JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 7, ISSUE 14, 2020

RELIABILITY AND EFFECTIVENESS OF INDIAN COVID-19 MOBILE APPS

Dr. Ankita Chaturvedi[1] , Dr. Sushil Kalyani[2], Dr Gyanesh Jain[3]

[1]Associate Professor, IIS (Deemed to be University), Rajasthan,
[2,3] Associate Professor, NIIT University, Rajasthan
Email: ankita2360@gmail.com[1], sushilk@niituniversity.in[2], gyanesh.jain@niituniversity.in[3]

Received: 14 March 2020 Revised and Accepted: 8 July 2020

ABSTRACT: As the number of coronavirus infections increases in India, the central and state government has launched many apps for tracing those who have come in contact with confirmed patients. This raises concerns that such smartphone apps may trespass upon citizens' privacy. When the users download these apps, it requires a lot of permissions at the time of registration. These permission includes access to device location, phone, Device ID, photos, media files , storage etc. Giving these personnel data permissions is a matter of great concern, Therefore, it was necessary to scrutinize these apps. Apart from the AarogyaSetu app, we have also analysed the policy documents of 21 different State/UT applications. It is found that these apps seeks a lot of unnecessary permissions and in some apps there is a absence of the policy documents regarding the application. In some cases the privacy policy are there but its too short and unclear about the purpose for which the data collected will be used. Therefore, it is essential that the Legal frameworks must have transparency about what data needs to be collected from individuals, what permissions are actually required for these applications, and a legal obligation should be established to use such information only for the public health system .The privacy policy of these applications should be transparent enough about the dismantle of these data after the COVID-19 pandemic, so as to safeguard the users.

KEYWORDS: Mobile apps, privacy policy, terms of use, permissions, legal framework

I. INTRODUCTION

As the whole world is suffering from ill effects of COVID 19 Pandemic and the negative numbers of positive cases are increasing day after day, WHO declared the confirmed cases of COVID 19 globally crossed 10 million on July 1, 2020 including deaths also crossing 5 lacs (source: https://covid19.who.int) leaving the economies worldwide bleeding.

While India was already expecting a downward trend in growth numbers even before spread of this virus, many other economies were jolted by the shockwave of this pandemic which has resulted in this unprecedented scenario and the largest global recession in the history. Companies from various industries worldwide, except a few, have seen the worst time ever and many have reached the verge of shut down or applying bankruptcy due to the lack of demand across globe. A few industries have gotten an advantage over others in this pandemic and those include industries which were dependent heavily on technology viz. Distance learning, Digital and Contactless payments, online shopping and robot deliveries, telehealth, online entertainment, and application facilitating work from home.

Many countries in the world went for either partial or full lockdown and India opted for a complete lockdown in 5 phases. The Central Government declared complete lockdown looking at the diverse geographies and population so as to control the effect of Virus. Since, the lockdown did not allow citizens to even go out of their homes unless there were situation cited as exceptional by the Government regulations, the usage of technology based digital services increased multifold. It came with many services provided by various players and there was also a flood of mobile applications (called "apps" nowadays) offered by various agencies including Governments (state &centre both) in India, focusing COVID 19 pandemic scenario and providing various information about COVID 19 spread and precautionary measures to name a few. Though all agencies were first advising the mobile users to download the apps so as to get the benefits available, few of these were made mandatory to be downloaded and be used by all the citizens who wanted to go out of their homes for either an emergency situation or for any other purpose allowed by regulations.

These application helped citizens of India in many ways but at the same time, since these application required the personal information of the user, there were many question marks and concerns of the users of these apps regarding the misuse of the information provided. Many organisations started pinpointing the safety measures

ISSN- 2394-5125 VOL 7, ISSUE 14, 2020

taken by the organisations about misuse of personal information and also raised the concern about breach of one's privacy after installing the apps on mobiles.

While many of the apps declare their privacy policy, many don't have any policy and thus intrigued us to evaluate all the apps being offered to the citizens of India in this pandemic scenario with respect to the personal information supplied to get the apps installed and the privacy policies framework by the agencies offering the apps, ensuring the level of safety measures to avoid the misuse of the information provided by the users. In this paper, first we discuss all the apps available in India and the features of these. Next we analyse the various information required to install and use the app by the user and the privacy policies being followed by the app providers. In the last, the conclusions are drawn based on our analysis of various apps, the information obtained by app providers and the privacy policy frameworks they follow.

