio-demographic characteristics.

Socio-demographic characteristics		Usefulness of Aarogya Setu app				
		Useful N (%)	Can't say N (%)	Not useful N (%)	Did not respond N (%)	P value
Gender	Male (536)	377 (70.3)	37 (6.9)	19 (3.5)	103 (19.2)	0.009
	Female (286)	174 (60.8)	19 (6.6)	10 (3.5)	83 (29.0)	
	18-29 (203)	122 (60.1)	13 (6.4)	5 (2.5)	63 (31.0)	
A co (voowa)	30-44 (398)	282 (70.9)	25 (6.3)	18 (4.5)	73 (18.3)	0.117
Age (years)	45- 59 (155)	104 (67.1)	12 (7.7)	5 (3.2)	34 (21.9)	0.117
	>60 (66)	43 (65.2)	6 (9.1)	1 (1.5)	16 (24.2)	
	Graduate (176)	116 (65.9)	15 (8.5)	4 (2.3)	41 (23.3)	0.428
Educational	Post-graduation and above (350)	237 (67.7)	23 (6.6)	12 (3.4)	78 (22.3)	
qualification	Professional degree (250)	170 (68.0)	15 (6.0)	13 (5.2)	52 (20.8)	
	Senior Secondary and below (46)	28 (60.9)	3 (6.5)	0 (0.0)	15 (32.6)	
	Government service (176)	126 (71.6)	7 (4.0)	7 (4.0)	36 (20.5)	0.022
	Private service (367)	260 (70.8)	30 (8.2)	11 (3.0)	66 (18.0)	
Occupation	Retired (54)	34 (63.0)	4 (7.4)	0 (0.0)	16 (29.6)	
	Student (49)	27 (55.1)	1 (2.0)	1 (2.0)	20 (40.8)	
	Unemployed (78)	45 (57.7)	7 (9.0)	5 (6.4)	21 (26.9)	
	Others (98)	59 (60.2)	7 (7.1)	5 (5.1)	27 (27.6)	
Medical/paramedical professional (268)		193 (72.0)	11 (4.1)	54 (20.1)	10 (3.7)	0.046

#### Use of Aarogya Setu app

The use of the app was assessed for only those participants who had the awareness regarding the app. More than three quarters (77%) of the respondents were using the app. Among the participants who were aware about the app (784), 638 (81%) were using the app. The usage was significantly associated with gender, age, education and occupation. The usage was found higher amongst males (81%), 30-44 years of age (96.5%), persons with professional degree (79.2%), employed in private service (82%). The use of the app was found to be less amongst females, young adults, lesser educated and students (Table 3).

#### Usefulness of Aarogya Setu app

Of the total respondents, 551 (67%) found it useful and 3.5% didn't find it useful. Rest of the respondents either were not eligible to respond or didn't have any say on this parameter. When it was compared to see whether sociodemographic characteristics had any association with usefulness of Aarogya setu app it was found that there was a significant association (p value<0.05) with gender, occupation and medical profession. More number of males (70.3%), 30-44 years' age group (70.9%), post graduates and above (67.7%) or respondents having professional degree (68%), respondents working in government (71.6%) or private sector (70.8%) and medical/ paramedical professionals (72%) found the app useful (Table 4).

#### Suggestions from the respondents for improving the app

The qualitative question which encompassed suggestions for improvement reported many suggestions which can be broadly classified into: 1) Privacy and transparency 2) Information about hotspot/zone classification and its alert 3) District level facilities like ambulance, bed, ventilators, testing centres etc. and lastly improvement in technical glitches and bugs. The users also mentioned that better promotion amongst public is required for the app. Further it was also reported that real time information from credible government sources ICMR, Ministry of Health and Family Welfare should be regularly updated on the app.

## **DISCUSSION**

The ongoing use of technology has significantly improved screening, prediction, forecasting, contact tracing, process for the COVID-19 pandemic. World over, as countries emerged from lockdowns imposed to blunt the coronavirus pandemic, dozens have rolled out phone apps to track a person's movements and who they come into contact with, giving officials a vital tool for limiting contagion risks. Asian countries were the first to roll out tracing apps, with China launching several that use either direct geolocalisation via cellphone networks,

or data compiled from train and airline travel or highway checkpoints. 13

As one of the most densely populated countries, India was particularly susceptible to spread of COVID-19. Government of India took several measures out of which introducing contact tracing and mass awareness app-Aarogya Setu was one of them. The success of this app depends upon its widespread usage. This research work was crucial as understanding the knowledge and insights towards this app can help the policymakers address the challenges in the application's acceptability. So far to the best of our knowledge, only one brief research on the application has been published making the present study extremely important value addition to the COVID-19 research.<sup>14</sup>

In the present study, majority of the participants were aware about the app, using it frequently and found the app to be quite useful. This acceptability is similar to the findings presented in the literature mentioned above. In another cross sectional survey it was reported that most of the Indian residents have positive attitude towards India winning the war against COVID-19. This finding correlates with the highly positive attitude towards the app as it is one of the important measures taken by the Government. This is also similar to other studies conducted in Iran and China where positive attitude towards respective government measures was reported. 16,17

The significant difference between the app awareness and usage amongst females and young population could be taken as a direction point for the government to address and include this challenge in the promotional activities. The higher usage, awareness and frequency amongst medical/paramedical staff was found similar to other studies where higher KAP towards COVID-19 was reported. In similar survey conducted in Pakistan showed that health workers have good knowledge and good practices amongst them. This contraindicated with findings from a meta-analysis wherein health care workers and medical students had lower knowledge and positive perception as compared to general population. Description 20

The concerns raised against safety of the app as reported by the participants, has been mentioned in the worldwide survey of the contact tracing apps that highlights the debates around privacy and data management. The other expectations from the users as reported in the previous section-hotspot classification, availability of health infrastructure, fixing the bugs should be addressed by the app makers for improved acceptance. These updates can be widely promoted for ensuring further downloads and usage. Thus it is recommended that the IEC concerning the app should target young population and address above mentioned issues.

The present study had few limitations. As virtual snowball sampling method was used, the survey was

respondent driven; hence it cannot be taken as a representation for general population. The knowledge and utility among population of lower class and with lower educational qualification was not obtained due to online English and Hindi questionnaire and restricted access to community during national lockdown. Better sampling techniques and large sample size of the population would help in analysing the actual use of the app and the challenges associated.

#### **CONCLUSION**

Majority of the respondents were found to be aware of the "Aarogya Setu" app. Use was found to be higher among the males, 30-44 years age group, educated people and people engaged in government and private service. There is a need to intensify the efforts among the students, younger age group, less educated and females. This study may help the policy makers and health managers to understand behavioural intention for Aarogya Setu application in a better way and can help them to improve the accessibility of the app and instilling confidence among the public to use the app through devising more robust training modules and appropriate communication material. It is important to study the awareness and utility of this app among other population who could not be covered in this study because of the limitation of conducting an online survey.

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