Community Based Self-Administered Syndromic Surveillance Mobile Application – A Strategic Approach to Monitor COVID Situation at Micro Level

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ABSTRACT

Introduction: Web based surveys avoid direct contact of health care workers to collect information and protect them from harmful exposure to the infectious diseases. They have already been used for influenza in different countries. Success of any health program depends upon the community participation, in a similar way participatory surveillance activity will help healthcare administrators work in early detection of cases and initiation of early treatment.

Methodology: Glide apps is a free platform to create mobile applications using Google spreadsheets. Creation and sharing of mobile app in Glide apps platform is hassle-free work and needs only a Gmail account. Based on this background, a mobile application was developed using Glide apps platform to collect information at micro level, about development of COVID symptoms in the public.

Results: The article discussed about need of community participation in the surveillance program and development of web based self-administered surveillance tools. Steps in creation of the mobile application were explained in detail and features of the surveillance tool were also depicted with images.

Conclusion: The advantages of participatory surveillance system over traditional surveillance practice were mentioned. Traditional surveillance system collects information through health care workers, whereas in participatory surveillance program information will come from the public. Strengths and limitations of the surveillance tool were discussed and scope for further development of the mobile application was also mentioned in the current review article.

Key-words: Community participation, COVID-19, Mobile application, Surveillance systems, Syndromic surveillance

INTRODUCTION

COVID (Corona virus disease)-2019 is a newly emerged communicable disease, reported first in China and later spread to all over the world and emerged as an ongoing global pandemic.[1,2] The disease is caused by Severe Acute Respiratory Syndrome Corona virus type 2 (SARS CoV-2), a positive stranded RNA virus with a crown like appearance.[3] It is believed to have zoonotic origin i.e., transmitted from bats to man.[3] The knowledge about the virus, disease and treatment options are still unclear in spite of several researches being conducted globally by several scientists. Most of the studies state that it is transmitted from person to person through respiratory droplets from

coughs and sneezes within a range of about 1.8 meters or through contact with contaminated surfaces.[4] Some studies also report virus transmission through air and through liquid waste water passing in the drainage canals.[5,6] Majority of infected cases remain as asymptomatic or have mild symptoms.[7] Some, however, have high grade fever, dry cough and breathlessness, muscle and joint pains and multi organ failure.[8] Patients, who have co morbid conditions such as hypertension, diabetes and other chronic respiratory problems are at high risk of developing sever disease compared to others.[8] The virus transmission is influenced by several factors such as overcrowding, movement of people from one place to another place, mass gatherings etc.[9] At the same time, risk of virus transmission is also increasing because of asymptomatic cases which is estimated to be about 80%(ref).(10) Current case fatality rates of COVID-19 are reported around 7% in the world and around 3% in India.[11,12] As the knowledge about treatment of the COVID-19 is limited, all the national governments depend upon the prevention strategies. Most countries have used the strategy of [13] They stopped travel to foreign countries and public transport within the country and people are advised to stay within the home. Governments created awareness among public about the usage of sanitizers, face masks and social distancing in public places as preventive measures of COVID-19.[14]

The number of reported cases might not actually represent the real situation. There might be many unreported cases, because of asymptomatic condition.[15] These asymptomatic cases create an iceberg phenomenon and a continuing risk of transmission of COVID- 19 to other persons even during lock down time. First COVID case in India reported in Kerala on January 30th 2020. From March 2nd 2020 onwards, COVID cases are being continuously reported in India and are in increasing trend.[16] To control further spread of disease, Government of India (GOI) imposed lockdown on total country on March 24th 2020.[17] But the measures to control COVID should be continued for a prolonged period. Finding every case, isolating, testing , taking care of them, and tracing and quarantine of every contact are the important steps in controlling the burden of COVID cases.[18] The first step therefore in controlling the disease is finding every case, which can be done by surveillance.