II. LITERATURE REVIEW

Ming, L C (2020) have evaluated the contents and features of COVID-19 mobile health applications (apps) available in android-based Play Store and iOS-based App Store. They found that most iOS-based apps incorporate infographic mapping of COVID-19 cases while most android-based apps incorporate home-monitoring surveillance features, instead of providing focused educational content on COVID-19. Ans also suggested to improve these apps. Marta Azevedo Silva – EENA(2020) has done a comprehensive analysis of the use of European mobile phone applications in the fight against the COVID-19 pandemic. And observed an exponential increase in the number of mobile applications based on contact tracing. Mobile contact tracing apps are especially popular in East Asia. Interim guidance WHO (2020) is projected to update public health programmes and governments that are seeing to develop or implement digital proximity tracking technologies for COVID-19 contact tracing. The document discusses the ethical principles, technical considerations and requirements that are consistent with these principles; and how to achieve equitable and appropriate use of such technologies.

III. VARIOUS APPS DEVELOPED AND PROVIDED IN DIFFERENT STATES OF INDIA

Aarogya Setu (National Informatics Centre)

This is an app mandated by the Government of India which enables the contact tracing and determining the individual's health status by performing a Self-assessment. The app works with the Bluetooth technology and alerts the user about the positive cases nearby who are registered on this app. It also informs the user what to do in the cases where the user develops any symptoms indicating the Corona Virus infection and provides the information about the health centres in the vicinity with the contact numbers.

Quarantine Watch

Quarantine Watch is a mobile app initiated by Government of Karnataka. Its features include the application being used to monitor the location of people who are in home in Karnataka state. According to the press release issued by the Minister of Medical Education, all home-quarantined persons in Karnataka necessarily have to upload their selfies every hour via the Quarantine Watch Android app to show that they are indeed at home. After home quarantine is completed, users need not to send the selfie but they have to send daily health status for 14 days.

It seeks the permission for Device location and Timestamp. There is no clear information about the privacy policy is given in the app. It leads to the URL landrecors.karnataka.gov.in, which is the portal of the Revenue Department of Karnataka. Going through the reviews posted on the app store , it is observed that the users are experiencing technical issues with the app and they do not have access to adequate and necessary information for using it properly.

Corona Watch

Corona Watch is a mobile app is for tracking of corona suffering people in Karnataka state. This app is developed by the Karnataka State Remote Sensing Applications Centre (KSRAC). It shows the location of Corona patients and their movement history of last 14 days. This application encouraged citizens to acquaint themselves with the list issued by the Karnataka state government, so that the violators of the quarantine rules could be found and reported. It seeks permission for Device location, WiFi connection, Phone Status and identity. Using the identity permission , it is technically possible to read the IMSi number which is a unique

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number provided to every SIM or it can read the iMEI number whivh is uniquilly assigned to every mobile handset or it can also read the 64 bit unique ID that Google assigns to every Android handset.

Covid-19 Quarantine Monitor

This app is a initiative of Tamil Nadu state government, to monitors the location of home-quarantined persons in the state. The app can monitor the live location of citizens who are under home quarantine. This is basically developed to check that whether people are maintaining social distance or not. The app also allows the users to update their symptoms such as fever, cough, breathing difficulty etc. so that the police and the state health department could be notified. It seeks permission for the device location.

Cova Punjab

Corona Virus Alert (COVA) is designed and developed by the state government of Punjab. The app provides the government advisories and the information about preventive care to the users. The users can get the curfew passes in case of emergency, can get information about the home quarantine patients and the foreign returned travellers. The users can also report mass gathering via this app. It also enables the users to connect with doctors and hospitals and can also request essentials. The app requires permission for personal information, device location

Mahakavach

In the pandemic times, many of the state governments came up with various apps for helping government fight the virus and be informed about the spread of this virus. Maharashtra being one of the top states of India in terms of numbers of positive cases, where the first case was reported on 9th March 2020 in Pune, this state has reported the highest number of positive cases of Corona Virus. As an effort to handle the situations, Maharashtra Government also launched the app and the name given to it is "MahaKavach" meaning in English "The Giant Shield". Unlike other states' apps, its only for the usage of Government to identify the suspected cases who are likely to be infected by the virus and those who are already in quarantine as per the government's guidelines. The app is used to geo-fence the infected patients so as to prevent the community transmission stage of this dangerous disease by tagging the location of the infected ones and also by locating the people who might have been in contact with the infected persons.

Covid Care

The Arunachal Pradesh state Government also came up with an app and named it as COVID CARE. This app helps people who are being quarantined on a real time basis and for 24X7. Its main features are that while providing care the help provider and the person on the recipient side should be safe. This was especially helpful for the health workers of state government of Arunachal Pradesh. The other features are self-checks and emergency call numbers.

Kavach

The state Government of Chhattisgarh launched the app named "Kavach". It has a dashboard for almost real time situation of Corona spread in state, country and globally. The common feature of self-check for any symptoms of virus infection is also there in this app like most of the other apps. The common precautions and instructions while traveling, ordering for home deliveries, not to be in crowded places and appeals by the state Government to avoid the spread of rumours and fake news and the list of prevented products are integrated in this app. It also provides the notifications and details of Emergency contact numbers dedicated for calls relevant to COVID 19 cases.

test yourself goa

Bagging the title of becoming the first state in India, Goa launched a digital interface for self-test of COVID-19 for people to find out if one is infected or not and that too without going to a hospital or physician and being exposed to the risk of exposure. The tool support languages like English, Konkani and Hindi.

Covid Locator

The state Government of Goa came up with the app 'COVID-Locator' which works on tracking using GPS based location to help the government locate the corona infected patients and to ensure that they are made available the medical services and are quarantined.

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The government has the plans to track the suspected and asymptomatic corona virus carriers' ones they leave after their quarantine period to avoid the community transmission stage.

Gcc - Corona Monitoring

To monitor the people who are at their homes and are quarantined, The Greater Chennai Corporation has developed an app named as 'Corona Monitoring app' and is available on corporation's website. This app provides various operations like Quarantine capture, symptoms of General fever also the information of place which are overcrowded.

Haryana Sahayak

Haryana state Government introduced an app in the pandemic named as "Haryana Sahayak" which as per the state is a one-stop app for its citizens. It provides various features like Dashboard, help in locating the nearby confirmed corona positive cases, the medical facility assigned for COVID 19 treatment by government nearby the person, the pass issued by the authority to enable people move in and out the containment and other zones, and measures to prevent outbreak of corona virus.

Corona Mukt Himachal

like the other state governments, Himachal Pradesh Government also got an app developed to help authorities tracking the suspects of corona 19 and if there are any violations of quarantine locations.

The app also helps the health workers to collect and manage the data relevant to the movement request of citizens of Himachal Pradesh as these requests are also received on this application.

Gok DIRECT - KERELA

Kerala, being one of the states of India to be able to control the spread of Corona virus well in time and being praised for its efforts in doing so, has become the role model for all the other states of India. Many other states are following the model Kerala implemented to curb this outbreak most efficiently.

The Kerala State Government launched a mobile based app in order to control the COVID 19 spread and has given it a name "GoK DIRECT" and it not only provides information but collects the information on various statistics of Corona virus spread in the state as well. The information provided is with respect to self-test, hotspots, destitute rehabilitation, Psychosocial support, community kitchen etc and also to control the spread of fake news.

Mp Covid Response

The Government of Madhya Pradesh and the National Health Mission released the app MP COVID RESPONSE to control the Corona virus and specially to monitor asymptomatic cases. This came as an improved version of "Indore 311" app which existed already and with some additional features to help the medical workers treating the corona virus infected patients. The app enables the patient and the people who are taking care of such patients to update the daily information with respect to the symptoms of corona like fever and the breathing problems to name a few. This also has a feature of an alarm which will ring if the patient doesn't abide by the government advisory and steps out 100 meters away from his house or the place where he is being quarantined.

COPE ODISHA And COVID 19 ODISHA

COPE Odisha is an app developed by Government of Odisha to help the authorities fight against the Corona Virus and to prevent its widespread. This app provides all the updates about the corona virus situation in the state.

The other app developed by Odisha Government is COVID 19 ODISHA which enables the citizens to know about the hotspots and to connect them to various health centres offering tests for Corona Virus infection. It also helps the government identify the possible positive cases. The fake news can add to the problems of any authority and hence, this app also provides measures to curb the spread of fake news and rumours and to help people report the violation of norms laid down by government with respect to the social distancing.

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Test Yourself- Puducherry

Puducherry government also opted for technological solution as a part of its efforts in controlling the spread of corona virus. The app named Test Yourself Puducherry helps the user to carry out self-assessment and also suggests the user to ascertain that they follow the measures to keep safe and away from the infection of this virus. It will also help the patients and suspects with the information like the quarantine facilities near by and the guidelines to follow so as to prevent the infection.