Surveillance is "an ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health".[19] However, the surveillance techniques differ in terms of scope, methods, and objectives: some for collecting information about Communicable diseases and some for non-communicable infections; some are involved in collecting information about behaviours and health conditions and some are based on laboratory reports. Apart from its use for public health action, surveillance data can be used to understand natural history of disease, spreading pattern of disease, and to generate hypothesis about the risk factors contributing to the disease occurrence. Surveillance can be done in two different ways viz., active or passive surveillance. Active surveillance is done in a small geographical area employing staff members to regularly contact heath care providers or the population to seek information about health conditions. Though providing the most accurate and timely information, it is also expensive Passive surveillance includes collection of reports from individuals, organizations and other institutions. It is relatively inexpensive strategy, but has some limitations like quality and completeness of data.[20] A combination of passive and active surveillance techniques will yield better results, passive surveillance being be applied to a large geographical area and active surveillance to where high number of cases are reported. Passive surveillance traditionally done by using paper and has now moved to a web-based system. Some studies already proved that, web-based surveillance of health indicators yields almost the same results as paper-and-pencil surveillance.[21, 22] Web based surveys avoid direct contact of health care workers to collect information and protect them from harmful exposure to the infectious diseases. Self-administered surveys have already been used to collect information about development of symptoms in influenza cases and to track the risk factors of non-communicable diseases.[23–26]

Need of community participation in the surveillance program:

Success of any health program depends upon the community participation, which is one of the four principles of primary health care approach.[27] Government has successfully spread health education and motivated the public in usage of sanitizers and masks. People understood the importance of social distance in public areas. In a similar way community participation in surveillance activities will help healthcare administrators work in early detection of cases and initiation of early treatment. It will play a crucial role in controlling further transmission of disease. Students in the colleges, staff in the offices need to be monitored regularly after the lockdown period. For that purpose, community based self-administered electronic surveillance tool would be very beneficial. Based on this background a web based self-administered surveillance tool was developed. It can be used to collect information about development of COVID-19 symptoms from the public at the micro level.

Development of web based self-administered surveillance tool:

Web based syndromic surveillance works on the assumption that people will voluntarily share information about the appearance and development of signs and symptoms. The tools can be of different types viz., websites or web forms mobile applications, SMS based software or IVRS tools.[28,29] With a good percentage of the population using smartphones and apps a mobile application can also be used for surveillance activities.

Several platforms are available for developing mobile applications. However, their development was beyond the scope of lay users as knowledge of coding and handling of the background data base was required. However new platforms have now emerged which obviate this requirement. No one can create an app just by draging and adding features to prebuilt templates in the website. One can chose features needed in the mobile application based on his or her requirement. Handling of the background data base is also relatively simple and within full control of the author.[30] Glide apps is a free platform to create mobile applications using Google spreadsheets. [31], Data collected by the app is stored in the google spreadsheets. Charts or maps can easily be incorporated. It also has a chat feature. Creation and sharing of mobile app in Glide apps platform is hassle-free work and needs only a Gmail account.(32) Based on this background, a mobile application was developed using Glide apps platform to collect information at micro level, about development of COVID symptoms in the public.

Steps in creation of the mobile application:

Creation of mobile application in go.glideapps.com is easy and doesn't require any coding knowledge.[32] To create an app, one needs to sign in to the website using a Google account. There will be two options in the user account dashboard to create a new app viz, copying an existing app template or creating an app by converting a Google spreadsheet automatically.[31] The current app was created by the second method of using Google sheets. The basic fields and tabs were created on the Google sheet. The website then automatically converted it into an app. After the initial template was generated, the options in the layout, tabs, data flow and settings were used to change or add new features and to visualize the data according to needs of the designer. The new features such as login page or maps are added by selecting options in the tabs. The display of each page was changed by using the lay out options.

For data security, access to the app was made with email sign in. On first sign in the demographic de-tails of the individual are captured. These details are visible only to the individual and to the person having administrative rights. The app is designed so that one member in the family only needs to have it.

Features of surveillance tool:

The app can be accessed as a web page from https://m6kyt.glieadpps.io. On first access a welcome page is displayed as in Fig 1a. and on registering a registration pin is sent to the mobile device. Once registered the page can be saved to make it a resident app on the device. The app has five tabs viz, Information, Personal details, Case details, Chat and Map. After log in the "Information" tab is displayed which describes the importance of surveillance in controlling the COVID transmission and how the app will help in the process. (Fig 1.b) On first accessing the personal details tab the user is directed to "Sign up". (Fig 1.c) A form page opens up wherein the demographic information of the individual along with the details of the number of people in the family is captured. (Fig 1.d). Once the details are entered the Personal details tab contains information given. (Fig 1.e) Only the data of the user is visible; for security reasons data of other users cannot be seen. Below the demographic particulars, there is a date series in the app to choose a particular date. This is the self-reporting form If any family member has symptoms suggestive of COVID the user can tick the particular date. Once that is done an "Open form" option will be displayed above the date series. (Fig 1.f) The user can enter the details about name of the patient, age, sex, date of onset of symptoms in form. (Fig 1.g) Further the user has to answer a list of related boolean questions such as presence of symptoms, questions related to previous health condition, travel history, contact with COVID patient also in the surveillance form. In addition to the above the user should fill address, area details and upload a photo of house for easy recognition of house in that area. (Fig 1.h) After filling the form, details are submitted by clicking on tick button in the top right corner. Automatically, each case will get an unique ID number. In the case details tab an administrator can access the line list of all cases entered by the all registered users. (Fig 1.i) After submitting the details, individual users cannot edit or access the case details. (Fig 1.j) In the chat tab, members can chat with others to discuss about various health issues. (Fig 1.k) In the map tab, a map with markers will be displayed. (Fig 1.l) Markers in the map will show the address of cases submitted in the case details form. It is useful to assess spatial clustering of cases. Once a drop pin is pressed the image of the house is displayed at the bottom. On clicking on the image of the house, the details of the individual will be displayed.
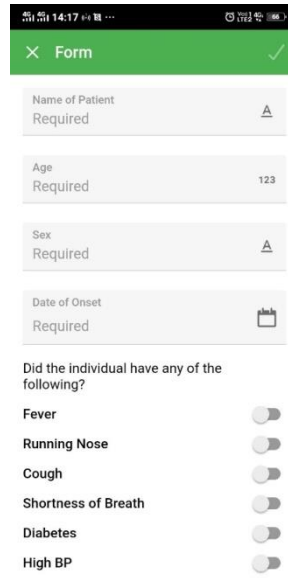
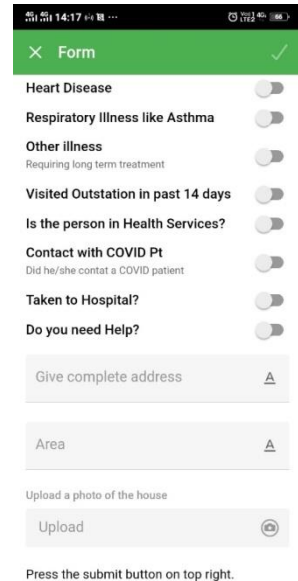**Figure 1: Images showing the features of web based syndromic surveillance tool**
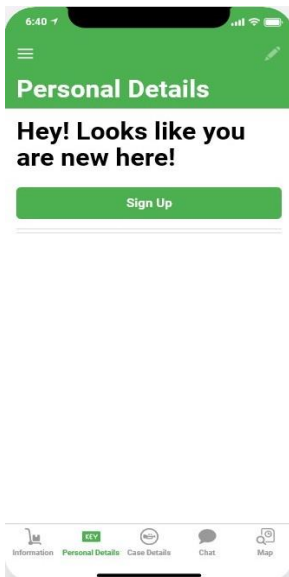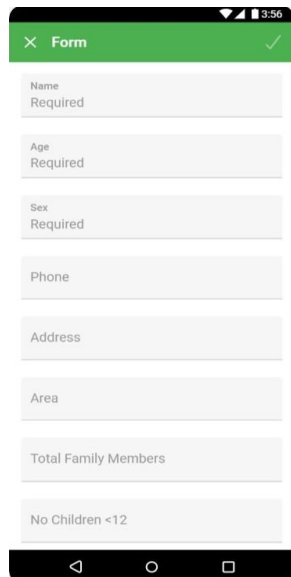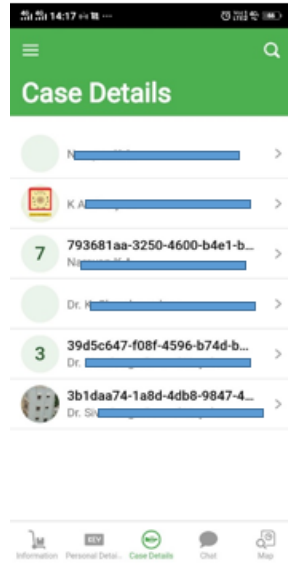