Rajcovidinfo

RajCovidInfo is an app developed by Government of Rajasthan State which has features such as providing the guidelines and advisory issued by state government at frequent intervals. It also provides the features like alerts based on location of a person, the health centers nearby, the guidelines and the emergency helpline number.

Bihar Saathi

The state Government of Bihar launched an app named BiharSaathi which is to support the citizens of state. This app offers the calling facility in the emergency using the app itself, the chatbot and an option to make donations for the cause of fighting COVID 19 pandemic.

Mcovid – 19

It is the mobile app from State Government of Mizoram which enables people to join the prevention task force fighting the COVID 19 and to register as volunteer to become a help to all those who are suffering from the disease.

Uttar Pradesh Self-Quarantine App Ayush Kavach - Covid

Uttar Pradesh government released 'AyushKavach-COVID' app to help citizens of UP monitor the COVID 19 situation and help them getting the required medical facilities in the time of requirement. It also provides help to the users with many immunity boosting measures using natural ingredients like Tulsi and Clove to be used for increasing the immunity of the body.

T Covid'19

Telangana being the hub of technology, the state government of this state also introduced an app to encounter the Covid19 pandemic. It helps user with self assessment, and to solve their doubts, if any regarding their health conditions.The app helps administration also in controlling the containment and is used as a single authenticated source of information on COVID-19 for citizens. It also provides accurate information on COVID-19 in terms of number of positive cases in the state, available labs for testing, the quarantine centers, and in case of requirement can work as interface between patients and doctors.

Covid 19 West Bengal Govt.

The West Bengal Government launched the app to help fight COVID 19 pandemic. It provides all the information related to the facilities available in terms of health centers and community kitchen. At the same time, it governs the movement of citizens of West Bengal in terms of entry and exit to and from the state ensuring that government authorities can monitor the migrants and control the virus spread more effectively.

IV.ANALYSIS AND RESULTS

In India, at present, there is no framework which controls the use of surveillance or decision-making technologies of the COVID-19 mobile apps in context to privacy policy , terms of uses and the permissions required from the users. Although, the European Union has encouraged voluntary, transparent, decentralised and privacy-preserving mechanisms,which ensure that the data gathered from the apps is used only for public health resolutions, and that the surveillance tools are dismantled as soon as the pandemic is over.

We had done an analysis of the Privacy Policy and the Terms of Service of the different mobile apps developed or designed by the Central/ State government of India to combat with this deadly disease.But when the users download these apps, it requires a lot of permissions at the time of registration. These permission includes access to device location, phone, Device ID, photos, media files , storage etc. Giving these personnel data permissions is a matter of great concern,Therefore, it was necessary to scrutinize

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these apps. Apart from the AarogyaSetu app, we have also analysed the policy documents of 21 different State/UT applications.

Table: 1.1 List of COVID-19 Mobile Applications Under Study and the Total Permissions needed .

	Applications	Central/ State Government	Developed by	Total Number of permissions needed(out of 9)
1	AarogyaSetu	Central Government	National Informatics Centre under the Ministry of Electronics and Information Technology	4
2	Quarantine Watch	State Government of Karnataka	Revenue Department of the Karnataka Government	7
3	Corona Watch	State Government of Karnataka	Karnataka State Remote Sensing Applications Centre (KSRAC)	7
4	COVID-19 Quarantine Monitor	State Government of Tamil Nadu	one Pixxon AI Solutions Private Limited	6
5	COVA Punjab	State Government of Punjab	State government of Punjab	5
6	COVID CARE	State government of Arunachal Pradesh	Atsuya Technologies Pvt. Ltd.	5
7	Kavach	State Government of Chhattisgarh	Governmentof Chhattisgarh	5
8	Covid Locator	State Government of Goa	Government of Goa	5
9	Test yourself Goa	State Government of Goa	Government of Goa	2
10	GCC- Corona Monitoring	State Government of Chennai	Greater Chennai Corporation	7
11	Haryana Sahayak	State Government of Haryana	Government of Haryana	5
12	Corona Mukt Himachal	State Government of Himachal Pradesh	Government of Himachal Pradesh	4
13	GoK Direct-Kerela	State Government of Kerela	Government of Kerela	3
14	MP Covid response	State Government of	Government of MP	6
15	Mahakavach	State Government of	Maharastra state innovation society	7
16	COPE Odisha	State Government of Odisha	Government of Odisha	5
17	COVID 19 Odisha	State Government of Odisha	Government of Odisha	4
18	Test Yourself-Puducherry	State Government of Puducherry	Innovacer Inc	2
19	RajCovidInfo	State Government of Rajasthan	Government of Rajasthan	5