1.a Registration

1.b Information tab
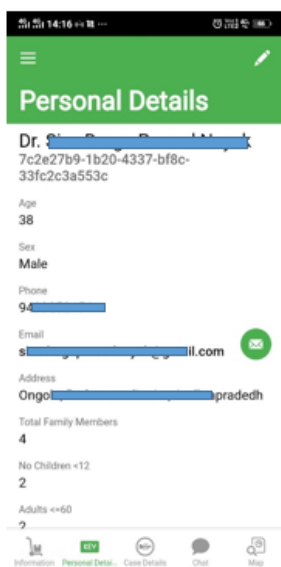
1.g Surveillance form

1.h Surveillance form
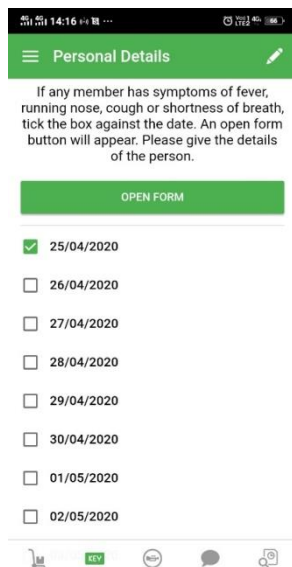
1.c Signup

1.d registration
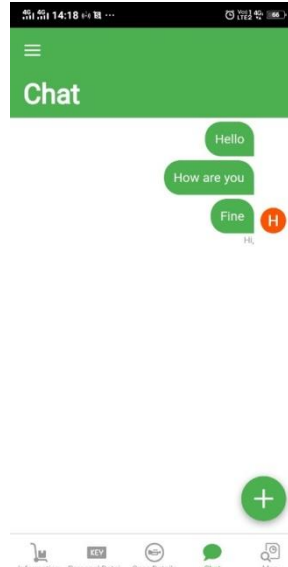
1.i Line list of cases
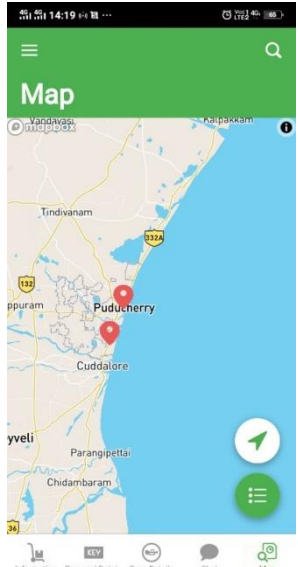
1.j Individual case details

1.e Personal details

1.f Open surveillance form

1.k Chat

1.l Map

This will help in easy identification of case location for further action. The app has as share feature, It can be shared to another person by scanning QR code with phone camera or by sending the link through SMS, Whatsapp or email.

DISCUSSION

A priority of the public health system is early and accurate detection of disease outbreaks. IDSP. In 2004 an Integrated Disease Surveillance Project (IDSP) was established to strengthen/maintain decentralized laboratory-based IT enabled disease surveillance system for epidemic prone diseases to monitor disease trends and to detect and respond to outbreaks in early rising phase through trained Rapid Response Team (RRTs). It is now called the Integrated Disease Surveillance Programme under National Health Mission and is operational in states at the district level.[33] The 3 data forms which are filled manually have the cumulative number of cases per week. Only the Laboratory forms have a line list of cases. By 2015 Block level data entry of the forms was implemented in phased manner across the country and by 2017 the Portal was upgraded to give real time data visualization. In November 2018 The IDSP component of was integrated into The Integrated Health Information Platform (IHIP), a web-enabled near-real-time electronic information system.   It consists of an android app which accesses a common population data base to report on illness, death or an event in the community and give geospatial information for managing disease outbreaks and related resources. However, the app is based on reporting by a health worker.[34,35]

This traditional practice for surveillance generally presents several issues, such as a delay of one week or more in releasing reports, population biases in the health-seeking behaviour, and the lack of a common definition. [36] Participatory surveillance systems have emerged in several countries around the world with the aim of monitoring influenza circulation through Internet reporting of self-selected participants[24,26,37]. One of these systems, the Influenza net project, has been established in Europe since 2011 and it is now present in ten European countries.[26] Participatory systems may suffer from self-selection bias causing non representativeness to the general population. Yet, they have been shown to provide relevant information to estimate age-specific influenza attack rates[38], influenza vaccine effectiveness[39], risk factors for ILI[38,39], and to assess health care seeking behaviour[28,36,39]

How reliable are patient and family self-reported information? Bourgeois et al., found they could assign cases to disease categories with sensitivities much higher than conventional data sources.[40] The sensitivity for Self-report tool for identifying respiratory and gastrointestinal problems were 88% and 86%, respectively.[40]

Strengths and limitations of the tool:

Self-administered surveillance tool is very easy to create and use. The biggest advantage is that the author can easily create the app and have full control on the data without the assistance of IT professionals. It protects health care workers to avoid unnecessary exposure to the corona virus while collecting surveillance details. The app can be saved as a template and modified for use for surveillance of other conditions, or self-reporting cohort studies, treatment compliance studies etc.[41] The tool language can be changed into any local language by changing the google sheets column headings in the data tab into the corresponding languages. The Surveillance form is self-explanatory, doesn't require any medical knowledge. Surveillance forms can be submitted every day, which will be useful to monitor progress of the disease. If the symptoms persist and condition deteriorates, administrator of app can inform health care worker to shift the case immediately to a hospital. Chat option can be used to chat with health care providers to clear doubts. Mapping the cases based on the area details is another strength of this app.

In spite of several strengths it has some limitations. The free version of the app has capacity to store data up to 500 rows only. That means one can collect information for about for hundred households. The paid version has no limit on the records. The user has to have a Smartphone and an email id with connection to the internet. An offline feature is under development. The free version of the tools will collect and store information for a small geographical area only. Data from different areas in the city or village will need to be integrated manually into a single data base.

Scope for Further development:

This mobile app basically developed for surveillance at micro level. Thus, integration among different surveillance apps is the major limitation of this surveillance tool. This limitation can be overcome by further advancement of the app.

CONCLUSION

COVID 19 is a newly emerged communicable disease in the world. Long term precautionary measures and surveillance activities should be conducted to control the incidence of new COVID cases in future. Community participation is one of the four principles of primary health care, without

which health care activities cannot be implemented effectively. Web based self-administered surveillance tool had the feature of community participation which improve the surveillance of COVID cases and ultimately protect the health status of people after lockdown.

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