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20	T COVID'19	State Government of Telangana	Government of Telangana	8
21	UP Self Quarantine App	State Government of Uttar Pradesh	State Government of Uttar Pradesh	2
22	COVID 19 West Bengal Govt	State Government of West Bengal	State Government of West Bengal	3

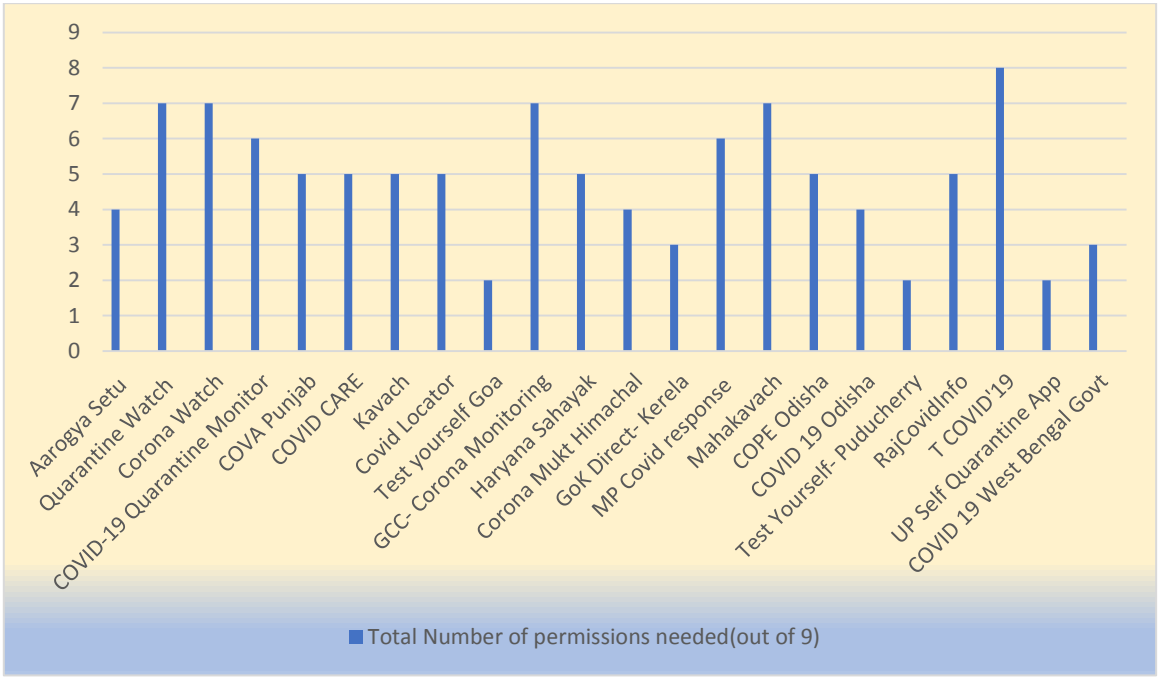

Table 1.2: Table Showing The Different Permissions Needed By Various COVID-19 Apps In India

	Yes	No	Percentage
Privacy Policy	18	4	81.82
Terms of services	7	15	31.82
Phone	11	11	50.00
Photo/ Media/ Files	15	7	68.18
Storage	15	7	68.18
Camera	8	14	36.36
Device ID and call information	5	17	22.73
Network Base location	9	13	40.91
GPS location	21	1	95.45
WIFI/Bluetooth Permission	3	19	13.64
Other Permissions	20	2	90.91

Source: Self Created Data sheet on Excel

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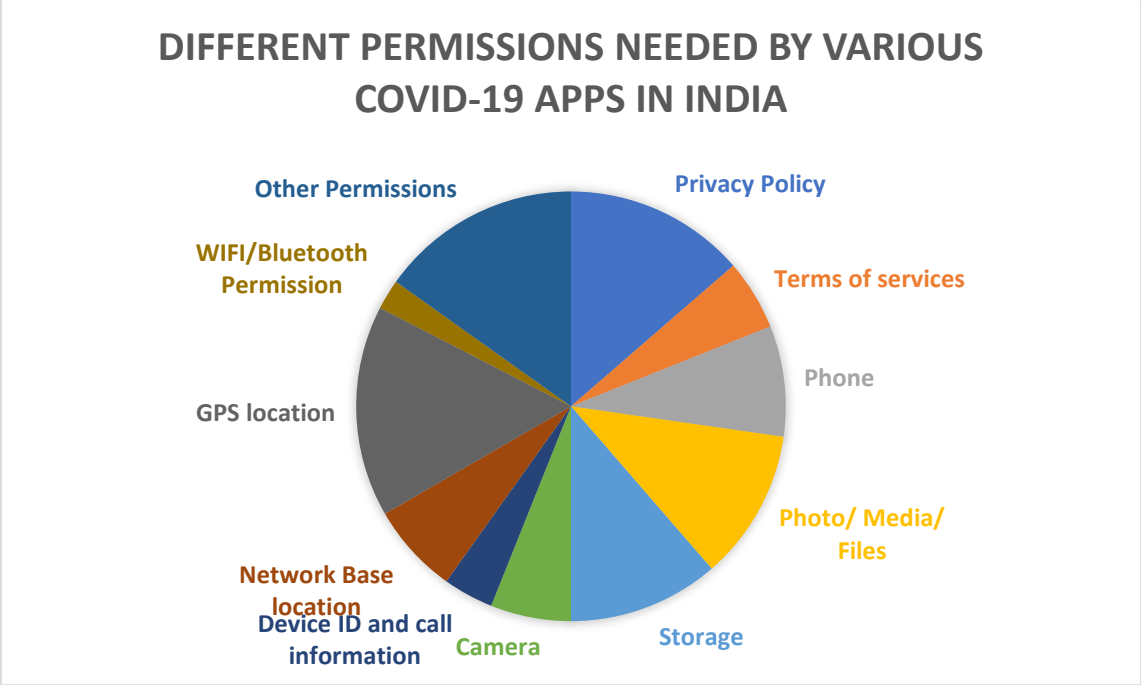

The above table and chart depicts that there is a absence of the privacy policy and the terms of services in many COVID-19 based applications. These are actually needed to bind the publisher/developer of the application and the end users. In some cases, the apps are developed by a private entity who are outsourced by the government itself but the link provided to the Privacy Policy readdresses to the website developers policy. There is a absence of the policy documents regarding the application. In some cases the privacy policy are there but its too short and unclear about the purpose for which the data collected will be used. Some of the app have the privacy policy but there is an absence of the terms of services. Some of the apps privacy policy are silent about how much data will be retained after the pandemic or the mode of retention.In some of the apps the user's account continues even if the app is deleted by the user from his/her phone. On the other side in some apps all personnel information collected will be purged from the app after 30 to 60 days depending on some clauses.

It is also observed that the Indian COVID-19 applications requires excessive permissions at the time of registration. It is a matter of concern that an app only intended to provide information and advisories require permission to access location, photos, media, files and the storage. 50 % of the applications under study required permission to access the phone, 68.18 % requires permission for photos/ media / files access. 68.18 % apps requires permission of storage. 36.36 % apps requires permission for camera. 22.73 % apps requires permission for Device ID and call information. Using the identity permission , it is technically possible to read the IMSI number which is a unique number provided to every SIM or it can read the IMEI number which is uniquely assigned to every mobile handset or it can also read the 64 bit unique ID that Google assigns to every Android handset. 40.91 % apps requires permission for network base location whereas majority of the apps i.e. 95.45% requires permission for GPS location. Very few apps i.e. 13.64 % requires WiFi/ Bluetooth permission . This is convenient, because most smartphones have it. But it has a history of security breaches that have been much-reported and studied. And there are lots many other permissions which are also required by these COVID-19 applications in India.

V. CONCLUSION

While some of these apps have sought sweeping access to smartphone functionalities, others stop just short of that, collecting and uploading data without specifically obtaining the consent of users in every case. Some of the features that do not necessarily adhere to all privacy norms are all right as long as the app is voluntary. It is essential that the Legal frameworks must have transparency about what data needs to be collected from individuals, what permissions are actually required for these applications. The unnecessary permissions need not to be taken. And there is a requirement that a legal obligation should be established to use such information only for the public health system .The privacy policy of these applications should be transparent enough about the dismantle of these data after the COVID-19 pandemic, so as to safeguard the users.Limitations of the study includes the number of COVID-19mobile apps taken in this study. The study

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has also not discussed about the technicalities related to these security breaches. There is a scope to discuss about the technicalities related to security and data breaches of the all COVID-19 mobile apps, developed by centre or the state government. Further a comparative analysis of the popular COVID-19 mobile apps across the world can be done.

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